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ECONOMIC PERFORMANCE AND THE  
MILITARY BURDEN IN THE  
SOVIET UNION

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A COMPENDIUM OF PAPERS

SUBMITTED TO THE

SUBCOMMITTEE ON FOREIGN ECONOMIC POLICY

OF THE

JOINT ECONOMIC COMMITTEE  
CONGRESS OF THE UNITED STATES



Printed for the use of the Joint Economic Committee

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## LETTERS OF TRANSMITTAL

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SEPTEMBER 18, 1970.

*To the Members of the Joint Economic Committee:*

Transmitted herewith for the use of the Joint Economic Committee, and other Members of Congress, is a study of current economic developments in the U.S.S.R. entitled "Economic Performance and the Military Burden in the Soviet Union." This is the latest in a series of studies of the Soviet economy supplemented by hearings which the committee has published periodically since 1955. The present comprehensive research study is designed to provide the committee and the Congress with factual data and authoritative interpretative comment on the economic performance of the Soviet Union.

The committee is indebted to the many contributors and agencies, listed in the letter of Representative Hale Boggs, chairman of the Foreign Economic Policy Subcommittee, Joint Economic Committee, who have given so generously of their time and abilities to complete this outstanding project.

Of course, the views expressed in these materials are those of the individual contributors and do not necessarily represent the views of the agencies with which they are connected, this committee, its individual members, or the committee staff.

Sincerely,

WRIGHT PATMAN,  
*Chairman, Joint Economic Committee.*

SEPTEMBER 17, 1970.

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

DEAR MR. CHAIRMAN: Transmitted herewith is a study of current economic developments in the U.S.S.R. entitled "Economic Performance and the Military Burden in the Soviet Union." This comprehensive research study is designed to be responsive to the continuing interest of the committee and the Congress in objective factual data and relevant interpretive comment on the economic performance of the Soviet Union in comparison with other industrially developed nations of the world. This is the latest in a series of hearings and studies of the Soviet economy published periodically by the committee since 1955.

The present study has been prepared in the form of a compendium embodying a selected range of professional papers contributed by invited specialists in their respective fields drawn from the agencies of the Federal Government in Washington, universities and a private research organization. The committee is indebted to these contributors

who have given generously of their time and expertise to provide the latest available information and competent analytical perspective on this important subject. They are the following:

|                      |                    |
|----------------------|--------------------|
| Michael Boretsky     | John P. Hardt      |
| David W. Bronson     | I. S. Koropecy     |
| Scot Butler          | Robert S. Kovach   |
| Terence E. Byrne     | Richard J. Lee     |
| David W. Carey       | Earl L. Michell    |
| Stanley H. Cohn      | Priscilla Painter  |
| Orah Cooper          | Stephen Rapawy     |
| Robert A. Dockstader | J. T. Reitz        |
| John T. Farrell      | Barbara S. Severin |
| Murray Feshbach      | Andrew Sheren      |
| Ann S. Goodman       | Rodney E. Steele   |

The committee wishes to avail itself of this opportunity to express its appreciation of the wholehearted cooperation it has received from the following agencies of Government and other institutions:

|                             |                              |
|-----------------------------|------------------------------|
| Bureau of the Census        | State University of New York |
| Central Intelligence Agency | (Binghamton, N. Y.)          |
| Department of Commerce      | Temple University            |
| Library of Congress         | Rand Analysis Corporation    |

Of course, the views expressed in these materials are those of the contributors and do not necessarily represent the views of the agencies, institutions, the committee, individual members thereof, or the committee staff. It is clear that some of these studies present different estimates for what apparently represents the same phenomenon—such as Soviet defense activities. For the most part, this is due to the high degree of secrecy surrounding such activities. It is hoped that publication of these data will permit fuller exploration of the subject matter by the experts with a view to minimizing discrepancies and arriving at closer approximations to the truth. This subcommittee plans to examine the more prominent areas of controversy through public hearings to aid in this process of achieving a fuller understanding of events.

A particular expression of thanks is hereby extended to the Legislative Reference Service of the Library of Congress for assigning to this project the services of the late Leon M. Herman who planned the scope of research and assembled the services of the authors. Also we take this opportunity to thank Vladimir N. Pregelj also of the Library of Congress for his valuable work in coordinating and editing the various chapters of the study. The study was supervised at the committee level by John R. Stark.

Sincerely,

HALE BOGGS,  
*Chairman, Subcommittee on Foreign Economic Policy.*



# CONTENTS

---

|  | Page |
|--|------|
| Letters of Transmittal.....  | iii  |
| Introduction.....  | 1    |
| COMPENDIUM ARTICLES  |      |
| Recent Trends in the Soviet Economy<br><i>By</i> Terence E. Byrne.....                                     | 3    |
| General Growth Performance of the Soviet Economy<br><i>By</i> Stanley H. Cohn.....                         | 9    |
| Developments in Soviet Industry<br><i>By</i> Robert A. Dockstader.....                                     | 18   |
| Soviet Agriculture<br><i>By</i> David W. Carey.....  | 26   |
| The Fuels Industries<br><i>By</i> J. Richard Lee.....  | 33   |
| Freight Transportation in the U.S.S.R.<br><i>By</i> Earl L. Michell <i>and</i> Priscilla Painter.....      | 38   |
| The Soviet Capital Investment Program<br><i>By</i> Scot Butler.....  | 43   |
| The State Budget for 1970<br><i>By</i> Rodney E. Steele.....   | 54   |
| Population<br><i>By</i> Murray Feshbach.....   | 60   |
| Labor and Wages<br><i>By</i> Murray Feshbach <i>and</i> Stephen Rapawy.....                                | 71   |
| Education<br><i>By</i> Ann S. Goodman.....   | 85   |
| Consumer Welfare<br><i>By</i> David W. Bronson <i>and</i> Barbara S. Severin.....                          | 93   |
| Foreign Trade of the U.S.S.R.<br><i>By</i> Robert S. Kovach <i>and</i> John T. Farrell.....                | 100  |
| Soviet Economic Assistance to the Less Developed Countries of the Free World<br><i>By</i> Orah Cooper..... | 117  |
| Structure and Organization of Defense-Related Industries<br><i>By</i> Andrew Sheren.....                   | 123  |
| Soviet Defense-Associated Activities Outside the Ministry of Defense<br><i>By</i> J. T. Reitz.....         | 133  |
| The Economic Burden of Soviet Defense Outlays<br><i>By</i> Stanley H. Cohn.....                            | 166  |
| The Technological Base of Soviet Military Power<br><i>By</i> Michael Boretsky.....                         | 189  |
| Industrial Location Policy in the U.S.S.R. During the Postwar Period<br><i>By</i> I. S. Koropeckyj.....    | 232  |

VI

COMPENDIUM AUTHORS

|  | Page |
|--|------|
| [Alphabetical listing]                         |      |
| Boretsky, Michael.....                         | 189  |
| Bronson, David W., and Barbara S. Severin..... | 93   |
| Butler, Scot.....                              | 43   |
| Byrne, Terence E.....                          | 3    |
| Carey, David W.....                            | 26   |
| Cohn, Stanley H.....                           | 9    |
| Cooper, Orah.....                              | 117  |
| Dockstader, Robert A.....                      | 18   |
| Farrell, John T., and Robert S. Kovach.....    | 100  |
| Feshbach, Murray.....                          | 60   |
| Feshbach, Murray, and Stephen Rapawy.....      | 71   |
| Goodman, Ann S.....                            | 85   |
| Koropeckyj, I. S.....                          | 232  |
| Kovach, Robert S., and John T. Farrell.....    | 100  |
| Lee, J. Richard.....                           | 33   |
| Michell, Earl L., and Priscilla Painter.....   | 38   |
| Painter, Priscilla, and Earl L. Michell.....   | 38   |
| Rapawy, Stephen, and Murray Feshbach.....      | 71   |
| Reitz, J. T.....                               | 133  |
| Severin, Barbara S., and David W. Bronson..... | 93   |
| Sheren, Andrew.....                            | 123  |
| Steele, Rodney E.....                          | 54   |

## INTRODUCTION

The Soviet leadership is preparing a blueprint for their next Five Year Plan for 1971-1975 to be aired at the Twenty-Fourth Party Congress. Such occasions in the past have often been used for announcing major economic decisions. This time may be such an occasion, with the formulation of those sections of the Ninth Five Year Plan on economic growth and military expenditures likely to be the focal points for interest. Therefore, it is timely for the Joint Economic Committee to take a look at the factors influencing these decisions and the possible impacts of alternative decisions among military and civil programs. It is thus appropriate that this volume represents not only an updating of previous annual indicators on the performance of the Soviet economy but also takes a special look at the economic implications of national security programs.

The current assessment of Soviet performance details the shortfalls in the last several years of the Eighth Five Year Plan in almost all areas. Agriculture, to be sure, continues to plague Soviet leaders—even as it did their Tsarist predecessors—when weather was bad. In 1969 weather was especially unfavorable for agriculture. But more disturbing to Soviet leaders was the slowdown in industry and the indications that only significant improvement in capital and labor productivity would return high levels of industrial growth.

Resumption of high growth involves addressing the pressing bottlenecks in fuel, labor, construction and agricultural supply. Each require more investment. The nub of the investment problem is the size and quality of the Soviet defense programs. In the short run, release of resources for addressing the many apparent bottlenecks lies in a lower defense priority. In the long run economic reform may raise the efficiency and responsiveness of the Soviet economy, but on the eve of the Ninth Five Year Plan immediate economic relief can be provided only by shift of resources from the Soviet military-support industries.

Indeed in the past, the Soviet economy has shifted among defense and civilian needs in a rather cyclical pattern. But throughout the shifts the military has maintained economic control not only in the industries connected with the Ministry of Defense but within wide ranging sectors of transport, health and para-military activities. To describe this control system as a Soviet military industrial complex would perhaps understate the direct control exercised by the Soviet military in normally civilian activities. This military institution during the decade just completed has commanded an increasing share of the national product for producing military and space hardware. At a time when the U.S. share may be declining the relative Soviet defense share takes on increasing importance.

With successful strategic arms limitations (SALT) talks, a moderating of war and tension in Southeast Asia, the Middle East and elsewhere, the Soviet priority for military needs may be reduced to allow

them to turn their attention to urgent domestic needs. Still, such a calming of international tensions may not be easily assumed. A continuation of the present situation may leave the voice of the military strong in Soviet policy circles and dictate the priorities of the upcoming Five Year Plan. In any event the papers in this volume will throw light on the urgent felt need to take steps to improve the Soviet economy and the consequences of inaction.

## RECENT TRENDS IN THE SOVIET ECONOMY

*By* TERENCE E. BYRNE

### PRODUCTION AGGREGATES

#### A. GROSS NATIONAL PRODUCT

For the Soviet Union, 1969 was a year of slower growth and generally unsatisfactory economic performance. Nevertheless, the USSR easily maintained its second place position among the world's economic powers, producing only half as much as the United States but almost 2½ times as much as third ranking Japan or fourth ranking West Germany. Measured on a per capita basis, however, Soviet gross national product (GNP) is only about 40 percent of the American or two-thirds of the northwest European and is comparable to the Italian or Japanese.

During 1969, Soviet GNP increased only 2.3 percent, that is, at less than half the rate maintained during the preceding several years and the lowest rate posted since the disastrous agricultural year of 1963. Over the years, the rapid growth of factor (i.e., capital and labor) inputs has been largely responsible for the rapid growth of Soviet output. Employment increased more rapidly in the Soviet Union during the 1960's than in any other major industrial nation, largely because of demographic circumstances. The Soviet capital stock also grew rapidly, thanks to rapid growth of investment. Another source of output growth has been rising joint factor productivity, that is, improvement in the efficiency with which measured inputs are used. From 1961 through 1967, joint factor productivity in Soviet industry increased slowly, however, and during 1968-69 it apparently registered a slight decrease. Year to year variations in weather conditions have been sufficient to cause sizable swings in the rate of change of joint factor productivity in agriculture.

Dissatisfaction of the Soviet leaders with the performance of the economy is evident in their speeches and in a flood of press articles that urge better and more intensive work and announce new measures to alleviate specific difficulties. Basically, concern seems to be centered on the declining rate of growth of nonagricultural production, but chronic difficulties in agriculture draw attention as well. Measures aimed at increasing the output obtained from given inputs have been widely publicized. Much attention has been given to measures for improving the distribution of labor and the organization of producing units or work tasks as well as to measures intended to speed the development and introduction of new technology. Enterprises and organizations of all sorts are being pressured to release unneeded workers for employment elsewhere. Nevertheless, large scale transfers of labor from agriculture, which absorbs an anachronistically large portion of the labor force, are not being advocated publicly. To date, no satisfactory cure for the deceleration in output growth has been hit upon.

## B. AGRICULTURAL PRODUCTION

Employing about one-third of the labor force, the agricultural sector accounts for over one-fifth of gross national product. Hence, poor results in agriculture were a major factor in the unsatisfactory overall economic performance of 1969. Total agricultural output declined 4½ percent, with crop production down 9 percent, but livestock production did post a slight increase. Grain output, down 5 percent, failed for the third successive year to surpass the record level achieved in 1966. Unfavorable weather was the most visible source of difficulties in agriculture. Failure to follow through on a major investment program and the continuation of chronic organizational problems exacerbated the situation. Deliveries to the farms of industrially produced inputs such as machinery and fertilizer increased but remained well below targets projected by the Brezhnev regime in 1965. Taking the longer view, it can be seen that Soviet agriculture is making progress despite occasional setbacks. Agricultural production in 1969 was 12 percent above the level achieved in 1964, the last year of the Khrushchev era.

## C. INDUSTRIAL PRODUCTION

During 1969, the rate of growth of civilian, i.e., non-defense, industrial production declined for the third year in the past four, reaching the lowest level of the post-World War II era. Dividing civilian industrial production into three broad categories, it can be observed that from 1968 to 1969 the growth rate for industrial materials declined from 5 percent to 4 percent, the growth rate for nondurable consumer goods from 5 percent to 3½ percent and the growth rate for civilian machinery from 9½ percent to 9 percent.

The 1969 decline in the rate of growth of industrial materials output was highlighted by a serious deceleration of growth in the paper and paperboard and the ferrous and nonferrous metals industries. Production of only one major type of industrial material—coal—increased faster in 1969 than in 1968. The growth of nondurable consumer goods production was slowed primarily by a sharp deceleration in the growth of processed foods output. In the civilian machinery category, consumer durables production set the pace.

## OBSERVATIONS ON GNP END USES

### A. DEFENSE

Soviet defense expenditures increased intermittently throughout the 1960's. During 1967 and 1968, explicit defense expenditures in the state budget increased about 25 percent, but this figure was influenced by the enactment of sweeping price changes. A further increase of 6 percent was registered in 1969. More than 10 percent of GNP currently is being allocated to defense objectives.

The defense activities that account for more than a tenth of Soviet gross national product naturally absorb productive resources that otherwise could be used to produce goods for consumption and/or investment. The continuing trend toward progressively more sophisticated and more expensive weapons systems has led to considerable

discussion in the United States of the hypothesis that defense is becoming an intolerable—or at least extremely onerous—burden upon the Soviet economy.

In support of the onerous burden hypothesis, it sometimes is argued that the Soviet leaders are finding it increasingly difficult to reject or postpone the satisfaction of consumers' wants. Revolutionary enthusiasm, it is said, no longer is sufficient to make sacrifices of consumer welfare acceptable either to the population at large or to many Communist Party members and leaders. The very sizable improvements that have been made in consumer welfare in recent years have not relieved universal dissatisfaction with living conditions, but rather may have whetted the general appetite for further gains. The conviction is said to be spreading that Communism must prove its superiority over capitalism by permitting the Soviet people to live even better than the people of advanced Western countries.

The defense burden also is thought to be growing more serious because the portion of gross national product that is invested rather than allocated to consumption or defense must be increased if output is to grow at the rates achieved in the past. If the growth of GNP is permitted to slow, the satisfaction of future needs of various sorts will have to be postponed or sacrificed. For several reasons the Soviets are finding that each given amount of gross investment is becoming associated with a progressively smaller increase in output. Growth of gross fixed investment was very rapid through the 1950's and has been significantly slower—though still a bit more rapid than growth of GNP—during the 1960's. This deceleration has caused a larger portion of gross investment to be absorbed in the replacement of worn-out capital; i.e., it has resulted in a decline of net investment relative to gross investment. Despite the slowing of investment growth, the capital stock continues to increase more rapidly than the labor force, and the continuing substitution of capital for labor that results from this growth disparity is encountering seriously diminishing returns. Conceivably, technological progress could boost joint factor productivity sufficiently to offset fully the forces tending to reduce the increment in output associated with a given amount of gross investment. However, in recent years technological progress has been inadequate to this task.

It sometimes is emphasized that reducing the priority of defense objectives would stimulate GNP growth not only because it would facilitate an increase in investment but also because it would foster technological progress and increases in joint factor productivity. Factor productivity would benefit from the shift of a portion of the research and development effort—now predominantly directed toward defense objectives—and a portion of the most innovative people—now generally occupied in defense related work—to non-defense sectors. This argument is buttressed by allusion to the existence of an inverse correlation between growth of defense expenditures and growth of joint factor productivity during the late 1950's and the early 1960's.

Perhaps the most noteworthy indication that the defense burden may not be becoming more onerous is the fact that defense objectives now claim a smaller portion of GNP than they did in the recent past and a much smaller portion than they claimed in the early 1950's.

Moreover, per capita GNP is much greater now than it was during the early 1950's, so the sacrifice of a given portion of output to defense needs should be less painful now.

Gross national product has been growing much faster than population in the Soviet Union, a fact that has permitted and would continue to permit per capita consumption to increase even while total consumption declines as a portion of GNP. Continuing growth of per capita output would permit allocations to defense and investment to increase not only absolutely but also relative to GNP. Total consumption did in fact decline from 61 percent of GNP in 1950 to 57 percent in 1960 and perhaps 55 percent in 1969, while per capita consumption in absolute terms was increasing significantly. If total consumption continues to increase less rapidly than—say four-fifths as fast as—GNP over the next half dozen years while the defense share in GNP remains constant, then GNP growth at an average annual rate of 5 percent would permit annual investment to rise more than 45 percent. Meanwhile, annual defense expenditures would increase by more than a third, making possible major improvements in Soviet military capabilities. Moreover, it can be argued convincingly that there is little reason to believe that the Soviet leaders would not impose greater sacrifices on the Soviet consumer if they believed security needs demanded it.

The positive effect that a reduction of defense expenditures would have on joint factor productivity might be less than first supposed. The inverse relationship between growth of defense expenditures and growth of joint factor productivity during the late 1950's and early 1960's may well have been unique to that time period. At least it is not observable in some other periods. Moreover, restriction of defense expenditure might not involve much, if any, reorientation of research and development activities from defense to non-defense objectives, especially if defense expenditures were held down because of an international agreement to limit the manufacture and deployment of certain types of weapons. In such a situation, large amounts of defense oriented research and development still would be needed to keep the Soviet Union at the frontier of military technology, and this work would be complicated by the reduction of opportunities for testing and gaining field experience. Finally, it must be noted that the continuing decline in investment yields probably would be aggravated by a further shift of resources into investment.

## B. INVESTMENT

The Soviet Union now invests nearly one-third of its gross national product. Consequently, the absolute amount of annual investment in the Soviet economy is comparable to the American total, although American GNP is twice that of the Soviet Union. During 1969, gross fixed investment in the Soviet economy increased about 4 percent, that is, much less rapidly than in preceding years but still a bit faster than GNP.

The development and implementation of Soviet investment plans are hampered by problems of long standing. Among these are a dearth of criteria for choosing among various potential projects, a tendency to spread construction efforts among an excessive number of projects, a chronic excess of uninstalled equipment, and a general inability to



coordinate assignments of construction services or deliveries of construction supplies. In an attempt to alleviate some of these difficulties, the number of newly initiated major construction projects recently was curtailed sharply, and administrative reforms were introduced.

#### C. CONSUMPTION

During 1969, a little more than half of Soviet gross national product was channeled into consumption. Per capita consumption rose by some 3½ percent, but remains at only about one-third the U.S. level.

Per capita consumption of food increased a scant one percent during 1969, as various constraints including reduced production of meat interrupted the trend of qualitative improvement in the Soviet diet. Per capita consumption of soft goods, of durable goods, of health and education services, and of personal services increased at a slower pace in 1969 than in the preceding year.

The amount of housing put into service in both 1968 and 1969 was less than the amount completed in 1967—which in turn was less than the amount put into service in 1960. Nevertheless, enough dwellings were completed during 1968–69 to increase the housing stock by some 5½ percent. The program of building large numbers of very small housing units now has been under way for more than a decade. Since 1960, the amount of living space available per capita has been increased by some 20 percent, but at 77 square feet it falls woefully short of the modest officially prescribed standard for health and decency—97 square feet. Moreover, many families still do not have dwelling units to themselves, and even the new housing is shoddy and poorly appointed.

Disposable money incomes continued to increase faster than the supply of consumer goods and services during 1969. In Moscow, prices rose some 10 percent in the basically unregulated collective farm markets, where peasants sell produce from their private garden plots. The centrally established prices of goods sold in the state and cooperative stores changed little, however. For this reason and because producing units do not necessarily adjust their activities in response to demand pressures, increases in disposable money incomes are a poor gauge of changes in the well-being of Soviet consumers. With many prices fixed and too little to buy, a large portion of the 1969 increase in earnings simply found its way into personal savings accounts in the state bank.

#### D. TRADE AND AID

Quantitatively, the Soviet Union is not heavily dependent on foreign commerce. Less than 5 percent of GNP is exported each year. Nevertheless, trade in a number of items is important to the Soviet economy. The value of Soviet trade turnover approximately doubled during the 1960's, and in 1969 an increase of about 8 percent was registered. Some ⅔ of Soviet trade is with other Communist countries, primarily with the countries of Eastern Europe. The share of total Soviet trade accounted for by commerce with Eastern Europe held constant in 1969. Soviet exports to Eastern Europe are dominated by industrial and agricultural raw materials, semifinished products, and fuels. By 1967, Soviet grain exports to the area had recovered a substantial

portion of the decline that had occurred in the mid-1960's following disappointing Soviet harvests. The Soviet Union also exports large and increasing quantities of machinery and equipment to Eastern Europe, particularly to the less advanced countries of the area. Soviet imports from Eastern Europe have been dominated by machinery and equipment and manufactured consumer goods. Imports of food have declined since the lean years of the mid-1960's.

Trade with the industrial West increased more than 12 percent in 1969. The share of trade with developed Western countries in total Soviet trade turnover increased from 18.5 percent in 1960 to 21.8 percent in 1969. Soviet commerce with the industrial West is mainly trade with Western Europe and consists in large measure of an exchange of Soviet fuels, raw materials, and semifinished products for Western machinery and equipment and manufactured consumer goods. Large quantities of wheat and wheat flour were imported from Western countries during the mid-1960's.

Trade with less developed countries (LDC's) accounts for about 10 percent of Soviet trade turnover. It increased slightly in 1968 and 1969 following a slight decline in 1967. Soviet exports to the LDC's consist largely of machinery and equipment. Textile fibers, natural rubber, and food are the principal Soviet imports from these countries.

During 1969, the Soviet Union concluded agreements extending \$462 million worth of economic assistance. This is substantially more than the amount committed in the preceding year but only a fraction of the amount committed in the peak year of 1966. The 1969 agreements extend aid primarily to Turkey, Iraq, and Guinea. The Sudan, Pakistan, Uruguay, and Mali also were beneficiaries. The drawing of credits by Soviet clients lags an average of 7 years behind formal extension. Annual drawings have been averaging about \$350 million in recent years.

Soviet trade policies are shaped by political rather than economic or other considerations in many cases, but it probably is safe to say that Soviet programs of assistance to less developed countries are politically motivated in practically all cases. The occurrence of a shift in the political importance of assistance programs in the eyes of Soviet leaders seems to be indicated by the peaking of aid commitments and aid drawings in the mid-1960's. During the last several years, Soviet aid commitments have been more selective and better tailored to local conditions and individual requirements.

# GENERAL GROWTH PERFORMANCE OF THE SOVIET ECONOMY

*By* STANLEY H. COHN

The general performance of the Soviet economy during the past two years has been below the growth trend plateau which had prevailed for several years after 1958. Averaged together, the past two years showed a GNP growth rate of 4.1 percent, considerably below the 4.9 percent average for the past decade. Viewed separately, however, the two recent years disclose a somewhat divergent record of performance. For the year 1968 output increased at a rate of 5.8 percent, considerably above the long term trend line. During 1969, according to present provisional calculations, aggregate economic output increased by only 2.3 percent.

As happened so often in the past, the divergence in the overall performance of the economy was strongly influenced by the annual disparity in the contribution made by the agricultural sector. In 1968 favorable growing conditions enabled output to increase by about 6 percent. Less favorable weather factors in 1969 have led to a decline in net production of a somewhat greater amount. After a forty year period of intensive industrialization, the Soviet economy still retains a large agricultural sector whose performance greatly influences the general health of the economy.

Compounding the impact of agricultural fluctuations on declining growth performance has been a progressive deterioration in the growth record of Soviet industry. In the past two years the increase in industrial production has been six percent and less, compared with around 7.5 percent during the early and mid-nineteen sixties.

If we abstract from the agricultural cycle in order to gain perspective on longer run trends, the results of the past two years distribute themselves around the longer run trend for Soviet GNP (Table 1). Since attaining the high-water mark of around 6.5 percent in the fifties, the Soviet economy's growth rate has declined and in the sixties has been averaging around 5.0 percent.

TABLE 1.—U.S.S.R.: Percentage of annual and period growth rates of gross national product for selected years, 1950-69

| Year:     | Rate | Period:      | Rate <sup>1</sup> |
|-----------|------|--------------|-------------------|
| 1959----- | 4.5  | 1967-----    | 4.9               |
| 1960----- | 5.1  | 1968-----    | 5.8               |
| 1961----- | 6.3  | 1969-----    | 2.3 <sup>2</sup>  |
| 1962----- | 3.3  | 1951-55----- | 5.9               |
| 1963----- | 2.2  | 1956-60----- | 6.5               |
| 1964----- | 7.6  | 1961-65----- | 5.0               |
| 1965----- | 5.5  | 1966-69----- | 4.8               |
| 1966----- | 6.4  |              |                   |

<sup>1</sup> Average annual rate.

<sup>2</sup> Preliminary estimate.

Sources: See appendix, "Derivation of Index of Soviet Gross National Product," p. 15.

## LONGRUN PERSPECTIVE

If cyclical trends in Soviet growth are explained by the vagaries of agriculture, the longer term decline and plateau have their explanations both in the changing pattern of economic priorities and in the availabilities and efficiency of use of productive resources. With regard to priorities, what is striking about the rapid growth rate years of the fifties are the rapid rates of increase in both consumption and capital investment and the near constancy in defense expenditures, particularly after 1955 (Table 2). By contrast in the current decade there has been a sharp deceleration both in private consumption and in capital investment, accompanied by rapid rates of growth in defense expenditures. Although the constraining impact of the latter category is difficult to delimit precisely, the coincidence between declining growth rates of GNP and rising rates for defense outlays merits careful scrutiny.<sup>1</sup> No other major economy has increased defense expenditures at the rate of the Soviet Union between 1960 and 1965. Since that date only the United States has matched and exceeded the Soviet rate. The U.S.S.R. is also unique in the degree of deceleration in the growth of per capita consumption and of capital investment in the current decade compared with that of the fifties.<sup>2</sup>

TABLE 2.—*Growth trends in principal uses of Soviet GNP*

[Average annual rates in percent]

| Period       | Private consumption | Public consumption | Capital investment | Defense | GNP |
|--------------|---------------------|--------------------|--------------------|---------|-----|
| 1951-55..... | 8.5                 | 5.6                | 12.5               | 5.5     | 5.8 |
| 1956-60..... | 5.5                 | 6.4                | 12.8               | .4      | 6.5 |
| 1961-65..... | 3.7                 | 6.8                | 6.3                | 8.5     | 5.2 |
| 1966-67..... | 6.1                 | 5.4                | 7.9                | 7.9     | 5.6 |

## SOURCES

Consumption: See table in section on "Consumer Welfare", p. 94.

Capital investment: U.S.S.R. Tsentral'noe Statisticheskoe Upravlenie, *Kapital'noe stroitel' stvo v S.S.S.R.* Moscow, Gosstatizdat, 1961; and *id. Narodnoe khoziaistvo S.S.S.R.* Moscow, Statistika, (Gosstatizdat) for following years: 1962, 1965, 1967.

Defense: See table 1 in supplementary paper on "The Economic Burden of Soviet Defense Outlays." below, p. 168.

GNP: See table 1.

<sup>1</sup> See supplementary paper on "The Economic Burden of Soviet Defense Outlays," below, pp. 166-188.<sup>2</sup> Stanley H. Cohn, "Soviet Growth Retardation", in U.S. Congress, Joint Economic Committee, *New Directions in the Soviet Economy*, Part II-A. Washington, U.S. Government Printing Office, 1966, pp. 108 and 117.

TABLE 3.—U.S.S.R. and market economies: Comparative GNP and labor productivity trends, average annual rates of growth

| Country and period | GNP  | Employment | Output per employee                    |                        |
|--------------------|------|------------|--|------------------------|
|                    |      |            | Annual average employment <sup>1</sup> | Man-years <sup>2</sup> |
| U.S.S.R.:          |      |            |  |                        |
| 1956-60.....       | 6.5  | 1.2        | 5.1                                    | 7.0                    |
| 1961-67.....       | 5.4  | 2.0        | 3.3                                    | 3.3                    |
| France:            |      |            |  |                        |
| 1956-60.....       | 5.0  | 0.2        | 4.8                                    | 4.4                    |
| 1961-67.....       | 5.1  | 0.4        | 4.7                                    | 4.9                    |
| Germany:           |      |            |  |                        |
| 1956-60.....       | 6.4  | 2.5        | 3.8                                    | 5.3                    |
| 1961-67.....       | 4.5  | 0.2        | 4.3                                    | 5.5                    |
| Italy:             |      |            |  |                        |
| 1956-60.....       | 5.9  | 0.7        | 5.2                                    | 5.0                    |
| 1961-67.....       | 5.3  | -0.6       | 6.0                                    | 6.7                    |
| United Kingdom     |      |            |  |                        |
| 1956-60.....       | 2.8  | 0.3        | 2.4                                    | 3.0                    |
| 1961-67.....       | 2.9  | 0.4        | 2.5                                    | 3.2                    |
| Japan:             |      |            |  |                        |
| 1956-60.....       | 10.0 | 1.6        | 8.3                                    | 8.8                    |
| 1961-67.....       | 10.1 | 1.6        | 8.4                                    | 9.4                    |
| United States:     |      |            |  |                        |
| 1956-60.....       | 2.0  | 0.5        | 1.5                                    | 2.3                    |
| 1961-67.....       | 4.7  | 1.9        | 2.8                                    | 2.5                    |

<sup>1</sup> Average annual increase in productivity measured as output per employee.

<sup>2</sup> Average annual increase in productivity measured as output per man-year.

Sources: GNP—U.S.S.R.: See Table 1. Market economies: OECD, *National Accounts of OECD Countries, 1950-66*; OECD, *Main Economic Indicators*, May 1969.

Employment and hours—U.S.S.R.: See appendix C in U.S. Congress, Joint Economic Committee, *New Directions in the Soviet Economy*, Part II-A, pp. 130-131; Ritchie H. Reed, *Estimates and Projections of the Labor Force and Civilian Employment in the U.S.S.R., 1950-1975*, (International population reports. Series P-91, No. 15). Washington, U.S. Bureau of the Census, 1967, p. 15; Ts S.U. *Trud v SSSR. Moscow, Statistika*, 1965, p. 239. Market economies: OECD, *Manpower Statistics, 1954-64* 1965; OECD, *Labor Force Statistics, 1956-66*, 1968; Angus Maddison, *Economic Growth in the West*, New York, 20th Century Fund, 1964; United Nations, Statistical Office, *Monthly Bulletin of Statistics*, v. 23, No. 6., June 1969.

If the growth record of the Soviet Union in recent years is compared with that of the principal market economies, a striking feature is the particular dependence of the U.S.S.R. on rapid additions to its active labor force and to its productive plant and equipment, as distinguished from its ability to use its basic productive resources efficiently. Since 1960 the rate of increments to the employed labor force has risen significantly compared with the 1956-60 period and has been the highest of any of the major industrial powers. (Table 3).<sup>3</sup> At the same time there has been a sharp reduction in the rate of increase in output per employed worker, expressed in either average annual employment or man-years. Whereas Soviet labor productivity in man-year terms was rising more rapidly than elsewhere, except for Japan, in the earlier period, since 1960 the record has been below that of all other major economies, other than the United States. Moreover, the rate of deterioration has been much higher in the U.S.S.R. than elsewhere.

A similar unfavorable trend emerges in an international comparison of the efficiency in the use of productive capital. In the 1955-60 period the U.S.S.R. had a relatively low incremental capital-output ratio; i.e., relatively less investment was required to obtain an additional unit of

<sup>3</sup> The U.S. increment would be much lower if it did not include the absorption of unemployed workers in the later period.

national product than in the United Kingdom or the United States. If the effect of the increase in employment on growth is removed from the comparison by comparing rates of increase in capital with changes in GNP per man-year, the U.S.S.R. was in a more favorable position than any other economy, except Japan (Table 4).

Since 1960 capital-output ratios (housing investment is excluded in this comparison) have generally risen for most industrialized economies, the United States being the only exception. Except for Germany, the rise in the Soviet ratio has been the largest. If adjustments are made for changes in employment, the rise in the Soviet ratio was nearly threefold, far larger than in any other major economy. This disparate result indicates an attempt to sustain growth through a continued large infusion of capital with rapidly diminishing returns.

TABLE 4.—U.S.S.R. and selected market economies: Comparative incremental capital-output ratios

| Country              | Aggregate <sup>1</sup> |           | Output per man-year <sup>2</sup> |           |
|----------------------|------------------------|-----------|----------------------------------|-----------|
|                      | I-1955-59              | I-1960-66 | I-1955-59                        | I-1960-66 |
|                      | O-1956-60              | O-1961-67 | O-1956-60                        | O-1961-67 |
| U.S.S.R. ....        | 2.7                    | 4.0       | 2.5                              | 6.6       |
| France .....         | 2.7                    | 2.9       | 3.1                              | 3.0       |
| Germany .....        | 2.6                    | 5.1       | 3.2                              | 4.2       |
| Italy .....          | 2.5                    | 2.8       | 2.8                              | 2.5       |
| Japan .....          | 1.8                    | 2.4       | 2.0                              | 2.6       |
| United Kingdom ..... | 4.1                    | 4.7       | 3.8                              | 4.3       |
| United States .....  | 5.7                    | 2.7       | 5.0                              | 5.1       |

<sup>1</sup> Increase in fixed nonhousing investment required to obtain a unit increase in gross national product. A lag of year between a unit of investment (I) and of output (O) has been assumed. Thus, investment for the 1955-59 period is assumed to affect output for the period 1956-60. The ratio is increased to the extent that unutilized productive capacity exists. Thus, the high U.S. ratio in the earlier period reflects idle capacity in the depressed year of 1960. A similar situation inflates the German ratio in 1967.

<sup>2</sup> Same as the aggregate measure except that (O) represents output per man-year.

Sources: U.S.S.R.—See tables 1 and 2. Market economies—OECD, *National Accounts Statistics, 1956-65*; OECD, *National Accounts of the OECD Countries, 1956-66*.

The combination of a decreasing rate of investment and a rising capital-output ratio bodes ill for the future growth of the Soviet economy. So long as defense expenditures continue to rise at a rapid rate, the investment growth rate will be depressed and the quality of investment, its productivity, will be reduced. The policy of channeling superior management and the best scientists and engineers into defense research and production denies prime innovative resources to civilian oriented investment. Furthermore, there are built-in factors of a locational and structural nature which will contribute to an inexorable rise in the capital-output ratio.<sup>4</sup>

Compounding this unattractive prospect are rising consumer inflationary pressures. Between 1960 and 1967 consumer disposable incomes rose by 69 percent, but personal savings rose by 148 percent, or at more than twice the rate. Whereas the Soviet consumer was saving 17 percent of his additional incomes in 1960, by 1967 he was saving 49 percent.<sup>5</sup> Such a high rate of savings is unprecedented in

<sup>4</sup> For examples of discussions by perceptive Soviet economists on this point see A. N. Nikol'skaia "Analiz dinamiki fondoemkosti v osnovnykh otrasliakh narodnogo khoziaistva SSSR (Analysis of the Dynamics of Capital-Output Ratios in the Basic Branches of the USSR National Economy)," *Ekonomika i matematicheskie metody*, v. 2, no. 2, Mar.-Apr. 1966, p. 183 (186-194); also T. Khachaturov, "Ekonomicheskaja effektivnost' kapital'nykh vlozhenii (Economic Effectiveness of Capital Investment)," *Kommunist* (Moscow), v. 43, no. 13, Sept. 1966, p. 66 (64-74).

<sup>5</sup> U.S. Congress, Joint Economic Committee. *Soviet Economic Performance, 1966-67*. Washington, U.S. Government Printing Office, 1968, pp. 95 and 96.

any economy, let alone one with the low per capita income of the U.S.S.R. Obviously, there is a situation of rising unsatisfied consumer demands. Persistence of such a trend will imperil the work incentives of a labor force with rapidly rising skills.

### COMPARATIVE SIZE OF GNP

Currently the dollar value of Soviet GNP is somewhat less than half, around 47 percent, of the US level. The Soviet Union occupies a strong second position among the economies of the world, some  $2\frac{1}{2}$  times the size of Japan, the economy in third position. In per capita terms the Soviet position is much lower with a level some two-fifths that of the United States and about two-thirds of the major economies of northwestern Europe (Table 5). Within reasonable margins of error, per capita GNP in the U.S.S.R. is about matched by those of Japan and Italy. This comparison overstates the relative position of the Soviet consumer, given the high proportions of output allotted to investment and defense.

As a proportion of the U.S. economy, the greatest gains made by the Soviet economy were accomplished during the fifties. Since 1960 the Soviet GNP has reached a proportionate plateau of around 45 to 47 percent. In terms of the absolute margin of the U.S. economy over the Soviet, the minimum difference was reached in 1958. Since then the dollar gap between Soviet and United States GNP has been steadily widening.

The economic significance of the gap depends on the variable being measured. If GNP is considered as a rough quantification of general economic potential, the comparison in Table 6 is appropriate. If the concern is with some concept of consumer welfare, the dollar gap between the two economies would be limited to a comparison of consumption and would show an even wider divergence. If the concern is military potential, the best indicator would be industrial production, in which case the gap would continue to narrow.

TABLE 5.—U.S.S.R. and selected market economies: Comparative dollar value of gross national product in 1967 (market prices; 1966 U.S. dollars)

|                                 |       |
|---------------------------------|-------|
| Ranked by total GNP (billions): |       |
| United States.....              | \$777 |
| U.S.S.R.....                    | 365   |
| Japan.....                      | 153   |
| Germany.....                    | 142   |
| United Kingdom.....             | 116   |
| France.....                     | 114   |
| Italy.....                      | 78    |
| Ranked by GNP per capita:       |       |
| United States.....              | 3,902 |
| Germany.....                    | 2,377 |
| France.....                     | 2,293 |
| United Kingdom.....             | 2,092 |
| U.S.S.R.....                    | 1,552 |
| Japan.....                      | 1,530 |
| Italy.....                      | 1,482 |

Sources and methodology: West European countries: 1967 GNP is originally expressed in the countries' own currencies, obtained from sources noted in table 3. Ratios for converting these estimates are initially based on the 1955 ratios in Milton Gilbert & Associates, *Comparative National Products and Price Levels*. Paris, Organization for European Economic Cooperation, 1958. The geometric means of U.S. and European weights are used. The ratios are moved to 1966 by indexes of European prices divided by those of U.S. prices. The price indexes can be obtained from the sources used to make the original estimates.

Japan: The same methodology is followed for Japan; 1967 yen estimates are obtained from the sources cited in table 3. A 1960 geometric conversion ratio has been constructed by Irving Kravis in the *Journal of Political Economy* (vol. 71, No. 4), August 1963, page 327. The ratio is expressed in 1966 prices by the same procedure used for the West European economies.

U.S.S.R.: The same methodology is followed for the U.S.S.R. The base year ruble estimate for Soviet GNP is obtained from Morris Bornstein, and others. *Soviet National Accounts for 1955*, Ann Arbor, Center for Russian Studies, University of Michigan, 1961, pages 71-72. The 1955 estimate is moved to 1967 by means of the GNP index computed in the appendix to this article. The 1955 geometric ratio conversion ratio has been obtained from Morris Bornstein, "A Comparison of Soviet and U.S. National Product," in U.S. Congress, Joint Economic Committee, *Comparisons of the U.S. and Soviet Economies*, Washington, U.S. Government Printing Office, 1959, pages 385-386. The ratio is moved to 1966 by the ratio of computed Soviet and U.S. price indexes.

TABLE 6.—U.S.S.R. and United States: Comparative trends in dollar values of GNP in market prices

[In billions of 1966 U.S. dollars]

| Country   | 1950 | 1955 | 1958 | 1960 | 1965 | 1967 | 1968 | 1969 <sup>1</sup> |
|---|------|------|------|------|------|------|------|-------------------|
| United States.....                                  | 414  | 508  | 519  | 565  | 711  | 777  | 815  | 838               |
| U.S.S.R.....  | 140  | 185  | 230  | 253  | 326  | 365  | 386  | 395               |
| Difference.....                                     | 275  | 322  | 289  | 312  | 385  | 412  | 417  | 443               |
| U.S.S.R. GNP as a percent of United States GNP..... | 33.8 | 36.4 | 44.3 | 44.8 | 45.8 | 47.0 | 47.4 | 47.1              |

<sup>1</sup> Preliminary.

Source: United States—Economic Report of the President, February 1970. USSR—1967 dollar estimate of table 5 moved by GNP index computed in appendix.

### PROSPECTIVE GROWTH TRENDS

The growth of an economy ultimately depends on the availability of new productive resources and upon the increased efficiency with which they are utilized. Through 1975 it will be assumed that the increase in employment will be 2.2 percent per year reflecting the best judgments of demographic specialists.<sup>6</sup> The maximum rise in capital stock will be determined by the gross investment target of 7.9 percent annually of the current Five Year Plan.<sup>7</sup> After provision is made for a retirement rate of about 2.5 percent per year, a net increase in assets of about 7.5 percent per year is projected.

Projections of trends in productivity of manpower and of capital stock, our indicators of the efficiency of use of resources, are based on recent historical analogues. Perhaps the best productivity performance (productivity of manpower and capital combined) occurred during the latter half of the nineteen fifties, both a period of liberalization and correction of the worst Stalinist errors and one in which there was little increase in defense expenditures (Table 2). The worst recent period was during 1960-63 when unusually poor agricultural weather conditions prevailed and in which defense expenditures rose at a rapid rate. The years 1963-67 have a productivity growth rate falling between the two extremes. The respective rates are as follows: 1955-60—2.5 percent; 1960-63—zero; and 1963-67—2.0 percent.<sup>8</sup> If these three

<sup>6</sup> Ritchie H. Reed. *Estimates and Projections of the Labor Force and Civilian Employment in the USSR: 1950-1975*. Washington, U.S. Bureau of the Census, 1967, p. 15.

<sup>7</sup> T. Khachaturov. "Kapital'nye vlozhenia i kapital'noe stroitel'stvo v SSSR za 50 let," *Voprosy ekonomiki*, v. 20, no. 8, Aug. 1967, p. 8 (3-17).

<sup>8</sup> For detailed calculation of productivity growth rates see Table 9 in supplementary paper on "The Economic Burden of Soviet Defense Expenditures," pp. 180, below.



alternatives are combined with the 3.5 percent average annual increase in the combined factor resources of manpower and capital, the GNP growth rates become, respectively, 6.0 percent, 3.5 percent, and 5.5 percent. A young Soviet mathematical economist has projected a 5.4 percent growth rate for a similar period.<sup>9</sup>

Recent estimates for the United States project the annual rate of growth of GNP through 1975 in a range of 4.0 to 4.5 percent.<sup>10</sup> The envisaged differential growth rates between the two economies are thus minor and will likely be narrowed if full employment and technological progress are sustained in the United States and if the overcommitment of resources and institutional stagnation continue to plague the Soviet Union.

## APPENDIX

### DERIVATION OF INDEX OF SOVIET GROSS NATIONAL PRODUCT

The index of Soviet GNP is composed of the output indexes of the seven component sectors of origin, weighted according to their respective value-added for 1959. The weights, which represent factor payments in the form of wages and supplements, incomes in kind, interest, rent, and depreciation charges, have been derived in a separate publication by the author.<sup>11</sup> The separate sector indexes have been obtained as follows:

#### INDUSTRY

Data from table C-1 in section on "Industrial Production." The coverage is limited to civilian production with military production excluded.

#### CONSTRUCTION

The indexes are official estimates in 1955 prices and are derived largely from various issues of the annual economic handbook. For precise source references see table 4 in supplementary paper on "The Economic Burden of Soviet Defense Outlays."

#### AGRICULTURE

The index is in terms of net output of the sector and, as such, excludes purchases from outside of agriculture. It, therefore, differs methodologically from the agricultural output series in the section "Soviet Agricultural" which represents marketings of farm products and thereby include nonagricultural inputs. The underlying data base is similar to that noted in the agricultural discussion.

#### TRANSPORTATION AND COMMUNICATIONS

Norman M. Kaplan, *Soviet Transport and Communications Output Indexes, 1928-62* (RM-4264-PR), Santa Monica, Calif., Rand Corp. 1964, pages 7, 55. Supplement to foregoing publication of November 1965, page 7. 1964-68 estimates for transportation obtained by adjusting link relative for volume of freight (U.S.S.R., Tsentral'noe Statisticheskoe Upravlenie, *Narodnoe khoziaistvo S.S.S.R. 1967*, page 513) by 1955-63 relation between index of freight volume and Kaplan's computed freight output index; 1964-68 estimates for communications obtained by adjusting 1964 link relative for employment in sector by the 1955-62 relation between index of employment and Kaplan's index of employment and revenue. For employment estimates see table C-1 in section on "Labor and Wages."

#### COMMERCE

Index moved by trend in employment in trade, procurement, and supply. Employment estimates are obtained from table C-1 in section on "Labor and Wages."

<sup>9</sup> B. N. Mikhalevskii, "Makroekonomicheskaiia proizvodstvennana funktsiia kak model' ekonomicheskogo rosta (Macroeconomic Production Function as a Model of Economic Growth)," *Ekonomika i matematicheskie metody*, v. 3, no. 2, Mar.-Apr. 1967, p. 218.

<sup>10</sup> U.S. Congress. Joint Economic Committee, *U.S. Economic Growth to 1975: Potentials and Problems*. Washington, U.S. Government Printing Office, 1966, p. 13.

<sup>11</sup> Stanley H. Cohn. *Derivation of 1959 Value-Added Weights for Originating Sectors of Soviet Gross National Product* (RAC-TP-210), McLean, Va., Research Analysis Corporation, 1966, p. 20.

## SERVICES

The index for this sector is composed of the weighted indexes for the component subsectors: defense (military personnel), education, health, public administration, science, and housing-communal services. These six sectors comprised over 97 percent of total outlays for services in 1959 (Stanley H. Cohn, *Derivation of 1959 Value-Added Weights for Originating Sectors of Soviet Gross National Product* (RAC-TP-210) Research Analysis Corp., 1966, pp. 15-17). The weights for each subsector are the summed cost elements of wages and supplements, interest, and depreciation charges. The wage bills are 1959 average annual wages per employee times 1959 employment in the subsector. The other cost elements are obtained from Stanley H. Cohn, *op. cit.*

The indexes for the subsectors, except for housing-communal services, are based on employment trends (see table 1 in section on "Labor and Wages," p. 75, below). The defense manpower estimates are obtained from estimates of the Institute of Strategic Studies and John Godaire. For precise references see table A-2 in the supplementary paper on "The Economic Burden of Soviet Defense Outlays" p. 183, below). The housing-communal services series is based on estimates of housing stock (see section on "Consumer Welfare").

APPENDIX TABLE 1.—Soviet gross national product: Indexes of component originating sectors (1959=100)

| Sector              | 1959 weight | 1950 | 1955 | 1958  | 1959  | 1960  | 1961  | 1962  | 1963  | 1964  | 1965  | 1966  | 1967  | 1968  | 1969  |
|---------------------|-------------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Industry.....       | 30.9        | 40.8 | 68.0 | 91.4  | 100.0 | 107.6 | 115.1 | 124.2 | 132.4 | 142.6 | 154.7 | 165.9 | 178.4 | 182.3 | 191.8 |
| Construction.....   | 9.8         | 31.8 | 56.9 | 86.5  | 100.0 | 108.1 | 109.0 | 110.8 | 113.0 | 119.7 | 130.0 | 139.0 | 150.7 | 161.0 | 169.0 |
| Agriculture.....    | 28.8        | 71.4 | 84.0 | 103.4 | 100.0 | 99.5  | 106.0 | 102.7 | 97.5  | 110.0 | 112.2 | 121.0 | 120.7 | 126.9 | 118.1 |
| Transportation..... | 7.3         | 35.8 | 63.7 | 89.6  | 100.0 | 109.9 | 118.8 | 128.5 | 139.6 | 152.9 | 167.6 | 176.9 | 193.2 | 207.5 | 217.8 |
| Communications..... | 0.7         | 58.9 | 78.2 | 93.9  | 100.0 | 108.6 | 118.1 | 125.0 | 135.2 | 146.5 | 162.8 | 177.6 | 189.1 | 201.2 | 214.0 |
| Commerce.....       | 5.3         | 76.5 | 85.6 | 95.4  | 100.0 | 106.5 | 114.1 | 119.7 | 125.0 | 131.0 | 136.9 | 142.6 | 149.9 | 158.8 | 168.1 |
| Services.....       | 17.2        | 85.3 | 94.7 | 96.7  | 100.0 | 105.3 | 112.1 | 116.2 | 118.9 | 123.5 | 128.0 | 132.3 | 136.4 | 142.3 | 147.5 |
| GNP.....            | 100.0       | 58.0 | 76.8 | 95.4  | 100.0 | 105.0 | 111.6 | 115.4 | 118.3 | 127.8 | 135.5 | 144.2 | 151.5 | 158.1 | 161.7 |

APPENDIX TABLE 2.—Value added by sectors of origin

[In billions of 1959 rubles]

| Sector                                 | 1950 | 1955  | 1958  | 1959  | 1960  | 1961  | 1962  | 1963  | 1964  | 1965  | 1966  | 1967  | 1968  | 1969  |
|--|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Industry.....                          | 17.1 | 28.4  | 38.2  | 41.8  | 45.0  | 48.1  | 51.9  | 55.3  | 59.6  | 64.7  | 69.3  | 74.6  | 76.2  | 80.2  |
| Construction.....                      | 3.8  | 6.8   | 10.2  | 11.8  | 12.8  | 12.9  | 13.1  | 13.3  | 14.1  | 15.3  | 16.4  | 17.8  | 19.0  | 19.9  |
| Agriculture.....                       | 27.8 | 32.3  | 40.2  | 38.9  | 38.7  | 41.2  | 40.0  | 37.9  | 42.8  | 43.6  | 47.1  | 47.0  | 49.4  | 45.9  |
| Transportation and Communications..... | 3.9  | 6.7   | 9.3   | 10.4  | 11.4  | 12.3  | 13.3  | 14.5  | 15.8  | 17.5  | 18.4  | 19.8  | 21.6  | 23.1  |
| Commerce.....                          | 5.7  | 6.4   | 7.2   | 7.5   | 8.0   | 8.6   | 9.0   | 9.4   | 9.8   | 10.3  | 10.7  | 11.2  | 11.9  | 12.6  |
| Services.....                          | 19.9 | 22.0  | 22.5  | 23.3  | 24.5  | 26.1  | 27.1  | 27.7  | 28.9  | 29.8  | 30.8  | 31.8  | 33.2  | 34.4  |
| GNP.....                               | 77.5 | 102.7 | 127.5 | 133.7 | 140.4 | 149.2 | 154.3 | 158.2 | 170.9 | 181.2 | 192.8 | 202.3 | 211.4 | 216.2 |

Source: See app. C of supplementary paper "The Economic Burden of Soviet Defense Outlays."

# DEVELOPMENTS IN SOVIET INDUSTRY

By ROBERT A. DOCKSTADER

## INDUSTRIAL PRODUCTION

The rate of growth of civilian industrial production in the Soviet Union fell below 6 percent in 1968-69, the lowest rate of growth for consecutive years since World War II.<sup>1</sup> In every sector of industry the rate of growth in 1968-69 was lower than in 1951-60 or in 1961-67. Sharp reductions in the rate of growth of industrial materials and nondurable consumer goods accounted for most of the downturn. The rate of growth of industrial materials fell from 6.8 percent in 1966-67 to 4.6 percent in 1968-69, and the rate of growth of nondurable consumer goods declined from 6.0 to 4.4 percent. The decline in the rate of growth of civilian machinery was not as steep—from 9.5 percent in 1966-67 to 9.1 percent in 1968-69.<sup>2</sup>

*U.S.S.R.: Average annual rates of growth of civilian industrial output, by major sector, 1951-69*<sup>1</sup>

|                                | [In percent] |         |         |         |         |
|--------------------------------|--------------|---------|---------|---------|---------|
|                                | 1951-55      | 1956-60 | 1961-65 | 1966-67 | 1968-69 |
| Total industry.....            | 10.5         | 9.4     | 6.8     | 7.2     | 5.6     |
| Industrial materials.....      | 10.4         | 9.0     | 7.0     | 6.8     | 4.6     |
| Civilian machinery.....        | 11.6         | 14.0    | 8.6     | 9.5     | 9.1     |
| Nondurable consumer goods..... | 10.0         | 7.0     | 4.8     | 6.0     | 4.4     |

<sup>1</sup> 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.

<sup>2</sup> 1969 data are preliminary.

The performance in 1969 was especially poor. Ten of the 11 branches represented in the sample of industrial production showed lower rates of growth than in 1968 as the average annual increase in the overall index of civilian industrial production slipped from 6.1 percent in 1968 to 5.2 percent in 1969 (see table 2). The direct and indirect effects of an extremely severe winter together with a slump in agricultural output contributed to the 1969 decline in industrial growth. Only the coal branch managed to increase output at a faster rate in 1969 than in 1968.

## SIGNIFICANT DEVELOPMENTS IN 1968-69

### INDUSTRIAL MATERIALS

The rate of growth of industrial materials fell by over 2 percentage points in 1968-69 as compared with 1966-67. In two branches (construction materials and paper and paperboard) the growth rate

<sup>1</sup> Because information on armaments production is not published, the growth of total industrial production cannot be measured independently. The share of armaments production in total industrial output is probably small enough to prevent moderate variations in military output from having a significant effect on the growth of total industrial production, at least since 1955.

<sup>2</sup> The rates of growth cited in this paper are calculated from the indexes presented in table 1 in the appendix.

dropped by almost two-thirds and in three branches (ferrous metals, nonferrous metals, and chemicals), by more than one-third. The extent of the decline is indicated by the fact that all of the nine industrial materials branches grew more slowly than in 1961-65 and 1966-67.

Growth in the fuels industry<sup>3</sup> dropped from 4 percent in 1966-67 to 3 percent in 1968-69. The record in 1968 was particularly poor. Of all fuel products, crude oil alone achieved the planned goal. The rate of growth of natural gas production declined to its lowest level since 1952. The 1968 shortfall was reportedly the result of faltering pipeline construction, shortages of equipment, technology inadequate to reach new oil and gas deposits located at greater depths, delays in modernizing existing facilities, and failure to meet planned goals for new capacity in mining and refining. Performance in the fuels sector in 1969, however, indicates that Soviet efforts to overcome these problems may have borne some fruit. The rate of growth of the coal industry increased 2 percentage points, and output of coal was about 14 million tons above the planned output. This apparently unexpected upsurge suggests that the Soviets are beginning to have some success in their costly efforts to reconstruct and reequip the older mine fields.

While the rate of growth of the petroleum products industry fell slightly in 1969, for the first time in recent years there was a marked increase in the construction of pipelines. Significantly, the growth in both the coal and petroleum products industries occurred almost entirely in the second half of 1969, well after the unusually severe winter of 1968-69 was over.

Investment problems in the mid-1960's have adversely affected recent growth in several of the other materials branches. The rate of growth of the chemicals branch showed a decline of 4½ percentage points in 1968-69 (compared with 1966-67) following an absolute decline in the level of investment in 1965-67. Difficulties encountered in putting existing or newly commissioned capacity to efficient use contributed substantially to the setback in growth. Until 1968-69, the output of construction materials increased at relatively high rates despite a dropoff in investment after 1963, but in 1968-69 the growth rate fell to 3.3 percent as constraints in production capacity made themselves felt. The production of ferrous metals was also affected by bottlenecks in the investment program (see below).

Metals production in 1968-69 increased by 5.2 percent as compared with an average of 7.9 percent in 1966-67. As in previous years, output of nonferrous metals grew more rapidly than production of ferrous metals. Expansion in ferrous metals continued to lose some of the momentum furnished by the boost in priority given the industry in 1965 by the Brezhnev-Kosygin leadership. The year 1969 was particularly bleak, with growth dropping to 2.8 percent from 6.4 percent in 1968. The growth of pig iron and ingot production sagged while the rate of increase in rolled steel output declined from 7.3 percent in 1966-67 to 3.5 percent in 1968-69. The ferrous metals sectors have been especially afflicted by continued long delays in bringing new capacity on line and by difficulties experienced in the attempt to shift to a more diversified product mix.

The growth rate of the paper and paperboard industry fell from 9.3 percent in 1966-67, to 3.5 percent in 1968-69, partly because of

<sup>3</sup> Based on weighted sum of output indexes for the petroleum products and coal branches.

the unusual severity of the 1968-69 winter. The paper and paperboard industry depends on the forest products industry for its raw materials, and the harsh winter seriously interfered with cutting and logging operations. Indeed, the output of the commercial timber industry declined absolutely in 1969.

#### CIVILIAN MACHINERY <sup>4</sup>

While growth in the industrial materials and nondurable consumer goods sectors slumped in 1968-69, the growth of civilian machinery declined only slightly, from 9.5 percent in 1966-67 to 9.1 percent in 1968-69. Performance in both these periods was better than in 1961-65, when growth averaged 8.6 percent per year. The improvement was due largely to a spurt in the production of consumer durables. Impressive gains have been made in the output of refrigerators, washing machines, and television sets, whose combined growth averaged 15.5 percent a year in 1966-69. 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.

Investment goods make up the major portion of producer durables, so the trend displayed by the producer durables index may be compared with the trend of official Soviet data on investment in equipment. The average annual growth rate of both series declined in 1968-69 as compared to 1966-67, but the drop in growth of investment in equipment is much sharper (6.8 percent a year to 5.7 percent a year) than the drop in growth of producer durables (8.2 percent to 8.1 percent a year). This may reflect difficulties in putting investment goods to use once they are produced. The recent rapid growth of stockpiles of uninstalled equipment (see chapter on "The Soviet Capital Investment Program," pp. 43-53) and the consequent reduction in the demand for more such goods, which would merely add to these stockpiles, may help to explain the absolute decline of output in several categories of producer durable goods in 1969—turbines, generators, metallurgical equipment, and oil equipment. These declines, however, were offset by continuing growth in the production of investment goods that do not require installation—tractors, agricultural equipment, excavators, and bulldozers.

#### NONDURABLE CONSUMER GOODS

The rate of growth of nondurable consumer goods declined from 6 percent in 1966-67 to 4.4 percent in 1968-69. The 1968-69 decline was partially the result of the pronounced failures in commissioning new capacity in this sector and the bad weather in 1969 which restricted the flow of raw materials from the agricultural sector. Livestock herds were particularly hard hit.

The growth of the processed foods branch fell to a meager 1.8 percent in 1969, the lowest rate of all industrial branches. Of the major processed food products, only the output of fish and confectioneries continued to rise at a noteworthy rate. Four key commodities (industrially processed meat, vegetable oil, soaps and detergents, and dairy products) suffered absolute declines in output, while output of sausage

<sup>4</sup> The index of output of civilian machinery has been changed somewhat in comparison to past presentations in the JEC series. The changes are described in "Indexes of Industrial Output—Notes to Tables," below.

and canned goods was only slightly above the 1968 level. The rate of growth of the soft goods branch also fell (from 7.2 percent in 1966-67 to 5.5 percent in 1968-69), largely because of an absolute decline in the output of linen fabrics and knitted underwear in 1969 and slower growth in the production of cotton fabrics and sewn garments.

#### INDUSTRIAL PRODUCTIVITY

The continued slowdown in industrial growth in 1968-69 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. Because of the impossibility of identifying the labor force and capital stock involved in military production in machine building and metal working (MBMW), the trends in productivity can be viewed most conveniently by comparing civilian industrial production and inputs of labor and capital outside of MBMW. Measured by the ratio of such output to a weighted sum of labor and capital inputs, industrial productivity actually fell in 1968-69. This performance was even worse than in 1961-65, when the near collapse of productivity growth proved to be a major stimulus for the economic reform that is still underway.

*U.S.S.R.: Average annual rates of growth of industrial output (excluding MBMW), factor inputs, and factor productivity, 1951-69*

[In percent]

|  | 1951-60 | 1961-65 | 1966-67 | 1968-69 <sup>1</sup> |
|--|---------|---------|---------|----------------------|
| Industrial output (excluding MBMW) .....         | 9.3     | 6.3     | 6.5     | 4.5                  |
| Inputs: <sup>2</sup>                             |         |         |         |                      |
| Labor (man-hours) and capital <sup>3</sup> ..... | 5.0     | 4.6     | 4.6     | 4.8                  |
| Man-hours .....                                  | 2.0     | 1.9     | 3.0     | 3.6                  |
| Capital .....                                    | 12.5    | 11.4    | 8.5     | 7.8                  |
| Factor productivity:                             |         |         |         |                      |
| Labor (man-hours) and capital .....              | 4.1     | 1.6     | 1.9     | -3                   |
| Man-hours .....                                  | 7.2     | 4.3     | 3.5     | 1.9                  |
| Capital .....                                    | -2.8    | -4.6    | -1.9    | -3.0                 |

<sup>1</sup> 1969 data are preliminary.

<sup>2</sup> Labor and capital in MBMW have been excluded from inputs.

<sup>3</sup> Inputs have been combined using a Cobb-Douglas (linearly homogeneous) production function with weights of 0.708 and 0.292 for labor and capital, respectively. Labor income and capital charges in MBMW have been excluded in deriving these weights.

#### OUTLOOK FOR 1970

The plan fulfillment results for industry in the first quarter of 1970 indicate a rate of growth of 8 percent compared to the first quarter of 1969—a considerable improvement over 1969. On balance, the outlook for 1970 is for some recovery in the rate of growth of civilian industrial production, but it is unlikely that the high rate of growth of the first quarter will be sustained for the whole year. Most of the improvement occurred in those sectors in which growth rates fell off sharply in the first quarter of 1969. For example, output in the processed foods industry, which grew only .5 percent in the first quarter of 1969, increased by 8 percent in the first quarter of 1970. Similarly, the production of construction materials and commercial timber, which fell absolutely in early 1969, grew by 12 percent and 9 percent, respectively, in the first quarter of 1970. Conversely, the rates of growth of most sectors which did not suffer such severe setbacks in the first part of 1969 did not change appreciably in the first quarter of 1970. Civilian machinery, for example, grew 10½ percent in the first quarter of 1969 and 9½ percent in the first quarter of 1970.

## INDEXES OF INDUSTRIAL OUTPUT—NOTES TO TABLES

The preceding description of the growth of civilian industrial production in the U.S.S.R. is based on the index shown in table 1. This index has been designed to approximate a value-added weighted index such as the Federal Reserve Board index of U.S. industrial production. Value-added weights are calculated only for the major branches of Soviet industry shown in the table, and the individual branch indexes represent the summation of the value of sample commodities in July 1, 1955, prices. The value-added weights represent the sum of labor costs (wages and social insurance deductions) and capital costs (depreciation charges and an 8 percent interest charge on fixed and working capital).

The weights used in this publication differ from those in previous articles on Soviet industrial production in Joint Economic Committee publications, e.g., *Annual Economic Indicators for the U.S.S.R.* (1964), *Current Economic Indicators for the U.S.S.R.* (1965), and *Soviet Economic Performance: 1966-67* (1968). The difference stems from (1) the revision of the 1960 weights to reflect more recent data on employment, earnings, and fixed capital in 1960, and (2) the addition of an explicit charge for working capital. A second major change in the index is the revision of the civilian machinery sample. The machinery index presented in previous Joint Economic Committee publications was derived by aggregating an index of civilian machinery (excluding electronics) and an index of total electronics with the aid of value-added weights (see JEC, *Dimensions of Soviet Economic Power*, 1962, p. 131). The total electronics series has been replaced by a civilian electronics sample composed of electronic instruments and consumer electronics. The present civilian machinery index is an aggregation of indexes of producer durables (including electronic instruments) and consumer durables (including consumer electronics). The 1960 weights of producer durables and consumer durables in enterprise wholesale prices have been estimated at 0.887 and 0.113, respectively. Furthermore, the civilian machinery sample has been expanded to include the officially reported value of production of instruments (both electronic and nonelectronic) and the physical product sample of equipment for consumer industries has been replaced by a series based on value of production as reported in Soviet handbooks. Compared to the series presented in *Soviet Economic Performance: 1966-67*, the net effect of these changes in the sample is to reduce the rate of growth of civilian machinery over the whole period 1951-68 and the rate of growth in each of the 5-year periods except 1956-60.

As a result of the revised weights and the changes in the estimates of output of individual commodities, the indexes and growth rates of tables 1 and 2 differ somewhat from those shown previously. For a more detailed discussion of the indexes (sources of data, coverage of commodity sample, and deficiencies of the index), see U.S. Congress, Joint Economic Committee, *Dimensions of Soviet Economic Power* (1962), p. 131-134.

TABLE 1.—U.S.S.R.: Indexes of civilian industrial production, 1960-69

[1960 = 100]

| Branch of industry                       | 1960 weights | 1960  | 1961  | 1962  | 1963  | 1964  | 1965  | 1966  | 1967  | 1968  | 1969 <sup>1</sup> |
|--|--------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------|
| Industrial materials.....                | 53.5         | 100.0 | 106.4 | 114.2 | 121.7 | 130.6 | 140.3 | 149.5 | 159.9 | 168.1 | 175.0             |
| Electric power.....                      | 4.9          | 100.0 | 112.1 | 126.5 | 140.7 | 156.4 | 172.2 | 185.3 | 199.6 | 217.1 | 234.3             |
| Coal products.....                       | 10.9         | 100.0 | 100.0 | 102.4 | 105.4 | 109.7 | 114.5 | 116.7 | 119.2 | 119.9 | 122.8             |
| Petroleum products..                     | 2.8          | 100.0 | 112.5 | 127.1 | 141.6 | 154.1 | 167.9 | 183.1 | 199.6 | 213.8 | 227.9             |
| Ferrous metals.....                      | 7.7          | 100.0 | 109.2 | 118.5 | 126.6 | 136.7 | 146.8 | 157.9 | 168.4 | 179.2 | 184.2             |
| Nonferrous metals....                    | 4.7          | 100.0 | 108.9 | 118.5 | 128.0 | 137.8 | 149.6 | 162.7 | 178.4 | 191.1 | 200.6             |
| Forest products.....                     | 9.9          | 100.0 | 101.3 | 105.3 | 111.2 | 116.4 | 118.4 | 120.7 | 127.7 | 132.9 | 136.6             |
| Paper and paperboard.                    | 1.1          | 100.0 | 106.0 | 113.4 | 119.7 | 128.3 | 145.2 | 160.4 | 173.5 | 182.3 | 186.0             |
| Construction mate-<br>rials.....         | 6.9          | 100.0 | 110.8 | 120.3 | 126.6 | 134.7 | 147.3 | 161.5 | 174.1 | 180.8 | 185.9             |
| Chemicals.....                           | 4.5          | 100.0 | 108.5 | 119.8 | 129.2 | 144.8 | 165.9 | 182.4 | 201.6 | 213.5 | 225.6             |
| Civilian machinery.....                  | 20.5         | 100.0 | 110.8 | 124.0 | 135.3 | 143.8 | 151.0 | 167.7 | 180.9 | 197.9 | 215.5             |
| Producer durables....                    | 18.1         | 100.0 | 110.9 | 125.1 | 136.2 | 143.7 | 149.2 | 163.4 | 174.8 | 189.1 | 204.3             |
| Consumer durables....                    | 2.4          | 100.0 | 110.0 | 115.7 | 128.7 | 144.3 | 162.0 | 200.1 | 226.3 | 263.8 | 303.5             |
| Nondurable consumer<br>goods.....        | 26.0         | 100.0 | 105.5 | 110.6 | 112.0 | 117.3 | 126.6 | 133.0 | 142.2 | 149.4 | 155.0             |
| Soft goods.....                          | 14.6         | 100.0 | 103.3 | 107.5 | 109.9 | 114.5 | 117.2 | 125.9 | 134.7 | 142.2 | 149.9             |
| Processed foods.....                     | 11.4         | 100.0 | 108.4 | 114.5 | 114.8 | 120.9 | 138.6 | 142.2 | 151.9 | 158.7 | 161.5             |
| Civilian industrial produc-<br>tion..... |              | 100.0 | 107.1 | 115.3 | 122.0 | 129.8 | 138.9 | 148.9 | 159.6 | 169.3 | 178.1             |

<sup>1</sup> Preliminary.



TABLE 2.—U.S.S.R.: Annual rates of growth in industrial production, 1960-69

|  | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 <sup>1</sup> |
|--|------|------|------|------|------|------|------|------|------|-------------------|
| Industrial materials <sup>2</sup> .....        | 7.7  | 6.4  | 7.3  | 6.6  | 7.3  | 7.4  | 6.6  | 7.0  | 5.1  | 4.1               |
| Electric power <sup>3</sup> .....              | 10.2 | 12.1 | 12.8 | 11.2 | 11.2 | 10.0 | 7.6  | 7.7  | 8.8  | 7.9               |
| Coal products <sup>3</sup> .....               | 2.2  | 0    | 2.4  | 3.0  | 4.0  | 4.4  | 1.9  | 2.2  | .6   | 2.4               |
| Petroleum products <sup>3</sup> .....          | 13.8 | 12.5 | 12.9 | 11.4 | 8.8  | 9.0  | 9.0  | 9.0  | 7.1  | 6.6               |
| Ferrous metals <sup>3</sup> .....              | 8.8  | 9.2  | 8.6  | 6.8  | 8.0  | 7.3  | 7.6  | 6.6  | 6.4  | 2.8               |
| Nonferrous metals <sup>3</sup> .....           | 9.1  | 8.9  | 8.8  | 8.0  | 7.7  | 8.6  | 8.8  | 9.6  | 7.1  | 5.0               |
| Forest products <sup>2</sup> .....             | 1.0  | 1.3  | 3.9  | 5.6  | 4.7  | 1.7  | 1.9  | 5.8  | 4.1  | 2.8               |
| Paper and paperboard <sup>3</sup> .....        | 4.5  | 6.0  | 7.0  | 5.6  | 7.5  | 12.8 | 10.5 | 8.2  | 5.1  | 2.0               |
| Construction materials <sup>3</sup> .....      | 15.3 | 10.8 | 8.6  | 5.3  | 6.4  | 9.3  | 9.7  | 7.8  | 3.9  | 2.8               |
| Chemicals <sup>3</sup> .....                   | 9.9  | 8.5  | 10.5 | 7.8  | 12.1 | 14.5 | 10.0 | 10.6 | 5.9  | 5.7               |
| Civilian machinery <sup>2</sup> .....          | 12.2 | 10.8 | 11.9 | 9.1  | 6.3  | 5.0  | 11.1 | 7.9  | 9.4  | 8.9               |
| Producer durables <sup>3</sup> .....           | 12.6 | 10.9 | 12.8 | 8.9  | 5.5  | 3.8  | 9.6  | 7.0  | 8.2  | 8.0               |
| Consumer durables <sup>3</sup> .....           | 10.3 | 10.0 | 5.2  | 11.2 | 12.1 | 14.5 | 21.1 | 13.1 | 16.5 | 15.0              |
| Nondurable consumer goods <sup>2</sup> .....   | 4.2  | 5.5  | 4.8  | 1.3  | 4.7  | 7.9  | 5.1  | 6.9  | 5.1  | 3.7               |
| Soft goods <sup>3</sup> .....                  | 5.8  | 3.3  | 4.1  | 2.2  | 4.2  | 2.3  | 7.4  | 7.0  | 5.6  | 5.4               |
| Processed foods <sup>3</sup> .....             | 2.3  | 8.4  | 5.6  | .3   | 5.3  | 14.7 | 2.6  | 6.8  | 4.5  | 1.8               |
| Total industrial production <sup>2</sup> ..... | 7.6  | 7.1  | 7.7  | 5.8  | 6.4  | 7.0  | 7.2  | 7.2  | 6.1  | 5.2               |

<sup>1</sup> Preliminary.<sup>2</sup> Computed from index numbers in Table 1.<sup>3</sup> Computed from production series expressed in ruble values (unrounded). These unrounded values underlie the corresponding index numbers in Table 1.

TABLE 3.—U.S.S.R. and United States: Production of selected industrial commodities in the U.S.S.R. 1960-69, and in the United States, 1968<sup>1</sup>

| Units                                  | U.S.S.R.                    |          |          |          |          |          |          |          |          |          | United States |           |
|--|-----------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------------|-----------|
|  | 1960                        | 1961     | 1962     | 1963     | 1964     | 1965     | 1966     | 1967     | 1968     | 1969     | 1968          |           |
| <b>Fuels and power:</b>                |                             |          |          |          |          |          |          |          |          |          |               |           |
| Primary energy <sup>2</sup> .....      | Million metric tons.....    | 662.7    | 705.5    | 763.0    | 821.4    | 883.2    | 942.5    | 1,006.5  | 1,062.8  | 1,112.1  | 1,167.8       | 1,941.6   |
| Electric power.....                    | Billion kilowatt hours..... | 292.3    | 327.6    | 369.3    | 412.4    | 458.9    | 505.7    | 544.6    | 587.7    | 638.7    | 689.0         | 1,523.0   |
| Coal.....                              | Million metric tons.....    | 509.6    | 506.4    | 517.4    | 531.7    | 554.0    | 577.7    | 585.6    | 595.2    | 594.0    | 608.0         | 505.0     |
| Crude oil.....                         | do.....                     | 147.9    | 166.1    | 186.2    | 206.1    | 223.6    | 242.9    | 265.1    | 288.1    | 300.2    | 328.0         | 449.9     |
| Natural gas <sup>3</sup> .....         | Billion cubic meters.....   | 45.3     | 59.0     | 73.5     | 89.8     | 108.6    | 127.7    | 143.0    | 157.4    | 169.1    | 181.3         | 547.1     |
| <b>Ferrous metals:</b>                 |                             |          |          |          |          |          |          |          |          |          |               |           |
| Pig iron.....                          | Million metric tons.....    | 46.8     | 50.9     | 55.3     | 58.7     | 62.4     | 66.2     | 70.3     | 74.8     | 78.8     | 81.6          | 81.0      |
| Crude steel.....                       | do.....                     | 65.3     | 70.8     | 76.3     | 80.2     | 85.0     | 91.0     | 96.9     | 102.2    | 106.5    | 110.0         | 118.0     |
| Rolled steel.....                      | do.....                     | 51.0     | 55.3     | 59.3     | 62.5     | 66.7     | 70.9     | 76.7     | 81.7     | 85.3     | 87.5          | 89.9      |
| <b>Nonferrous metals:</b>              |                             |          |          |          |          |          |          |          |          |          |               |           |
| Aluminum (primary).....                | Thousand metric tons...     | 640.0    | 890.0    | 900.0    | 960.0    | 1,000.0  | 1,075.0  | 1,220.0  | 1,360.0  | 1,525.0  | (4)           | 2,952.0   |
| Copper (refined).....                  | do.....                     | 490.0    | 530.0    | 590.0    | 640.0    | 700.0    | 772.0    | 828.0    | 915.0    | 992.0    | 1,078.0       | 1,681.2   |
| Lead (primary).....                    | do.....                     | 324.0    | 343.0    | 364.0    | 385.0    | 408.0    | 433.0    | 463.0    | 495.0    | 528.0    | 563.0         | 423.9     |
| Tin (primary and secondary).....       | do.....                     | 16.2     | 16.7     | 16.7     | 19.7     | 19.7     | 19.7     | 21.5     | 23.5     | 24.8     | (4)           | 3.6       |
| Zinc (refined primary).....            | do.....                     | 364.0    | 377.0    | 403.0    | 419.0    | 436.0    | 504.0    | 551.0    | 610.0    | 678.0    | 747.8         | 982.9     |
| <b>Construction materials:</b>         |                             |          |          |          |          |          |          |          |          |          |               |           |
| Cement.....                            | Million metric tons.....    | 45.5     | 50.9     | 57.3     | 61.0     | 64.9     | 72.4     | 80.0     | 84.8     | 87.5     | 89.8          | 68.8      |
| Bricks.....                            | Million units.....          | 35,498.0 | 36,692.0 | 35,979.0 | 35,183.0 | 35,939.0 | 36,574.0 | 37,757.0 | 39,940.0 | 40,491.0 | 40,000.0      | 7,909.1   |
| <b>Chemicals:</b>                      |                             |          |          |          |          |          |          |          |          |          |               |           |
| Mineral fertilizers <sup>5</sup> ..... | Million metric tons.....    | 13.9     | 15.3     | 17.3     | 19.9     | 25.5     | 31.3     | 35.9     | 40.1     | 43.5     | 46.0          | 64.8      |
| Mineral fertilizers <sup>6</sup> ..... | Thousand metric tons...     | 3,281.0  | 3,593.0  | 4,078.0  | 4,647.0  | 6,003.0  | 7,389.0  | 8,438.0  | 9,406.0  | 10,221.0 | 10,800.0      | 13,987.9  |
| Sulfuric acid (100 percent).....       | do.....                     | 5,398.0  | 5,718.0  | 6,132.0  | 6,885.0  | 7,647.0  | 8,518.0  | 9,367.0  | 9,737.0  | 10,159.0 | 10,664.0      | 25,748.0  |
| Caustic soda (100 percent).....        | do.....                     | 704.0    | 825.0    | 884.0    | 965.0    | 1,061.0  | 1,199.0  | 1,282.0  | 1,402.0  | 1,525.0  | 1,668.0       | 7,988.0   |
| Plastics.....                          | do.....                     | 311.6    | 383.7    | 451.7    | 567.2    | 700.8    | 803.1    | 971.2    | 1,113.6  | 1,291.0  | 1,452.0       | 7,100.0   |
| Rubber tires.....                      | Thousand units.....         | 17,225.0 | 18,996.0 | 20,846.0 | 22,563.0 | 24,361.0 | 26,434.0 | 27,656.0 | 29,635.0 | 31,773.0 | 32,600.0      | 208,682.0 |
| Chemical fiber.....                    | Thousand metric tons...     | 211.2    | 250.4    | 277.3    | 308.4    | 361.1    | 407.3    | 458.3    | 510.6    | 553.7    | 583.0         | 2,169.0   |

|                                   |                            |         |         |          |          |          |          |          |          |          |          |            |
|-----------------------------------|----------------------------|---------|---------|----------|----------|----------|----------|----------|----------|----------|----------|------------|
| <b>Machinery and equipment:</b>   |                            |         |         |          |          |          |          |          |          |          |          |            |
| Metal cutting machine tools.....  | Thousand units.....        | 155.9   | 165.8   | 176.8    | 182.7    | 184.4    | 186.1    | 192.2    | 197.6    | 200.8    | 206.0    | 70.5       |
| Metal forming machine tools.....  | do.....                    | 29.9    | 30.5    | 33.4     | 34.2     | 34.5     | 34.6     | 38.4     | 41.1     | 42.1     | 42.7     | 754.6      |
| Electric generators.....          | Thousands kilowatts.....   | 7,915.0 | 9,450.0 | 11,022.0 | 11,838.0 | 12,791.0 | 14,390.0 | 13,447.0 | 14,575.0 | 14,529.0 | 12,700.0 | 827,432.5  |
| Trucks and buses.....             | Thousand units.....        | 384.8   | 406.4   | 411.5    | 413.9    | 417.9    | 415.0    | 445.0    | 477.3    | 520.5    | 550.7    | 91,896.1   |
| Tractors.....                     | do.....                    | 238.5   | 263.6   | 287.0    | 325.3    | 329.0    | 354.5    | 382.5    | 405.1    | 423.4    | 442.0    | 10233.8    |
| <b>Consumer goods:</b>            |                            |         |         |          |          |          |          |          |          |          |          |            |
| <b>Durables:</b>                  |                            |         |         |          |          |          |          |          |          |          |          |            |
| Passenger cars.....               | do.....                    | 138.8   | 148.9   | 165.9    | 173.1    | 185.2    | 201.2    | 230.3    | 251.4    | 280.3    | 293.6    | 98,822.2   |
| Refrigerators.....                | do.....                    | 529.5   | 686.5   | 837.8    | 910.9    | 1,134.0  | 1,675.0  | 2,205.0  | 2,697.0  | 3,155.0  | 3,700.0  | 5,150.0    |
| Washing machines.....             | do.....                    | 895.5   | 1,285.6 | 1,797.0  | 2,282.4  | 2,850.6  | 3,430.0  | 3,869.0  | 4,324.0  | 4,700.0  | 5,200.0  | 4,520.0    |
| Television sets.....              | do.....                    | 1,726.0 | 1,949.0 | 2,168.0  | 2,473.0  | 2,927.0  | 3,655.0  | 4,415.0  | 4,955.0  | 5,742.0  | 6,600.0  | 11,794.0   |
| Radios and radio phonographs..... | do.....                    | 4,165.0 | 4,228.0 | 4,251.0  | 4,796.0  | 4,766.0  | 5,160.0  | 5,842.0  | 6,416.0  | 6,981.0  | 7,300.0  | 1124,487.0 |
| <b>Soft goods:</b>                |                            |         |         |          |          |          |          |          |          |          |          |            |
| Cotton fabrics.....               | Million linear meters..... | 6,386.9 | 6,425.0 | 6,454.0  | 6,618.6  | 6,976.1  | 7,076.9  | 7,237.8  | 7,414.3  | 7,561.8  | 7,592.0  | 6,704.0    |
| Rayon and acetate fabrics.....    | do.....                    | 755.0   | 771.0   | 906.0    | 921.0    | 940.0    | 900.0    | 970.0    | 1,036.0  | 1,033.0  | 1,113.0  | 1,584.0    |
| Footwear <sup>12</sup> .....      | Million pairs.....         | 419.3   | 443.2   | 456.3    | 462.7    | 474.7    | 486.0    | 522.2    | 561.3    | 597.6    | 635.0    | 642.4      |

<sup>1</sup> With the exceptions of the estimates for nonferrous metals, production data for the U.S.S.R. are official Soviet figures; 1969 data are preliminary. For metal forming machine tools 1968 data for the United States was not available; 1967 data was used.

<sup>2</sup> Data are for coal, crude oil, natural gas, and hydroelectric power expressed in terms of coal equivalents (calorific value of 7,000 kilocalories per kilogram) but exclude minor fuels such as peat, shale, and fuel wood.

<sup>3</sup> Data for the U.S.S.R. are for gross production less losses and waste, whereas data for the United States are for net marketed production.

<sup>4</sup> Not available.

<sup>5</sup> In Soviet standard units.

<sup>6</sup> In terms of pure nutrient.

<sup>7</sup> 1968 data not available. Figure shown is for 1967.

<sup>8</sup> Shipments of units 4,000 kilowatts and larger.

<sup>9</sup> Factory sales.

<sup>10</sup> Data for wheel-type tractors are shipments.

<sup>11</sup> Data for radiophonograph combinations are factory sales.

<sup>12</sup> Shoes and slippers.

## SOVIET AGRICULTURE

By DAVID W. CAREY

### RECENT TRENDS IN PRODUCTION

In the period 1968-69 agricultural production was marked by fluctuation, increasing 5½ percent in 1968 and falling 4½ percent the following year. As a result, after reaching a record high level of output in 1968, farm output in 1969 dropped to nearly the level of output in 1967, and on a per capita basis, it registered an absolute decline (see Table 1).

Crop production in 1968-69 increased 7½ percent then fell 9 percent. The increase in total crop production in 1968 was due mainly to a bumper grain harvest of 135 million metric tons, ranking second only to the record crop of 140 million tons harvested in 1966 (see Table 3). The overall decrease in crop production in 1969 included smaller harvests of grain, potatoes, sugar beets, cotton, and fruits and vegetables. As usual, weather was the most important factor affecting crop production in both years; relatively favorable weather in 1968 was followed by generally unfavorable weather in 1969. Unfavorable weather conditions in 1969 resulted in above-normal damage to winter grain and other fall-sown crops, prevented timely spring planting, and seriously compressed the time available for fall harvesting. On the other hand, a noticeable upward trend in yields per acre for most crops was promoted by improvements in tillage practices, the wider use of better plant varieties, and a somewhat larger supply of soil additives (fertilizer and lime). The 1969 grain crop of 128 million tons was below both the 1968 level and the average level achieved in 1966-68 (132 million tons), yet it was one-third above the near-disastrous grain harvests of 1963 and 1965. Grain supplies will be further enhanced as the result of the recent purchase of 2 million tons of wheat from Canada for delivery in 1970. This amount of grain should permit the U.S.S.R. to meet current domestic needs for bread supplies in 1970, to fulfill current export commitments, and to maintain sizable grain stocks.

While livestock production in 1969 was almost 4 percent above the 1967 level, most of this gain occurred in 1968. In that year, the number of livestock decreased, but output of major livestock products increased moderately (see Table 4). The lack of progress in increasing the output of major livestock products in 1968 continued in 1969. Declines in the output of meat (-4 percent), milk (-1 percent), and wool (-6 percent) more than offset a moderate increase in the production of eggs (3½ percent) and led to a slight decrease in overall output of livestock products.<sup>1</sup> The decline in meat production in 1969 reflected the convergence of several developments that either directly

<sup>1</sup> The index of total output of livestock includes changes in inventories of livestock held for investment purposes. As indicated in Table 1, there was a small increase in total livestock output including changes in inventories.

or indirectly impinged on output of meat, milk, wool, and other livestock products. In addition to the smaller carryover of herds from the previous year, these developments included (1) a loss of livestock during the year due to adverse weather conditions, (2) a small decline in availability of feed per head of livestock, (3) a possible increase in the incidence of disease, and (4) the adoption of a policy of expanding depleted herds by foregoing slaughtering in 1969. Nevertheless, a limited success could be claimed in 1969: while the size of private herds continued to decline, the annual declines in overall inventories of livestock registered in the 2 previous years were arrested. A 1-percent gain in total value of livestock inventories reflected a substantial buildup in hog numbers, which by the end of 1968 had dropped some  $10\frac{1}{2}$  million (or nearly 20 percent) below the 1965 level. Even with the increase in 1969 of more than 7 million head, hog numbers remained 6 percent below 1965 levels. This increase, moreover, was nearly nullified by a major reduction in inventories of sheep and a small decline in cattle numbers. Cattle, sheep, and goat herds have now declined to the lowest level since the end of 1965. The buildup in hog inventories marked a retreat from the policy of encouraging hog raising only on specialized farms. The reduction in sheep flocks resulted from severe winter weather in the first quarter of the year.

#### CURRENT DEVELOPMENTS IN AGRICULTURAL POLICY

When Khrushchev's successors assumed control in late 1964, they were confronted with near stagnation of agricultural production in the face of steadily rising demand for farm products. Hence, a program for improving the state of Soviet agriculture, popularly termed the Brezhnev Program, was spelled out at a plenum of the CPSU in March 1965 and elaborated upon at the Twenty-Third Party Congress and at another Plenum in the Spring of 1966. Included in a long list of remedial measures were a number of provisions for expanding the production base of the farm sector during the period 1966-70. These were highlighted by targets requiring a doubling of deliveries to farms of new machinery and equipment and soil additives (fertilizer and lime) in 1966-70 in comparison with 1961-65. In addition, a major boost in investment in land reclamation was scheduled to result in an expansion of nearly 30 percent in the stock of irrigated and drained land by 1970.

Steps were taken in 1965-66 to implement major parts of the Brezhnev Program, but the striking success in increasing farm output in 1966 evidently led to a considerable weakening of the priority of the farm sector and, perhaps, an enhanced priority to other resource claimants in the allocation of resources in 1967-69. Those parts of the program that did not depend primarily on industrially produced goods for agriculture—such as plans for the use of improved cropping practices and for the introduction of a variety of incentives for farmers—were put into effect, while those parts of the program that required a sharp acceleration in investments and provision of industrially produced materials were permitted to lag far behind the original schedule. An initial spurt in 1965-66 in the flow of industrially produced goods to farms was followed in 1967-69 by major cutbacks from the original

plan for deliveries of both investment goods (tractors, trucks, and agricultural machinery) and industrially produced materials (fertilizer, lubricants, electric power, and the like). Even these new plans have not been met except in the case of fertilizer.

Deliveries of tractors and agricultural machinery during 1966-70 were scheduled to be nearly two-thirds above the deliveries for 1961-65. But during 1966-69 actual deliveries were only slightly more than one-third above the first 4 years (1961-64) of the previous 5-year period. Similarly, deliveries of trucks during 1966-69 were slightly more than three-fourths over 1961-64; a staggering 163 percent increase was targeted for 1966-70. The shortfall in investment in agricultural machinery and equipment means slower growth in inventories of farm machinery. During 1966-69, it is estimated that parks of the major types of machinery increased at an average annual rate of about 4 percent. If this tempo continues, the increase in total inventories of machinery in 1966-70 will be less than half that originally planned. For example, the park of tractors was to rise from about 1.6 million at the end of 1965 to 2.5 million at the end of 1970: combines from 520,000 to 790,000. At current estimated rates of progress, the net additions will be about 380,000 tractors and 105,000 combines or roughly 40 percent of planned increases.

Brezhnev's program called for a large expansion in the use of fertilizer and lime as a means of boosting crop yields. Annual deliveries of fertilizer to agriculture were to reach 55 million tons by 1970, double the 1965 level. The new plan also called for the liming of nearly 30 million hectares of croplands during 1966-70, a goal that would require doubling output of lime for agricultural purposes by 1970. Fertilizer deliveries—which amounted to almost 39 million tons in 1969—are nearest on schedule. Moreover, the addition of 11 million tons of new fertilizer capacity in 1969 indicated marked progress. Although this addition to capacity was below the planned 13 million ton increase, it was more than twice the new capacity added in 1968 and more than three times that added in either 1966 or 1967. In the past 4 years, however, lime was applied to only about 60 percent of the total area planned for 1966-70. Much of the blame for this lag is officially placed on the lack of transport and spreading equipment.

Under the Brezhnev Program, newly irrigated and drained land was to provide nearly one-third of the increase in gross agricultural production and grain output planned for 1966-70. Although investment in land reclamation thus far has proceeded at a somewhat brisker pace than other parts of the investment program, the total area reclaimed has not yet increased appreciably. Its average quality, however, is now higher. In 1966-69, investment in land amelioration was slightly more than 7 billion rubles, about 60 percent of the planned total for 1966-70. But annual gross additions of irrigated and drained land remained at about the 1965 level and cumulatively are only slightly more than one-half of the overall target for 1966-70. Because of this lag and because of stepped-up retirements from use of land previously reclaimed, the total stock of drained and irrigated land has remained largely unchanged.

#### OUTLOOK FOR 1970

Following the decline in agricultural production in 1969, the regime announced plans for an 8½ percent increase in gross agricultural output in 1970. A crash program to expand the agricultural resource base has

not been undertaken, yet it does not appear that stagnation in output will be accepted. Although the scheduled allocation of machinery and most other major inputs in 1970 is at or below the unimpressive rates of growth in 1966-69, significant increases are planned in the allocation of resources, such as soil additives, that are directly related to short-run gains in productivity. Deliveries of mineral fertilizer in 1970 are scheduled to increase by about 20 percent, a substantial increase over the 10 percent average annual rate of growth in deliveries for the preceding four years (1966-69). In addition, the capacity for mineral fertilizer production is to increase by 8.6 million tons in 1970, somewhat below the all time high of 11 million tons of capacity commissioned in 1969 but more than twice the average annual increase for 1966-68. The 1970 plan also calls for the application of lime to 5.5 million hectares (13.6 million acres). This amounts to an increase of 12 percent over 1969, but does not represent a significant deviation from the average annual increase of about 13½ percent from 1966 to 1969.

Short-run increases in output are also achievable by encouraging production in the private sector, and there are some indications that this activity is being stimulated. Party leaders have recently called upon local organs to accelerate the sale of young animals—especially pigs—to private households, to expand sales of grain and other feed-stuffs to the private sector and to encourage households to accept grain as in-kind payments for work in collective farms. Efforts are also being made to reverse the policy of specialization on collective and state farms which will enable these enterprises to maintain a flow of young stock to individual collective farmers and state farm workers.

#### NOTE TO TABLES ON INDEXES OF AGRICULTURAL OUTPUT

The indexes shown in Table 1 are based on the physical output for most crops and animal products, including changes in inventories of livestock, weighted by 1960 prices. 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 and potatoes, and milk fed to livestock and for the amounts of grain and potatoes used as seed. The physical commodities series rely in part on the acceptance of official data; in part on independent estimates for selected products (the individual grains); and in part on estimates that reflect downward adjustments of official claims for other products (oilseeds, meat, and milk). Official data is available for the 1969 production of most commodities, but the output of other products must be estimated (fruit, fiber flax, tobacco, makhorka, tea, silk cocoons, and minor oilseeds).

Differences between the figures shown in Tables 1 and 2 and those given in U.S. Congress, Joint Economic Committee, *Soviet Economic Performance: 1966-67*, page 28, are due to the following:

(1) The sample of commodities included in the index has been expanded from 11 to 17 commodity groups. Additional commodity groups include: fruits and berries, tobacco, makhorka, tea, silk cocoons, and minor oilseeds.

(2) 1960 price weights have been substituted for 1958 price weights in aggregating the output of farm products expressed in physical terms. The 1960 prices are the average realized prices received by all producers (collective and state farms and individual producers) for output sold through state channels and the collective farm market.

(3) Production data (official or estimated) for 1967 for several commodities have been changed.

For a more detailed description of the indexes (sources of data, coverage of commodity sample, methods of estimation), see U.S. Congress, Joint Economic Committee, *New Directions in the Soviet Economy*, Part II-B, pages 368-71.

## SPECIAL PROBLEM: PRODUCTION STATISTICS FOR MEAT, 1969

As suggested above, Western analysts generally have agreed that official Soviet production statistics for some of the major agricultural commodities contain considerable exaggeration. As indicated, although most publicity has been given to the inflation of statistics on grain, there is also evidence of exaggeration in output claims for meat, milk, and selected oilseeds. Official claims are therefore discounted to determine estimates of meat production. From 1950 to 1956, a standard discount of 10 percent was applied in deriving an estimated series of annual outputs. From 1957 to 1963, during Khrushchev's campaign to "catch up" with the United States in meat output, higher and varying discounts were used, reflecting pressures believed to have been placed on reporting officials at various levels to fulfill unrealistic goals which led to a greater-than-usual degree of falsification during this period. In 1964-68, however, a standard discount rate of 12 percent was applied to official estimates. This reflected collateral evidence bearing on the validity of official claims of meat output which did not suggest the need for either a varying rate of discount or as high a rate as for the latter years of the Khrushchev era. In 1969, however, the evidence at hand suggested that a somewhat larger deduction was in order when production was compared to 1968. It was officially claimed that the combined output of meat by the socialized and private sectors of the economy remained at the 1968 level. But a reduction in output of industrially processed meat, which constitutes nearly 90 percent of the total meat output of the socialized sector of the economy, was also announced. To maintain meat output at the 1968 level, a reduction in total meat output of the socialized sector would have to be compensated for by an increase in production of meat by the private sector of the economy, but, based upon the past relationship between the size of privately owned livestock herds and the production of meat by the private sector, such an increase appears unlikely. In addition, Brezhnev, in a speech in late November to the Kolkhoz Congress, admitted that per capita consumption of meat in 1969 was 4 percent below that in 1968. In summary, these indicators of meat output by the socialized sector and by the private sector imply a decline in total meat output, in contrast to the official claim that output in 1969 was maintained at the 1968 level. Therefore, in 1969 the official claim for meat output is discounted by 15½ percent, leading to a drop of 4 percent below the estimated level of output in 1968.

TABLE 1.—U.S.S.R.: *Indexes of net agricultural production, 1950-69*

[1960=100]

|           | Total | Crops <sup>1</sup> | Livestock <sup>2</sup> |           |                    |                        |
|-----------|-------|--------------------|------------------------|-----------|--------------------|------------------------|
|           |       |                    |                        | Total     | Crops <sup>1</sup> | Livestock <sup>2</sup> |
| 1950..... | 69    | 84                 | 56                     | 1960..... | 100                | 100                    |
| 1951..... | 63    | 68                 | 59                     | 1961..... | 107                | 107                    |
| 1952..... | 70    | 84                 | 58                     | 1962..... | 105                | 101                    |
| 1953..... | 72    | 80                 | 66                     | 1963..... | 102                | 99                     |
| 1954..... | 74    | 81                 | 67                     | 1964..... | 116                | 130                    |
| 1955..... | 83    | 93                 | 75                     | 1965..... | 118                | 115                    |
| 1956..... | 94    | 107                | 83                     | 1966..... | 128                | 133                    |
| 1957..... | 94    | 96                 | 93                     | 1967..... | 129                | 133                    |
| 1958..... | 102   | 109                | 96                     | 1968..... | 136                | 143                    |
| 1959..... | 100   | 96                 | 103                    | 1969..... | 130                | 130                    |

<sup>1</sup> Crop production less adjustments for seed and feed.<sup>2</sup> Livestock products adjusted for changes in livestock numbers.



TABLE 2.—U.S.S.R.: Average annual rates of growth of net agricultural output, selected periods, 1951-69<sup>1</sup>

|              | [In percent]            |   |
|--------------|-------------------------|---|
|              | Straight annual average | Moving average for 3 years <sup>2</sup> |
| 1951-69..... | 3.4                     | <sup>3</sup> 3.6                        |
| 1951-60..... | 3.8                     | 4.3                                     |
| 1961-65..... | 3.4                     | 3.4                                     |
| 1961-69..... | 3.0                     | <sup>3</sup> 2.7                        |
| 1966-69..... | 2.5                     | <sup>3</sup> 1.9                        |

<sup>1</sup> The base year for the calculations shown in each line is the year before the stated initial year of period; i.e., the average annual rate of increase for 1951-68 is computed by relating production in 1968 to base year 1950.

<sup>2</sup> Average annual rates of growth were computed by relating the 3-year average for the terminal year (for example, using the average for 1959, 1960, and 1961 as output for 1960) to a similar 3-year average for the base year 1950.

<sup>3</sup> End year is not a 3-year average but net agricultural output for that year only.

TABLE 3.—U.S.S.R.: Production of major crops, 1960-69<sup>1</sup>

|                              | [In million metric tons] |       |       |       |       |       |       |       |       |       |
|------------------------------|--------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                              | 1960                     | 1961  | 1962  | 1963  | 1964  | 1965  | 1966  | 1967  | 1968  | 1969  |
| Total grain: <sup>2</sup>    |                          |       |       |       |       |       |       |       |       |       |
| Estimated <sup>3</sup> ..... | 93.0                     | 110.0 | 109.0 | 92.0  | 120.0 | 100.0 | 140.0 | 122.0 | 135.0 | 128.0 |
| Soviet official.....         | 125.5                    | 130.8 | 140.2 | 107.5 | 152.1 | 121.1 | 171.2 | 147.9 | 169.5 | 160.5 |
| Wheat:                       |                          |       |       |       |       |       |       |       |       |       |
| Estimated <sup>3</sup> ..... | 46.0                     | 55.0  | 57.0  | 40.0  | 58.0  | 48.0  | 85.0  | 63.0  | 74.4  | 62.8  |
| Soviet official.....         | 64.3                     | 66.5  | 70.8  | 49.7  | 74.4  | 59.7  | 100.5 | 77.4  | 93.4  | 78.7  |
| Potatoes.....                | 84.4                     | 84.3  | 69.7  | 71.8  | 93.6  | 88.7  | 87.9  | 95.5  | 102.2 | 91.7  |
| Vegetables.....              | 16.6                     | 16.2  | 16.0  | 15.2  | 19.5  | 17.6  | 17.9  | 20.5  | 19.0  | 18.2  |
| Sugar beets (factory use)... | 57.7                     | 50.9  | 47.4  | 44.1  | 81.2  | 72.3  | 74.0  | 87.1  | 94.3  | 71.0  |
| Sunflower seeds:             |                          |       |       |       |       |       |       |       |       |       |
| Estimated <sup>4</sup> ..... | 3.65                     | 4.37  | 4.41  | 3.94  | 5.57  | 5.01  | 5.66  | 6.08  | 6.15  | 5.80  |
| Soviet official.....         | 3.97                     | 4.75  | 4.80  | 4.28  | 6.06  | 5.45  | 6.15  | 6.61  | 6.68  | 6.30  |
| Seed cotton.....             | 4.29                     | 4.52  | 4.30  | 5.21  | 5.28  | 5.66  | 5.98  | 5.97  | 5.95  | 5.71  |

<sup>1</sup> Soviet official data unless otherwise indicated.

<sup>2</sup> Including pulses.

<sup>3</sup> Estimate of usable grain. Net usable grain is estimated as the gross output minus excess moisture, unripe and damaged kernels, weed seeds, and postharvest 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.

<sup>4</sup> Official data for gross output have been reduced by about 8 percent to allow for excess 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.

TABLE 4.—U.S.S.R.: Livestock numbers and production of major livestock products, 1960-69

|  | 1960  | 1961  | 1962  | 1963  | 1964  | 1965  | 1966  | 1967  | 1968  | 1969  |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <b>A. Livestock numbers at end of year (million head):</b>     |       |       |       |       |       |       |       |       |       |       |
| Cattle:  |       |       |       |       |       |       |       |       |       |       |
| Total.....   | 75.8  | 82.1  | 87.0  | 85.4  | 87.2  | 93.4  | 97.1  | 97.2  | 95.7  | 95.0  |
| Cows.....  | 34.8  | 36.3  | 38.0  | 38.3  | 38.8  | 40.1  | 41.2  | 41.6  | 41.2  | 40.6  |
| Hogs.....  | 58.7  | 66.7  | 70.0  | 40.9  | 52.8  | 59.6  | 58.0  | 50.9  | 49.0  | 56.1  |
| Sheep and goats.....   | 140.3 | 144.5 | 146.4 | 139.6 | 130.7 | 135.3 | 141.0 | 144.0 | 146.1 | 136.3 |
| <b>B. Production of major livestock products: <sup>1</sup></b> |       |       |       |       |       |       |       |       |       |       |
| Meat: <sup>2</sup>   |       |       |       |       |       |       |       |       |       |       |
| Official.....  | 8.7   | 8.7   | 9.5   | 10.2  | 8.3   | 10.0  | 10.7  | 11.5  | 11.6  | 11.6  |
| Adjusted <sup>3</sup> .....                                    | 7.4   | 7.4   | 8.1   | 8.5   | 7.3   | 8.8   | 9.4   | 10.1  | 10.2  | 9.8   |
| Milk: <sup>4</sup>   |       |       |       |       |       |       |       |       |       |       |
| Official.....  | 61.7  | 62.6  | 63.9  | 61.2  | 63.3  | 72.6  | 76.0  | 79.9  | 82.3  | 81.6  |
| Adjusted <sup>4</sup> .....                                    | 55.5  | 56.3  | 58.1  | 56.3  | 59.5  | 68.2  | 71.4  | 75.1  | 77.4  | 76.7  |
| Eggs (in billions) <sup>6</sup> .....                          | 27.5  | 29.3  | 30.1  | 28.5  | 26.7  | 29.1  | 31.7  | 33.9  | 35.7  | 37.0  |
| Wool (thousand metric tons) <sup>7</sup> .....                 |       |       |       |       |       |       |       |       |       |       |
|  | 357.0 | 366.0 | 371.0 | 373.0 | 341.0 | 357.0 | 371.0 | 395.0 | 415.0 | 390.0 |

<sup>1</sup> Million metric tons except as noted.

<sup>2</sup> Slaughter weight basis, including slaughter fats, edible byproducts, poultry, and miscellaneous meats.

<sup>3</sup> Official data reduced by 12 to 17 percent to arrive at estimated amount of meat actually produced.

<sup>4</sup> Includes milk fed to calves and pigs.

<sup>5</sup> Official data reduced by 6 to 10 percent to arrive at estimated amount of milk actually produced.

<sup>6</sup> Soviet official data.

<sup>7</sup> Grease basis.

## THE FUELS INDUSTRIES

*By* J. RICHARD LEE

The U.S.S.R. leads the world in the production of coal and ranks second to the United States in output of crude oil and natural gas. The rate of growth in production of fuels in the U.S.S.R., however, has been declining for several years and without substantial increases in investment is unlikely to improve in the near future. During 1966-69 average annual growth in output of major fuels was about 5.5 percent, compared with about 7.3 percent annually during 1961-65. The unfavorable performance of the fuels industries in recent years results from the failure to solve several chronic problems related to the allocation of investment and the management of investment programs. Growing demand for fuel coupled with depletion of resources in older producing regions is forcing exploitation of reserves at greater depths or in new areas, many of them remote from centers of consumption and affected by severe extremes of climate. Some of the exploration and production technology and equipment now employed are not suited to the changing geologic and climatic conditions. As a result, substantial capital investment for modernization and reequipment will be required. In the recent past, however, increases in production per unit of additional investment have been growing smaller, at least in part because more output has come from remote, high-cost areas.

The record of plan fulfillment in the Soviet fuels industries in 1968 was the worst in recent years. Only the goal for production of crude oil—309 million tons—was achieved, while the output of gas was underfulfilled by some 2 billion cubic meters. Production of coal not only failed to meet plan, but actually declined for the first time since 1961. There was some improvement, however, in 1969 when coal production rose sharply, about 2 percent above plan. Crude oil output met plan, but the percentage increase (6.1 percent) was the smallest in the postwar period. Natural gas production failed to reach the goal by almost 3 billion cubic meters. (See Tables 1 and 2.) The achievements in oil and coal production in 1969 were significant, considering that output in the first half of the year was behind that in the same period of 1968 because of the severe winter weather in early 1969.

Annual goals for production of crude oil since 1950 have generally been fulfilled, and at times overfulfilled. Since 1966, however, the rate of increase in annual output has fallen steadily, and in 1969 it reached the lowest level of the postwar period, only 6.1 percent despite the record production of 328 million tons. The plan for 1970 calls for production of some 350 million tons of crude oil, about 22 million tons more than in 1969 and an increase of 6.7 percent. This goal, although somewhat optimistic, can be achieved if production difficulties in West Siberia can be overcome.

Output of natural gas has failed to meet annual goals during the past decade because of inadequate investment in producing and consuming equipment and in pipeline facilities. In 1969, production of natural gas reached about 181 billion cubic meters, almost 3 billion cubic meters below plan, and an increase of 7.2 percent—the lowest rate of increase since 1952 when this branch of the petroleum industry was still insignificant. The goal for production in 1970 was lowered in 1969 from 200 billion cubic meters to about 196 billion, and even the reduced level may be difficult to achieve unless further progress is made in solving the problems of providing adequate pipelines and producing and consuming equipment.

Construction of gas pipelines has been given priority in the Soviet Union because natural gas is a low cost, clean, and efficient source of energy that can be transported economically, only by pipeline. As a result of the lower priority given to building oil pipelines, about 40 percent of all oil moved in the U.S.S.R. is transported by rail at a cost about 3 times that of pipeline transport. The U.S.S.R. leads the world in the use of large-diameter pipelines, but construction of oil and gas pipelines has not proceeded steadily and has not kept pace with plans because of shortages of equipment, such as valves, compressors, and pumps, and because of difficult supply problems in remote areas, especially in Western Siberia. For example, in 1968, only about 3,400 kilometers of gas lines and 1 700 kilometers of oil lines were built, the lowest annual total since 1962. In 1969, however, one of the best completion records was achieved—7,300 kilometers of gas pipelines and 2,700 kilometers of oil pipelines. With the erratic performance of pipeline construction during 1966–69, it is doubtful that the 1970 goal for construction of oil pipelines can be achieved, whereas that for gas pipelines could be with another outstanding year of construction. At the end of 1969, the length of the gas pipeline system was more than 63,000 kilometers, and the goal for 1970 is 70,000 kilometers. The oil pipeline network amounted to almost 37,000 kilometers at the end of 1969. To reach the goal of 41,000 kilometers by the end of 1970 more than 4,000 kilometers of oil lines would have to be built in one year, on achievement not previously attained in oil pipeline construction.

Soviet demands for high quality petroleum products are increasing but much of the specialized refining equipment required to produce these products is not being installed as rapidly as needed, or when completed is not operated at design capacity. Expansion of existing refineries has not been completed on schedule and the proper mix of products to meet seasonal and regional demands has not been provided. Not a single new oil refinery was started during 1962–68 and two important refineries planned in 1965 have not as yet reached the blueprint stage.

Production of oil industry equipment, primarily refining equipment, has fluctuated within wide limits during the past 15 years—from a low of about 49,000 tons in 1955 to a high of almost 148,000 tons in 1966. Irregular delivery of equipment probably has contributed to the failure to complete refinery construction on schedule. In 1969, output of oil equipment amounted to about 123,000 tons, approximately 2,000 tons less than in 1968 and 17,000 tons less than in 1967. Not since 1966 has output of oil equipment fulfilled the planned goals.

Exports of oil from the U.S.S.R. in 1968 increased about 9 percent above those in 1967, whereas in 1969 such exports did not increase. Annual rates of increase in exports during 1960-67, however, averaged about 15 percent.

In 1969—for the first time since 1955 when the Soviet Union became a net exporter of oil—exports of oil to the free world declined, by about 3 million tons (see table 3). Oil exports to the free world have been the largest single source of foreign exchange for the U.S.S.R. during the past several years. Hard currency earnings from such exports amounted to about \$350 million in 1969. Early in 1969, V. D. Shashin, Minister of the Petroleum Extraction Industry, stated that Soviet exports of oil will not increase significantly in the future because of rising domestic demands for oil. He said that the Soviet Union will maintain a high level of exports to Eastern Europe, but doubted that exports to the West will continue to increase indefinitely.

The U.S.S.R. evidently is committed to supply larger amounts of oil to meet the rapidly rising needs of Eastern Europe. To provide this oil the Friendship crude oil pipeline system between the U.S.S.R. and Poland, East Germany, Czechoslovakia, and Hungary is being paralleled. As a result, Soviet exports to the free world may continue to decline, along with earnings of hard currency from such exports. To enable the U.S.S.R. to provide the petroleum needed by Eastern Europe, most of the East European countries have agreed to invest in the development of Soviet petroleum and other industrial resources. Within the past year or so, Eastern European countries that are heavily dependent on Soviet oil have signed agreements with Middle East countries to import supplemental quantities of Middle East crude oil in exchange for commercial goods.

In the latter part of 1969 the U.S.S.R. signed agreements to export natural gas to West Germany and Italy in exchange for large-diameter pipe. The imported pipe will be delivered during 1970-72 and will facilitate construction of Soviet gas and oil pipeline systems. These gas exports eventually will earn foreign exchange and thus may compensate for a decline in oil exports to the free world. Until the mid-1970's, however, the U.S.S.R. will be a net importer of gas, as imports from Afghanistan and Iran will exceed total exports.

The Soviet coal industry in 1968 and 1969 showed sharply different production results. In 1968, output was 594 million tons, about 1 million tons less than in 1967, the first decline since 1961 and only the second in the postwar period. Commissioning of additional mining capacity also lagged badly in 1968, amounting to only 12 million tons, compared with an average of more than 17 million tons per year during 1961-67. In 1969, however, production of coal amounted to about 608 million tons, 2 percent more than plan. The 14-million ton increase was the largest since 1965 when output rose 24 million tons. The program for modernizing and reequipping the older underground mines, which has been underway for at least 5 years and which has lagged behind schedule, may now be starting to pay off. With this indication of improved output, the 1970 goal of 618 million tons seems readily attainable.

Most of the capital investment in the coal industry has been allocated to the development of high-cost underground mining areas, such as the Donets Basin. In the extension of mining to greater depths,

unforeseen and difficult geological conditions were encountered that led to higher unit costs. Nevertheless, greater attention is being given to the production of coking coal as there is no adequate substitute for coke in the manufacture of iron and steel. Huge deposits of low-cost, low-quality coal in the eastern region have not been developed as expected because of the lack of consumers in the area. During 1962-68, investment in the coal industry as a whole rose at an average annual rate of 4.6 percent while coal production increased at an average of only 2.3 percent per year.

Soviet exports of coal and coke during 1966-69 remained rather constant at about 26 million tons per year. Of this total, almost 9 million tons per year, valued at approximately \$110 to \$120 million, were exported to the industrialized countries of the Free World.

Although the U.S.S.R. is the world's leading producer of coal, since 1963 oil and gas have accounted for a larger share of total fuel production at the expense of coal. In 1968, crude oil surpassed coal for the first time as the major fuel produced in the Soviet Union (see Table 4). In the future, coal will be consumed mainly in those sectors of the economy where it cannot be replaced or where it is cheaper than oil or gas. Increases in coal output will depend to a large degree on expanding production of coke for use in the metallurgical industries and on the use of coal as a fuel in thermal powerplants.

TABLE 1.—U.S.S.R. output of major fuels, 1960-69

| Fuel                           | 1960  | 1961  | 1962  | 1963  | 1964  | 1965  | 1966  | 1967  | 1968  | 1969  |
|--------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Coal <sup>1</sup> .....        | 509.6 | 506.4 | 517.4 | 531.7 | 554.0 | 577.7 | 585.6 | 595.2 | 594.0 | 608.0 |
| Crude oil <sup>1</sup> .....   | 147.9 | 166.1 | 186.2 | 206.1 | 223.6 | 242.9 | 165.1 | 288.1 | 309.2 | 328.0 |
| Natural gas <sup>2</sup> ..... | 45.3  | 59.0  | 73.5  | 89.8  | 108.6 | 127.7 | 143.0 | 157.4 | 169.1 | 181.3 |

<sup>1</sup> Million metric tons.

<sup>2</sup> Billion cubic meters (excludes gases manufactured from coal and oil shale).

TABLE 2.—U.S.S.R. annual rates of growth in production of major fuels, 1960-68

[In percent]

| Fuel             | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 |
|------------------|------|------|------|------|------|------|------|------|------|------|
| Coal.....        | 1.3  | -0.6 | 2.2  | 2.8  | 4.2  | 4.3  | 1.4  | 1.6  | -0.2 | 2.4  |
| Crude oil.....   | 14.1 | 12.3 | 12.1 | 10.6 | 8.5  | 8.6  | 9.2  | 8.7  | 7.3  | 6.1  |
| Natural gas..... | 28.0 | 30.2 | 24.7 | 22.2 | 20.9 | 17.6 | 12.0 | 10.1 | 7.4  | 7.2  |

TABLE 3.—U.S.S.R.: Exports of petroleum, 1960-69<sup>1</sup>

[In millions of metric tons]

| Year                    | Exports to free world countries |          |       | Exports to other Communist countries |          |       | Grand total <sup>2</sup> |
|-------------------------|---------------------------------|----------|-------|--------------------------------------|----------|-------|--------------------------|
|                         | Crude oil                       | Products | Total | Crude oil                            | Products | Total |                          |
| 1960.....               | 9.0                             | 9.1      | 18.1  | 8.8                                  | 6.3      | 15.1  | 33.2                     |
| 1962.....               | 13.6                            | 11.1     | 24.7  | 12.7                                 | 8.0      | 20.7  | 45.4                     |
| 1964.....               | 18.8                            | 12.5     | 31.3  | 17.9                                 | 7.4      | 25.3  | 56.6                     |
| 1965.....               | 21.0                            | 14.5     | 35.5  | 22.4                                 | 6.5      | 28.9  | 64.4                     |
| 1966.....               | 24.8                            | 16.5     | 41.3  | 25.5                                 | 6.8      | 32.3  | 73.6                     |
| 1967.....               | 26.8                            | 16.9     | 43.7  | 27.3                                 | 8.1      | 35.4  | 79.0                     |
| 1968.....               | 26.7                            | 18.0     | 44.7  | 32.5                                 | 9.0      | 41.5  | 86.2                     |
| 1969 <sup>3</sup> ..... | 25.2                            | 16.5     | 41.7  | 36.0                                 | 8.5      | 44.5  | 86.2                     |

<sup>1</sup> Data derived from official Soviet trade statistics (U.S.S.R. Ministerstvo Vneshnei Torgovli, *Vneshniiiaia torgovlia S.S.R. za . . . god*, Moscow, Vneshtorgizdat, annual).

<sup>2</sup> Because of rounding, components may not add to total shown.

<sup>3</sup> Preliminary estimate.

TABLE 4.—U.S.S.R. share of fuels in national output, 1960-69 <sup>1</sup>

[In percent]

| Fuel             | 1960  | 1961  | 1962  | 1963  | 1964  | 1965  | 1966  | 1967  | 1968  | 1969 <sup>2</sup> |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------------|
| Coal.....        | 45.9  | 50.5  | 48.8  | 45.9  | 44.2  | 42.7  | 40.7  | 39.4  | 38.0  | 37.1              |
| Crude oil.....   | 30.5  | 32.4  | 34.2  | 34.8  | 35.1  | 35.8  | 36.7  | 37.8  | 39.2  | 39.7              |
| Natural gas..... | 7.9   | 9.7   | 10.9  | 12.4  | 13.9  | 15.5  | 16.5  | 17.2  | 17.9  | 18.5              |
| Fuelwood.....    | 4.1   | 4.0   | 3.7   | 3.6   | 3.6   | 3.5   | 3.1   | 2.8   | 2.5   | 2.4               |
| Peat.....        | 2.5   | 2.7   | 1.7   | 2.5   | 2.4   | 1.7   | 2.3   | 2.1   | 1.6   | 1.7               |
| Shale.....       | .7    | .7    | .7    | .8    | .8    | .8    | .7    | .7    | .8    | .6                |
| Total.....       | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0             |

<sup>1</sup> 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 khoziatstvo SSSR v 1968 g.*, p. 233).

<sup>2</sup> Preliminary estimate.

## FREIGHT TRANSPORTATION IN THE U.S.S.R.

*By* EARL L. MICHELL *and* PRISCILLA PAINTER

The Soviet transportation system continued to grow in 1968-69, although showing signs of strain at times. Total freight traffic in 1968 increased 7 percent compared with the 1967 level, and grew 5 percent more in 1969 to 3,581 billion ton-kilometers, according to official preliminary data.

Two-thirds of this traffic was handled by the railroads. The role of the various modes of transportation in tons and ton-kilometers is shown in the tabulation below. The relative standing of the various modes differs greatly when measured by tons carried rather than ton-kilometers because of differences in the average length of haul, which is particularly short for motor transport.

Railroads still lead in ton-kilometers but in recent years other modes of transportation—especially pipeline and maritime—have been growing more rapidly (table 1). Because of differences in the nature of the traffic, the average revenue per ton-kilometer of freight varies considerably among different modes of transportation. In the period since 1960, however, a value-weighted index of growth (table 2) showed about the same rate as an index based on ton-kilometers.



*U.S.S.R. freight traffic by mode, 1968-69*<sup>1</sup>

|                      | Tons carried (million) |          | Average length of haul<br>(kilometers) |       | Ton-kilometers<br>(billion) |         | Percent      |      |                |     |
|----------------------|------------------------|----------|--|-------|-----------------------------|---------|--------------|------|----------------|-----|
|                      |                        |          |  |       |                             |         | Tons carried |      | Ton-kilometers |     |
|                      | 1968                   | 1969     | 1968                                   | 1969  | 1968                        | 1969    | 1968         | 1969 |                |     |
| Railroads.....       | 2,705.6                | 2,760.0  | 841                                    | 858   | 2,274.8                     | 2,367.1 | 16           | 16   | 67             | 66  |
| Maritime.....        | 146.6                  | 145.0    | 4,003                                  | 4,150 | 586.8                       | 601.3   | 1            | 1    | 17             | 17  |
| Oil pipelines.....   | 301.3                  | 324.0    | 717                                    | 755   | 215.9                       | 244.6   | 2            | 2    | 6              | 7   |
| Motor transport..... | 12,800.4               | 14,000.0 | 15                                     | 15    | 187.1                       | 206.4   | 79           | 79   | 5              | 6   |
| Inland water.....    | 322.5                  | 332.0    | 482                                    | 482   | 165.4                       | 160.0   | 2            | 2    | 5              | 4   |
| Air.....             | 1.6                    | 1.7      | 1,101                                  | 1,118 | 1.8                         | 1.9     | (?)          | (?)  | (?)            | (?) |
| Total.....           | 16,278.0               | 17,563.0 |  |       | 3,421.8                     | 3,581.3 | 100          | 100  | 100            | 100 |

<sup>1</sup> Data for 1968 are official Soviet statistics as published in *Narodnoe khoziaistvo SSSR v 1968 godu*, Moscow, Statistika, 1969. Data for 1969 ton-kilometers are the latest preliminary official Soviet figures, published in *Vestnik statistiki*, No. 5, 1970, p. 88. Data for 1969 tons for oil pipelines and inland water transport are from *Pravda*, January 25, 1970. Data in *Pravda* for railroads are presumed to refer to broad-gauge railroads only, based on past reporting; in the above table the rail figures include an allowance for traffic on narrow-gauge railroads for comparability with 1968 rail data. The estimate for maritime traffic

assumes some underfulfillment of the 1969 plan for more than 150 million tons because the plan of 638 billion ton-kilometers was underfulfilled. (The plans were reported in *Vodnyi transport*, v. 38, no. 15 (5454), Feb. 4, 1969, p. 1.) The figure for motor transport tons in 1969 was estimated from ton-kilometers by assuming that the average length of haul was about the same as in 1968. For other modes the average length of haul was calculated by dividing ton-kilometers by tons.

<sup>2</sup> Negligible.

The railroads worked under considerable strain during 1968 and did not fully satisfy the demand for freight transportation, according to the public statements of Soviet officials, and the situation apparently worsened in 1969. Although annual plans for total rail freight traffic in both tons and ton-kilometers were overfulfilled in 1968 and more than 99 percent fulfilled in 1969, unduly large quantities of freight accumulated at producing enterprises, primarily the result of a continued tight supply of freight cars.<sup>1</sup> Unusually bad weather contributed to difficulties in 1969.

During 1968-69 the U.S.S.R. continued its long-range program of replacing steam locomotives with electric and diesel locomotives, a program undertaken to increase line capacity and to reduce operating costs. The U.S.S.R. has found it worthwhile to electrify rail lines primarily because of the high freight density. Average net freight traffic density on Soviet electrified railroads in 1968 was 34 million ton-kilometers per kilometer of route, twice the national average of 17 million ton-kilometers per kilometer. Average net rail freight traffic density in the United States is only about 3 million ton-kilometers per kilometer, on a rail network almost three times as long as the Soviet and which carries only half of the ton-kilometers. In 1968 electric locomotives were responsible for hauling 46 percent of all Soviet rail freight traffic, diesel locomotives 48 percent, and steam, 6 percent. In 1969 the steam share decreased to 4 percent. During 1968 and 1969 the length of route served by electric locomotives increased by about 3,100 kilometers, bringing the total to 32,200 kilometers, or 24 percent of the route length of the railroad network (now about 134,400 kilometers). Diesel locomotives operated on about 73,000 kilometers, or on 54 percent of the route.

The pace of railroad electrification in the U.S.S.R. has been slowing and is significantly slower than once envisioned in long-range plans. The pace of construction of new rail lines and second track is even slower relative to long-range plans. It now appears that of the 7,000 kilometers of new rail lines that were originally scheduled to be commissioned during 1966-70 only 3,700 will be put in service, and only half of the planned 4,000 kilometers of second track will be commissioned. About 331 kilometers of new railroad lines were commissioned in 1968 and another 778 kilometers in 1969, compared with an average of about 1,000 kilometers annually during 1961-67. Construction has continued on such important new railroad lines as those to the new oil producing areas and to other areas of new development.

Motor freight transportation in the U.S.S.R. is still largely a short-haul operation, although long-haul trucking is increasing. The average haul of motor freight traffic is only about 15 kilometers as compared with 858 kilometers on the railroad. The Soviet truck inventory is estimated at about one-fourth the U.S. inventory. Soviet trucks generally are in poor condition compared with U.S. trucks for various reasons, including defects at time of manufacture, insufficient repair facilities, and a severe shortage of spare parts.

<sup>1</sup> The U.S.S.R. does not publish statistics on freight car inventory, but one high-ranking Soviet official says that freight cars are used four times as intensively in the U.S.S.R. as in the United States. (K. Simonov, chief of the CC CPSU's Division of Transportation and Communication, in *Ekonomicheskaya gazeta*, No. 34, August 1969, p. 5.)

Greater attention is now being given to the long-neglected road system. The 480,000-kilometer Soviet surfaced road network—excluding dirt roads but including gravel and other inferior type surfaces—is only one-tenth that of the U.S. and the Soviet network of asphalt and concrete roads is only one-fourteenth of the U.S. figure. In August 1968 Soviet officials announced a stepped up highway construction program to provide for a yearly increase of about 20 percent in the construction of surfaced roads during 1971–80. As a result, 40,000 kilometers of new surfaced roads are to be commissioned in 1975 and more than 100,000 kilometers in 1980, compared with about 13,000 kilometers in 1968 and 15,000 kilometers planned for 1969.<sup>2</sup> Soviet roadbuilding, however, will continue to be restricted by shortages of asphalt and construction machinery.

The Soviet oil pipeline network increased by 1,700 kilometers in 1968 and by another 2,700 kilometers in 1969, bringing the total to about 36,800 kilometers. Construction of oil pipelines has lagged behind needs for a long time. In recent years the pace of construction has suffered from the priority given to construction of gas pipelines, which compete for available pipe, labor, and funds. In 1968–69 the network of mainline gas pipelines was increased by 10,800 kilometers to a total of about 63,400 kilometers. Insufficient pipeline capacity of mainline oil and gas pipelines in some regions has been retarding the growth of oil and gas production and Soviet officials say pipeline construction needs to be accelerated. A substantial portion of the oil that now moves on the railroad could be transported much more cheaply by pipeline.

The Soviet merchant fleet continued to expand during 1968–69 and at the end of 1969 consisted of more than 1,300 ships with a total capacity exceeding 11 million deadweight tons. The fleet remained the seventh largest in the world and during 1968–69 carried more than half of Soviet seaborne foreign trade.

Soviet air freight transportation is small in terms of ton-kilometers, but it is of importance for the movement of mail and for freight with a high value-to-weight ratio, especially in remote regions not easily accessible by other modes of transportation. The tremendous growth of Aeroflot in the 1960's has been in passenger traffic rather than in freight.

#### NOTE TO TABLES ON FREIGHT TRANSPORTATION

The data on freight traffic in the following tables are taken from Soviet statistical publications. Traffic reported for motor transport includes traffic carried by both common carrier transport organizations and other organizations and enterprises.

In constructing the index of the value of total freight traffic in table 2, the individual ton-kilometer indexes were weighted by the estimated average revenue per ton-kilometer in the various modes of transport. Although it can be argued that an alternative set of weights based on unit costs would be more appropriate, an index of the value of total freight traffic based on such unit cost weights does not differ appreciably from the index presented in table 2.

<sup>2</sup> These figures on new construction do not include all additions to the network of surfaced roads because Soviet data on the surfaced road network for recent years show increases about twice the size of new construction figures. The difference may represent surfacing that is classed as repair work rather than new construction.

TABLE 1.—U.S.S.R. growth of freight traffic by type of carrier, 1960–69

|                  | [Billion ton-kilometers] |           |                 |               |              |          |       |
|------------------|--------------------------|-----------|-----------------|---------------|--------------|----------|-------|
|                  | All carriers             | Railroads | Motor transport | Oil pipelines | Inland water | Maritime | Air   |
| 1960.....        | 1,885.7                  | 1,504.3   | 98.5            | 51.2          | 99.6         | 131.5    | 0.563 |
| 1961.....        | 1,998.2                  | 1,556.6   | 105.7           | 60.0          | 106.0        | 159.1    | .802  |
| 1962.....        | 2,116.9                  | 1,646.3   | 111.9           | 74.5          | 109.9        | 173.4    | .890  |
| 1963.....        | 2,301.7                  | 1,749.4   | 119.7           | 90.9          | 114.5        | 226.3    | .913  |
| 1964.....        | 2,521.5                  | 1,854.1   | 132.1           | 112.1         | 124.5        | 297.6    | 1.141 |
| 1965.....        | 2,764.0                  | 1,950.2   | 143.1           | 146.7         | 133.9        | 388.8    | 1.338 |
| 1966.....        | 2,918.3                  | 2,016.0   | 155.3           | 165.0         | 137.7        | 442.8    | 1.445 |
| 1967.....        | 3,186.8                  | 2,160.5   | 170.2           | 183.4         | 143.9        | 527.1    | 1.662 |
| 1968.....        | 3,421.8                  | 2,274.8   | 187.1           | 215.9         | 155.4        | 586.8    | 1.803 |
| 1969.....        | 3,581.3                  | 2,367.1   | 206.4           | 244.6         | 160.0        | 601.3    | 1.950 |
| Index (1960=100) |                          |           |                 |               |              |          |       |
| 1960.....        | 100                      | 100       | 100             | 100           | 100          | 100      | 100   |
| 1961.....        | 106                      | 104       | 107             | 117           | 106          | 121      | 142   |
| 1962.....        | 112                      | 109       | 114             | 146           | 110          | 132      | 158   |
| 1963.....        | 122                      | 116       | 122             | 178           | 115          | 172      | 162   |
| 1964.....        | 134                      | 123       | 134             | 219           | 125          | 226      | 203   |
| 1965.....        | 147                      | 130       | 145             | 287           | 134          | 296      | 238   |
| 1966.....        | 155                      | 134       | 158             | 322           | 138          | 337      | 257   |
| 1967.....        | 169                      | 144       | 173             | 358           | 144          | 401      | 295   |
| 1968.....        | 181                      | 151       | 190             | 422           | 156          | 446      | 320   |
| 1969.....        | 190                      | 157       | 210             | 478           | 161          | 457      | 346   |

TABLE 2.—U.S.S.R.: Value and volume indexes of the growth of total freight traffic, 1960–69

|           | Value <sup>1</sup> |                  | Volume                 |                  |
|-----------|--------------------|------------------|------------------------|------------------|
|           | Million Rubles     | Index (1960=100) | Billion Ton-kilometers | Index (1960=100) |
| 1960..... | 16,379             | 100              | 1,885.7                | 100              |
| 1961..... | 17,417             | 106              | 1,998.2                | 106              |
| 1962..... | 18,468             | 113              | 2,116.9                | 112              |
| 1963..... | 19,827             | 121              | 2,301.7                | 122              |
| 1964..... | 21,723             | 133              | 2,521.5                | 134              |
| 1965..... | 23,535             | 144              | 2,764.0                | 147              |
| 1966..... | 25,134             | 153              | 2,918.3                | 155              |
| 1967..... | 27,444             | 168              | 3,186.8                | 169              |
| 1968..... | 29,754             | 182              | 3,421.8                | 181              |
| 1969..... | 32,001             | 195              | 3,581.3                | 190              |

<sup>1</sup> Expressed in terms of new rubles at 1955 prices. Sum of the value of production for each carrier. This was obtained by multiplying ton-kilometers by estimated average revenue for 1955 (new kopeks per ton-kilometer) as follows:

Railroads, 0.488 (1). Motor transport, 3.78. Calculated from the rate per ton for class 2 freight (presumed typical) at the average haul distance in 1955, according to rates established July 1, 1955 (2). Pipelines, 0.20. Estimated same as cost per ton-kilometer, which was calculated from ton-kilometers and total costs (3). Inland water, 0.387. Cost plus profit (4). Maritime, 0.297. Estimated same as cost per ton (5). Air, 20.

## Sources

(1) Minsker, Samuil Sergeevich, comp. *Razvitiye zheleznodorozhnogo transporta v semiletii, sbornik statei*, Moscow, 1960, p. 320.

(2) U.S.S.R. Ministerstvo avtomobil'nogo transporta i shosseinykh dorog, *Spravochnik edinykh tarifov na perevozku gruzov avtomobil'nym transportom*, Moscow, 1955, p. 5.

(3) Akademiya nauk SSSR, Institut kompleksnykh transportnykh problem. *Transportnye izderzhki v narodnom khoziaistve SSSR*, Moscow, 1959, p. 34.

(4) U.S.S.R. Tsentral'noe statisticheskoe upravlenie, *Transport i vliaz' SSSR*, Moscow, 1957, p. 24; *Rechnoi transport*, v. 16, no. 2, Feb. 1957, p. 7.

(5) U.S.S.R. Tsentral'noe statisticheskoe upravlenie, *Transport i svyaz' SSSR*, p. 24.

# THE SOVIET CAPITAL INVESTMENT PROGRAM

By SCOT BUTLER

## GENERAL BACKGROUND

Between 1950 and 1969 Soviet gross fixed investment grew nearly twice as fast as total GNP. The significant increase in the allocation of resources to investment during this period reflected the determined pursuit of economic growth on the part of the Soviet leadership. This investment policy achieved its primary objective of creating a vast industrial complex in the Soviet Union, but at a high cost.<sup>1</sup>

The functional structure of Soviet investment continues to be heavily weighted in favor of construction activity (at present about 60 percent of total investment), although the share of the equipment component has been rising gradually since 1950. Soviet construction requirements appear to be almost limitless given the vast undeveloped areas east of the Urals, the many conservation and reclamation projects in some of the more densely populated regions, and the inadequacy of the present housing stock.<sup>2</sup> Furthermore, the requirements for new technologies in many types of industrial production call for construction of new plant from the ground up rather than simply the redesigning of existing plant.<sup>3</sup> As a result there has been no significant change in the functional structure of Soviet investment over the last 5 years.

The sectoral structure of Soviet investment, however, has shown some tendency to vary in recent years. Heavy industry has lost some ground, although it continues to maintain a wide margin as the leading claimant on investment (almost 30 percent of the total). Until 1964 housing came next, but since then agriculture and services have been vying for second and third place. The shifting priorities of the sectors has tended to reflect not only the preferences of the planners but also the intrusion on these preferences of various domestic and foreign developments. Crop failures in 1963 jolted the leadership into doubling the annual growth rate of agricultural investment (from 10 percent in 1963 to nearly 20 percent in 1964), while relative neglect of the public services sector in 1962-64 necessitated an all-out drive in 1965-67 to remedy the situation (the growth of investment jumped from an average annual rate of 5 percent to one of 12½ percent). Technological advances in the industrial West and the arms-space race with the United States also caused the Soviet leadership to alter the structure of investment among and within the branches of industry in the late 1950's and early 1960's. Thus investment in chemicals and petro-

<sup>1</sup> Some of the growth in investment was simply the result of inefficient use of capital. Since 1960 the capital cost associated with achieving economic growth has risen markedly (for a comparison of marginal capital-output ratios in the 1950's and the 1960's see table 6 in the chapter on "The Economic Burden of the Soviet Defense Outlays," p. 172.

<sup>2</sup> Soviet housing per capita amounts to about 80 percent of the minimum sanitary requirement established by law. At the end of 1963 per capita housing (useful space) in the U.S.S.R. was only about 35 percent of that in the United States and large numbers of Soviet families were still continuing to share apartments.

<sup>3</sup> Despite official encouragement of expansion and renovation of existing plants as a capital-saving technique the percentage of total investment channeled into such activity has failed to increase in recent years, and has even declined quite markedly in some industries.

chemicals increased at rates of 50 percent or more in 1958 and 1959, while investment in machine building increased nearly 20 percent annually in both 1959 and 1960.

When originally unveiled in 1966, the current (eighth) 5-year plan—1966–70—was vague in its statement of investment goals. In October 1967, the overall volume of planned investment—set at about 310 billion rubles the year before—was reduced to 303.2 billion rubles. The cutback in the original plan was mainly, if not entirely, in agricultural investment. Based on the cumulative volume of investment during 1966–69 (about 234 billion rubles) the revised goal of 303 billion rubles for the entire 5-year period will probably be reached.<sup>4</sup> It is doubtful, however, that the pattern of investment will conform to the plan or that the planners will get the desired return on investment funds in terms of new productive capacity, housing space, or public service facilities. It has already been officially acknowledged that investment in agriculture will fall short of the planned goal.<sup>5</sup> There are clear indications that the investment costs of some types of industrial plant were seriously underestimated, that many new plants are or will be obsolete by the time they come on stream, and that in a number of cases investment funds were squandered on sub-marginal projects.

#### PERFORMANCE IN 1968 AND 1969

Total investment in the Soviet economy grew at an average annual rate of about 6 percent during 1968–69, somewhat below the 8 percent average registered in 1966–67. The growth of investment in 1968 exceeded the plan, whereas in 1969 it fell considerably short. Both years were marked by difficulties for the central government in maintaining control over the investment program. Also, the period was one of declining growth of efficiency in capital construction: labor productivity grew at a retarded rate and the volume of unfinished construction increased significantly.

#### *U.S.S.R.: Indicators of utilization of investment, 1961–69*

[Average annual rates of growth, in percent]

|   | 1961–65 | 1966 | 1967 | 1968 | 1969 |
|---|---------|------|------|------|------|
| Growth of:  |         |      |      |      |      |
| Gross fixed investment.....                             | 6.3     | 7.4  | 8.3  | 8.1  | 4    |
| Volume of unfinished construction <sup>1</sup> .....    | 6.7     | 9.8  | 10.0 | 14.9 | (?)  |
| Gross additions of new fixed capital <sup>2</sup> ..... | 6.5     | 7.1  | 8.8  | 3.3  | (?)  |
| Labor productivity in construction.....                 | 5.2     | 4.7  | 6.7  | 4.2  | 3    |

<sup>1</sup> This indicator is computed in current prices and some of the increase in 1967 and 1968 is due to price increases introduced on July 1, 1970.

<sup>2</sup> Not available.

<sup>3</sup> Gross additions of fixed capital differs from gross fixed investment in that it includes investments only in projects that were completed and accepted for use during the year.

<sup>4</sup> Because of the shift to new investment prices of January 1, 1969, the results of the investment plan expressed in prices of July 1, 1955, may not be announced. However, using a rough conversion ratio, it can be calculated that cumulative investment during 1966–69 represented about 77 percent of the revised 5-year goal and that the investment planned for 1970 just makes up the balance.

<sup>5</sup> Assuming fulfillment of the 1970 goal for agricultural investment, it is estimated that cumulative agricultural investment in 1966–70 will amount to about 80 percent of the original program and about 90 percent of the revised program.

In 1968, so-called "centralized" investment increased only 5 percent while "noncentralized" investment (influenced by the central planners but also reflecting local preferences) increased by almost 17 percent as against a plan of about 6 percent. Soviet officials took a number of steps in 1969 to check the further runaway growth of noncentralized investment, although at the cost of some slowdown in the overall growth of investment. One of the steps adopted was to severely limit the number of major new construction projects authorized under the 1969 plan<sup>6</sup> with the aim of concentrating investment resources on completion of those projects deemed most critical to the growth of the economy. The growth of noncentralized investment was temporarily checked in 1969 and a 9-percent increase was achieved in the commissioning of new fixed capital from centralized investment, including sizeable increases of capacity for the production of electric power, crude steel, and mineral fertilizers. Nevertheless, the Soviet leaders expressed dissatisfaction with the overall performance.

*U.S.S.R.: Growth of centralized and noncentralized investment, 1961-69*

[In percent]

|                       | 1961-65 <sup>1</sup> | 1966 | 1967 | 1968 | 1969 |
|-----------------------|----------------------|------|------|------|------|
| Total investment..... | 6.3                  | 7.4  | 8.3  | 8.1  | 4.0  |
| Centralized.....      | 7.5                  | 5.4  | 5.1  | 4.9  | 25.7 |
| Noncentralized.....   | 3.0                  | 13.7 | 18.0 | 16.6 | (3)  |

<sup>1</sup> Average annual rate (1960 base).

<sup>2</sup> Estimated.

<sup>3</sup> Estimated negligible.

The growth of construction activity averaged nearly 6 percent annually during 1968-69, a drop of about 1½ percentage points from the average in 1966-67 (see table 1). Only a modest gain was achieved in increasing the proportion of contract work, an important indicator of progress toward the adoption of more efficient methods of construction.<sup>7</sup> Despite the launching of numerous reforms in 1968-69, the construction industry continued to be plagued with problems that interfered with the pursuit of efficiency: high labor turnover, shortages of some skills, shortages of certain construction materials, underutilization of construction equipment, jurisdictional disputes, revisions in plans, mismanagement in the delivery of supplies, and confusion arising from too many competing projects. It is likely that these factors contributed to the further decline in 1969 of the growth of construction activity, but since most of them are permanent to the scene in a greater or lesser degree, the major cause of the decline was probably the cutback in the number of new projects (the initial stages of new construction projects generally account for the most rapid increases in the volume of construction work).

<sup>6</sup> According to Gosplan Chairman Baibakov the final list of some 300 new projects submitted for government approval represented only about half the number originally included in the plan.

<sup>7</sup> Contract construction work is usually performed by professional construction organizations, either specialized or general. The work of these organizations is generally more efficient than noncontract construction work because the bulk of the construction equipment and trade skills are concentrated in their hands. It is the aim of the Soviet authorities to replace noncontract work by contract work to the greatest extent feasible.

Investment in equipment grew at an average annual rate of about 5½ percent in 1968-69 as compared to nearly 7 percent in 1966-67. The significant dropoff in growth to about 2½ percent in 1969 (see table 1) is all the more striking in view of the emphasis that was placed on the completion and commissioning of major construction projects in 1969. A major investment item in such projects should certainly be the equipment that is installed in the final stages of construction. Apparently much of the equipment destined for installation did not get that far to judge by the sizable increase in inventories of equipment (so-called "stocks of uninstalled equipment") at construction sites and industrial enterprises.<sup>8</sup>

Between January 1, 1969 and October 1, 1969, these inventories increased from some 4 billion rubles to 5.5 billion rubles, including 1.9 billion rubles of equipment above norm.<sup>9</sup> It is not clear how much of this stock may have entered into fixed investment between October 1 and December 31, 1969, but Soviet officials have indicated great concern over the fate of both the domestic and imported equipment at these sites.<sup>10</sup> It is likely that a great deal of the equipment in Soviet inventories remained uninstalled in 1969 because of lagging construction schedules. If so, the low growth of investment forced on the economy in 1969 should yield opportunities for rapid growth of investment in 1970.

Although complete information on investment by sector has not yet been reported for 1969, available evidence indicates that consumer-oriented investment continued to outpace producer-oriented investment during 1968-69, but by a somewhat smaller margin than in 1966-67 (see tables 2 through 4).

The growth of producer-oriented investment is largely determined by the growth of its dominant component—heavy industry. The small increase of investment in heavy industry in 1969 was apparently due to delays in the completion of work by the industrial construction ministries.<sup>11</sup> These delays in turn prevented the carrying out of planned installation of equipment at a number of projects. During 1966-69, investment in the construction industry has been growing faster than planned in order to meet a number of contingencies, but the absolute volume of this investment is still relatively small and does not greatly affect the growth of producer-oriented investment. The transport and communications sector has experienced a low rate of growth in investment ever since 1965.

Much of the decline in growth of consumer-oriented investment in 1969 was due to mediocre performance in implementation of the agricultural investment program. Unlike industrial investment where most of the equipment component must be installed in buildings and structures, agricultural investment in equipment includes large quantities of mobile machinery which does not require installation and such investment is therefore independent of the agricultural construction program. The slowdown in growth of agricultural construction in

<sup>8</sup> Equipment that is designed to be installed in a building or structure does not get counted in fixed investment until the process of installation begins.

<sup>9</sup> The 1969 plan called for the drawing down of 1.4 billion rubles of uninstalled equipment.

<sup>10</sup> Above-norm stocks at construction sites of the Ministry of Ferrous Metallurgy and the Ministry of the Chemical Industry alone amounted to almost 0.5 billion rubles, or one-quarter of all the above-norm stocks in the economy as of October 1, 1969.

<sup>11</sup> For example, the U.S.S.R. Ministry of Industrial Construction and the U.S.S.R. Ministry for Construction of Heavy-Industry Enterprises fulfilled their annual plans by only 94 percent and 96 percent, respectively.



1969<sup>12</sup> may have been partly due to the adverse weather conditions in the early months of the year.

During 1968-69 the rate of growth of investment in housing grew somewhat more slowly than in 1966-67, even though the Government made special provisions for the diversion of funds from plant construction to housing construction. One of the factors contributing to this slowdown was a further decline in individual private housing construction. The urban housing stock in 1969 continued to show a faster growth than the rural stock, as it has consistently done since 1960 (see the tabulation below). The great growth of the urban population over the past decade has put heavy pressure on urban housing construction and contributed to a rise in the average cost of housing construction in the U.S.S.R. (due to the inclusion of such "amenities" as central heat, water, gas, sewers, and baths, as well as to the construction of taller apartment buildings requiring heavier foundations and frameworks). Thus the housing stock shows a more rapid growth when measured in rubles (constant prices) than in square meters of useful space.

*U.S.S.R.: Average annual rates of growth of the housing stock, 1961-69*

[In percent]

| Unit                |                               | 1961-65 | 1966 | 1967 | 1968 | 1969 <sup>1</sup> |
|---------------------|-------------------------------|---------|------|------|------|-------------------|
| Total housing stock | Ruble value.....              | 5.8     | 4.8  | 5.2  | 5.2  | ( <sup>2</sup> )  |
| Total housing stock | Square meter of useful space. | 3.8     | 3.2  | 3.4  | 3.0  | 3.0               |
| Urban               | do.....                       | 5.3     | 4.2  | 4.7  | 4.4  | 4.4               |
| Rural               | do.....                       | 2.2     | 1.9  | 1.8  | 1.4  | 1.2               |

<sup>1</sup> Estimated.

<sup>2</sup> Not available.

No comprehensive data on investment by branch of industry has been published for 1968-69. Based on fragmentary information that has appeared in the Soviet press, however, investment estimates are presented for several major branches in table 5. In 1968 aggregate investment in the branches of heavy industry and in the branches of the consumer goods industries grew at approximately the same rate—8 percent (see table 7). Present evidence indicates that within heavy industry investment in ferrous metallurgy and chemicals showed little or no growth but that investment in the fuels industry started to grow at an accelerated rate.

### THE 1970 PLAN

The economic plan for 1970—the final year of the Eighth Five Year Plan—calls for total investments of 76.5 billion rubles, including 54.4 billion rubles of centralized investment and 22.1 billion rubles of noncentralized investment (expressed in the new estimate-cost prices of January 1, 1969). These investment goals represent planned increases of 7.6, 7.8, and 7.3 percent, respectively, over 1969.<sup>13</sup> The

<sup>13</sup>The U.S.S.R. Ministry of Rural Construction—the principal contracting organization for agricultural construction—was scheduled to increase its volume of work by 14 percent but actually achieved only a 7 percent increase. One of its major problems was apparently the high labor turnover (almost 50 percent) which was ascribed in large part to the lack of housing for rural construction workers.

<sup>14</sup> Because the Soviet preliminary estimate of investment in 1969 was 0.6 billion rubles higher than the figure subsequently announced, the adjusted percentage increase for total investment is 8.5 percent. Lacking information on where the shortfall occurred, it is not possible to adjust the centralized and noncentralized increases correspondingly.

policy implication of these growth rates is that the tight controls applied to noncentralized investment in 1969 are being relaxed somewhat in 1970. Because faster growth of noncentralized investment is basic to the operation of the economic reform introduced in 1965 this provision of the 1970 plan is consistent with what is in fact expected to happen. At the same time, however, the regime is again limiting to 300 the number of major new industrial projects on which work is authorized to begin in 1970 and is again calling for a concentration of investment resources on important construction projects scheduled for early operation.

In view of the existence of large inventories of uninstalled equipment at the end of 1969 (see above, p. 46) it is not surprising that the 1970 plan envisages a much higher growth rate for fixed investment in the equipment component than in the construction component (about 11 percent and 7½ percent, respectively<sup>14</sup>). Approximately 75 percent of the investment in equipment under the 1970 plan falls within centralized investment. In addition to these provisions the performance of the construction industry is to be bolstered by further innovations, including two-shift operation of construction machinery. The construction industry is shifting to the economic reform and construction organizations are to be reimbursed only upon completion of designated stages of work and not simply at regular intervals on the basis of work performed. Labor productivity in the construction industry is scheduled to increase by 6.3 percent.

The 1970 plan contains a considerable amount of information on investment in selected sectors of the economy (agriculture, housing)<sup>15</sup> and in individual branches of industry (fuels, machine building, consumer goods, chemicals, pulp-and-paper, and metallurgy). Railroad transportation is also singled out for a large increase in investment. As usual, however, the percentage increases given or implied in the plan are not easily related to Soviet handbook data and are so large in some cases as to invite skepticism (see "Note to Tables on Investment", below). A rundown of these data from the 1969 and 1970 plans is presented below.

*Planned increases in investment announced for selected branches of industry in the 1969 and 1970 plans*

[In percent]

|  | 1969 plan | 1970 plan         |
|--|-----------|-------------------|
| Chemicals.....   | (1)       | 16.6              |
| Consumer nondurables.....  | 26        | <sup>2</sup> 24.3 |
| Construction materials.....  | 10        | (1)               |
| Construction and roadbuilding machinery.....   | (4)       | (1)               |
| Fuels.....   | (1)       | <sup>2</sup> 22.0 |
| Machine tools and tools.....   | 44        | (3)               |
| Machine building for light industry, the food industry and household appliances..... | (1)       | 62.0              |
| Metallurgy, ferrous and nonferrous.....  | (1)       | 6.5               |
| Mineral fertilizers.....   | 55        | (1)               |
| Motor vehicles.....  | (4)       | (1)               |
| Tractor and agricultural machinery.....  | (1)       | 39.0              |
| Pulp and paper.....  | (1)       | 12.5              |

<sup>1</sup> Not available.

<sup>2</sup> Designated as centralized investment only.

<sup>3</sup> More than 41.

<sup>4</sup> Almost 100.

<sup>14</sup> Unadjusted to reflect the revision in 1969 investment reported subsequent to publication of the 1970 plan.

<sup>15</sup> See Table 2.

## NOTES TO TABLES ON INVESTMENT

Soviet reporting of statistics on gross fixed investment continues to be marked by extensive revision of previously published data (reported for selected years only) and numerous gaps in recent data. To these two drawbacks has been added the problem of trying to relate investment expenditures expressed in the new norms and estimate-cost prices of January 1, 1969, to the official handbook investment series expressed in the norms and estimate-cost prices of July 1, 1955.<sup>16</sup> An attempt has been made in this paper to link the two series together using conversion coefficients. The results, however, are of limited reliability because of incomplete information with respect to the correct conversion coefficient to be used for each category of investment. Conversion coefficients could be obtained directly from the Soviet investment data only for total investment in the economy and for investment in agriculture. For the other categories of investment, coefficients were taken as reported in collateral sources<sup>17</sup> and adjusted proportionally to fit into total investment.

The data for 1968 used in the tables were taken from the statistical handbook *Narodnoe khoziaistvo SSSR v 1968 g.* (Moscow, 1969). Later data for 1968 appearing in the journal of the Soviet Central Statistical Administration<sup>18</sup> indicate that some of the handbook data have been slightly revised. Because these later data were incomplete and also were rounded, however, they could not be reconciled with the handbook data for the purpose of making a comprehensive revision. Consequently they were not used directly in the tables but only in support of the analytic interpretation of the handbook data.

Information on actual investment in 1969 has not yet been officially reported in any detail. Estimates for 1969 appearing in the tables below therefore are subject to a considerable range of error. For the individual branches of industry (table 5) there was not sufficient information to permit even provisional estimates in most cases.

Another problem continues to be the data presented on planned increases in investment for individual branches of industry (see above). The increases implied for total industrial investment do not appear capable of simultaneously absorbing increases of the size announced for various branches. Nor do subsequent investment statistics by branch of industry, when they finally appear in the statistical handbooks, bear out the kinds of increases announced in the plan. Consequently it can only be assumed that many of these increases apply to incomplete universes (e.g., centralized or ministerial investment only) and are offset by planned reductions in the remainder of the universe. If true, this feature severely limits the analytic usefulness of planned investment data on branches of industry.

<sup>16</sup> It is not clear whether the investment series presented in the Soviet handbooks will continue to be reported in the old (1955) prices through 1970 (the end of the current 5-year plan), whether the new series will simply be linked on to the old series through a common year (1968 or 1969), or whether an entirely revised investment series expressed in the new prices of January 1, 1969, will be calculated. Serious statistical distortions are apt to result in growth calculations unless 1 series is completely recalculated in the prices of the other.

<sup>17</sup> The principal sources for coefficients (based on the structure of centralized investment in 1967) were: Efremov, S. A., et al., *Novye smetnye normy i tseny v stroitel'stve*, Moscow, 1969, and *Ekonomika stroitel'stva*, v. 10, no. 12, December 1968, pp. 3-7.

<sup>18</sup> *Vestnik statistiki*, No. 2, 1970, pp. 92-93.

TABLE 1.—U.S.S.R.: Gross fixed investment by function, 1950, 1960, 1965–69, and 1970 plan<sup>1</sup>

|  | In billions of rubles <sup>2</sup> |      |      |      |      |         |                      |      | Rates of growth, in percent <sup>3</sup> |                      |                      |      |      |      |      |                           |
|--|------------------------------------|------|------|------|------|---------|----------------------|------|--|----------------------|----------------------|------|------|------|------|---------------------------|
|  | 1950                               | 1960 | 1965 | 1966 | 1967 | 1968(A) | 1968(B) <sup>4</sup> | 1969 | 1970<br>plan                             | 1951–60 <sup>4</sup> | 1961–65 <sup>5</sup> | 1966 | 1967 | 1968 | 1969 | 1970<br>plan <sup>4</sup> |
| Total investment.....                    | 10.9                               | 35.9 | 48.7 | 52.3 | 56.7 | 61.3    | 67.8                 | 70.5 | 76.5                                     | 12.7                 | 6.3                  | 7.4  | 8.3  | 8.1  | 4.0  | 8.5                       |
| Construction <sup>6</sup> .....          | 7.1                                | 24.0 | 29.0 | 31.1 | 33.6 | 35.9    | 40.9                 | 42.9 | 45.6                                     | 13.0                 | 3.9                  | 7.2  | 8.0  | 6.8  | 4.9  | 6.3                       |
| Equipment.....                           | 3.1                                | 9.7  | 16.3 | 17.2 | 18.6 | 20.3    | 22.2                 | 22.7 | 25.5                                     | 12.1                 | 10.9                 | 5.5  | 8.1  | 9.1  | 2.3  | 12.3                      |
| Other capital outlays <sup>7</sup> ..... | .7                                 | 2.2  | 3.4  | 4.1  | 4.5  | 5.1     | 4.7                  | 4.9  | 5.4                                      | 12.1                 | 9.1                  | 20.6 | 9.8  | 13.3 | 4.3  | 10.2                      |

<sup>1</sup> Based on Soviet investment data appearing in *Narodnoe khoziaistvo S.S.S.R. v 1968 g.*, *Pravda*, Jan. 25, 1970, and *Vestnik statistiki*, No. 2, 1970. Data on the 1970 plan are based on information appearing in *Pravda*, Dec. 17, 1969, and *Ekonomika stroitel'stva*, v. 12, No. 2, February 1970, pp. 3–10. The ruble values for total investment have been rounded from unrounded data accurate to the nearest million rubles (see table 2) in order to bring them into conformity with the rounded data on the functional components of investment.

<sup>2</sup> Data for 1950–68(A) are given in estimate prices of July 1, 1955 and data for 1968(B)–1970 plan, in estimate prices of Jan. 1, 1969.

<sup>3</sup> Computed from unrounded data in table 2.

<sup>4</sup> Estimated.

<sup>5</sup> Average annual rate (1950 base).

<sup>6</sup> Average annual rate (1960 base).

<sup>7</sup> Sum of the rounded components exceeds the rounded total.

<sup>8</sup> Including assembly and installation work.

<sup>9</sup> For surveys, plans and designs, technical documentation, and the like.

TABLE 2.—U.S.S.R.: Gross fixed investment in consumer-oriented and producer-oriented sectors of the economy, 1950, 1960, 1965-69, and 1970 plan <sup>1</sup>

|  | [In millions of rubles <sup>2</sup> ] |        |        |        |        |         |                      |                   |                        |
|--|---------------------------------------|--------|--------|--------|--------|---------|----------------------|-------------------|------------------------|
|  | 1950                                  | 1960   | 1965   | 1966   | 1967   | 1968(A) | 1968(B) <sup>3</sup> | 1969 <sup>4</sup> | 1970 plan <sup>5</sup> |
| Total investment.....                      | 10,903                                | 35,914 | 48,733 | 52,339 | 56,701 | 61,309  | 67,800               | 70,500            | 76,500                 |
| Consumer-oriented.....                     | 5,598                                 | 20,737 | 27,195 | 30,033 | 32,858 | 35,669  | 439,300              | 441,200           | 444,700                |
| Agriculture <sup>6</sup> .....             | 4 1,560                               | 4,891  | 8,574  | 9,385  | 10,014 | 11,225  | 12,600               | 13,300            | 14,700                 |
| Consumer goods industry <sup>6</sup> ..... | 512                                   | 1,945  | 2,295  | 2,531  | 2,678  | 2,890   | 4 3,200              | 4 3,400           | 4 4,000                |
| Housing.....                               | 2,007                                 | 8,209  | 8,162  | 8,957  | 9,643  | 10,120  | 11,100               | 11,800            | 12,500                 |
| Services <sup>6</sup> .....                | 4 1,519                               | 5,692  | 8,164  | 9,160  | 10,523 | 11,434  | 12,400               | 12,700            | 13,500                 |
| Producer-oriented.....                     | 5,305                                 | 15,177 | 21,538 | 22,306 | 23,843 | 25,640  | 28,500               | 29,300            | 31,800                 |
| Construction industry.....                 | 287                                   | 1,021  | 1,312  | 1,547  | 1,785  | 2,040   | 2,300                | 2,500             | 3,000                  |
| Heavy industry <sup>7</sup> .....          | 3,672                                 | 10,728 | 15,381 | 15,757 | 16,831 | 18,180  | 20,200               | 20,600            | 22,200                 |
| Transport and communications.....          | 1,346                                 | 3,428  | 4,845  | 5,002  | 5,227  | 5,420   | 6,000                | 6,200             | 6,600                  |

<sup>1</sup> Based on Soviet investment data appearing in *Narodnoe khoziaistvo SSSR v 1968 g.*, *Pravda*, Dec. 17, 1969, and Jan. 25, 1970 (for the methodology used to link investment figures expressed in prices of Jan. 1, 1969, to those expressed in prices of July 1, 1955, see "Note to Tables on Investment"). In this table (as well as in tables 3 and 4) sectors of the economy have been classified as consumer-oriented or producer-oriented according to the disposition of the bulk of each sector's output (goods and services). Although such a division of investment is not quantitatively precise, it does provide an indication of official allocational policies in the short run, i.e., investment in sectors primarily benefiting consumers directly versus investment in sectors producing goods for future growth.

<sup>2</sup> Data for 1950-68(A) are given in estimate prices of July 1, 1955, and data for 1968(B)-1970 plan, in estimate prices of Jan. 1, 1969.

<sup>3</sup> Data in this column are rounded to the nearest hundred million rubles.

<sup>4</sup> Estimated.

<sup>5</sup> The figures in this series differ from those published in the JEC study *Soviet Economic Performance: 1966-67* as a result of subsequent Soviet reclassification of investment in agricultural procurement facilities and forestry. Such investment is now excluded from agriculture and included in services.

<sup>6</sup> Essentially the light and food industries, which are primarily engaged in producing consumer nondurable goods.

<sup>7</sup> Includes investment in facilities producing durable consumer goods such as passenger cars, radios, television sets, refrigerators, and washing machines.

TABLE 3.—U.S.S.R.: Indexes of gross fixed investment in consumer-oriented and producer-oriented sectors of the economy, 1950, 1960, 1965-69, and 1970 plan <sup>1</sup>

|                                  | [In percent (1960=100)] |      |       |       |       |       |                   |                        |
|----------------------------------|-------------------------|------|-------|-------|-------|-------|-------------------|------------------------|
|                                  | 1950                    | 1960 | 1965  | 1966  | 1967  | 1968  | 1969 <sup>2</sup> | 1970 plan <sup>2</sup> |
| Total investment.....            | 30.4                    | 100  | 135.7 | 145.7 | 157.9 | 170.7 | 178               | 193                    |
| Consumer-oriented.....           | 27.0                    | 100  | 131.1 | 144.8 | 158.5 | 172.0 | 180               | 195                    |
| Agriculture.....                 | 31.9                    | 100  | 175.3 | 191.9 | 204.7 | 229.5 | 242               | 268                    |
| Consumer goods industry.....     | 26.3                    | 100  | 118.0 | 130.1 | 137.7 | 148.6 | 158               | 186                    |
| Housing.....                     | 24.4                    | 100  | 99.4  | 109.1 | 117.5 | 123.3 | 131               | 138                    |
| Services.....                    | 26.7                    | 100  | 143.4 | 160.9 | 184.9 | 200.9 | 206               | 219                    |
| Producer-oriented.....           | 35.0                    | 100  | 141.9 | 147.0 | 157.1 | 168.9 | 174               | 189                    |
| Construction industry.....       | 28.1                    | 100  | 128.5 | 151.5 | 174.8 | 199.8 | 217               | 261                    |
| Heavy industry.....              | 34.2                    | 100  | 143.4 | 146.9 | 156.9 | 169.5 | 173               | 185                    |
| Transport and communications.... | 39.3                    | 100  | 141.3 | 145.9 | 152.5 | 158.1 | 163               | 174                    |

<sup>1</sup> Based on data in table 2.<sup>2</sup> Because of the estimative character of most of the underlying data, the index numbers in this column have been rounded to the nearest full percent.TABLE 4.—U.S.S.R.: Rates of growth of gross fixed investment in consumer-oriented and producer-oriented sectors of the economy, 1951-69 and 1970 plan <sup>1</sup>

|                                   | [In percent]         |                      |      |      |      |                   |                        |
|-----------------------------------|----------------------|----------------------|------|------|------|-------------------|------------------------|
|                                   | 1951-60 <sup>2</sup> | 1961-65 <sup>3</sup> | 1966 | 1967 | 1968 | 1969 <sup>4</sup> | 1970 plan <sup>4</sup> |
| Total investment.....             | 12.7                 | 6.3                  | 7.4  | 8.3  | 8.1  | 4                 | 9                      |
| Consumer-oriented.....            | 14.0                 | 5.6                  | 10.4 | 9.4  | 8.6  | 5                 | 8                      |
| Agriculture.....                  | 12.1                 | 11.9                 | 9.5  | 6.7  | 12.1 | 6                 | 11                     |
| Consumer goods industry.....      | 14.3                 | 3.4                  | 10.3 | 5.8  | 7.9  | 6                 | 18                     |
| Housing.....                      | 15.1                 | —                    | 9.7  | 7.7  | 4.9  | 6                 | 6                      |
| Services.....                     | 14.1                 | 7.5                  | 12.2 | 14.9 | 8.7  | 2                 | 6                      |
| Producer-oriented.....            | 11.1                 | 7.3                  | 3.6  | 6.9  | 7.5  | 3                 | 9                      |
| Construction industry.....        | 13.5                 | 5.1                  | 17.9 | 15.4 | 14.3 | 9                 | 20                     |
| Heavy industry.....               | 11.3                 | 7.5                  | 2.4  | 6.8  | 8.0  | 2                 | 8                      |
| Transport and communications..... | 9.8                  | 7.2                  | 3.2  | 4.5  | 3.7  | 3                 | 6                      |

<sup>1</sup> Based on data in table 2.<sup>2</sup> Average annual rate (1950 base).<sup>3</sup> Average annual rate (1960 base).<sup>4</sup> Because of the estimative character of most of the underlying data, the growth rates in this column have been rounded to the nearest full percent.TABLE 5.—U.S.S.R.: Gross fixed investment in industry, by branch, 1950, 1960, 1965-69, and 1970 plan <sup>1</sup>

|                                     | [In millions of rubles] <sup>2</sup> |        |        |        |        |              |                           |                   |                        |
|-------------------------------------|--------------------------------------|--------|--------|--------|--------|--------------|---------------------------|-------------------|------------------------|
|                                     | 1950                                 | 1960   | 1965   | 1966   | 1967   | 1968-<br>(A) | 1968-<br>(B) <sup>3</sup> | 1969 <sup>3</sup> | 1970 plan <sup>3</sup> |
| Industry, total.....                | 4,184                                | 12,673 | 17,676 | 18,288 | 19,509 | 21,070       | 23,400                    | 24,000            | 26,200                 |
| Heavy industry.....                 | 3,672                                | 10,728 | 15,381 | 15,757 | 16,831 | 18,180       | 20,200                    | 20,600            | 22,200                 |
| Ferrous metallurgy.....             | 456                                  | 1,192  | 1,543  | 1,466  | 1,681  | 1,700        | 1,900                     | 2,000             | 2,200                  |
| Chemicals and petrochemicals.....   | 166                                  | 890    | 1,833  | 1,769  | 1,737  | 1,700        | 1,900                     | 1,900             | 2,200                  |
| Fuels and power.....                | 1,651                                | 3,739  | 5,090  | 6,026  | 6,222  | (*)          | (*)                       | (*)               | (*)                    |
| Fuels.....                          | 1,282                                | 2,317  | 3,546  | 3,789  | 3,855  | 4,300        | 4,900                     | 5,400             | 6,600                  |
| Electric power.....                 | 369                                  | 1,422  | 2,144  | 2,237  | 2,337  | (*)          | (*)                       | (*)               | (*)                    |
| Machine building.....               | 631                                  | 1,787  | 2,755  | 3,021  | 3,423  | (*)          | (*)                       | (*)               | (*)                    |
| Construction materials.....         | 128                                  | 997    | 866    | 911    | 975    | (*)          | (*)                       | (*)               | (*)                    |
| Timber, woodworking, and paper..... | 229                                  | 710    | 967    | 922    | 965    | (*)          | (*)                       | (*)               | (*)                    |
| Others <sup>4</sup> .....           | 411                                  | 1,413  | 1,727  | 1,642  | 1,828  | (*)          | (*)                       | (*)               | (*)                    |
| Consumer goods industry.....        | 512                                  | 1,945  | 2,295  | 2,531  | 2,678  | 2,890        | 3,200                     | 3,400             | 4,000                  |

<sup>1</sup> Based on Soviet investment data appearing in *Narodnoe khoziaistvo SSSR v 1957 g.* and on subsequent fragmentary information appearing in Soviet collateral sources.<sup>2</sup> Data for 1950-68(A) are given in estimate prices of July 1, 1955, and data for 1968(B)-70 plan, in estimate prices of Jan. 1, 1969.<sup>3</sup> Estimated to nearest hundred million rubles.<sup>4</sup> Not available.<sup>5</sup> Believed to include the following branches: nonferrous metallurgy; peat and shale; abrasives; glass and porcelain.

TABLE 6.—U.S.S.R.: *Indexes of gross fixed investment in industry, by branch, 1950, 1960, 1965-69, and 1970 plan*<sup>1</sup>

|   | [In percent (1960=100)] |      |       |       |       |                    |                   | 1970<br>plan <sup>2</sup> |
|---|-------------------------|------|-------|-------|-------|--------------------|-------------------|---------------------------|
|   | 1950                    | 1960 | 1965  | 1966  | 1967  | 1968               | 1969 <sup>3</sup> |                           |
| Industry, total.....                        | 33.0                    | 100  | 139.5 | 144.3 | 153.9 | 166.3              | 171               | 186                       |
| Heavy industry.....                         | 34.2                    | 100  | 143.4 | 146.9 | 156.9 | 169.5              | 173               | 186                       |
| Ferrous metal-<br>lurgy.....                | 38.3                    | 100  | 129.4 | 123.0 | 141.0 | <sup>3</sup> 143.0 | 151               | 166                       |
| Chemicals and<br>petrochemicals..           | 18.7                    | 100  | 206.0 | 198.8 | 195.2 | <sup>3</sup> 191.0 | 191               | 223                       |
| Fuels and power..                           | 44.2                    | 100  | 152.2 | 161.2 | 166.4 | ( <sup>4</sup> )   | ( <sup>4</sup> )  | ( <sup>4</sup> )          |
| Fuels.....                                  | 55.3                    | 100  | 153.0 | 163.5 | 167.7 | <sup>3</sup> 186.0 | 205               | 250                       |
| Electric power                              | 25.9                    | 100  | 150.8 | 157.3 | 164.3 | ( <sup>4</sup> )   | ( <sup>4</sup> )  | ( <sup>4</sup> )          |
| Machine building                            | 35.3                    | 100  | 154.2 | 169.1 | 191.6 | ( <sup>4</sup> )   | ( <sup>4</sup> )  | ( <sup>4</sup> )          |
| Construction ma-<br>terials.....            | 12.8                    | 100  | 86.9  | 91.4  | 97.8  | ( <sup>4</sup> )   | ( <sup>4</sup> )  | ( <sup>4</sup> )          |
| Timber, wood-<br>working, and<br>paper..... | 32.3                    | 100  | 136.2 | 129.9 | 135.9 | ( <sup>4</sup> )   | ( <sup>4</sup> )  | ( <sup>4</sup> )          |
| Others.....                                 | 29.1                    | 100  | 122.2 | 116.2 | 129.4 | ( <sup>4</sup> )   | ( <sup>4</sup> )  | ( <sup>4</sup> )          |
| Consumer goods in-<br>dustry.....           | 26.3                    | 100  | 118.0 | 130.1 | 137.7 | 148.6              | 158               | 186                       |

<sup>1</sup> Based on data in table 5.<sup>2</sup> Because of the estimative character of most of the underlying data, the index numbers in this column have been rounded to the nearest full percent.<sup>3</sup> Estimated to the nearest full percent.<sup>4</sup> Not available.TABLE 7.—U.S.S.R.: *Rates of growth of gross fixed investment in industry, by branch, 1951-69 and 1970 plan*<sup>1</sup>

|  | [In percent]         |                      |      |      |                  |                   | 1970<br>plan <sup>4</sup> |
|--|----------------------|----------------------|------|------|------------------|-------------------|---------------------------|
|  | 1951-60 <sup>2</sup> | 1961-65 <sup>3</sup> | 1966 | 1967 | 1968             | 1969 <sup>4</sup> |                           |
| Industry, total.....                   | 11.7                 | 6.9                  | 3.5  | 6.7  | 8.0              | 3                 | 9                         |
| Heavy industry.....                    | 11.3                 | 7.5                  | 2.4  | 6.8  | 8.0              | 2                 | 8                         |
| Ferrous metallurgy                     | 10.1                 | 5.3                  | -5.0 | 14.7 | <sup>5</sup> 1   | 5                 | 10                        |
| Chemicals and petro-<br>chemicals..... | 18.3                 | 15.5                 | -3.5 | -1.8 | <sup>5</sup> -2  | 0                 | 17                        |
| Fuels and power.....                   | 8.5                  | 8.8                  | 5.9  | 3.3  | ( <sup>6</sup> ) | ( <sup>6</sup> )  | ( <sup>6</sup> )          |
| Fuels.....                             | 6.1                  | 8.9                  | 6.9  | 2.5  | <sup>5</sup> 11  | 10                | 22                        |
| Electric power                         | 14.4                 | 8.6                  | 4.3  | 4.5  | ( <sup>6</sup> ) | ( <sup>6</sup> )  | ( <sup>6</sup> )          |
| Machine building                       | 11.0                 | 9.0                  | 9.7  | 13.3 | ( <sup>6</sup> ) | ( <sup>6</sup> )  | ( <sup>6</sup> )          |
| Construction materials                 | 22.8                 | -2.8                 | 5.2  | 7.0  | ( <sup>6</sup> ) | ( <sup>6</sup> )  | ( <sup>6</sup> )          |
| Timber, woodworking, and<br>paper..... | 12.0                 | 6.4                  | -4.7 | 4.7  | ( <sup>6</sup> ) | ( <sup>6</sup> )  | ( <sup>6</sup> )          |
| Others.....                            | 13.1                 | 4.1                  | -4.9 | 11.3 | ( <sup>6</sup> ) | ( <sup>6</sup> )  | ( <sup>6</sup> )          |
| Consumer goods industry                | 14.3                 | 3.4                  | 10.3 | 5.8  | 7.9              | 6                 | 18                        |

<sup>1</sup> Based on data in table 5.<sup>2</sup> Average annual rate (1950 base).<sup>3</sup> Average annual rate (1960 base).<sup>4</sup> Because of the estimative character of most of the underlying data, the growth rates in this column have been rounded to the nearest full percent.<sup>5</sup> Estimated to the nearest full percent.<sup>6</sup> Not available.

## THE STATE BUDGET FOR 1970

*By* RODNEY E. STEELE

The State Budget for 1970 calls for an increase in expenditures of 5.5 percent over the anticipated 1969 results, a rate of increase commensurate with the planned rate of growth of national income and industrial output. The Soviet State Budget constitutes, in size, nearly 50 percent of the gross national product, a proportion approximately one-and-a-half times the share for the combined budgets at the Federal, State, and local level of government in the United States. The larger scope of the Soviet budget is a reflection of the inclusion of funds for financing activities such as investment, higher education, health, recreation, and culture which are normally privately financed in the United States.

The budget is the chief vehicle for mobilizing and distributing the financial resources of the economy in support of the economic plan. Once the economic plan is formulated—mostly in physical terms—the financial plan (including the budget) reflects in rubles the allocational decisions embodied in the economic plan. After the Soviet plan and budget have been approved, funds are allocated to subordinate agencies and expenditures are monitored by the Ministry of Finance and the state banks. These actions implementing the budget constitute part of the pressure in the system which insures that the economic plan is carried out in accordance with the priorities established by the leadership.

The usefulness of announced budget data as indicators of future Soviet economic policies is severely limited. For one thing, the scope of the Soviet budget is changing as a result of the financing and accounting changes being introduced by the economic reform. Budgetary expenditures are decreasing as a share of total financing of the economy, as capital investment is being financed to a greater extent from higher retained profits of enterprises and from long-term bank credit. Another difficulty in analyzing Soviet budget data is that the public version of the budget is highly aggregated. Large sums are included as unspecified residuals, and the content and coverage of many of the categories are only partly known. For example, Defense is a single number in the Budget with no further breakdown. Moreover, a number of defense and defense-related activities are known to be included under other budget categories.

The State Budget of the U.S.S.R. for 1970 is highlighted by a smaller planned rate of increase of budget expenditures for Defense as compared to rates of growth in earlier years of the post-Khrushchev regime. The appropriation for Defense in 1970 is set at 17.9 billion rubles, an increase of less than 1 percent over the 1969 figure. This increase is the smallest since 1965, and contrasts to an average annual increase of nearly 10 percent during 1967–69. The Defense share of total planned budget expenditures in 1970—12.3 percent—is the lowest in many years.



Part of the decline in the growth of budget expenditures for Defense in 1970 can probably be attributed to the effect of price revisions. Just as upward price revisions were partly responsible for a large increase in appropriations in 1968, price reductions on individual products in the electrotechnical, instrument building, machine tool building, radio, and other industries introduced on January 1, 1970, could be expected to affect the prices of some military end items, thus understating the real changes in defense programs.

As indicated above, the explicit item for Defense, moreover, does not include all military expenditures. For one, a substantial portion of military-space research probably is carried out under expenditures for science. In addition, some kinds of defense-related items may be regularly located in the expenditure residuals. The consistent equality of planned and actual expenditures for Defense in recent years suggests that any divergences from the planned outlays may also be concealed under the residuals.

One particularly large expenditure residual is that part under Financing the National Economy after the subcategories are accounted for. The size of this residual has been difficult to assess in recent years because of a paucity of budget data. Actual expenditures for the subcategories are not available after 1966 and planned expenditure data are incomplete for 1968 and 1970. Nevertheless, it appears that the residual in the planned budgets has increased from approximately 7 billion rubles in 1968 to 12.9 billion rubles in 1969 and to perhaps 15 to 16 billion rubles in 1970. A large part of the residual in the past could be accounted for by price subsidies for agricultural procurement. This subsidy, identified for the first time in the 1969 Budget Plan, was expected to be 6.5 billion rubles for that year. Some other items which probably have been included in the residual are funds for purchasing state material reserves (stocks of raw material, fuel, food and equipment to provide a buffer against seasonal interruptions or other contingencies), special accounts for price regulation, allocations for geologic prospecting, and state gold purchases. The lack of information on the components of this residual has led observers to suggest that sizeable military expenditures might also be involved. For example, additions to state reserves of a military nature may be financed here.

Other expenditures of a defense-related nature may be financed under the residual formed after expenditures for the primary budget categories are summed. The allocation for internal security is believed to be included under this budgetary expenditures residual. Other items that are probably financed under this residual include tax refunds to individuals and enterprises, allocations to state banks for expansion of long-term credit, and numerous small miscellaneous expenditures. This residual in 1969 amounted to 5.8 billion rubles, considerably higher than the levels of 2.8 and 3 billion rubles in 1967 and 1968. In plan budgets, the residual also includes reserve funds of the Council of Ministers. These are contingency funds to meet unplanned requirements for funds arising in the course of the year. In the actual budget fulfillment, the reserve funds are reclassified under the categories for which they were expended.

Budget planning appears to have been particularly difficult in recent years. Actual total expenditures are usually slightly higher than plan, but in 1967 and 1968 the excesses over the announced budget plans were about 5 billion rubles and in 1969 more than 3 billion rubles. As above-plan expenditures were offset by above-plan revenues, the traditional budget surplus was obtained. The Minister of Finance in the annual budget speeches, however, reported budget fulfillment for expenditures of only .3 and 1.4 billion rubles over plan in 1967 and 1968 and .1 billion rubles under plan in 1969, implying that the budget plans had been revised during the course of the year. How these budget revisions were instituted is not clear. The announced budget is approved, usually in December, by the Supreme Soviet and is published as the Budget Law.

It appears that the overplan expenditures in 1967 and 1968 were, in part, a result of miscalculating the effect of the 1967 revision of industrial wholesale prices. The process of implementing the economic reforms probably contributed to the uncertainty of budget planning. A principal feature of the reform was the supplanting of budgetary expenditure by self-financing of enterprises and by bank credit. Thus, for Industry and Construction—the largest subcategory under Financing the National Economy—budgetary appropriations declined as a share of total planned financing from 52 percent in 1966 to 37 percent in 1969. While the absolute amount of budget outlays was planned to remain fairly constant, financing from other sources—principally from retained profits and amortization—was to nearly double over the same period. Actual expenditures for Industry and Construction in this period are not yet published, but it is likely that sizeable above-plan budget expenditures occurred. By 1969, most of the industrial enterprises had been transferred to the new system and the 1970 budget plan calls for the same proportions of budget and nonbudget financing as was planned in 1969.

The agricultural sector has received only modest increases in budgetary outlays after a large planned increase in 1968. Budget appropriations for the subcategory Agriculture and Procurement were to increase at the nominal rate of 2 to 3 percent in 1969 and 1970 above the plans for the previous years. One official of the Ministry of Finance apologized for the slowdown in the growth of appropriations, citing the "difficult" international situation. Budgetary funding of agriculture is much larger than shown under the allocation to Agriculture and Procurement if the price subsidy on state procurement of agricultural products is added. In 1969, for example, the subsidy was to be more than two-thirds as large as the explicit allocation to the subcategory.

The budget allocations to Social-Cultural Measures cover a broad group of public services—social security and welfare measures, education, public health and medical care, mass media communications, recreational and cultural activities—and financing of Science. These expenditures have comprised about 38 percent of total budget outlays since 1965. Budget expenditures for Science have grown by almost one-half during 1966-69 compared to about a one-third increase for the sum of the other Social-Cultural Measures. A large share

of these science expenditures may be devoted to military R. & D., and space activities. In addition to the budget appropriation—planned at 6.3 billion rubles in 1969—enterprises and organizations finance approximately one-third of the total outlays for science.

The State Budget is planned so that total revenues will exceed total expenditures. According to published data, there have been no budget deficits since 1943. The budgetary surplus is reportedly used for increasing the credit resources of the State Bank. To the extent that the surplus is not fully loaned out, it serves as a deflationary force, representing a net withdrawal of money from the economy.

The Soviet Union relies primarily on indirect taxation for its revenue. The two major sources of revenue—turnover tax and deductions from profit—account for about two-thirds of the total budget receipts. Both sources of revenue are obtained by setting prices of goods at levels higher than the costs of production and appropriating some part of the difference. To some extent there is a trade-off between the two taxes. For example, if wholesale prices of consumer goods are raised relative to the retail prices, profits (and profit deductions) are increased at the expense of turnover tax. Until 1969, turnover tax supplied a steadily declining portion of total revenue while profit deductions were growing in importance. From 45 percent of total revenue in 1958, turnover tax revenue dropped to 31 percent in 1968. Over the same period, profit deductions increased from 20 percent to 37 percent. In 1969, and according to the 1970 plan budget, however, revenue from turnover tax is to increase more than profit deductions.

The method of distributing profits has changed under the economic reform. Previously, planned profit deductions were included in the plan assignments of the enterprise. Under the reform, profit payments are divided into three parts: a capital charge, currently 6 percent of fixed and working capital for most enterprises; a rent charge paid mainly by enterprises in the extractive industries for especially favorable natural, transportation or other conditions; and a "free" profit remainder formed after payment of all other obligations, including repayment of loans and stipulated deductions into various enterprise funds. The free profit remainder, however, is by far the largest of the profit payments into the budget, accounting for about one-half of total planned profit deductions in 1970. Profit payments of all types to the budget currently absorb 63 percent of total profits in the economy.

Direct taxes on the population account for less than 9 percent of total revenue. The personal income tax—the most important of the direct taxes—was supposed to be gradually abolished but, instead, its revenue has grown more rapidly than total revenues. The income tax is paid on a progressive rate schedule, exempting those with incomes of under 60 rubles a month. Other taxes on the population include an agricultural tax levied on incomes from private plots, a tax on privately owned horses, and a bachelor and small family tax levied on single men between 20 and 50 years of age and childless couples.

TABLE 1.—U.S.S.R.: Expenditures of the State Budget <sup>1</sup>

[Billion current rubles]

|   | 1965   | 1966   | 1967   | 1968   | 1969     |        | 1970<br>plan |
|---|--------|--------|--------|--------|----------|--------|--------------|
|   |        |        |        |        | Plan     | Actual |              |
| Financing the national economy.....         | 44.92  | 45.18  | 52.8   | 58.7   | 58.32    | 60.4   | 63.48        |
| Industry and construction.....              | 20.99  | 21.06  | (?)    | (?)    | 22.2     | (?)    | 23.9         |
| Agriculture and procurement....             | 6.77   | 6.30   | (?)    | (?)    | 9.2      | (?)    | 9.5          |
| Trade (foreign and domestic)....            | 2.27   | 2.84   | (?)    | (?)    | 6.5      | (?)    | 6.1          |
| Transportation and communi-<br>cations..... | 2.83   | 2.61   | (?)    | (?)    | 2.6      | (?)    | 2.8          |
| Municipal economy and hous-<br>ing.....     | 4.23   | 4.53   | (?)    | (?)    | 4.9      | (?)    | } 21.2       |
| Residual.....                               | 7.83   | 7.83   | (?)    | (?)    | 12.9     | (?)    |              |
| Social-cultural measures.....               | 38.16  | 40.76  | 43.48  | 48.31  | 51.12    | 51.3   | 54.85        |
| Education, science, and culture..           | 17.51  | 18.73  | 20.09  | 21.85  | 23.2     | 23.2   | 24.5         |
| Science <sup>2</sup> .....                  | 4.26   | 4.61   | 5.05   | 5.52   | 6.3      | (?)    | (?)          |
| Health and physical culture....             | 6.67   | 7.10   | 7.45   | 8.14   | 8.4      | 8.5    | 9.2          |
| Social welfare measures.....                | 13.99  | 14.93  | 15.94  | 18.32  | 19.5     | 19.6   | 21.1         |
| Defense <sup>4</sup> .....                  | 12.78  | 13.40  | 14.5   | 16.7   | 17.70    | 17.7   | 17.85        |
| Administration <sup>5</sup> .....           | 1.28   | 1.41   | 1.5    | 1.6    | 1.6      | 1.7    | 1.71         |
| Loan service <sup>6</sup> .....             | .1     | .1     | .2     | .2     | 7.2      | 7.2    | 7.2          |
| Budgetary expenditures residual....         | 4.38   | 4.73   | 2.76   | 3.05   | 7.8 4.96 | 7.5 8  | 7.8 6.56     |
| Total expenditures.....                     | 101.62 | 105.58 | 115.24 | 128.56 | 133.90   | 137.1  | 144.66       |

<sup>1</sup> Because of rounding components may not add to the totals shown.<sup>2</sup> Not available.<sup>3</sup> Including expenditures for capital investment.<sup>4</sup> Excluding outlays for most of military R. & D. and space, internal security forces, and possibly other defense-related items.<sup>5</sup> Including financing for all local and central government agencies such as planning and financial bodies, ministries, government departments, and the courts and judicial organs.<sup>6</sup> Consisting of payments of interest and principal on the public debt.<sup>7</sup> Estimated.<sup>8</sup> The budget plan includes reserve funds of the Council of Ministers.

TABLE 2.—U.S.S.R.: Revenues of the State Budget <sup>1</sup>  
 [Billion current rubles]

|  | 1965   | 1966   | 1967   | 1968   | 1969              |        | 1970<br>plan      |
|--|--------|--------|--------|--------|-------------------|--------|-------------------|
|  |        |        |        |        | Plan              | Actual |                   |
| Social sector .....                            | 93.89  | 97.02  | 107.1  | 119.4  | 121.64            | 126.0  | 131.34            |
| Turnover tax .....                             | 38.66  | 39.31  | 40.1   | 40.8   | 43.0              | 44.3   | 46.4              |
| Deductions from profits .....                  | 30.87  | 35.67  | 41.8   | 48.0   | <sup>2</sup> 48.0 | 48.2   | <sup>3</sup> 50.4 |
| Income tax on organizations <sup>4</sup> ..... | 1.55   | 1.15   | 1.3    | 1.1    | } 30.6            | } 33.5 | } 34.3            |
| Social insurance receipts <sup>5</sup> .....   | 5.56   | 6.00   | 6.5    | 7.2    |                   |        |                   |
| Residual <sup>6</sup> .....                    | 17.25  | 14.89  | 17.4   | 22.3   |                   |        |                   |
| Private sector .....                           | 8.43   | 9.27   | 10.1   | 11.4   | 12.5              | 12.5   | 13.6              |
| State taxes on the population .....            | 7.70   | 8.44   | 9.3    | 10.5   | 11.5              | 11.7   | 12.7              |
| State loans <sup>6</sup> .....                 | .18    | .22    | .1     | .3     | -----             |        | -----             |
| Local taxes and lotteries <sup>7</sup> .....   | .55    | .61    | .7     | .6     | 1.0               | .8     | .9                |
| Total revenues .....                           | 102.32 | 106.30 | 117.16 | 130.84 | 134.10            | 138.5  | 144.03            |
| Budget surplus .....                           | .70    | .72    | 1.92   | 2.28   | .20               | 1.4    | .27               |

<sup>1</sup> Because of rounding, components may not add to the totals shown.

<sup>2</sup> Including removal of surplus working capital and recalculations of previous year's profits.

<sup>3</sup> Including collective farms, consumer, and producer cooperatives.

<sup>4</sup> The state social insurance budget is a separate budget, but is consolidated with the union budget and the budgets of individual republics to form the overall state budget.

<sup>5</sup> Including income from forestry operations, customs duties, repayments on loans made to foreign countries, proceeds from gold sales, income from the sale or rent of state-owned properties, entertainment tax, and various other taxes and fees paid by enterprises and organizations.

<sup>6</sup> Consisting mainly of purchases by individuals of a 3-percent domestic lottery.

<sup>7</sup> Consisting of republic cash-or-commodity lotteries and miscellaneous local taxes and fees.

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## POPULATION

By MURRAY FESHBACH

Population developments in the Soviet Union are highlighted by the continuing decline in the crude birth rate. The increase of 2.2 million in the total population during 1968 was smaller than that for any other year since 1950 (Table 1)—due largely to a lower birth rate. This rate has dropped from 26.7 per thousand population in 1950 to 17.3 in 1968 (Table 2). In contrast, the crude death rate dropped from 9.7 per thousand in 1950 to 7.1 in 1960, but has since increased slightly to 7.7 in 1968. Migration has not been a significant factor in total population growth.

The national birth rate, however, obscures the differences between the rates reported for some of the individual republics. For example, in 1968 the Latvian S.S.R. reported a birth rate of 14.1 per thousand population. At the other extreme, the rates for the four republics of Central Asia were all over 30 per thousand, with the Tadzhik S.S.R. reporting a rate of 37.3. The three republics with predominantly Slavic populations had rates under the national level: The R.S.F.S.R.—14.2 per thousand; the Ukrainian S.S.R.—14.9; and the Belorussian S.S.R.—16.5.<sup>1</sup> Preliminary results from the January 15, 1970, census reflect these regional fertility differentials. According to these figures, the population in each of the four Central Asian republics increased by 40 percent or more between 1959 and 1970. On the other hand, the population of the R.S.F.S.R. increased by only 11 percent, that of the Ukrainian S.S.R. by 13 percent, and that of the Belorussian S.S.R. by 12 percent.<sup>2</sup>

According to projections prepared by the Foreign Demographic Analysis Division, Bureau of the Census, U.S. Department of Commerce, the total population of the Soviet Union is expected to increase from 239 million in 1969 (Table 3) to between 276 million and 310 million by 1990 (Table 4). These projections, which were prepared in April 1969, supersede those given in the Joint Economic Committee study published in 1966.<sup>3</sup> They are based on later Soviet estimates of the total population, more detailed data on the numbers of births (by sex) and the total numbers of males and females in the population, and different assumptions concerning the future trends of fertility and mortality. The projections presented here show relatively more females and fewer males throughout the projection period than do the earlier projections. Generally, these current projections are consistent with

<sup>1</sup> U.S.S.R. Tsentral'noe statisticheskoe upravlenie (TsSU), *Narodnoe khoziaistvo SSSR v 1968 g., statisticheskii ezhegodnik*, Moscow, Statistika, 1969, pp. 38-39. (Cited hereafter as *Nar. khoz. v 1968*.)

<sup>2</sup> *Izvestia*, Apr. 19, 1970, p. 1.

<sup>3</sup> James W. Brackett and John W. DePauw, "Population Policy and Demographic Trends in the Soviet Union," in U.S. Congress, Joint Economic Committee, *New Directions in the Soviet Economy*, pt. III, Washington, D.C., 1966, pp. 657-682.

preliminary results of the 1970 census. If an allowance is made for population growth during the first half of January, the census figure of 241,748,000 for January 15, 1970, falls between the figures for 1970 given in the series A and B projections. The census results probably indicate that the official estimates for the years prior to 1970 were slightly low.

Table 5 contains figures from the above estimates and projections on the number of males in the military ages. A youth is now required to register for the draft when he reaches 17 years of age; if called into service, he will enter at age 18 and serve for a period of 2 to 3 years. The number of males in the prime military ages, considered here to be 17 to 34 years, fluctuated sharply during the period 1950-69; it will increase steadily until 1983 and then drop off slightly. Similar but more distinct fluctuations can be seen in the striking changes in the size of the 17-, 18-, and 19-year-old cohorts.

The regional differences in the birth rates noted above are also reflected in the latest handbook on *Women and Children in the U.S.S.R.*,<sup>4</sup> which contains information from a special survey taken in September 1967 of worker and employee families with children under 16 years of age. (Collective farm families were omitted, as were families with children 16 years of age and over only, and childless families.) These data indicate that the average family size in the Central Asian republics is much larger than that in the western areas. For urban families living in the R.S.F.S.R., the Ukrainian S.S.R., and the Baltic republics, the proportion with only one or two children exceeded 90 percent; however, the corresponding proportion for the Central Asian republics was 71.4 percent. For rural families, the proportion with five or more children under 16 years of age was 6.8 percent for the nation as a whole, but was 22.2 percent for the Central Asian republics (Table 6). The differentials in fertility, plus the effect of internal migration, have resulted in a decline in the proportion of the total population that resides in the R.S.F.S.R.—from 56.3 percent in 1959 to 53.8 percent in 1970.<sup>5</sup> If these trends continue, in the not too distant future the R.S.F.S.R. will no longer contain a majority of the population. It is not unreasonable to label this the "50-percent problem." Soviet writers of late have been discussing questions of differential fertility, which suggests concern over the possibility that the Great Russians may well become a minority nationality in the country.

Data on migration to and from urban areas of the U.S.S.R. in 1967 are presented in Table 7. The net increase of 1.5 million persons in urban areas due to rural-urban migration during that year indicates that the long-term flow of population to the cities is continuing. The preliminary 1970 census results also confirm the trend toward urbanization. Whereas in 1959 a majority of the population was rural, the 1970 figures indicate that 136 million persons, or 56 percent, live in urban areas and 105.7 million, or 44 percent, live in rural areas. The rural-urban migration accounted for one-half of the 3 million increase in the urban population during 1967 (Table 1), and more than offset the natural increase of the rural population. The rates of urban arrivals

<sup>4</sup> U.S.S.R., Tsentral'noe statisticheskoe upravlenie, *Zhenshchiny i deti v SSSR*. Moscow, Statistika, 1969.

<sup>5</sup> *Nar. khoz. v 1968*, p. 9, and *Izvestia*, Apr. 19, 1970, p. 1.

and departures per thousand population varied widely and apparently without pattern among the various republics and regions; these rates were highest in the two eastern regions of the R.S.F.S.R. and lowest in the three republics of the Transcaucasus—Georgia, Azerbaidzhan, and Armenia.

On January 15, 1970, some 670,000 enumerators and other personnel began the general enumeration in the fifth<sup>6</sup> Soviet census of population. The census was scheduled to be taken during the 8-day period ending January 22, and followup checks were to be conducted during the period January 24 through 29. Census administrators decided not to use self-enumeration procedures such as those which have been adopted in U.S. censuses, but required enumerators to visit every household. Sampling techniques were introduced, however, and persons in every fourth household were asked a special set of questions. Eleven questions were asked of 100 percent of the population, consisting of relationship to head of family, number of persons temporarily absent and the number temporarily present, sex, age, marital status, nationality, native language, educational level, type of educational institution attended, and source of livelihood. An additional seven questions were asked of the sample households, consisting of place of work, occupation, length of time worked in 1969, social group, length of time residing in place of enumeration, place of residence 2 years previously, and reason for changing place of residence. Special questionnaires were also to be completed to collect information on the characteristics and circumstances of all able-bodied persons who were not employed outside the household and on the characteristics and commuting habits of all workers and students in cities of 500,000 population or more.

Initial processing of the census returns will be carried out at the oblast and republic offices of the statistical administration, but the final processing and tabulation will be done at the Computing Center of the Central Statistical Administration in Moscow. Soviet sources indicate that automatic sensing devices and electronic computers are to be used to process and tabulate the data. Elaborate plans have been made for detailed cross-tabulations, by small area. The schedule called for the publication of the brief initial results in April 1970 and of the final results in 1973.<sup>7</sup> Following this schedule, preliminary results were first published on April 19. In addition to the information indicated above, the preliminary results show that females now comprise 53.9 percent of the total population as compared with 55.0 percent in 1959. Totals for over 240 cities with 100,000 inhabitants or more and for all smaller cities which are oblast or krai centers are also given.

<sup>6</sup> The sixth census, if the abortive 1937 census is included.

<sup>7</sup> For additional information on census plans, see Frederick A. Leedy, "The 1970 Soviet Census of Population: Content, Organization, and Processing," Washington, D.C., U.S. Bureau of the Census, Foreign Demographic Analysis Division. Paper prepared for the annual meeting of the American Statistical Association, New York, Aug. 22, 1969, and Murray Feshbach, "Observations on the Soviet Census," *Problems of Communism*, vol. 19, No. 3, May-June 1970, pp. 63-64.



TABLE 1.—Population of the U.S.S.R., by urban and rural residence and by sex, 1913-70

[Absolute figures in millions. Figures may not add to totals due to rounding]

| Territory and date                              | Population |       |       | Percent of total population |        |
|---|------------|-------|-------|-----------------------------|--------|
|   | Total      | Urban | Rural | Male                        | Female |
| <b>Interwar territory:</b>                      |            |       |       |                             |        |
| 1913 .....                                      | 139.3      | 24.8  | 114.5 | 49.7                        | 50.3   |
| 1917 .....                                      | 143.5      | 25.8  | 117.7 | (1)                         | (1)    |
| 1919 .....                                      | 138.0      | 21.5  | 116.5 | (1)                         | (1)    |
| 1920 .....                                      | 136.8      | 20.9  | 115.9 | (1)                         | (1)    |
| Dec. 17, 1926 .....                             | 147.0      | 26.3  | 120.7 | 48.3                        | 51.7   |
| 1929 .....                                      | 153.4      | 28.7  | 124.7 | (1)                         | (1)    |
| 1937 .....                                      | 163.8      | 46.6  | 117.2 | (1)                         | (1)    |
| 1938 .....                                      | 167.0      | 50.0  | 117.0 | (1)                         | (1)    |
| Jan. 17, 1939 .....                             | 170.6      | 56.1  | 114.5 | 47.9                        | 52.1   |
| 1940 territory: Jan. 1, 1939 <sup>2</sup> ..... | 190.7      | 60.4  | 130.3 | 47.9                        | 52.1   |
| <b>Postwar territory:</b>                       |            |       |       |                             |        |
| 1913 .....                                      | 159.2      | 28.5  | 130.7 | * 49.0                      | * 51.0 |
| 1917 .....                                      | 163.0      | 29.1  | 133.9 | (1)                         | (1)    |
| Jan. 1, 1940 .....                              | 194.1      | 63.1  | 131.0 | 47.9                        | 52.1   |
| Jan. 1, 1941 .....                              | 196.7      | 64.9  | 131.8 | (1)                         | (1)    |
| Jan. 1, 1950 .....                              | 178.5      | 69.4  | 109.1 | 43.9                        | 56.1   |
| Jan. 1, 1951 .....                              | 181.6      | 73.0  | 108.6 | 44.0                        | 56.0   |
| Jan. 1, 1952 .....                              | 184.8      | 76.8  | 108.0 | 44.1                        | 55.9   |
| Jan. 1, 1953 .....                              | 188.0      | 80.2  | 107.8 | 44.3                        | 55.7   |
| Jan. 1, 1954 .....                              | 191.0      | 83.6  | 107.4 | 44.4                        | 55.6   |
| Jan. 1, 1955 .....                              | 194.4      | 86.3  | 108.1 | 44.5                        | 55.5   |
| Jan. 1, 1956 .....                              | 197.9      | 88.2  | 109.7 | 44.7                        | 55.3   |
| Jan. 1, 1957 .....                              | 201.4      | 91.4  | 110.0 | 44.8                        | 55.2   |
| Jan. 1, 1958 .....                              | 204.9      | 95.6  | 109.3 | 44.9                        | 55.1   |
| Jan. 15, 1959 .....                             | 208.8      | 100.0 | 108.8 | 45.0                        | 55.0   |
| Jan. 1, 1960 .....                              | 212.3      | 103.8 | 108.5 | 45.2                        | 54.8   |
| Jan. 1, 1961 .....                              | 216.2      | 108.3 | 107.9 | 45.3                        | 54.7   |
| Jan. 1, 1962 .....                              | 219.8      | 111.8 | 108.0 | 45.4                        | 54.6   |
| Jan. 1, 1963 .....                              | 223.2      | 115.1 | 108.1 | 45.5                        | 54.5   |
| Jan. 1, 1964 .....                              | 226.4      | 118.5 | 107.9 | 45.6                        | 54.4   |
| Jan. 1, 1965 .....                              | 229.3      | 121.7 | 107.6 | 45.7                        | 54.3   |
| Jan. 1, 1966 .....                              | 231.8      | 124.7 | 107.1 | 45.8                        | 54.2   |
| Jan. 1, 1967 .....                              | 234.4      | 128.0 | 106.4 | 45.8                        | 54.2   |
| Jan. 1, 1968 .....                              | 236.7      | 131.0 | 105.7 | 45.9                        | 54.1   |
| Jan. 1, 1969 .....                              | 238.9      | 134.2 | 104.7 | 46.0                        | 54.0   |
| Jan. 15, 1970 .....                             | 241.7      | 136.0 | 105.7 | 46.1                        | 53.9   |

<sup>1</sup> Not available.

<sup>2</sup> The figures shown are official Soviet estimates for the territory of the U.S.S.R., including the western oblasts of the Ukraine and Belorussia, Moldavia, Lithuania, Latvia, and Estonia. The figures presumably apply to the interwar territory, adjusted for the annexations of 1939 and 1940, but exclude the population in the territory retroceded to Poland at the end of the war.

\* For the European part of the U.S.S.R.

Source:

*Total population and residence:*1913-39: U.S.S.R. Tsentral'noe statisticheskoe upravlenie (TsSU), *Narodnoe khoziaistvo SSSR v 1962 godu, statisticheskii ezhegodnik*, Moscow, Gosstatizdat, 1963, pp. 7-8. (This volume and others in this series cited hereafter as *Nar. khoz. v 19---*.)1940, 1950-65: TsSU, *Trud v SSSR, statisticheskii sbornik*, Moscow, Statistika, 1968, p. 19.1941, 1966-69: *Vestnik statistiki*, no. 4, April 1969, p. 95, and *Nar. khoz. v 1968*, p. 7.1970: *Izvestiia*, April 19, 1970, p. 1.*Sex:*1913 (interwar territory), 1940: TsSU, *Strana Sovetov za 50 let, sbornik statisticheskikh materialov*, Moscow, Statistika, 1967, p. 15.1913 (postwar territory), 1926, 1939 (1940 territory), 1941-58, 1960-65: *Vestnik statistiki*, no. 4, April 1969, p. 95.1939 (interwar territory): *Nar. khoz. v 1964*, p. 8.1959, 1966-69: *Nar. khoz. v 1968*, p. 8.1970: *Izvestiia*, April 19, 1970, p. 1.

TABLE 2.—*Vital rates for the U.S.S.R., 1913-68*

[Rate per 1,000 population, except as noted]

| Year              | Birth | Death | Natural increase | Infant mortality <sup>1</sup> |
|-------------------|-------|-------|------------------|-------------------------------|
| 1913 <sup>2</sup> | 45.5  | 29.1  | 16.4             | 269                           |
| 1926 <sup>2</sup> | 44.0  | 20.3  | 23.7             | 174                           |
| 1939 <sup>2</sup> | 36.5  | 17.3  | 19.2             | 167                           |
| 1940 <sup>2</sup> | 31.2  | 18.0  | 13.2             | 182                           |
| 1950              | 26.7  | 9.7   | 17.0             | 81                            |
| 1951              | 27.0  | 9.7   | 17.3             | 84                            |
| 1952              | 26.5  | 9.4   | 17.1             | 75                            |
| 1953              | 25.1  | 9.1   | 16.0             | 68                            |
| 1954              | 26.6  | 8.9   | 17.7             | 68                            |
| 1955              | 25.7  | 8.2   | 17.5             | 60                            |
| 1956              | 25.2  | 7.6   | 17.6             | 47                            |
| 1957              | 25.4  | 7.8   | 17.6             | 45                            |
| 1958              | 25.3  | 7.2   | 18.1             | 41                            |
| 1959              | 25.0  | 7.6   | 17.4             | 41                            |
| 1960              | 24.9  | 7.1   | 17.8             | 35                            |
| 1961              | 23.8  | 7.2   | 16.6             | 32                            |
| 1962              | 22.4  | 7.5   | 14.9             | 32                            |
| 1963              | 21.2  | 7.2   | 14.0             | 31                            |
| 1964              | 19.6  | 6.9   | 12.7             | 29                            |
| 1965              | 18.4  | 7.3   | 11.1             | 27                            |
| 1966              | 18.2  | 7.3   | 10.9             | 26                            |
| 1967              | 17.4  | 7.6   | 9.8              | 26                            |
| 1968              | 17.3  | 7.7   | 9.6              | 26                            |

<sup>1</sup> Number of deaths under 1 year of age per 1,000 live births.<sup>2</sup> Refers to the postwar territory.Source: 1913-50, 1955-68: *Nar. khoz. v 1968*, p. 36; 1951-54: *Vestnik statistiki*, no. 2, February 1966, p. 93

TABLE 3.—Estimated and projected population of the U.S.S.R., by age and sex, 1950-69

[In thousands as of Jan. 1. Figures may not add to totals due to rounding]

| Age                                     | 1950 <sup>1</sup> |         |          | 1960       |         |          | 1965       |          |          | 1969       |          |          |
|---|-------------------|---------|----------|------------|---------|----------|------------|----------|----------|------------|----------|----------|
|   | Both sexes        | Male    | Female   | Both sexes | Male    | Female   | Both sexes | Male     | Female   | Both sexes | Male     | Female   |
| All ages.....                           | 178, 619          | 78, 183 | 100, 336 | 212, 300   | 95, 900 | 116, 400 | 229, 300   | 104, 800 | 124, 500 | 2 239, 000 | 109, 936 | 129, 063 |
| Under 5 years.....                      | 17, 830           | 9, 059  | 8, 771   | 24, 517    | 12, 521 | 11, 996  | 23, 797    | 12, 082  | 11, 715  | 20, 361    | 10, 306  | 10, 055  |
| 5 to 9 years.....                       | 14, 214           | 7, 161  | 7, 053   | 22, 532    | 11, 464 | 11, 068  | 24, 243    | 12, 326  | 11, 917  | 24, 259    | 12, 258  | 12, 001  |
| 10 to 14 years.....                     | 21, 661           | 10, 771 | 10, 890  | 17, 434    | 8, 837  | 8, 597   | 22, 456    | 11, 400  | 11, 056  | 23, 901    | 12, 143  | 11, 758  |
| 15 to 19 years.....                     | 18, 134           | 8, 994  | 9, 140   | 14, 065    | 7, 071  | 6, 994   | 17, 363    | 8, 779   | 8, 584   | 21, 814    | 11, 039  | 10, 775  |
| 20 to 24 years.....                     | 19, 839           | 9, 223  | 10, 616  | 21, 352    | 10, 580 | 10, 772  | 13, 968    | 6, 987   | 6, 981   | 15, 108    | 7, 597   | 7, 511   |
| 25 to 29 years.....                     | 13, 163           | 5, 374  | 7, 789   | 17, 778    | 8, 757  | 9, 021   | 21, 173    | 10, 434  | 10, 739  | 16, 197    | 8, 038   | 8, 159   |
| 30 to 34 years.....                     | 10, 538           | 4, 087  | 6, 451   | 10, 363    | 8, 928  | 10, 435  | 8, 627     | 8, 983   | 19, 933  | 19, 933    | 9, 746   | 10, 187  |
| 35 to 39 years.....                     | 12, 577           | 4, 903  | 7, 674   | 12, 806    | 5, 166  | 7, 640   | 19, 156    | 8, 784   | 10, 372  | 17, 783    | 8, 620   | 9, 163   |
| 40 to 44 years.....                     | 11, 469           | 4, 550  | 6, 919   | 10, 179    | 3, 887  | 6, 292   | 12, 644    | 5, 070   | 7, 574   | 18, 503    | 8, 290   | 10, 213  |
| 45 to 49 years.....                     | 9, 762            | 3, 471  | 6, 291   | 12, 037    | 4, 607  | 7, 430   | 10, 006    | 3, 796   | 6, 210   | 11, 227    | 4, 326   | 6, 901   |
| 50 to 54 years.....                     | 7, 927            | 2, 915  | 5, 012   | 10, 807    | 4, 177  | 6, 630   | 11, 733    | 4, 448   | 7, 285   | 9, 954     | 3, 762   | 6, 192   |
| 55 to 59 years.....                     | 6, 299            | 2, 393  | 3, 906   | 8, 970     | 3, 058  | 5, 921   | 10, 416    | 3, 978   | 6, 438   | 11, 493    | 4, 312   | 7, 181   |
| 60 to 64 years.....                     | 5, 248            | 1, 940  | 3, 308   | 6, 982     | 2, 407  | 4, 575   | 8, 406     | 2, 845   | 5, 651   | 9, 502     | 3, 544   | 5, 958   |
| 65 to 69 years.....                     | 3, 947            | 1, 417  | 2, 530   | 5, 205     | 1, 817  | 3, 388   | 6, 392     | 2, 143   | 4, 249   | 7, 531     | 2, 406   | 5, 125   |
| 70 to 74 years.....                     | 2, 789            | 952     | 1, 837   | 3, 929     | 1, 309  | 2, 620   | 4, 508     | 1, 512   | 2, 996   | 5, 303     | 1, 740   | 3, 563   |
| 75 years and over.....                  | 3, 122            | 973     | 2, 149   | 4, 335     | 1, 314  | 3, 021   | 5, 339     | 1, 589   | 3, 750   | 6, 130     | 1, 809   | 4, 321   |
| Under 16 years.....                     | 57, 135           | 28, 684 | 28, 451  | 66, 542    | 33, 862 | 32, 680  | 74, 695    | 37, 936  | 36, 759  | 72, 868    | 36, 910  | 35, 958  |
| 16 to 59/54 years <sup>3</sup> .....    | 102, 372          | 44, 217 | 58, 155  | 119, 386   | 55, 191 | 64, 195  | 123, 432   | 58, 775  | 64, 657  | 130, 484   | 63, 527  | 66, 957  |
| 60/55 years and over <sup>4</sup> ..... | 19, 012           | 5, 282  | 13, 730  | 26, 372    | 6, 847  | 19, 525  | 31, 173    | 8, 089   | 23, 084  | 35, 647    | 9, 499   | 26, 148  |

<sup>1</sup> The proportions male (43.8 percent) and female (56.2 percent) of these projections are slightly different from those given in table 1.

<sup>2</sup> After these projections were prepared, a total population of 238,928,000 for Jan. 1, 1969, was published in *Vestnik statistiki*, No. 11, November 1969, p. 96.

<sup>3</sup> Males 16 to 59 years of age and females 16 to 54 years of age.

<sup>4</sup> Males 60 years of age and over and females 55 years of age and over.

Source: Prepared by the Foreign Demographic Analysis Division, Bureau of the Census, U.S. Department of Commerce. The base population was an estimated age-sex distribution as of Jan. 15, 1959, that was derived from the results of the 1959 census. The base population was backdated to Jan. 1, 1950, and updated to Jan. 1, 1960, 1965, and 1969, by using reported and estimated data on fertility, mortality, and total population.

TABLE 4.—Projected population of the U.S.S.R., by age and sex, 1970–90

[In thousands as of Jan. 1]

| Age and series  | 1970       |         |         | 1975       |         |         | 1980       |         |         | 1985       |         |         | 1990       |         |         |        |
|-----------------|------------|---------|---------|------------|---------|---------|------------|---------|---------|------------|---------|---------|------------|---------|---------|--------|
|                 | Both sexes | Male    | Female  | Both sexes | Male    | Female  | Both sexes | Male    | Female  | Both sexes | Male    | Female  | Both sexes | Male    | Female  |        |
| All ages:       |            |         |         |            |         |         |            |         |         |            |         |         |            |         |         |        |
| A.....          | 241,729    | 111,397 | 130,331 | 256,503    | 119,321 | 137,181 | 273,416    | 128,401 | 145,014 | 292,209    | 138,451 | 153,757 | 310,501    | 148,263 | 162,237 |        |
| B.....          | 241,324    | 111,191 | 130,132 | 253,363    | 117,732 | 135,630 | 266,167    | 124,743 | 141,423 | 279,098    | 132,291 | 147,706 | 293,164    | 139,515 | 153,648 |        |
| C.....          | 241,122    | 111,088 | 130,033 | 251,789    | 116,937 | 134,851 | 262,535    | 122,907 | 139,627 | 273,885    | 129,201 | 144,683 | 284,505    | 135,144 | 149,360 |        |
| D.....          | 240,919    | 110,985 | 129,933 | 250,218    | 116,143 | 134,074 | 258,914    | 121,079 | 137,834 | 267,787    | 126,126 | 141,660 | 275,863    | 130,785 | 145,077 |        |
| Under 5 years:  |            |         |         |            |         |         |            |         |         |            |         |         |            |         |         |        |
| A.....          | 20,480     | 10,363  | 10,117  | 23,795     | 12,044  | 11,751  | 27,065     | 13,707  | 13,358  | 30,026     | 15,214  | 14,812  | 30,546     | 15,486  | 15,060  |        |
| B.....          | 20,075     | 10,157  | 9,918   | 21,051     | 10,654  | 10,397  | 22,926     | 11,611  | 11,315  | 25,017     | 12,676  | 12,341  | 25,355     | 12,853  | 12,502  |        |
| C.....          | 19,873     | 10,054  | 9,819   | 19,676     | 9,959   | 9,717   | 20,856     | 10,561  | 10,295  | 22,516     | 11,409  | 11,107  | 22,776     | 11,546  | 11,230  |        |
| D.....          | 19,670     | 9,951   | 9,719   | 18,305     | 9,266   | 9,039   | 18,791     | 9,515   | 9,276   | 20,014     | 10,142  | 9,872   | 20,205     | 10,241  | 9,964   |        |
| 5 to 9 years:   |            |         |         |            |         |         |            |         |         |            |         |         |            |         |         |        |
| A.....          | 23,520     | 11,876  | 11,644  | 20,276     | 10,200  | 10,076  | 23,576     | 11,865  | 11,711  | 26,843     | 13,525  | 13,318  | 29,806     | 15,033  | 14,773  |        |
| B.....          |            |         |         | 19,880     | 10,001  | 9,879   | 20,861     | 10,501  | 10,360  | 22,738     | 11,459  | 11,279  | 24,836     | 12,527  | 12,309  |        |
| C.....          |            |         |         | 19,681     | 9,901   | 9,780   | 19,496     | 9,814   | 9,682   | 20,682     | 10,419  | 10,263  | 22,354     | 11,276  | 11,078  |        |
| D.....          |            |         |         | 19,481     | 9,800   | 9,681   | 18,140     | 9,133   | 9,007   | 18,640     | 9,392   | 9,248   | 19,866     | 10,020  | 9,846   |        |
| 10 to 14 years: |            |         |         |            |         |         |            |         |         |            |         |         |            |         |         |        |
| A.....          | 24,134     | 12,246  | 11,888  | 20,207     | 10,142  | 10,065  | 23,502     | 11,803  | 11,699  | 26,767     | 13,461  | 13,306  | 28,767     | 13,461  | 13,306  |        |
| B.....          |            |         |         | 19,812     | 9,944   | 9,868   | 20,798     | 10,444  | 10,354  | 22,677     | 11,402  | 11,275  | 22,677     | 11,402  | 11,275  |        |
| C.....          |            |         |         | 19,615     | 9,845   | 9,770   | 19,438     | 9,760   | 9,678   | 20,627     | 10,365  | 10,262  | 19,438     | 9,760   | 9,678   | 20,627 |
| D.....          |            |         |         | 19,415     | 9,744   | 9,671   | 18,084     | 9,080   | 8,904   | 18,593     | 9,346   | 9,247   | 18,593     | 9,346   | 9,247   |        |
| 15 to 19 years: |            |         |         |            |         |         |            |         |         |            |         |         |            |         |         |        |
| A.....          | 22,338     | 11,307  | 11,031  | 20,118     | 10,076  | 10,042  | 23,407     | 11,732  | 11,675  | 26,407     | 13,212  | 13,192  | 28,407     | 13,212  | 13,192  |        |
| B.....          |            |         |         | 19,725     | 9,879   | 9,846   | 20,712     | 10,377  | 10,377  | 20,712     | 10,377  | 10,335  | 19,725     | 9,879   | 9,846   |        |
| C.....          |            |         |         | 19,529     | 9,780   | 9,749   | 19,359     | 9,699   | 9,660   | 19,359     | 9,699   | 9,660   | 19,529     | 9,780   | 9,749   |        |
| D.....          |            |         |         | 19,329     | 9,679   | 9,650   | 18,010     | 9,021   | 8,989   | 18,010     | 9,021   | 8,989   | 19,329     | 9,679   | 9,650   |        |
| 20 to 24 years: |            |         |         |            |         |         |            |         |         |            |         |         |            |         |         |        |
| A.....          | 17,223     | 8,665   | 8,558   | 19,984     | 9,967   | 10,017  | 19,984     | 9,967   | 10,017  | 19,984     | 9,967   | 10,017  | 19,984     | 9,967   | 10,017  |        |
| B.....          |            |         |         | 19,593     | 9,772   | 9,821   | 19,593     | 9,772   | 9,821   | 19,593     | 9,772   | 9,821   | 19,593     | 9,772   | 9,821   |        |
| C.....          |            |         |         | 19,398     | 9,674   | 9,724   | 19,398     | 9,674   | 9,724   | 19,398     | 9,674   | 9,724   | 19,398     | 9,674   | 9,724   |        |
| D.....          |            |         |         | 19,198     | 9,573   | 9,625   | 19,198     | 9,573   | 9,625   | 19,198     | 9,573   | 9,625   | 19,198     | 9,573   | 9,625   |        |

|                                    |         |        |        |         |        |        |         |        |        |         |        |        |         |        |        |
|------------------------------------|---------|--------|--------|---------|--------|--------|---------|--------|--------|---------|--------|--------|---------|--------|--------|
| 25 to 29 years.....                | 13,830  | 6,877  | 6,953  | 17,058  | 8,539  | 8,519  | 21,961  | 11,019 | 10,942 | 23,636  | 11,868 | 11,778 | 22,967  | 11,445 | 11,522 |
| 30 to 34 years.....                | 20,950  | 10,265 | 10,685 | 13,690  | 6,772  | 6,918  | 16,891  | 8,412  | 8,479  | 21,761  | 10,869 | 10,892 | 23,436  | 11,708 | 11,728 |
| 35 to 39 years.....                | 17,406  | 8,476  | 8,990  | 20,724  | 10,100 | 10,624 | 13,543  | 6,661  | 6,882  | 16,718  | 8,282  | 8,436  | 21,559  | 10,717 | 10,842 |
| 40 to 44 years.....                | 18,881  | 8,602  | 10,279 | 17,171  | 8,314  | 8,857  | 20,458  | 9,913  | 10,545 | 13,374  | 6,542  | 6,832  | 16,528  | 8,144  | 8,384  |
| 45 to 49 years.....                | 12,423  | 4,943  | 7,480  | 18,553  | 8,395  | 10,158 | 16,879  | 8,120  | 8,759  | 20,130  | 9,693  | 10,437 | 13,160  | 6,396  | 6,764  |
| 50 to 54 years.....                | 9,750   | 3,663  | 6,087  | 12,126  | 4,778  | 7,348  | 18,096  | 8,111  | 9,985  | 16,471  | 7,853  | 8,618  | 19,667  | 9,387  | 10,280 |
| 55 to 59 years.....                | 11,209  | 4,225  | 7,074  | 9,416   | 3,486  | 5,930  | 11,723  | 4,556  | 7,167  | 17,485  | 7,735  | 9,750  | 15,924  | 7,498  | 8,426  |
| 60 to 64 years.....                | 9,848   | 3,696  | 6,152  | 10,723  | 3,930  | 6,793  | 8,954   | 3,247  | 5,707  | 11,173  | 4,259  | 6,914  | 16,642  | 7,226  | 9,416  |
| 65 to 69 years.....                | 7,781   | 2,535  | 5,246  | 9,044   | 3,297  | 5,747  | 9,863   | 3,509  | 6,354  | 8,265   | 2,906  | 5,359  | 10,346  | 3,828  | 6,518  |
| 70 to 74 years.....                | 5,542   | 1,784  | 3,758  | 6,766   | 2,116  | 4,650  | 7,876   | 2,759  | 5,117  | 8,616   | 2,937  | 5,679  | 7,253   | 2,441  | 4,812  |
| 75 years and over.....             | 6,323   | 1,874  | 4,449  | 7,552   | 2,216  | 5,336  | 9,160   | 2,639  | 6,521  | 10,936  | 3,308  | 7,628  | 12,508  | 3,794  | 8,714  |
| Under 16 years:                    |         |        |        |         |        |        |         |        |        |         |        |        |         |        |        |
| A.....                             | 72,857  | 36,881 | 35,976 | 72,450  | 36,547 | 35,903 | 75,071  | 37,837 | 37,234 | 84,712  | 42,719 | 41,993 | 92,046  | 46,453 | 45,593 |
| B.....                             | 72,452  | 36,675 | 35,777 | 69,310  | 34,958 | 34,352 | 67,822  | 34,179 | 33,643 | 72,501  | 36,559 | 35,942 | 77,154  | 38,933 | 38,221 |
| C.....                             | 72,250  | 36,572 | 35,678 | 67,736  | 34,163 | 33,573 | 64,190  | 32,343 | 31,847 | 66,388  | 33,469 | 32,919 | 69,721  | 35,175 | 34,546 |
| D.....                             | 72,047  | 36,409 | 35,578 | 66,165  | 33,369 | 32,796 | 60,569  | 30,515 | 30,054 | 60,290  | 30,394 | 29,896 | 62,308  | 31,435 | 30,873 |
| 16 to 59/54 years: <sup>1</sup>    |         |        |        |         |        |        |         |        |        |         |        |        |         |        |        |
| A.....                             | 132,303 | 64,627 | 67,676 | 144,037 | 71,215 | 72,822 | 155,324 | 78,410 | 76,914 | 158,756 | 82,322 | 76,434 | 163,279 | 84,521 | 78,758 |
| B.....                             |         |        |        |         |        |        |         |        |        |         |        |        |         |        |        |
| C.....                             |         |        |        |         |        |        |         |        |        |         |        |        |         |        |        |
| D.....                             |         |        |        |         |        |        |         |        |        |         |        |        |         |        |        |
| 60/55 years and over: <sup>2</sup> | 36,568  | 9,889  | 26,679 | 40,015  | 11,559 | 28,456 | 43,020  | 12,154 | 30,866 | 48,740  | 13,410 | 35,330 | 55,175  | 17,289 | 37,886 |

<sup>1</sup> Males 16 to 59 years of age and females 16 to 54 years of age.

<sup>2</sup> Males 60 years of age and over and females 55 years of age and over.

Source: Prepared by the Foreign Demographic Analysis Division, Bureau of the Census, U.S. Department of Commerce, in April 1969, and published in Godfrey S. Baldwin, *Projections of the Population of the U.S.S.R., by Age and Sex: 1969 to 1990* (U.S. Bureau of the Census, International Population Reports, Series P-91, No. 19), Washington, D.C., 1969. That report also provides projections by 5-year age groups and sex for each year of the period 1959 to 1990. The four series of projections differ as a result of varying assumptions about future fertility. Series A projections assume that the maternal gross reproduction rate will rise from its level of about 117 in 1968 to 128 in 1969 and will continue

to rise by a constant annual amount until 1979, after which it will stabilize at 140. Series B projections assume that the maternal gross reproduction rate will remain constant at the 1968 level throughout the projection period. Series C projections assume that the maternal gross reproduction rate will decline to 111 in 1969 and will continue to decline by a constant annual amount until 1979, after which it will stabilize at 105. Series D projections assume that the maternal gross reproduction rate will decline to 105 in 1969 and will continue to decline by a constant annual amount until 1979, after which it will stabilize at 93. All series assume that mortality will decline by an amount to accord with an increase in life expectancy at birth of approximately 2.5 years over the projection period. Migration is assumed to be insignificant over the projection period.

The methodology is described more fully in *ibid.*

TABLE 5.—*Estimated and projected male population of military age in the U.S.S.R., 1950-90*

[In thousands as of Jan. 1]

| Year and series | 17 to 34 years | 17 years | 18 years | 19 years |
|-----------------|----------------|----------|----------|----------|
| 1950.....       | 24,054         | 1,827    | 1,764    | 1,779    |
| 1951.....       | 25,041         | 1,927    | 1,823    | 1,760    |
| 1952.....       | 25,826         | 1,687    | 1,923    | 1,819    |
| 1953.....       | 26,684         | 1,737    | 1,683    | 1,918    |
| 1954.....       | 27,813         | 2,003    | 1,733    | 1,679    |
| 1955.....       | 29,288         | 2,337    | 2,000    | 1,730    |
| 1956.....       | 30,830         | 2,384    | 2,333    | 1,996    |
| 1957.....       | 32,157         | 2,233    | 2,380    | 2,329    |
| 1958.....       | 33,130         | 2,045    | 2,229    | 2,376    |
| 1959.....       | 33,692         | 1,858    | 2,042    | 2,225    |
| 1960.....       | 33,377         | 1,223    | 1,853    | 2,036    |
| 1961.....       | 32,543         | 917      | 1,220    | 1,849    |
| 1962.....       | 31,672         | 1,036    | 915      | 1,217    |
| 1963.....       | 31,013         | 1,263    | 1,035    | 914      |
| 1964.....       | 30,692         | 1,580    | 1,259    | 1,032    |
| 1965.....       | 30,661         | 1,778    | 1,578    | 1,257    |
| 1966.....       | 30,888         | 2,033    | 1,773    | 1,573    |
| 1967.....       | 31,254         | 2,120    | 2,029    | 1,770    |
| 1968.....       | 31,611         | 2,196    | 2,115    | 2,023    |
| 1969.....       | 31,939         | 2,257    | 2,191    | 2,110    |
| 1970.....       | 32,519         | 2,274    | 2,252    | 2,186    |
| 1971.....       | 32,970         | 2,195    | 2,269    | 2,247    |
| 1972.....       | 33,356         | 2,388    | 2,190    | 2,264    |
| 1973.....       | 33,405         | 2,367    | 2,383    | 2,185    |
| 1974.....       | 33,418         | 2,372    | 2,362    | 2,378    |
| 1975.....       | 33,645         | 2,438    | 2,367    | 2,357    |
| 1976.....       | 34,104         | 2,493    | 2,433    | 2,362    |
| 1977.....       | 34,739         | 2,491    | 2,488    | 2,428    |
| 1978.....       | 36,023         | 2,537    | 2,486    | 2,483    |
| 1979.....       | 37,519         | 2,462    | 2,532    | 2,481    |
| 1980.....       | 38,783         | 2,351    | 2,457    | 2,527    |
| 1981.....       | 39,746         | 2,262    | 2,346    | 2,452    |
| 1982.....       | 40,255         | 2,116    | 2,258    | 2,341    |
| 1983.....       | 40,472         | 2,013    | 2,112    | 2,253    |
| 1984.....       | 40,447         | 2,009    | 2,009    | 2,108    |
| 1985.....       | 40,265         | 1,937    | 2,005    | 2,005    |
| 1986.....       | 40,021         | 1,949    | 1,933    | 2,001    |
| 1987:           |                |          |          |          |
| A.....          | 39,940         | 2,170    |          |          |
| B.....          | 39,744         | 1,974    |          |          |
| C.....          | 39,645         | 1,875    | 1,945    | 1,929    |
| D.....          | 39,544         | 1,774    |          |          |
| 1988:           |                |          |          |          |
| A.....          | 39,899         | 2,226    | 2,166    |          |
| B.....          | 39,483         | 2,006    | 1,970    |          |
| C.....          | 39,274         | 1,895    | 1,872    | 1,941    |
| D.....          | 39,060         | 1,782    | 1,771    |          |
| 1989:           |                |          |          |          |
| A.....          | 39,997         | 2,286    | 2,222    | 2,162    |
| B.....          | 39,337         | 2,042    | 2,002    | 1,966    |
| C.....          | 39,006         | 1,919    | 1,892    | 1,868    |
| D.....          | 38,669         | 1,796    | 1,779    | 1,767    |
| 1990:           |                |          |          |          |
| A.....          | 39,968         | 2,348    | 2,282    | 2,218    |
| B.....          | 39,038         | 2,077    | 2,038    | 1,998    |
| C.....          | 38,573         | 1,942    | 1,916    | 1,888    |
| D.....          | 38,101         | 1,806    | 1,793    | 1,776    |

Source: See source note to table 4. The different series of projections do not affect these age groups until 1987.

TABLE 6.—Percent distribution of families of workers and employees in the U.S.S.R. with children under 16 years of age, by republic and number of children, September 1967

| Republic                                    | All families with children under 16 years of age | Of which, families with— |              |                |               |                       |
|---|--|--------------------------|--------------|----------------|---------------|-----------------------|
|   |  | One child                | Two children | Three children | Four children | Five or more children |
| U.S.S.R. ....                               | 100.0  | 50.1                     | 34.5         | 9.5            | 3.3           | 2.6                   |
| Urban .....                                 | 100.0  | 54.7                     | 34.7         | 7.3            | 2.0           | 1.3                   |
| Rural .....                                 | 100.0  | 34.3                     | 34.1         | 16.9           | 7.9           | 6.8                   |
| R.S.F.S.R. ....                             | 100.0  | 52.8                     | 34.9         | 8.5            | 2.4           | 1.4                   |
| Urban .....                                 | 100.0  | 57.3                     | 34.5         | 6.3            | 1.3           | .6                    |
| Rural .....                                 | 100.0  | 36.5                     | 36.2         | 16.4           | 6.5           | 4.4                   |
| Ukrainian S.S.R. ....                       | 100.0  | 57.3                     | 35.7         | 5.7            | 1.0           | .3                    |
| Urban .....                                 | 100.0  | 59.9                     | 34.8         | 4.5            | .6            | .2                    |
| Rural .....                                 | 100.0  | 45.1                     | 40.0         | 11.3           | 2.6           | 1.0                   |
| Belorussian S.S.R. ....                     | 100.0  | 42.7                     | 40.2         | 12.4           | 3.4           | 1.3                   |
| Urban .....                                 | 100.0  | 49.0                     | 42.1         | 7.4            | 1.2           | .3                    |
| Rural .....                                 | 100.0  | 30.7                     | 36.4         | 21.8           | 7.8           | 3.3                   |
| Kazakh S.S.R. ....                          | 100.0  | 35.6                     | 32.6         | 16.3           | 8.2           | 7.3                   |
| Urban .....                                 | 100.0  | 43.6                     | 35.9         | 12.7           | 4.6           | 3.2                   |
| Rural .....                                 | 100.0  | 25.2                     | 28.0         | 21.0           | 13.0          | 12.8                  |
| Central Asian Republics <sup>1</sup> .....  | 100.0  | 33.8                     | 29.4         | 14.8           | 9.5           | 12.5                  |
| Urban .....                                 | 100.0  | 39.2                     | 32.2         | 12.9           | 6.9           | 8.8                   |
| Rural .....                                 | 100.0  | 19.8                     | 22.1         | 19.9           | 16.0          | 22.2                  |
| Transcaucasian Republics <sup>2</sup> ..... | 100.0  | 31.5                     | 32.7         | 19.1           | 9.4           | 7.3                   |
| Urban .....                                 | 100.0  | 34.2                     | 35.0         | 18.4           | 7.7           | 4.7                   |
| Rural .....                                 | 100.0  | 18.9                     | 22.2         | 22.2           | 17.1          | 19.6                  |
| Baltic Republics <sup>3</sup> .....         | 100.0  | 56.4                     | 34.4         | 7.1            | 1.4           | .7                    |
| Urban .....                                 | 100.0  | 59.6                     | 34.1         | 5.2            | .9            | .2                    |
| Rural .....                                 | 100.0  | 44.6                     | 35.7         | 13.9           | 3.5           | 2.3                   |

<sup>1</sup> Includes the Uzbek, Kirgiz, Tadzhik, and Turkmen Republics.

<sup>2</sup> Includes the Georgian, Azerbaïdzhani, and Armenian Republics.

<sup>3</sup> Includes the Lithuanian, Latvian, and Estonian Republics and Kaliningrad Oblast of the R.S.F.S.R.

NOTE.—These figures are based on a survey of 250,000 families. Families with no children, with children 16 years of age and over only, and all families on collective farms were not included.

Source: TsSU, *Zhenshchiny i deti v SSSR*, Moscow, Statistika, 1969, pp. 112-113.

TABLE 7.—*Migration to and from cities and urban-type settlements in the U.S.S.R., by republic and region, 1967*

[Absolute figures in thousands]

| Republic and region      | Number                  |                            |            | Rate per 1,000 population |                            |            |
|--------------------------|-------------------------|----------------------------|------------|---------------------------|----------------------------|------------|
|                          | Arriving in urban areas | Departing from urban areas | Net change | Arriving in urban areas   | Departing from urban areas | Net change |
| U.S.S.R.....             | 1 8,582                 | 1 7,081                    | 1 1,501    | 66.3                      | 54.7                       | 11.6       |
| R.S.F.S.R.....           | 1 5,235                 | 1 4,438                    | 1 797      | 67.6                      | 57.3                       | 10.3       |
| Northwestern.....        | 571                     | 495                        | 76         | 66.1                      | 57.4                       | 8.7        |
| Central.....             | 811                     | 637                        | 174        | 44.2                      | 34.8                       | 9.4        |
| Volga-Viatka.....        | 250                     | 201                        | 49         | 60.0                      | 48.2                       | 11.8       |
| Central Black Earth..... | 194                     | 148                        | 46         | 66.9                      | 51.2                       | 15.7       |
| Volga.....               | 691                     | 513                        | 178        | 70.5                      | 52.3                       | 18.2       |
| Northern Caucasus.....   | 547                     | 443                        | 104        | 80.3                      | 65.0                       | 15.3       |
| Urals.....               | 698                     | 666                        | 32         | 66.8                      | 63.7                       | 3.1        |
| Western Siberia.....     | 588                     | 526                        | 62         | 80.9                      | 72.4                       | 8.5        |
| Eastern Siberia.....     | 416                     | 392                        | 24         | 94.0                      | 88.5                       | 5.5        |
| Far Eastern.....         | 430                     | 380                        | 50         | 103.7                     | 91.6                       | 12.1       |
| Ukrainian S.S.R.....     | 1,627                   | 1,283                      | 344        | 66.0                      | 52.0                       | 14.0       |
| Donets-Dnieper.....      | 885                     | 738                        | 147        | 63.5                      | 53.0                       | 10.5       |
| Southwestern.....        | 463                     | 339                        | 124        | 63.0                      | 46.1                       | 16.9       |
| Southern.....            | 279                     | 206                        | 73         | 83.5                      | 61.5                       | 22.0       |
| Belorussian S.S.R.....   | 270                     | 190                        | 80         | 74.5                      | 52.6                       | 21.9       |
| Uzbek S.S.R.....         | 222                     | 158                        | 64         | 55.9                      | 39.8                       | 16.1       |
| Kazakh S.S.R.....        | 546                     | 462                        | 84         | 89.0                      | 75.2                       | 13.8       |
| Georgian S.S.R.....      | 58                      | 46                         | 12         | 26.0                      | 20.5                       | 5.5        |
| Azerbaijdzhan S.S.R..... | 79                      | 72                         | 7          | 32.3                      | 29.4                       | 2.9        |
| Lithuanian S.S.R.....    | 94                      | 62                         | 32         | 66.4                      | 43.5                       | 22.9       |
| Moldavian S.S.R.....     | 71                      | 50                         | 21         | 70.7                      | 50.1                       | 20.6       |
| Latvian S.S.R.....       | 87                      | 68                         | 19         | 60.4                      | 47.4                       | 13.0       |
| Kirgiz S.S.R.....        | 88                      | 74                         | 14         | 81.4                      | 68.7                       | 12.7       |
| Tadzhik S.S.R.....       | 57                      | 55                         | 2          | 57.4                      | 55.7                       | 1.7        |
| Armenian S.S.R.....      | 37                      | 21                         | 16         | 29.4                      | 16.5                       | 12.9       |
| Turkmen S.S.R.....       | 55                      | 55                         | 0          | 56.3                      | 56.2                       | .1         |
| Estonian S.S.R.....      | 56                      | 47                         | 9          | 67.8                      | 56.7                       | 11.1       |

<sup>1</sup> The sums of the regional figures for the RSFSR do not equal the reported totals shown here. The total figures for the USSR and RSFSR obtained by adding the parts are as follows:

NOTE.—These figures presumably exclude migration between rural localities, therefore they do not indicate the full extent of the migratory flows.

|                | Arriving | Departing | Net change |
|----------------|----------|-----------|------------|
| U.S.S.R.....   | 8,543    | 7,044     | 1,499      |
| R.S.F.S.R..... | 5,196    | 4,401     | 795        |

Source: *Vestnik statistiki*, No. 10, October 1968, p. 89.



## LABOR AND WAGES

By MURRAY FESHBACH and STEPHEN RAPAWY

In the summer of 1968, after a hiatus of more than 30 years, the Soviet Central Statistical Administration released a statistical handbook on labor, *Trud v SSSR*.<sup>1</sup> This handbook contains much information which was not previously available, and its publication raised the possibility of establishing numerous time series of statistics on labor. However, the latest statistical yearbook,<sup>2</sup> which was released in mid-October 1969, contains revised data for certain earlier years and in effect dashes many of these hopes concerning time series. For example, the employment series given in the labor handbook has now been changed for the years 1960 and 1966-67, due to the reclassification of industrial and other economic activities adopted in August 1967. The figures for the industry, construction, and agriculture branches of the national economy, as well as those for most of the branches of industry, have been altered for these years. In addition, the wage series for the branches of the national economy has been changed because the scope of wages reported on has been expanded to include more than just the direct payments from the wage fund which were published in *Trud v SSSR* and the previous statistical yearbooks on the national economy.

Estimates of the population, labor force, and civilian employment in the U.S.S.R. given in table 1 indicate continued stringencies in the labor supply. (The estimates of employment and labor force in this table reflect changes introduced by the new classification system referred to above and therefore are different from figures for the same years published in previous studies by the Joint Economic Committee.<sup>3</sup>) Civilian employment increased by over 20 percent between 1960 and 1968, whereas the population aged 14 and over increased by slightly less than 15 percent and the civilian labor force by just over 16 percent. The increased demand for labor created during the current 5-year plan and the increasing level of participation in full-time secondary and higher education by young adults have contributed to this situation. While there apparently is much malutilization of labor, the overall impression given by the writings of Soviet economists and planners is one of a labor shortage, particularly in certain skills and in various regions and cities. The Soviet Government has taken steps to ease some of the tautness through change in pension laws, attempts to reduce labor turnover and seasonality, and the development of industry in particular labor-surplus areas. In addition, a new state committee on labor resource utilization has been created in each republic to study the problem and to suggest

<sup>1</sup> U.S.S.R. Tsentral'noe statisticheskoe upravlenie (TsSU), *Trud v SSSR, statisticheskii sbornik*, Moscow, Statistika, 1968, 343 pp.

<sup>2</sup> TsSU, *Narodnoe khoziaistvo SSSR v 1968 g., statisticheskii ezhegodnik*, Moscow, Statistika, 1969, 532 pp. (This volume and others in this series are cited hereafter as *Nar. khoz. v 19--*.)

<sup>3</sup> See U.S. Congress, Joint Economic Committee, *Soviet Economic Performance: 1966-67*, Washington, D.C., 1968, p. 69.

remedies.<sup>4</sup> A practice presently employed to relieve the labor shortage, particularly in places where Soviet workers appear to be unwilling to go, is the importation of foreign labor. According to *Pravda*, there were 800 Bulgarians working in the Komi A.S.S.R. in January 1969, and by March of 1970 a Bulgarian newspaper reported that the total number of Bulgarians in Komi had increased to 2,000 persons. More are to come under the terms of a 10-year agreement between the two countries. For example, by 1975 some 9,000 Bulgarians are expected to be employed in the Komi A.S.S.R., including 6,000 in logging work.<sup>5</sup> Perhaps some of the surplus unskilled labor in Poland will be utilized in the same fashion, to the mutual benefit of the two countries.

Many of the annual average numbers of workers and employees given in table 2 also have been revised as a result of the 1967 reclassification. As noted above, this has affected especially the number of persons employed in industry, construction, and agriculture—including state farms, subsidiary state agricultural establishments, and the “other” agricultural establishments which have now been identified as “agricultural and veterinary services” and “hired personnel in collective farms.” In addition to these revisions, for the first time since 1936 a detailed breakdown of the administrative branch is available, and new disaggregations of employment in science are presented for the years since 1958.

A considerable amount of detailed information on the structure of various branches of the national economy is available in *Trud v SSSR* for the year 1966, as shown in table 3. These data were reported according to the classification system used in 1966, and therefore do not follow the 1967 classification. Nevertheless, the detail in which the data are reported, especially for the subbranches of agriculture, transportation, trade, health, and education, is particularly noteworthy.<sup>6</sup>

The numbers of wageworkers reported by branch of industry in *Nar. khoz. v 1968* also reflect the 1967 classification system. In order to show the differences caused by the reclassification, two tables on employment in industry are given here. Table 4 presents data on the numbers of industrial-production personnel, wageworkers, and engineering-technical personnel, by branch of industry, which were published in *Trud v SSSR* and *Nar. khoz. v 1967*, and which are grouped primarily according to the classification system used prior to 1967. These data are labeled the “old” series. Table 5 presents what data are available on the “new” series on industrial employment by branch of industry. As can be seen, the aggregate number of industrial wageworkers was increased by 425,000 in 1967, due to the change in the classification system and the consequent statistical

<sup>4</sup> U.S. Congress, *Soviet Economic Performance*, p. 69. A sharp critique of the usual Soviet claims of a general labor shortage has been made by A. Birman in his article “U chetyrekh istochnikov” (Among Four Sources), *Literaturnaiia gazeta*, v. 41 no. 41, October 8, 1969, p. 10. Birman cites the following as steps which can and should be taken immediately to make more labor available: the replacement of obsolete equipment; a reduction in the number of persons performing administrative-management work; part-time employment of pensioners and housewives; and the adoption of the Shebekino Chemical Combine experiment of reducing the size of the plant labor force and retaining wages saved for wage and incentive payments. A statement of the “overall shortage of labor in the country” and its link to labor turnover is given by E. Antosenkov in “Problemy tekuchestii kadrov” (Problems of Cadre Labor Turnover), *Trud*, v. 49, no. 230, October 2, 1969, p. 2.

<sup>5</sup> *Pravda*, January 20, 1969, p. 6, and *Otechestven front (National Front)*, March 3, 1970, p. 1.

<sup>6</sup> See Murray Feshbach, “Comments on Labor Handbook,” *ASTE Bulletin*, vol. 10, no. 3, Winter 1968, pp. 1-9.

transfer of employment from agriculture to industry (and construction). The number of wagedworkers in the "new" series for the machine-building and metalworking industry is larger by 247,000 persons (or 3 percent) than the number for the same year (1967) given in the "old" series. Increases also occur in the timber, woodworking, pulp and paper; food; light; construction materials; and electric power industries. Even figures for the chemical and petrochemical industry, which was newly introduced as a branch category in 1967, were changed for the years 1960, 1965, and 1966. No changes are shown for the coal and ferrous metallurgy branches. Figures for the pulp and paper subbranch were not changed for the years 1966 and 1967, but for some inexplicable reason they were revised downward for 1960 and 1965.

The data on labor turnover in 1965 given in table 6 are the most detailed available on the subject since the 1930's. Published in a secondary source rather than an official handbook, they show both the total number of separations and the number of voluntary quits as proportions of the annual average number of wagedworkers. The aggregate number of voluntary quits represents 62 percent of all separations from industrial enterprises. The highest rate of voluntary quits occurred in the food industry, where almost one-third of the annual average number of wagedworkers quit voluntarily—due in large part, no doubt, to the sizable proportion of women in the branch. According to the data shown in the table, the highest regional rate of voluntary quits was in the Tadzhik machine-building and metalworking industry, where over half of the workers quit during the year. Although not shown in the table, the same industry in Tuvinskaiia A.S.S.R. had an almost complete voluntary turnover (95.8 percent) of the annual average number of wagedworkers and the food industry of Magadan oblast had total separations amounting to 119.9 percent of its annual average number of wagedworkers.<sup>7</sup>

Wage data also have been changed. *Trud v SSSR* reported a variety of wage data, by branch of the economy and branch of industry, and *Nar. khoz. v 1967* repeated them and added figures for one more year. However, beginning with the May 1969 issue of *Vestnik statistiki*, revised figures on the average wages for all workers and employees have been reported. According to the footnote to the relevant table in *Vestnik statistiki*, the wage figures now include some bonuses and other payments which are not included in the wage fund and which were not previously included in the average figures. The effect of this expanded scope for the wage data ranges from an increase of 6 rubles in the annual average wage of all workers and employees in 1960 to an increase of 16 rubles in 1967. *Nar. khoz. v 1968* continued the reporting of revised wage data. This "new" series shows increases in the 1967 annual averages wages of a minimum of 1 ruble in education and in health services, and a maximum of 58 rubles in construction.<sup>8</sup> These changes are relatively small, but they may be followed by further revisions due to the inclusion of other types of payments in the wages. In addition, the changes in the number of persons employed

<sup>7</sup> *Problemy ekonomicheskoi effektivnosti razmeshcheniia sotsialisticheskogo proizvodstva v SSSR*, (Ia'kov Grigor'evich Feigin and others, eds.) Moscow, Nauka, 1968, pp. 114-115.

<sup>8</sup> *Nar. khoz. v 1967*, pp. 657-658, and *Nar. khoz. v 1968*, pp. 555-556.

in industry, construction, and agriculture noted above (Table 2) may also engender further changes to the series on wages.

Table 7 presents annual average wages, by branch of the economy, according to the "new," or expanded, scope of wage payments. Table 8 shows annual average wages in more detailed breakdown by branch of industry and class of worker, as reported for the "old" scope of wage payments. Comparisons between the two series can be made for the wages of industrial-production personnel in the branch of industry as a whole. Thus, Table 7 shows an annual average wage of 1,294 rubles in 1966 for all industrial-production personnel, and Table 8 shows 1,282 rubles. The differences for all years are relatively minor, which suggests that although the "old" series of wages given in Table 8 are no longer officially correct, the relationships between the figures for the various branches and subbranches are still indicative of those existing in the "new" series.

The size of defense-industry employment in the Soviet Union is not published. It is known, however, that the machine-building branch of industry contains defense-industry enterprises, and it is believed that employment in these enterprises is included in data reported for the branch as a whole. Also, in the 1967 classification of the branches of the national economy and branches of industry, which is contained in a planning manual, defense industry is specifically designated as part of the machine-building branch. The rubric "Enterprises and Organizations on a Special List" is used in this manual as a special designation for the enterprises of defense industry, as well as for enterprises of the aircraft, shipbuilding, radio, and electronic industries, and "other" enterprises, presumably civilian, producing specified types of products.<sup>9</sup>

<sup>9</sup> U.S.S.R. Gosudarstvennyi planovyi komitet, *Metodicheskie ukazaniia k sostavleniiu gosudarstvennogo plana razvitiia narodnogo khoziaistva SSSR*, Moscow, Ekonomika, 1969, pp. 719-720.

TABLE 1.—*Estimates of population, labor force, and civilian employment, U.S.S.R., 1950-68*

[In thousands. Population and labor force figures are as of July 1]

| Item   | 1950 <sup>1</sup> | 1960    | 1965    | 1966    | 1967    | 1968    |
|--|-------------------|---------|---------|---------|---------|---------|
| <b>POPULATION</b>                              |                   |         |         |         |         |         |
| Total population aged 14 and over.....         | 129,708           | 151,303 | 164,656 | 167,694 | 170,641 | 173,625 |
| Male.....                                      | 53,633            | 64,863  | 71,990  | 73,610  | 75,192  | 76,785  |
| Female.....                                    | 76,075            | 86,440  | 92,666  | 94,084  | 95,449  | 96,840  |
| <b>LABOR FORCE</b>                             |                   |         |         |         |         |         |
| Total.....                                     | 97,030            | 108,625 | 119,936 | 121,235 | 124,575 | 125,759 |
| Armed forces.....                              | 4,600             | 3,300   | 3,150   | 3,165   | 3,220   | 3,220   |
| Civilian labor force.....                      | 92,430            | 105,325 | 116,786 | 118,070 | 121,355 | 122,539 |
| Nonagricultural sectors.....                   | 42,499            | 60,755  | 73,727  | 76,331  | 78,954  | 81,713  |
| Agricultural sectors (excluding forestry) ..   | 49,931            | 44,570  | 43,059  | 41,739  | 42,401  | 40,826  |
| Workers and employees.....                     | 4,398             | 7,754   | 9,665   | 9,855   | 9,797   | 9,864   |
| Collective farmers.....                        | 35,709            | 28,856  | 24,457  | 24,068  | 23,810  | 23,421  |
| Private sector.....                            | 9,824             | 7,960   | 8,937   | 7,816   | 8,794   | 7,541   |
| <b>CIVILIAN EMPLOYMENT</b>                     |                   |         |         |         |         |         |
| Total (annual average).....                    | 80,119            | 95,728  | 108,349 | 111,475 | 113,063 | 115,316 |
| Nonagricultural sectors.....                   | 36,983            | 55,239  | 68,211  | 70,815  | 73,438  | 76,197  |
| Agricultural sectors (excluding forestry)..... | 43,136            | 40,489  | 40,138  | 40,660  | 39,645  | 39,119  |
| Workers and employees.....                     | 3,437             | 6,793   | 8,704   | 8,894   | 8,836   | 8,903   |
| Collective farmers.....                        | 27,600            | 22,300  | 18,900  | 18,600  | 18,400  | 18,100  |
| Attached workers.....                          | 200               | 500     | 500     | 500     | 500     | 500     |
| Private sector.....                            | 11,899            | 10,896  | 12,034  | 12,666  | 11,909  | 11,616  |
| Class of worker:                               |                   |         |         |         |         |         |
| Workers and employees.....                     | 40,420            | 62,032  | 76,915  | 79,709  | 82,274  | 85,100  |
| Collective farmers.....                        | 27,600            | 22,300  | 18,900  | 18,600  | 18,400  | 18,100  |
| Private sector.....                            | 11,899            | 10,896  | 12,034  | 12,666  | 11,909  | 11,616  |
| Attached workers.....                          | 200               | 500     | 500     | 500     | 500     | 500     |

<sup>1</sup> Labor force and employment figures given in this column have not been officially revised to accord with the 1967 reclassification of economic activities. Figures for the years 1960-68 do reflect the reclassification, as reported in USSR Tsentral'noe statisticheskoe upravlenie (TsSU), *Narodnoe khoziaistvo SSSR v 1968 g., statisticheskiy ezhegodnik*, Moscow, Statistika, 1969. (This volume and others in this series are cited hereafter as *Nar. khoz. v 19*—.) The 1968 yearbook does not report employment data for 1950. See text for a discussion of the 1967 reclassification.

**NOTE.**—*Labor force:* This term refers to those persons who claim to have an occupation, even if they work during only part of the year. It is different from the U.S. concept in that it does not measure both employment and unemployment at a particular point in time. No allowance is made for recording unemployment as defined in U.S. statistics. Unemployment was "abolished" in the U.S.S.R. in 1930, and since that time no unemployment data have been collected. If a person does not claim to have an occupation, he is considered to be out of the labor force whether he is seeking work or not. If a person works at more than 1 job he is recorded as belonging to what he considers as his primary occupation.

*Annual average civilian employment:* This term refers to the annual average registered number of persons (*средняя списочная численность работников*). 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. Due primarily to seasonality, the average employment number will be smaller than the labor force number. For instance, a person working 6 months of the year is registered as 1 person in the labor force, but only as ½ of an annual average worker, employee, or collective farmer.

*Source: Population:* All years: Estimates prepared by the Foreign Demographic Analysis Division, U.S. Bureau of the Census.

*Labor force:* All years: Estimated in the same manner as described in Ritchie 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, p. 22, utilizing revised data reported in *Nar. khoz. v 1967*, pp. 648-649, and *Nar. khoz. v 1968*, pp. 548-549. The Armed Forces and total labor force figures given in Reed for 1965-67 were adjusted upward to accord with estimates reported in various issues of The Institute for Strategic Studies, *The Military Balance*.

*Civilian employment:* 1950: Reed, *Estimates*, 1967, p. 30, adjusted upward by 25,000 to account for revised annual average numbers of workers and employees published in *Nar. khoz. v 1967*, p. 648. In addition, the non-agricultural sector employment figures given in Reed were adjusted to include members of producers' cooperatives. The data for attached workers (*privlechennye*) are reported for 1950 in *Nar. khoz. v 1967*, p. 451, and for 1960-68 in *Nar. khoz. v 1968*, p. 446. Total employment figures given in Reed were changed to include these figures for attached workers. These workers are permanently employed in other sectors, and are recorded in the labor force for these sectors; hence they are not shown as a separate labor force category.

1960-66: U.S. Congress, *Soviet Economic Performance*, p. 69. The pertinent figures were adjusted to accord with revised data reported for industry, construction, and agriculture in *Nar. khoz. v 1968*, pp. 548-549.

1967-68: *Nar. khoz. v 1968*, pp. 446, 548-549. Private sector employment was estimated in the same manner as in Reed, *Estimates*, 1967, p. 29, using data for agricultural holdings reported in *Nar. khoz. v 1968*, pp. 358, 394-395.

TABLE 2.—*Workers and employees, by branch of the national economy, U.S.S.R., 1940-68 (New series)*

[Annual average figures in thousands, as reported according to the "new," or revised classification system adopted in August 1967. Figures in parentheses are estimated]

| Branch of the national economy  | 1940             | 1960   | 1965             | 1966             | 1967             | 1968             |
|---|------------------|--------|------------------|------------------|------------------|------------------|
| Total.....  | 33,926           | 62,032 | 70,915           | 79,709           | 82,274           | 85,100           |
| Industry (industrial-production personnel).....   | 13,079           | 22,620 | 27,447           | 28,514           | 29,448           | 30,428           |
| Manufacturing <sup>1</sup> .....  | ( <sup>2</sup> ) | 18,646 | 23,302           | 24,308           | 25,158           | 26,086           |
| Mining <sup>3</sup> .....   | ( <sup>2</sup> ) | 2,143  | 2,230            | 2,271            | 2,306            | 2,317            |
| Electricity and gas <sup>4</sup> .....  | ( <sup>2</sup> ) | 403    | 543              | 584              | 605              | 628              |
| Other branches <sup>5</sup> .....   | ( <sup>2</sup> ) | 1,428  | 1,372            | 1,351            | 1,379            | 1,397            |
| Construction (construction—installation personnel).....   | 1,620            | 5,143  | 5,685            | 5,871            | 6,124            | 6,342            |
| Agriculture.....  | 2,983            | 7,152  | 9,106            | 9,303            | 9,248            | 9,324            |
| Sovkhoz and other state agricultural enterprises.....   | 1,760            | 6,022  | 8,250            | 8,407            | 8,305            | 8,320            |
| MTS/RTS.....  | 530              | 348    | ( <sup>6</sup> ) | ( <sup>6</sup> ) | ( <sup>6</sup> ) | ( <sup>6</sup> ) |
| Agriculture and veterinary services <sup>7</sup> .....  | 177              | 423    | 454              | 487              | 531              | 583              |
| Hired personnel of collective farms <sup>7</sup> .....  | 236              | 359    | 402              | 409              | 412              | 421              |
| Forestry.....   | 280              | 359    | 402              | 409              | 412              | 421              |
| Transport and communications.....   | 4,009            | 7,017  | 8,259            | 8,437            | 8,590            | 8,793            |
| Transport.....  | 3,525            | 6,279  | 7,252            | 7,364            | 7,467            | 7,606            |
| Railroad.....   | 1,767            | 2,348  | 2,312            | 2,317            | 2,287            | 2,281            |
| Water transport.....  | 206              | 322    | 348              | 347              | 353              | 361              |
| Motor vehicle, urban electrical, and other transport; freight handling; and road economy.....                   | 1,552            | 3,609  | 4,592            | 4,700            | 4,827            | 4,964            |
| Communications.....   | 484              | 738    | 1,007            | 1,073            | 1,123            | 1,187            |
| Trade, procurement, material-technical supply and sales, and public dining.....                                 | 3,351            | 4,675  | 6,009            | 6,261            | 6,575            | 6,964            |
| Retail trade.....   | 1,414            | 2,226  | 2,974            | 3,128            | 3,290            | 3,485            |
| Domestic and foreign wholesale trade <sup>8</sup> .....   | ( <sup>2</sup> ) | 206    | 296              | 300              | 303              | 332              |
| Material-technical supply and sales <sup>9</sup> .....  | ( <sup>2</sup> ) | 578    | 689              | 726              | 779              | 842              |
| Procurement <sup>9</sup> .....  | ( <sup>2</sup> ) | 596    | 573              | 570              | 565              | 537              |
| Public dining.....  | 788              | 1,069  | 1,477            | 1,537            | 1,638            | 1,768            |
| Health services and education.....  | 4,552            | 10,027 | 13,502           | 14,063           | 14,567           | 15,244           |
| Health services.....  | 1,512            | 3,461  | 4,277            | 4,427            | 4,545            | 4,747            |
| Education and science.....  | 3,040            | 6,566  | 9,225            | 9,636            | 10,022           | 10,497           |
| Educational and cultural and informal educational institutions.....   | 2,678            | 4,803  | 6,600            | 6,895            | 7,172            | 7,507            |
| Science.....  | 362              | 1,763  | 2,625            | 2,741            | * 2,850          | 2,990            |
| Scientific, scientific-research and project-design organizations, other scientific service institutions.....    | 268              | 1,327  | 2,160            | 2,274            | 2,390            | ( <sup>2</sup> ) |
| Geologic prospecting organizations.....   | 70               | 384    | 404              | 406              | 409              | ( <sup>2</sup> ) |
| Hydrometeorological services.....   | 24               | 52     | 61               | 61               | 61               | ( <sup>2</sup> ) |
| "Other" sectors.....  | 4,332            | 5,397  | 6,907            | 7,261            | 7,722            | 8,005            |
| Housing-communal economy.....   | 1,516            | 1,920  | 2,386            | 2,489            | 2,674            | 2,800            |
| Administrative organs <sup>10</sup> .....   | 1,837            | 1,245  | 1,460            | 1,546            | 1,651            | 1,744            |
| Ministries and central institutions of the U.S.S.R.....   |                  |        |                  |                  |                  |                  |
| Ministries and central institutions of the union republics.....   | 122              | { 33   | { 55             | { 74             | { 81             |                  |
| Sovnarkhozy (including branch administrations, combines, and trusts with rights of branch administrations)..... | ( <sup>6</sup> ) | { 62   | { 90             | { 107            | { 111            |                  |
| Administrative organs of capital cities of republics, oblasts, krais, and A.S.S.R.'s, and Leningrad.....        | 120              | { 136  | { 174            | { 190            | { 199            | " (1,581)        |
| Administrative organs of all cities excluding those above.....  | 531              | { 345  | { 384            | { 411            | { 433            |                  |
| Rural and village soviets.....  | 213              | { 142  | { 147            | { 151            | { 168            |                  |
| Court and juridical institutions.....   | 75               | { 69   | { 67             | { 67             | { 68             |                  |
| Economic administrative agencies (trusts, offices, and others).....   | 586              | { 269  | { 365            | { 399            | { 425            |                  |
| Administrative, organs of cooperative and social organizations.....   | 190              | { 125  | { 139            | { 147            | { 155            | " (163)          |

See footnotes at end of table.

TABLE 2.—*Workers and employees, by branch of the national economy, U.S.S.R., 1940-68 (New series)—Continued*

[Annual average figures in thousands, as reported according to the "new," or revised classification system adopted in August 1967. Figures in parentheses are estimated]

| Branch of the national economy                  | 1940 | 1960  | 1965                | 1966              | 1967                | 1968                |
|---|------|-------|---------------------|-------------------|---------------------|---------------------|
| "Other" sectors—Continued                       |      |       |                     |                   |                     |                     |
| Credit and insurance organizations.....         | 267  | 265   | 300                 | 313               | 329                 | 345                 |
| Other residual.....                             | 712  | 1,969 | 2,761               | 2,911             | 3,068               | 3,116               |
| Capital repair of buildings and structures..... | (2)  | (2)   | <sup>12</sup> (929) | <sup>13</sup> 948 | <sup>14</sup> (956) | <sup>15</sup> (957) |
| Drilling.....                                   | (2)  | (2)   | <sup>12</sup> (175) | <sup>13</sup> 189 | <sup>14</sup> (184) | <sup>15</sup> (175) |
| Project-survey organizations.....               | (2)  | (2)   | <sup>12</sup> (547) | <sup>13</sup> 542 | <sup>14</sup> (620) | <sup>15</sup> (680) |
| Literature and publishing.....                  | (2)  | (2)   | <sup>12</sup> (106) | <sup>13</sup> 107 | <sup>14</sup> (109) | <sup>15</sup> (114) |
| Art.....  | (2)  | (2)   | <sup>12</sup> (366) | <sup>13</sup> 380 | <sup>14</sup> (376) | <sup>15</sup> (383) |
| Other unidentified.....                         | (2)  | (2)   | <sup>12</sup> (650) | <sup>13</sup> 745 | <sup>14</sup> (823) | <sup>15</sup> (807) |

<sup>1</sup> All disaggregations of employment in industry are from official materials of the International Labour Office. Including fishing and primary processing of fish; excluding publishing and the construction, repair and dismantling of buildings and structures performed on force account (*khozposobom*). In other years, employment is reported as (in thousands): 1958—16,946; 1959—17,626; 1961—19,862; 1962—20,719; 1963—21,426; and 1964—22,272.

<sup>2</sup> Not available.

<sup>3</sup> Excluding surveying and drilling of oil and gas wells and mineral deposit surveying and preparation for exploitation. In 1958 (thousands)—2,211; 1959—2,174; 1961—2,134; 1962—2,114; 1963—2,121; and 1964—2,146.

<sup>4</sup> In 1958 (thousands)—329; 1959—357; 1961—434; 1962—451; 1963—480; and 1964—505.

<sup>5</sup> Including secondary processing of ferrous metals, logging, repair and restoration of knitted wear sewn goods, film copying factories, and water works. In 1958 (thousands)—1,511; 1959—1,513; 1961—1,396; 1962—1,393; 1963—1,415; and 1964—1,390.

<sup>6</sup> Not applicable.

<sup>7</sup> Derived as a combined residual for all years (except 1940 figure on "agricultural and veterinary services" given in TsSU, *Trud v SSSR*, 1968, p. 24; "hired personnel" are derived as a residual) by subtracting reported figures for sovkhosy and MTS/RTS's, as appropriate, from the total for "Agriculture."

<sup>8</sup> Estimates for all years from Stephen Rapawy, *Wages in the U.S.S.R. 1950-1967: Trade* (U.S. Bureau of the Census, International Population Reports, Series P-95, no. 67), Washington, D.C., 1970, p. 10.

<sup>9</sup> TsSU, *Trud v SSSR*, 1968, p. 25, gives a total for science of 2,860,000 and figures for the components as shown. The total given here is from *Nar. khoz. v 1968*, p. 549, which was published subsequently to *Trud v SSSR* but does not give a breakdown.

<sup>10</sup> Data for the breakdown of the government *apparát* in all years except 1968 are from TsSU, *Trud v SSSR*, 1968, pp. 28-29. Data for the years 1945, 1950, 1955, 1963, and 1964, not shown here, also are given in *Trud v SSSR*. The figure for 1967 shown in the table here is from *Nar. khoz. v 1968*, p. 549, some 11,000 persons more than the sum of the components as reported in *Trud v SSSR*.

<sup>11</sup> Estimated from information in R. S. F. S. R. Tsentral'noe statisticheskoe upravlenie, *Narodnoe khoziaistvo RSFSR v 1968 godu* [*Nar. khoz. RSFSR 68*], Moscow, Statistika, 1969, p. 326, in the same manner as described in Murray Feshbach, "Manpower in the U.S.S.R.: A Survey of Recent Trends and Prospects," in U.S. Congress, Joint Economic Committee, *New Directions in the Soviet Economy*, part III, Washington, D.C., 1966, p. 773, footnote 5.

<sup>12</sup> Estimated from information in *Nar. khoz. RSFSR 65*, 1966, p. 395, in the same manner as described in Feshbach, "Manpower," 1966, p. 773, footnote 6.

<sup>13</sup> TsSU, *Trud v SSSR*, 1968, pp. 26-27.

<sup>14</sup> Estimated from information in *Nar. khoz. RSFSR 67*, 1968, p. 379, in the same manner as described in Feshbach, "Manpower," 1966, p. 773, footnote 6.

<sup>15</sup> Estimated from information in *Nar. khoz. RSFSR 68*, 1969, p. 326, in the same manner as described in Feshbach, "Manpower," 1966, p. 773, footnote 6.

NOTE.—The annual average number of workers and employees in 1969 was 87,900,000; *Izvestia*, Jan. 25, 1970, p. 2.

Source: Except as noted above, all data from *Nar. khoz. v 1968*, pp. 555-556.

TABLE 3.—*Workers and employees, by detailed branch of the national economy, U.S.S.R., 1966*

[Annual average figures in thousands, as reported according to the classification system in use in 1966. Figures in parentheses are estimated]

| Branch of the national economy                           | Number |
|--|--------|
| Total.....   | 79,709 |
| Industry (industrial-production personnel).....          | 28,105 |
| Construction (construction-installation personnel).....  | 5,768  |
| Capital repair of buildings and structures.....          | 948    |
| Drilling.....  | 189    |
| Project-survey organizations servicing construction..... | 542    |
| Agriculture.....   | 9,405  |
| Sovkhosy and other state agricultural enterprises.....   | 8,772  |
| Agricultural and veterinary services.....                | 437    |
| Hired personnel on collective farms (nonmembers).....    | 196    |

TABLE 3.—*Workers and employees, by detailed branch of the national economy, U.S.S.R., 1966—Continued*

[Annual average figures in thousands, as reported according to the classification system in use in 1966. Figures in parentheses are estimated]

| Branch of the national economy—Continued  | Number |
|---|--------|
| Forestry.....   | 409    |
| Transport.....  | 7,364  |
| Railroad transport.....   | 2,317  |
| Water transport.....  | 347    |
| Urban electrical transport.....   | 216    |
| Timber rafting.....   | 179    |
| Motor and other transport.....  | 4,047  |
| Freight handling.....   | 258    |
| Communications.....   | 1,073  |
| Trade, public dining, procurement, and material-technical supply and sales.....   | 6,261  |
| Trade.....  | 3,428  |
| Retail trade.....   | 3,128  |
| Domestic wholesale and foreign trade <sup>1</sup> .....   | (300)  |
| Public dining.....  | 1,537  |
| Procurement.....  | 570    |
| Material-technical supply and sales.....  | 726    |
| Other branches of material production.....  | 854    |
| Of which, literature and publishing.....  | 107    |
| Housing-communal economy.....   | 2,489  |
| Health services.....  | 4,427  |
| Primary curative and preventive services.....   | 4,199  |
| Physical culture and sports organizations.....  | 66     |
| Other institutions of health services and social security.....  | 162    |
| Education.....  | 6,895  |
| Educational institutions for cadre training.....  | 1,148  |
| Higher educational institutions.....  | 478    |
| Specialized secondary educational institutions.....   | 265    |
| Vocational-technical schools.....   | 236    |
| Unidentified residual.....  | (169)  |
| General education schools and child-care institutions.....  | 5,167  |
| Primary, 8-year, and secondary schools.....   | 3,570  |
| Working and rural youth schools.....  | 181    |
| Kindergartens, creche-kindergartens, and open-air kindergartens.....  | 1,251  |
| Children's homes.....   | 165    |
| Cultural and informal educational institutions.....   | 580    |
| Science.....  | 2,741  |
| Scientific, scientific-research, and project-design organizations, and other scientific service institutions.....                             | 2,274  |
| Geologic prospecting organizations.....   | 406    |
| Hydrometeorological organizations.....  | 61     |
| Art.....  | 380    |
| Credit and insurance organizations.....   | 313    |
| The <i>apparat</i> of organs of state and economic administrations, and of administrative organs of cooperative and social organizations..... | 1,546  |

<sup>1</sup> Derived as a residual and presumed to relate to these subbranches.

Source: TsSU, *Trud v SSSR*, 1968, pp. 26-27.



TABLE 4.—*Industrial-production personnel, wageworkers, and engineering-technical personnel, by branch of industry, U.S.S.R., 1940-68 (old series)*

[Annual average figures in thousands, as reported according to the classification system in use in 1966]

| Branch of industry                          | 1940    | 1950    | 1955    | 1960    | 1965    | 1966    | 1967    | 1968    |
|---|---------|---------|---------|---------|---------|---------|---------|---------|
| <b>Total, all branches:</b>                 |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | 13, 079 | 15, 317 | 18, 868 | 22, 291 | 27, 056 | 28, 105 | 28, 997 | 29, 900 |
| Wageworkers.....                            | 9, 971  | 12, 226 | 15, 522 | 18, 574 | 22, 206 | 22, 896 | 23, 594 | 24, 200 |
| Engineering-technical personnel.....        | 1, 023  | 1, 277  | 1, 647  | 2, 008  | 2, 860  | 3, 087  | 3, 296  | (1)     |
| <b>Machine-building and metalworking:</b>   |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | 4, 293  | 5, 457  | 7, 065  | 9, 670  | 10, 154 | (1)     | (1)     |
| Wageworkers.....                            | 2, 576  | 3, 337  | 4, 419  | 5, 663  | 7, 591  | 7, 986  | 8, 173  | (1)     |
| Engineering-technical personnel.....        | 2 430   | 502     | 657     | 880     | 1, 380  | 1, 503  | (1)     | (1)     |
| <b>Fuel:</b>                                |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | 1, 243  | 1, 447  | 1, 557  | 1, 574  | 1, 586  | (1)     | (1)     |
| Wageworkers.....                            | (1)     | 1, 042  | 1, 223  | 1, 327  | 1, 318  | 1, 319  | (1)     | (1)     |
| Engineering-technical personnel.....        | (1)     | 101     | 131     | 149     | 173     | 182     | (1)     | (1)     |
| <b>Coal:</b>                                |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | 858     | 1, 047  | 1, 196  | 1, 200  | 1, 202  | (1)     | (1)     |
| Wageworkers.....                            | 436     | 733     | 898     | 1, 031  | 1, 016  | 1, 011  | 1, 009  | (1)     |
| Engineering-technical personnel.....        | 4 42    | 72      | 95      | 111     | 128     | 132     | (1)     | (1)     |
| <b>Ferrous metallurgy:</b>                  |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | 743     | 891     | 1, 047  | 1, 236  | 1, 267  | (1)     | (1)     |
| Wageworkers.....                            | 405     | 605     | 744     | 886     | 1, 037  | 1, 060  | 1, 086  | (1)     |
| Engineering-technical personnel.....        | 4 42    | 63      | 75      | 85      | 115     | 122     | (1)     | (1)     |
| <b>Timber, woodworking, pulp and paper:</b> |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | 2, 202  | 2, 516  | 2, 598  | 2, 710  | 2, 725  | (1)     | (1)     |
| Wageworkers.....                            | 1, 594  | 1, 842  | 2, 139  | 2, 265  | 2, 346  | 2, 338  | 2, 341  | (1)     |
| Engineering-technical personnel.....        | (1)     | 122     | 156     | 162     | 196     | 207     | (1)     | (1)     |
| <b>Timber exploitation:</b>                 |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | 1, 212  | 1, 333  | 1, 299  | 1, 231  | 1, 214  | (1)     | (1)     |
| Wageworkers.....                            | (1)     | 1, 012  | 1, 128  | 1, 018  | 1, 042  | 1, 023  | (1)     | (1)     |
| Engineering-technical personnel.....        | (1)     | 64      | 84      | 82      | 69      | 94      | (1)     | (1)     |
| <b>Woodworking:</b>                         |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | 817     | 989     | 1, 112  | 1, 261  | 1, 272  | (1)     | (1)     |
| Wageworkers.....                            | (1)     | 675     | 847     | 968     | 1, 087  | 1, 092  | (1)     | (1)     |
| Engineering-technical personnel.....        | (1)     | 46      | 58      | 67      | 88      | 92      | (1)     | (1)     |
| <b>Pulp and paper:</b>                      |         |         |         |         |         |         |         |         |
| Wageworkers.....                            | 50      | 124     | (1)     | 162     | 190     | 199     | 209     | (1)     |
| <b>Sugar:</b>                               |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | 122     | 141     | 170     | 203     | 203     | (1)     | (1)     |
| Wageworkers.....                            | (1)     | 103     | 123     | 151     | 178     | 176     | (1)     | (1)     |
| Engineering-technical personnel.....        | (1)     | 7       | 8       | 10      | 14      | 14      | (1)     | (1)     |
| <b>Meat:</b>                                |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | 122     | 153     | 238     | 290     | 312     | (1)     | (1)     |
| Wageworkers.....                            | (1)     | 87      | 115     | 190     | 235     | 254     | (1)     | (1)     |
| Engineering-technical personnel.....        | (1)     | 11      | 14      | 20      | 28      | 30      | (1)     | (1)     |
| <b>Fish:</b>                                |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | 192     | 213     | 251     | 300     | 311     | (1)     | (1)     |
| Wageworkers.....                            | (1)     | 152     | 167     | 189     | 224     | 230     | (1)     | (1)     |
| Engineering-technical personnel.....        | (1)     | 16      | 26      | 42      | 54      | 59      | (1)     | (1)     |
| <b>Milk and milk products:</b>              |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | 164     | 178     | 245     | 292     | 309     | (1)     | (1)     |
| Wageworkers.....                            | (1)     | 116     | 132     | 193     | 230     | 245     | (1)     | (1)     |
| Engineering-technical personnel.....        | (1)     | 17      | 18      | 24      | 32      | 34      | (1)     | (1)     |
| <b>Flour milling and grain cracking:</b>    |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | 149     | 132     | 126     | 125     | 128     | (1)     | (1)     |
| Wageworkers.....                            | (1)     | 94      | 91      | 88      | 86      | 88      | (1)     | (1)     |
| Engineering-technical personnel.....        | (1)     | 16      | 17      | 17      | 18      | 19      | (1)     | (1)     |
| <b>Breadbaking:</b>                         |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | 319     | 378     | 420     | 535     | 543     | (1)     | (1)     |
| Wageworkers.....                            | (1)     | 243     | 318     | 361     | 467     | 472     | (1)     | (1)     |
| Engineering-technical personnel.....        | (1)     | 18      | 20      | 21      | 28      | 29      | (1)     | (1)     |
| <b>Fruit and vegetables:</b>                |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | 51      | 60      | 142     | 190     | 192     | (1)     | (1)     |
| Wageworkers.....                            | (1)     | 40      | 54      | 125     | 161     | 161     | (1)     | (1)     |
| Engineering-technical personnel.....        | (1)     | 3       | 3       | 8       | 14      | 14      | (1)     | (1)     |
| <b>Alcohol:</b>                             |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | 86      | 80      | 45      | 46      | 47      | (1)     | (1)     |
| Wageworkers.....                            | (1)     | 67      | 63      | 34      | 34      | 35      | (1)     | (1)     |
| Engineering-technical personnel.....        | (1)     | 9       | 10      | 6       | 7       | 7       | (1)     | (1)     |
| <b>Wine:</b>                                |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | 32      | 49      | 60      | 87      | 98      | (1)     | (1)     |
| Wageworkers.....                            | (1)     | 23      | 37      | 46      | 68      | 77      | (1)     | (1)     |
| Engineering-technical personnel.....        | (1)     | 3       | 6       | 7       | 10      | 12      | (1)     | (1)     |
| <b>Tea:</b>                                 |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | 7       | 9       | 10      | 11      | 12      | (1)     | (1)     |
| Wageworkers.....                            | (1)     | 5       | 6       | 7       | 7       | 8       | (1)     | (1)     |
| Engineering-technical personnel.....        | (1)     | 1       | 2       | 2       | 3       | 3       | (1)     | (1)     |
| <b>Chemical and petrochemical:</b>          |         |         |         |         |         |         |         |         |
| Industrial-production personnel.....        | (1)     | (1)     | (1)     | (1)     | (1)     | (1)     | (1)     | (1)     |
| Wageworkers.....                            | 299     | 353     | (1)     | 631     | 966     | 1, 016  | 1, 149  | (1)     |
| Engineering-technical personnel.....        | (1)     | (1)     | (1)     | (1)     | (1)     | (1)     | (1)     | (1)     |

See footnotes at end of table, p. 80.

TABLE 4.—*Industrial-production personnel, wageworkers, and engineering-technical personnel, by branch of industry, U.S.S.R., 1940-68 (old series)*—Continued

[Annual average figures in thousands, as reported according to the classification system in use in 1966]

| Branch of industry                   | 1940             | 1950                | 1955             | 1960                | 1965                | 1966                | 1967   | 1968 |
|--------------------------------------|------------------|---------------------|------------------|---------------------|---------------------|---------------------|--------|------|
| Light:                               |                  |                     |                  |                     |                     |                     |        |      |
| Industrial-production personnel..... | (1)              | 2, 670              | 3, 371           | 3, 893              | 4, 323              | 4, 510              | (1)    | (1)  |
| Wageworkers.....                     | 2, 332           | <sup>2</sup> 2, 146 | 2, 833           | <sup>2</sup> 3, 329 | <sup>2</sup> 3, 718 | <sup>2</sup> 3, 860 | 4, 005 | (1)  |
| Engineering-technical personnel..... | <sup>3</sup> 140 | 147                 | 188              | 193                 | 229                 | 244                 | (1)    | (1)  |
| Textiles:                            |                  |                     |                  |                     |                     |                     |        |      |
| Industrial—production personnel..... | (1)              | 1, 399              | 1, 692           | 1, 814              | 1, 953              | 2, 004              | (1)    | (1)  |
| Wageworkers.....                     | (1)              | 1, 174              | 1, 455           | 1, 592              | 1, 697              | 1, 732              | (1)    | (1)  |
| Engineering—technical personnel..... | (1)              | 63                  | 77               | 76                  | 91                  | 96                  | (1)    | (1)  |
| Garment:                             |                  |                     |                  |                     |                     |                     |        |      |
| Industrial—production personnel..... | (1)              | 764                 | 1, 102           | 1, 372              | 1, 660              | 1, 764              | (1)    | (1)  |
| Wageworkers.....                     | (1)              | 592                 | 899              | 1, 174              | 1, 436              | 1, 514              | (1)    | (1)  |
| Engineering—technical personnel..... | (1)              | 50                  | 74               | 73                  | 90                  | 97                  | (1)    | (1)  |
| Leather, fur, and shoe:              |                  |                     |                  |                     |                     |                     |        |      |
| Industrial—production personnel..... | (1)              | 498                 | 566              | 687                 | 695                 | 722                 | (1)    | (1)  |
| Wageworkers.....                     | (1)              | 391                 | 472              | 588                 | 595                 | 614                 | (1)    | (1)  |
| Engineering—technical personnel..... | (1)              | 33                  | 37               | 42                  | 47                  | 50                  | (1)    | (1)  |
| Construction materials:              |                  |                     |                  |                     |                     |                     |        |      |
| Industrial-production personnel..... | (1)              | 673                 | 1, 000           | 1, 493              | 1, 630              | 1, 686              | (1)    | (1)  |
| Wageworkers.....                     | 295              | <sup>2</sup> 577    | <sup>2</sup> 877 | <sup>2</sup> 1, 358 | <sup>2</sup> 1, 452 | <sup>2</sup> 1, 494 | 1, 545 | (1)  |
| Engineering personnel.....           | <sup>3</sup> 22  | 38                  | 62               | 106                 | 146                 | 157                 | (1)    | (1)  |
| Cement:                              |                  |                     |                  |                     |                     |                     |        |      |
| Industrial-production personnel..... | (1)              | 45                  | 55               | 83                  | 106                 | 104                 | (1)    | (1)  |
| Wageworkers.....                     | (1)              | 37                  | 45               | 70                  | 89                  | 86                  | (1)    | (1)  |
| Engineering-technical personnel..... | (1)              | 4                   | 5                | 7                   | 10                  | 10                  | (1)    | (1)  |
| Glass and chinaware:                 |                  |                     |                  |                     |                     |                     |        |      |
| Industrial-production personnel..... | (1)              | 176                 | 217              | 226                 | 271                 | 279                 | (1)    | (1)  |
| Wageworkers.....                     | (1)              | 148                 | 186              | 198                 | 234                 | 240                 | (1)    | (1)  |
| Engineering-technical personnel..... | (1)              | 11                  | 14               | 13                  | 19                  | 20                  | (1)    | (1)  |
| Electric power:                      |                  |                     |                  |                     |                     |                     |        |      |
| Industrial-production personnel..... | (1)              | 184                 | 249              | 340                 | 498                 | 541                 | (1)    | (1)  |
| Wageworkers.....                     | 108              | 131                 | 192              | 265                 | 381                 | 142                 | 428    | (1)  |
| Engineering-technical personnel..... | (1)              | 25                  | 34               | 47                  | 83                  | 93                  | (1)    | (1)  |

<sup>1</sup> Not available.

<sup>2</sup> These figures for wageworkers in the machine-building and metalworking industry, the timber, wood-working, pulp and paper industry, the pulp and paper subbranch of that industry, and the construction materials industry, as reported in *Nar. khoz. v 1967*, were revised as a result of the 1967 reclassification of economic activities, and all are slightly higher than comparable figures reported in *Trud v SSSR*. Data for industrial-production personnel and engineering-technical personnel in these industries were not revised. Figures for wageworkers in light industry reported in *Nar. khoz. v 1967* were revised downward to reflect the transfer of the rubber shoes subbranch to the chemical industry.

<sup>3</sup> *Trud v SSSR*, p. 85.

## SOURCES

1940, 1967: *Nar. khoz. v 1967*, p. 207.1950, 1955, 1960, 1965-66: *Trud v SSSR*, 1968, pp. 86-89.1968: RSFSR, TsSU, *RSFSR v tsifrah v 1968 godu, kratkii statisticheskii sbornik*, Moscow, Statistika 1969, p. 16.TABLE 5.—*Industrial wageworkers, by branch of industry, U.S.S.R., 1940-68 (new series)*

[Annual average figures in thousands, as reported according to the "new," or revised, classification system adopted in August 1967]

| Branch of industry                             | 1940   | 1960    | 1965    | 1966    | 1967    | 1968    |
|--|--------|---------|---------|---------|---------|---------|
| Total.....                                     | 9, 971 | 18, 887 | 22, 576 | 23, 283 | 24, 019 | 24, 668 |
| Machine-building and metalworking.....         | 2, 576 | 5, 787  | 7, 797  | 8, 107  | 8, 420  | 8, 684  |
| Coal.....                                      | 436    | 1, 031  | 1, 016  | 1, 011  | 1, 009  | 997     |
| Ferrous metallurgy.....                        | 405    | 886     | 1, 037  | 1, 060  | 1, 086  | 1, 116  |
| Timber, woodworking, pulp and paper.....       | 1, 594 | 2, 330  | 2, 415  | 2, 423  | 2, 425  | 2, 449  |
| Of which, pulp and paper.....                  | 50     | 149     | 181     | 199     | 209     | 213     |
| Food.....                                      | 1, 161 | 1, 760  | 2, 120  | 2, 185  | 2, 279  | 2, 367  |
| Chemical and petrochemical.....                | 299    | 648     | 1, 017  | 1, 085  | 1, 148  | 1, 178  |
| Light.....                                     | 2, 332 | 3, 341  | 3, 728  | 3, 861  | 4, 009  | 4, 125  |
| Construction materials.....                    | 295    | 1, 381  | 1, 465  | 1, 508  | 1, 559  | 1, 608  |
| Electric power.....                            | 108    | 320     | 421     | 449     | 462     | 473     |
| Other unidentified branches <sup>1</sup> ..... | 715    | 1, 254  | 1, 379  | 1, 395  | 1, 413  | 1, 458  |

<sup>1</sup> Derived as a residual.Source: *Nar. khoz. v 1968*, p. 205.

TABLE 6.—Labor turnover in the U.S.S.R., by republic or city and branch of industry, 1965

[Total number of wageworkers who were separated and those who quit voluntarily, per 100 annual average wageworkers]

| Republic and city               | Industry total | Ferrous metallurgy | Nonferrous metallurgy | Oil extraction | Machine-building and metal-working | Timber exploitation | Construction materials | Light industry | Food industry |
|---------------------------------|----------------|--------------------|-----------------------|----------------|------------------------------------|---------------------|------------------------|----------------|---------------|
| U.S.S.R., total.....            | 30.7           | 19.8               | 25.3                  | 30.5           | 26.0                               | 42.5                | 46.3                   | 26.2           | 55.0          |
| Voluntary quits.....            | 19.1           | 12.1               | 15.4                  | 14.4           | 16.0                               | 28.3                | 29.7                   | 17.8           | 31.0          |
| R.S.F.S.R., total.....          | 29.5           | 20.2               | 25.2                  | 33.3           | 24.3                               | 43.6                | 43.7                   | 26.0           | 52.0          |
| Voluntary quits.....            | 18.4           | 12.6               | 14.5                  | 15.3           | 14.7                               | 29.3                | 28.0                   | 16.8           | 31.5          |
| Leningrad, total.....           | 28.8           | 28.5               | 27.3                  | (1)            | 26.2                               | (1)                 | 32.6                   | 29.6           | 48.9          |
| Voluntary quits.....            | 14.9           | 15.6               | 10.5                  | (1)            | 13.3                               | (1)                 | 15.8                   | 15.6           | 20.8          |
| Moscow, total.....              | 26.4           | 22.0               | 23.7                  | (1)            | 24.2                               | (1)                 | 26.5                   | 25.8           | 40.5          |
| Voluntary quits.....            | 14.2           | 12.0               | 11.1                  | (1)            | 13.1                               | (1)                 | 14.0                   | 13.5           | 22.0          |
| Ukrainian S.S.R., total.....    | 30.3           | 18.2               | 16.4                  | 21.7           | 27.6                               | 32.4                | 44.7                   | 24.5           | 59.3          |
| Voluntary quits.....            | 17.5           | 10.5               | 10.3                  | 10.6           | 16.5                               | 19.9                | 26.6                   | 17.7           | 26.1          |
| Belorussian S.S.R., total.....  | 23.7           | 14.0               | (1)                   | (1)            | 21.1                               | 30.7                | 32.4                   | 18.9           | 39.0          |
| Voluntary quits.....            | 14.9           | 9.0                | (1)                   | (1)            | 14.2                               | 15.4                | 18.5                   | 14.0           | 21.6          |
| Uzbek S.S.R., total.....        | 38.0           | 15.1               | 26.0                  | 41.8           | 38.2                               | 45.6                | 59.4                   | 32.3           | 43.5          |
| Voluntary quits.....            | 27.4           | 11.0               | 21.1                  | 22.6           | 26.8                               | 30.8                | 43.0                   | 23.8           | 31.7          |
| Kazakh S.S.R., total.....       | 41.1           | 29.5               | 26.4                  | 32.2           | 41.5                               | 44.4                | 66.3                   | 35.5           | 57.2          |
| Voluntary quits.....            | 28.8           | 19.5               | 18.2                  | 14.7           | 29.1                               | 35.5                | 45.9                   | 27.0           | 38.8          |
| Georgian S.S.R., total.....     | 42.8           | 20.6               | 27.3                  | 22.2           | 41.6                               | 67.6                | 56.0                   | 31.4           | 82.3          |
| Voluntary quits.....            | 26.7           | 12.4               | 10.8                  | 17.8           | 24.1                               | 35.7                | 36.6                   | 23.9           | 41.4          |
| Azərbaydzhan S.S.R., total..... | 42.3           | 21.2               | 33.0                  | 25.9           | 48.5                               | 52.4                | 69.1                   | 36.2           | 71.9          |
| Voluntary quits.....            | 24.6           | 16.6               | 23.1                  | 12.7           | 29.6                               | 30.5                | 40.8                   | 23.7           | 29.3          |
| Lithuanian S.S.R., total.....   | 29.4           | 35.6               | (1)                   | (1)            | 28.8                               | 37.1                | 43.9                   | 16.4           | 43.8          |
| Voluntary quits.....            | 20.2           | 29.3               | (1)                   | (1)            | 20.7                               | 25.2                | 28.3                   | 12.3           | 25.1          |
| Moldavian S.S.R., total.....    | 51.4           | (1)                | (1)                   | (1)            | 34.8                               | 8.1                 | 60.0                   | 18.9           | 94.7          |
| Voluntary quits.....            | 31.2           | (1)                | (1)                   | (1)            | 24.0                               | 7.7                 | 46.4                   | 15.5           | 45.6          |
| Latvian S.S.R., total.....      | 35.1           | 23.2               | (1)                   | (1)            | 32.6                               | 34.8                | 40.0                   | 32.6           | 46.1          |
| Voluntary quits.....            | 23.5           | 15.1               | (1)                   | (1)            | 22.7                               | 22.1                | 26.5                   | 23.0           | 30.1          |
| Kirgiz S.S.R., total.....       | 42.5           | (1)                | 30.7                  | 32.4           | 41.4                               | 48.6                | 72.4                   | 25.6           | 71.5          |
| Voluntary quits.....            | 28.4           | (1)                | 21.1                  | 13.4           | 28.0                               | 41.9                | 48.3                   | 18.3           | 44.4          |
| Tadzhik S.S.R., total.....      | 47.1           | (1)                | 33.4                  | 74.4           | 69.7                               | 41.1                | 63.3                   | 34.4           | 69.4          |
| Voluntary quits.....            | 34.6           | (1)                | 19.2                  | 27.4           | 53.3                               | 36.0                | 50.0                   | 25.2           | 49.1          |
| Armenian S.S.R., total.....     | 38.8           | 39.5               | (1)                   | (1)            | 38.6                               | 51.8                | 56.8                   | 26.6           | 75.1          |
| Voluntary quits.....            | 26.7           | 24.6               | 24.8                  | (1)            | 24.7                               | 20.9                | 38.0                   | 21.4           | 45.9          |
| Turkmen S.S.R., total.....      | 45.6           | (1)                | 9.5                   | 29.7           | 58.7                               | 44.9                | 70.6                   | 32.8           | 54.5          |
| Voluntary quits.....            | 32.8           | (1)                | 4.0                   | 16.4           | 38.6                               | 38.6                | 49.3                   | 25.2           | 40.5          |
| Estonian S.S.R., total.....     | 31.4           | (1)                | (1)                   | (1)            | 30.2                               | 31.1                | 39.9                   | 24.0           | 50.0          |
| Voluntary quits.....            | 19.1           | (1)                | (1)                   | (1)            | 19.4                               | 20.9                | 23.7                   | 15.8           | 31.7          |

<sup>1</sup> Not available; Source: *Problemy ekonomicheskoi effektivnosti razmeshcheniya sotsialisticheskogo proizvodstva v SSSR*, (Ia. G. Feigin and others, eds.), Moscow, Nauka, 1968, pp. 114-115.

TABLE 7.—Annual average money wages of workers and employees, by branch of the national economy, U.S.S.R., 1940-68 (new series)

[In rubles, as reported according to the expanded scope of payments adopted in 1969]

| Branch of the national economy  | 1940 | 1958  | 1959  | 1960  | 1961  | 1962  | 1963  | 1964  | 1965  | 1966  | 1967  | 1968  |
|---|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Total .....   | 397  | 940   | 954   | 967   | 1,007 | 1,040 | 1,058 | 1,090 | 1,158 | 1,202 | 1,256 | 1,351 |
| Industry (industrial—production personnel).....                             | 409  | 1,048 | 1,073 | 1,099 | 1,138 | 1,163 | 1,186 | 1,213 | 1,250 | 1,294 | 1,361 | 1,463 |
| Wageworkers.....  | 389  | 1,026 | 1,052 | 1,079 | 1,114 | 1,139 | 1,160 | 1,187 | 1,220 | 1,259 | 1,316 | 1,423 |
| Manufacturing.....  | (1)  | 978   | 997   | 1,028 | 1,072 | 1,098 | 1,121 | 1,146 | 1,177 | 1,223 | 1,293 | 1,396 |
| Mining.....   | (1)  | 1,606 | 1,706 | 1,723 | 1,744 | 1,780 | 1,822 | 1,876 | 1,980 | 2,002 | 2,015 | 2,129 |
| Construction (construction—installation personnel).....                     | 408  | 1,049 | 1,062 | 1,109 | 1,168 | 1,199 | 1,234 | 1,248 | 1,349 | 1,400 | 1,490 | 1,574 |
| Wageworkers.....  | 372  | 1,004 | 1,021 | 1,070 | 1,126 | 1,156 | 1,187 | 1,187 | 1,296 | 1,348 | 1,432 | 1,528 |
| State farms and subsidiary state agricultural enterprises.....              | 264  | 638   | 655   | 646   | 694   | 792   | 803   | 846   | 895   | 960   | 1,013 | 1,105 |
| Transport.....  | 418  | 990   | 1,009 | 1,044 | 1,121 | 1,174 | 1,194 | 1,230 | 1,272 | 1,326 | 1,399 | 1,512 |
| Railroad.....   | 410  | 973   | 985   | 995   | 1,088 | 1,133 | 1,140 | 1,162 | 1,184 | 1,218 | 1,276 | 1,392 |
| Water transport.....  | 494  | 1,186 | 1,198 | 1,283 | 1,464 | 1,505 | 1,549 | 1,590 | 1,621 | 1,690 | 1,738 | 1,853 |
| Motor vehicle, urban electrical, and other transport; freight handling..... | 414  | 983   | 1,007 | 1,056 | 1,111 | 1,170 | 1,198 | 1,238 | 1,290 | 1,352 | 1,433 | 1,546 |
| Communications.....   | 338  | 698   | 701   | 752   | 850   | 865   | 872   | 883   | 890   | 910   | 944   | 1,056 |
| Trade, public dining, procurement, and material-technical supply.....       | 300  | 701   | 700   | 707   | 736   | 767   | 778   | 792   | 902   | 956   | 994   | 1,087 |
| Housing-communal economy.....   | 313  | 665   | 679   | 692   | 714   | 733   | 752   | 787   | 864   | 908   | 948   | 1,055 |
| Health services.....  | 306  | 707   | 708   | 707   | 718   | 730   | 745   | 784   | 948   | 970   | 988   | 1,080 |
| Education (including cultural and informal education institutions).....     | 388  | 833   | 836   | 839   | 870   | 886   | 904   | 943   | 1,123 | 1,146 | 1,158 | 1,234 |
| Science and scientific services.....  | 565  | 1,282 | 1,274 | 1,264 | 1,274 | 1,313 | 1,332 | 1,357 | 1,402 | 1,439 | 1,487 | 1,553 |
| Credit and insurance institutions.....                                      | 401  | 869   | 866   | 848   | 875   | 925   | 941   | 952   | 1,036 | 1,075 | 1,124 | 1,244 |
| Government and administration.....  | 468  | 1,020 | 1,028 | 1,037 | 1,066 | 1,090 | 1,132 | 1,160 | 1,271 | 1,342 | 1,372 | 1,416 |

<sup>1</sup> Not available.

NOTE.—The annual average wage of all workers and employees in 1969 was 1,404 rubles. *Izvestia*, Jan. 25, 1970, p. 2. The annual average wages of workers and employees in the nonagricultural sectors are as follows (in rubles): In 1959, 980; 1960, 1,002; 1961, 1,042; 1962, 1,067; 1963, 1,084; 1964, 1,112; 1965, 1,181; 1966, 1,220; 1967, 1,270; and 1968, 1,382. International Labour Office, *Year Book of Labour Statistics, 1969*, Geneva, 1969, p. 534.

Source: 1940, 1960, 1965-68: *Nar. khoz. v 1968*, pp. 555-556. 1958-59, 1961-64: Official materials of the International Labour Office.

TABLE 8.—Annual average money wages, by branch of industry and class of worker, U.S.S.R., 1950-66 (old series)

[In rubles, as reported according to the scope of payments used prior to 1969]

| Branch of industry and class of worker       | 1950  | 1955  | 1960  | 1961  | 1962  | 1963  | 1964  | 1965  | 1966  |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <b>Total, all branches:</b>                  |       |       |       |       |       |       |       |       |       |
| Industrial-production personnel.....         | 844   | 940   | 1,096 | 1,134 | 1,159 | 1,181 | 1,206 | 1,240 | 1,282 |
| Wageworkers.....                             | 824   | 914   | 1,078 | 1,112 | 1,138 | 1,158 | 1,184 | 1,216 | 1,253 |
| Engineering-technical personnel.....         | 1,450 | 1,517 | 1,596 | 1,627 | 1,642 | 1,654 | 1,673 | 1,729 | 1,801 |
| Salaried employees.....                      | 763   | 814   | 878   | 948   | 958   | 964   | 977   | 1,012 | 1,058 |
| <b>Electric power:</b>                       |       |       |       |       |       |       |       |       |       |
| Industrial-production personnel.....         | 934   | 1,020 | 1,124 | 1,218 | 1,241 | 1,260 | 1,291 | 1,328 | 1,358 |
| Wageworkers.....                             | 865   | 930   | 1,032 | 1,120 | 1,140 | 1,154 | 1,180 | 1,208 | 1,226 |
| Engineering-technical personnel.....         | 1,694 | 1,772 | 1,818 | 1,930 | 1,948 | 1,942 | 1,960 | 2,010 | 2,069 |
| Salaried employees.....                      | 742   | 818   | 936   | 1,078 | 1,106 | 1,108 | 1,144 | 1,174 | 1,200 |
| <b>Coal:</b>                                 |       |       |       |       |       |       |       |       |       |
| Industrial-production personnel.....         | 1,463 | 1,522 | 2,030 | 2,048 | 2,080 | 2,126 | 2,178 | 2,335 | 2,344 |
| Wageworkers.....                             | 1,447 | 1,475 | 2,012 | 2,034 | 2,066 | 2,114 | 2,160 | 2,297 | 2,311 |
| Engineering-technical personnel.....         | 2,190 | 2,387 | 2,695 | 2,663 | 2,650 | 2,684 | 2,765 | 3,138 | 3,108 |
| Salaried employees.....                      | 1,006 | 1,081 | 1,211 | 1,188 | 1,176 | 1,174 | 1,232 | 1,356 | 1,361 |
| <b>Ferrous metallurgy:</b>                   |       |       |       |       |       |       |       |       |       |
| Industrial-production personnel.....         | 1,172 | 1,224 | 1,402 | 1,406 | 1,429 | 1,452 | 1,482 | 1,513 | 1,548 |
| Wageworkers.....                             | 1,147 | 1,196 | 1,398 | 1,404 | 1,424 | 1,445 | 1,469 | 1,490 | 1,518 |
| Engineering-technical personnel.....         | 2,011 | 2,010 | 1,022 | 1,988 | 2,023 | 2,051 | 2,107 | 2,218 | 2,302 |
| Salaried employees.....                      | 922   | 955   | 980   | 973   | 982   | 998   | 1,028 | 1,087 | 1,129 |
| <b>Chemical:</b>                             |       |       |       |       |       |       |       |       |       |
| Industrial production personnel.....         | 919   | 1,004 | 1,168 | 1,178 | 1,204 | 1,220 | 1,250 | 1,282 | 1,320 |
| Wageworkers.....                             | 876   | 961   | 1,121 | 1,128 | 1,156 | 1,171 | 1,201 | 1,223 | 1,254 |
| Engineering-technical personnel.....         | 1,500 | 1,558 | 1,774 | 1,802 | 1,810 | 1,813 | 1,841 | 1,906 | 1,993 |
| Salaried employees.....                      | 875   | 918   | 1,016 | 1,033 | 1,042 | 1,042 | 1,062 | 1,108 | 1,158 |
| <b>Machine-building and metalworking:</b>    |       |       |       |       |       |       |       |       |       |
| Industrial-production personnel.....         | 925   | 1,008 | 1,120 | 1,138 | 1,165 | 1,186 | 1,210 | 1,235 | 1,278 |
| Wageworkers.....                             | 893   | 972   | 1,092 | 1,112 | 1,141 | 1,162 | 1,186 | 1,210 | 1,246 |
| Engineering-technical personnel.....         | 1,441 | 1,513 | 1,538 | 1,534 | 1,549 | 1,559 | 1,568 | 1,600 | 1,681 |
| Salaried employees.....                      | 820   | 857   | 908   | 938   | 948   | 955   | 966   | 991   | 1,049 |
| <b>Timber, woodworking, pulp, and paper:</b> |       |       |       |       |       |       |       |       |       |
| Industrial-production personnel.....         | 730   | 883   | 1,040 | 1,097 | 1,122 | 1,142 | 1,178 | 1,202 | 1,264 |
| Wageworkers.....                             | 719   | 874   | 1,046 | 1,094 | 1,121 | 1,144 | 1,181 | 1,208 | 1,270 |
| Engineering-technical personnel.....         | 1,279 | 1,338 | 1,350 | 1,427 | 1,447 | 1,453 | 1,480 | 1,499 | 1,583 |
| Salaried employees.....                      | 727   | 811   | 859   | 994   | 1,006 | 1,010 | 1,020 | 1,034 | 1,078 |
| <b>Construction materials:</b>               |       |       |       |       |       |       |       |       |       |
| Industrial-production personnel.....         | 732   | 829   | 1,027 | 1,073 | 1,108 | 1,135 | 1,174 | 1,208 | 1,252 |
| Wageworkers.....                             | 709   | 810   | 1,013 | 1,054 | 1,090 | 1,116 | 1,156 | 1,190 | 1,231 |
| Engineering-technical personnel.....         | 1,316 | 1,320 | 1,400 | 1,463 | 1,489 | 1,504 | 1,547 | 1,578 | 1,632 |
| Salaried employees.....                      | 778   | 791   | 910   | 996   | 1,006 | 1,009 | 1,030 | 1,055 | 1,096 |
| <b>Cement:</b>                               |       |       |       |       |       |       |       |       |       |
| Industrial-production personnel.....         | 918   | 970   | 1,212 | 1,225 | 1,243 | 1,249 | 1,264 | 1,304 | 1,324 |
| Wageworkers.....                             | 875   | 936   | 1,183 | 1,189 | 1,208 | 1,210 | 1,223 | 1,259 | 1,292 |
| Engineering-technical personnel.....         | 1,690 | 1,536 | 1,807 | 1,846 | 1,846 | 1,846 | 1,864 | 1,952 | 2,008 |
| Salaried employees.....                      | 948   | 932   | 1,087 | 1,094 | 1,090 | 1,092 | 1,108 | 1,171 | 1,223 |
| <b>Light:</b>                                |       |       |       |       |       |       |       |       |       |
| Industrial-production personnel.....         | 619   | 691   | 791   | 853   | 874   | 887   | 908   | 931   | 976   |
| Wageworkers.....                             | 624   | 697   | 797   | 853   | 874   | 887   | 907   | 932   | 979   |
| Engineering-technical personnel.....         | 1,044 | 1,026 | 1,121 | 1,226 | 1,247 | 1,252 | 1,261 | 1,306 | 1,387 |
| Salaried employees.....                      | 628   | 665   | 739   | 824   | 840   | 842   | 850   | 896   | 932   |
| <b>Textiles:</b>                             |       |       |       |       |       |       |       |       |       |
| Industrial-production personnel.....         | 677   | 746   | 846   | 896   | 913   | 925   | 946   | 961   | 1,006 |
| Wageworkers.....                             | 685   | 756   | 854   | 902   | 919   | 932   | 950   | 967   | 1,012 |
| Engineering-technical personnel.....         | 1,157 | 1,127 | 1,214 | 1,290 | 1,312 | 1,319 | 1,334 | 1,378 | 1,474 |
| Salaried employees.....                      | 652   | 680   | 762   | 839   | 852   | 853   | 866   | 904   | 955   |

See footnotes at end of table, p. 84.

TABLE 8.—Annual average money wages, by branch of industry and class of worker, U.S.S.R., 1950-66 (old series)—Continued

[In rubles, as reported according to the scope of payments used prior to 1969]

| Branch of industry and class of worker | 1950  | 1955  | 1960  | 1961  | 1962  | 1963  | 1964  | 1965  | 1966  |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <b>Garment:</b>                        |       |       |       |       |       |       |       |       |       |
| Industrial-production personnel.....   | 523   | 588   | 686   | 772   | 803   | 816   | 838   | 869   | 913   |
| Wageworkers.....                       | 520   | 586   | 688   | 767   | 796   | 809   | 832   | 866   | 913   |
| Engineering-technical personnel.....   | 914   | 919   | 1,002 | 1,141 | 1,166 | 1,172 | 1,174 | 1,219 | 1,290 |
| Salaried employees....                 | 594   | 632   | 702   | 803   | 822   | 828   | 826   | 886   | 899   |
| <b>Footwear:</b>                       |       |       |       |       |       |       |       |       |       |
| Industrial-production personnel.....   | 556   | 680   | 818   | 864   | 884   | 898   | 942   | 971   | 1,021 |
| Wageworkers.....                       | 554   | 686   | 826   | 864   | 882   | 896   | 940   | 970   | 1,024 |
| Engineering-technical personnel.....   | 953   | 972   | 1,123 | 1,218 | 1,229 | 1,228 | 1,270 | 1,325 | 1,382 |
| Salaried employees....                 | 590   | 656   | 737   | 808   | 826   | 826   | 852   | 884   | 930   |
| <b>Food:</b>                           |       |       |       |       |       |       |       |       |       |
| Industrial-production personnel.....   | 635   | 732   | 877   | 968   | 991   | 1,012 | 1,036 | 1,070 | 1,112 |
| Wageworkers.....                       | 614   | 702   | 838   | 924   | 944   | 964   | 986   | 1,016 | 1,056 |
| Engineering-technical personnel.....   | 1,080 | 1,210 | 1,432 | 1,565 | 1,591 | 1,614 | 1,648 | 1,709 | 1,762 |
| Salaried employees.....                | 688   | 736   | 805   | 902   | 911   | 916   | 923   | 960   | 1,001 |
| <b>Sugar:</b>                          |       |       |       |       |       |       |       |       |       |
| Industrial-production personnel.....   | 594   | 624   | 775   | 852   | 860   | 864   | 892   | 934   | 973   |
| Wageworkers.....                       | 571   | 602   | 760   | 839   | 844   | 842   | 874   | 908   | 946   |
| Engineering-technical personnel.....   | 1,166 | 1,069 | 1,196 | 1,258 | 1,291 | 1,279 | 1,306 | 1,402 | 1,448 |
| Salaried employees....                 | 691   | 650   | 728   | 812   | 821   | 812   | 830   | 889   | 928   |
| <b>Meat:</b>                           |       |       |       |       |       |       |       |       |       |
| Industrial-production personnel.....   | 620   | 697   | 824   | 883   | 908   | 947   | 941   | 992   | 1,039 |
| Wageworkers.....                       | 606   | 690   | 832   | 883   | 908   | 948   | 935   | 979   | 1,020 |
| Engineering-technical personnel.....   | 1,074 | 1,076 | 1,110 | 1,196 | 1,200 | 1,222 | 1,220 | 1,345 | 1,430 |
| Salaried employees....                 | 720   | 739   | 805   | 865   | 871   | 882   | 876   | 941   | 1,007 |
| <b>Fish:</b>                           |       |       |       |       |       |       |       |       |       |
| Industrial-production personnel.....   | 966   | 1,310 | 1,652 | 1,861 | 1,932 | 2,005 | 2,069 | 2,132 | 2,174 |
| Wageworkers.....                       | 901   | 1,181 | 1,454 | 1,657 | 1,726 | 1,784 | 1,840 | 1,897 | 1,942 |
| Engineering-technical personnel.....   | 1,932 | 2,408 | 2,804 | 3,042 | 3,134 | 3,264 | 3,328 | 3,396 | 3,377 |
| Salaried employees....                 | 1,062 | 1,177 | 1,240 | 1,367 | 1,402 | 1,411 | 1,432 | 1,494 | 1,502 |

<sup>1</sup> The 1966 wage of industrial-production personnel in nonferrous metallurgy was reported as 1,968 rubles in *Profsoituznaia rabota na metallurgicheskikh predpriatiakh* (I. I. Kostinukov, ed.), Moscow, Profizdat, 1967, pp. 66-67.

<sup>2</sup> Annual wages for 1958, 1959, and 1967 were reported as 1,082, 1,094, and 1,392 rubles, respectively, in International Labour Office, *Year Book of Labour Statistics 1968*, Geneva, 1968, p. 598. This source also contains monthly wage data for other branches of industry not listed here.

Source: TsSU, *Trud v SSSR*, 1968, pp. 140-144.

## EDUCATION

*By* ANN S. GOODMAN.

Enrollment in Soviet schools (excluding factory training programs) was 60 million in the 1968-69 school year, an increase of 44 percent over the 42 million students enrolled in 1960-61 (table 1). This rise in enrollment, which occurred largely in grades 5-10, is evidence of the continuing effort being made in the Soviet Union to improve educational opportunity and attainment.

Total enrollment in specialized secondary schools more than doubled in this 8-year period, from 2.1 million in 1960-61 to 4.3 million in 1968-69 (table 2). Similar growth occurred in higher educational institutions, where enrollment increased from 2.4 million to 4.5 million during the same period. The major share of these increases, particularly in the early part of the period, was due to rising enrollment in part-time—evening and correspondence—divisions. In specialized secondary schools part-time enrollment rose from 47 percent of total enrollment in 1960 to 50 percent in 1965, and in higher schools from 52 to 59 percent. Part-time enrollment at both levels has begun to taper off during the current 5-year period, however, as planned increases in full-time enrollment have been effected. In the 1968-69 school year, part-time students comprised 45 percent of total enrollment in specialized secondary schools and 55 percent in higher schools. Plans call for a further decrease to 43 percent in specialized secondary schools by 1970.

There were 12.4 million graduates of higher educational schools in the United States in 1968, almost twice as many as the 6.7 million in the Soviet Union (table 3). Nearly 73 percent of these college graduates in the United States were employed in the civilian economy; in the U.S.S.R., the level of participation was substantially higher, 83 percent, due primarily to the larger proportion of female college graduates in the labor force. There has been some increase in the rate of gainful employment of college graduates in the Soviet Union since 1950, whereas in the United States the rate has been relatively stable.

The number of college graduates in the Soviet Armed Forces as a proportion of the total labor force with a higher education has decreased in recent years—9 percent in 1957, 6 percent in 1960, and 4 percent in 1967. In the U.S. Armed Forces, this proportion has remained at approximately the same level during these years, between 3 and 4 percent.

More than 22 million persons with higher and specialized secondary education in the U.S.S.R. will be employed in the civilian labor force by 1975, according to the projections presented in tables 4 and 5. This is an increase of 48 percent over the 15 million specialists employed in 1969. The number of persons with higher education employed in the civilian economy will increase from 1.4 million in 1950

to more than 8 million by 1975, while the number of those with specialized secondary education will rise from 1.8 million to nearly 14 million.

Engineers, who comprise the largest single group of specialists with a higher education, have shown tremendous numerical growth since 1950. The number of engineers in the national economy more than doubled between 1950 and 1960, increasing from 400,000 to 1 million. In 1969 there were more than 2 million, and the number is projected to increase to about 2.9 million by 1975. This would represent an average annual growth rate of 8.3 percent for the years 1950-75.

Technicians employed in the national economy similarly comprise the largest group of specialists with a specialized secondary education, nearly 43 percent at the beginning of 1969. There were 507,000 technicians employed in 1950, and 1.7 million in 1960. This group has been projected to reach 6.1 million in 1975. Should this number be attained, the size of this group would have grown by 10.5 percent per year during the period 1950-75.

Military training in the U.S.S.R. is conducted in various types of institutions, including, among others, military schools (*voennye uchilishcha*); higher military command schools; higher military institutions (VVUZy), which consist of military institutes, military departments attached to civilian higher educational institutions, and higher military engineering schools; and military academies. Appendix A contains a list of schools that have been identified from available sources. This list includes only post-specialized secondary schools and higher degree-granting institutions; it clearly does not include all technical or senior service schools. Students who complete the 3-year training course in military schools, where the course work is largely devoted to military subjects, receive only a commission in the rank of lieutenant and not a higher education diploma. These schools give specialized training above the secondary level to graduates of 10-year schools. Graduates of the 4-year higher command schools receive a standard all-union higher education diploma with a civilian specialty and a nonspecialized commission (*obshchevoiskovoi ofitser*). Graduates of higher military institutions must complete the 5-year training program and pass the state examinations to receive a diploma in their specialty and a commission in the rank of lieutenant. Certain post-graduate academies, such as the Order of Lenin Naval Academy and the Military Air Academy at Monino, offer professional military training of 4-6 years duration for company grade officers, usually leading to field grade promotion. They perform the same function as graduate institutions of the U.S. military establishment.<sup>1</sup>

There are no published statistical data available on the number of students in military schools in the U.S.S.R. It is known, however, that students in higher military institutions are excluded from the annual series on enrollment in and graduations from higher schools published by the Central Statistical Administration.<sup>2</sup>

<sup>1</sup> Moscow, Voennno-politicheskaya akademiya, *Osnovy sovetskogo voennogo zakonodatel'stva* (Artem Grigor'evich Gornyi, ed.), Moscow, Voenizdat, 1966, pp. 93-97. See also Nicholas De Witt, *Education and Professional Employment in the U.S.S.R.*, Washington, D.C., National Science Foundation, 1961, pp. 221-222.

<sup>2</sup> *My i planeta: tsifry, fakty* (IAkov Abramovich Ioffe, comp.), Moscow, Izdat. polit. lit., 1967, p. 169, and Armentan S.S.R., Tsentral'noe statisticheskoe upravlenie, *Erevan v tsifrah; statisticheskiy sbornik*, Erevan, 1968, p. 179.



## APPENDIX

## HIGHER MILITARY SCHOOLS, INSTITUTIONS, AND ACADEMIES IN THE U.S.S.R.

(Location of the school is given when known)

## I. MILITARY SCHOOLS

## A. Army Schools

General Command: Baku, Blagoveshchensk, Kiev,\* Leningrad, Moscow, Omsk, Ordzhonikidze, Tashkent.  
 Tank Training: Blagoveshchensk, Cheliabinsk, Chirchik, Kazan', Khar'kov, Ulianovsk.  
 Tank Technology: Omsk.  
 Airborne: Riazan'.  
 Engineering Technology: Kaliningrad, Kazan',\* Khar'kov,\* Leningrad, Rostov, Saratov,\* Serpukhov, Tiumen'.  
 Artillery Engineers: Kiev,\* Penza.\*  
 Radio Technology: Kiev,\* Minsk.\*  
 Communications: Cherepovets, Gor'kii, Kemerovo, Kiev, Tomsk.  
 Political: Donetsk, Leningrad, L'vov,\* Novosibirsk, Simferopol', Sverdlovsk.  
 Anti-Aircraft Artillery: Leningrad, Orenburg, Poltava.  
 Motor Vehicle: Cheliabinsk, Riazan', Ussuriisk.  
 Topography: Leningrad.  
 Chemical: Kostroma, Saratov.  
 Construction: Kamyshin, Leningrad/Pushkin.  
 Rear Echelon: Vol'sk.

## B. Naval Schools

For Fleets and Flotillas: Arkhangel'sk, Baku,\* Kaliningrad, Leningrad, Sevastopol', Vladivostok.  
 Submarine Training: Kaliningrad, Leningrad, Odessa.  
 Engineering: Leningrad, Pushkin, Sevastopol'.  
 Coast Guard: Leningrad.  
 Naval Air Force: Leningrad.  
 Medical Services: Leningrad, Odessa.  
 Navigation: Nevel'sk.  
 Radio Electronics: Leningrad/Petrodvorets.  
 Political: Kiev, Leningrad.

## C. Air Force Schools

Pilot Training: Balashov, Barnaul, Chernigov, Eisk, Khar'kov, Orenburg, Syzran', Tambov, Volgograd.  
 Aviation School for Navigators: Cheliabinsk, Lugansk.  
 Aviation Technical: Achinsk, Irkutsk, Kaliningrad, Khar'kov (first and second), Perm', Tambov, Vasil'kov; Voronezh.  
 Engineering: Kiev.  
 Political: Kurgan.

## D. Schools for PVO (Anti-Aircraft Defense) Forces

Pilots for PVO Forces: Armavir.  
 Political: Leningrad/Gorelovo.

## II. HIGHER MILITARY INSTITUTIONS (VVUzy)

Institute for Military History: Moscow.  
 Department of Physical Culture and Sports of the Leningrad State Institute of Physical Culture named for P. F. Lesgaft.\*  
 Central Scientific Research Institute.  
 Military Department of the Moscow Finance Institute.\*  
 Military Institute of Foreign Languages: Moscow.\*  
 Military Band Masters Department of the Moscow State Conservatory named for P. I. Chaikovskii.

## III. MILITARY ACADEMIES

## A. Army Academies

Higher Military Academy of the General Staff (postgraduate—joint services academy): Moscow.

\*Training is also offered through the correspondence division.

Military Academy named for M. V. Frunze: Moscow.\*  
 Military Political Academy named for V. I. Lenin: Moscow.\*  
 Military Artillery Academy named for M. I. Kalinin: Leningrad(?)\*  
 Military Engineering Academy named for F. E. Dzerzhinskii: Leningrad.\*  
 Military Engineering Academy named for A. F. Mozhaiskii: Leningrad.\*  
 Military Academy of Armored Troops named for R. I. A. Malinovskii: Moscow.\*  
 Military Engineering Academy named for V. V. Kuibyshev: Moscow.\*  
 Artillery Academy for Radio Technology named for L. A. Govorov Khar'kov.\*  
 Military Academy of Chemical Defense: Moscow (?) \*  
 Military Academy of Communications: Leningrad.\*  
 Military Academy of Rear Echelon and Transport: Moscow.\*  
 Military Medical Academy named for S. M. Kirov: Moscow.  
 Academy for Military Economics.  
 Military Juridical Academy: Moscow.

#### B. Naval Academies

Naval Academy of Shipbuilding and Armaments named for A. N. Krylov:  
 Leningrad\* (postgraduate).  
 Order of Lenin Naval Academy: Leningrad (postgraduate)

#### C. Air Force Academies

Military-Air Academy: Monino (postgraduate cosmonaut training center).\*  
 Military-Aviation Engineering Academy named for N. E. Zhukovskii: Moscow\*  
 (postgraduate).

#### D. PVO Forces Academy

Military Command Academy of PVO Forces: Kalinin.\*

Sources: *Kalendar' voina na 1969 god*, Moscow, Voenizdat, 1968, pp. 133-136; Ivan Antonovich Kamkov, *Dlia tekhn, kto khochet uchit'sia v voennykh uchilishchakh i akademiakh; spravki, soveti*, Moscow, Voenizdat, 1968, pp. 23-25, 41-49; I. F. Pobezhimov and B. A. Viktorov, *Spravochnik ofitsera po sovetskomu zakonodatel'stvu*, Moscow, 1966, pp. 133-134; Erich Ferdinand Pruck, "Militärlehranstalten und Offizierausbildung in der UdSSR," *Wehrkunde*, v. 16, no. 10, October 1967, pp. 523-531; *Krasnaia zvezda*, March 4, 1969, p. 4.

TABLE 1.—Enrollment in schools and training programs of the U.S.S.R., 1950-51 to 1968-69

[In thousands as of the beginning of the school year]

| Type of school and training program   | 1950-51 | 1960-61 | 1965-66 | 1966-67          | 1967-68          | 1968-69 | 1969-70 |
|---|---------|---------|---------|------------------|------------------|---------|---------|
| Total enrollment.....   | 48,770  | 52,665  | 71,835  | 73,589           | 76,025           | 77,526  | .....   |
| General education schools.....  | 34,752  | 36,187  | 48,255  | 48,170           | 48,902           | 49,195  | 49,000  |
| Type of school:   |         |         |         |                  |                  |         |         |
| Primary, 7-year, 8-year, and general secondary schools.....   | 33,314  | 33,417  | 43,410  | 43,529           | 44,451           | 45,077  | (NA)    |
| Schools for working and rural youth and schools for adults.....   | 1,438   | 2,770   | 4,845   | 4,641            | 4,451            | 4,118   | (NA)    |
| Grades:   |         |         |         |                  |                  |         |         |
| 1 to 4.....   | 20,023  | 18,659  | 20,243  | 20,740           | 21,101           | 21,321  | (NA)    |
| 5 to 8.....   | 13,705  | 14,798  | 19,770  | 20,128           | 20,343           | 20,523  | (NA)    |
| 9 to 10 (11).....   | 907     | 2,594   | 7,979   | 7,302            | 7,458            | 7,351   | (NA)    |
| Schools for handicapped children.....   | 117     | 136     | 263     | ( <sup>1</sup> ) | ( <sup>1</sup> ) | (NA)    | (NA)    |
| Trade, vocational-technical, and factory schools.....   | 882     | 1,113   | 1,672   | 1,961            | 2,129            | 2,263   | (NA)    |
| Specialized secondary schools.....  | 1,298   | 2,060   | 3,659   | 3,994            | 4,167            | 4,262   | 4,300   |
| Higher educational institutions.....  | 1,247   | 2,396   | 3,861   | 4,123            | 4,311            | 4,470   | 4,500   |
| Training programs for new trades and raising qualifications in factory and other courses (excluding political education)..... | 10,591  | 10,909  | 14,388  | 15,341           | 16,516           | 17,336  | (NA)    |

NA—Not available.

<sup>1</sup> Included in grade distribution, above.

Source: 1950-51 to 1967-68: U. S. S. R. Tsentral'noe statisticheskoe upravlenie (TsSU), *Narodnoe khoziaistvo SSSR v 1967 g., statisticheskii ezhegodnik*, Moscow, Statistika, 1968, pp. 777-778. (This volume and others in this series cited hereafter as *Nar. khoz. v 19—*.) See also U. S. Congress, Joint Economic Committee, *Soviet Economic Performance 1966-67*, p. 82. 1968-69: *Nar. khoz. v 1968*, p. 669. 1969-70: *Izvestia*, Jan. 25, 1970, p. 2. Enrollment in general education schools is given as "more than 49,000,000."

\*Training is also offered through the correspondence division.

TABLE 2.—Admissions, enrollment, and graduations—higher and specialized secondary educational institutions of the U.S.S.R., by division: 1950-70

[In thousands. Admissions and enrollment as of September, graduations as of June]

| Type of school and year                | Admissions |       |         |                | Enrollment |         |         |                | Graduations |       |         |                |
|--|------------|-------|---------|----------------|------------|---------|---------|----------------|-------------|-------|---------|----------------|
|  | Division   |       |         |                | Division   |         |         |                | Division    |       |         |                |
|  | Total      | Day   | Evening | Correspondence | Total      | Day     | Evening | Correspondence | Total       | Day   | Evening | Correspondence |
| <b>HIGHER EDUCATIONAL INSTITUTIONS</b> |            |       |         |                |            |         |         |                |             |       |         |                |
| 1950.....                              | 349.1      | 228.4 | 9.1     | 111.6          | 1,247.0    | 818.0   | 27.0    | 402.0          | 176.9       | 145.9 | 2.0     | 29.0           |
| 1954.....                              | 409.0      | 276.2 | 22.9    | 109.9          | 1,730.5    | 1,084.1 | 62.4    | 584.0          | 234.8       | 170.5 | 3.9     | 60.4           |
| 1955.....                              | 461.4      | 257.2 | 28.4    | 175.8          | 1,867.0    | 1,147.0 | 80.9    | 639.1          | 245.8       | 179.2 | 4.6     | 62.0           |
| 1958.....                              | 455.9      | 215.5 | 42.2    | 198.2          | 2,179.0    | 1,180.0 | 153.0   | 846.0          | 290.8       | 205.4 | 8.7     | 76.7           |
| 1960.....                              | 593.3      | 257.9 | 77.2    | 258.2          | 2,396.0    | 1,156.0 | 245.0   | 995.0          | 343.3       | 228.7 | 15.4    | 99.2           |
| 1961.....                              | 666.9      | 279.4 | 93.1    | 294.4          | 2,640.0    | 1,204.0 | 307.0   | 1,129.0        | 325.5       | 204.9 | 18.1    | 102.5          |
| 1962.....                              | 727.5      | 312.1 | 102.3   | 313.1          | 2,944.0    | 1,287.0 | 374.0   | 1,283.0        | 316.6       | 195.1 | 22.5    | 99.0           |
| 1963.....                              | 772.4      | 339.0 | 108.2   | 325.2          | 3,261.0    | 1,383.0 | 439.0   | 1,439.0        | 331.7       | 200.7 | 25.9    | 105.1          |
| 1964.....                              | 820.5      | 356.2 | 117.6   | 346.7          | 3,608.0    | 1,514.0 | 506.0   | 1,588.0        | 354.0       | 200.8 | 31.2    | 122.0          |
| 1965.....                              | 853.7      | 378.4 | 125.2   | 350.1          | 3,861.0    | 1,584.0 | 569.0   | 1,708.0        | 403.9       | 224.8 | 43.5    | 135.6          |
| 1966.....                              | 897.5      | 427.1 | 134.5   | 335.9          | 4,123.0    | 1,740.0 | 618.0   | 1,765.0        | 431.8       | 229.3 | 56.0    | 146.5          |
| 1967.....                              | 888.1      | 436.9 | 135.0   | 316.2          | 4,311.0    | 1,890.0 | 652.0   | 1,769.0        | 479.5       | 249.9 | 65.7    | 163.9          |
| 1968.....                              | 887.9      | 453.2 | 131.8   | 302.9          | 4,470.0    | 2,029.0 | 670.0   | 1,771.0        | 510.6       | 262.2 | 73.3    | 175.1          |
| 1969.....                              | 895.0      | 460.0 | (2)     | 435.0          | 4,500.0    | (2)     | (2)     | (2)            | 565.0       | (2)   | (2)     | (2)            |
| 1970 (plan).....                       | 905.0      | (2)   | (2)     | (2)            | 4,700.0    | (2)     | (2)     | (2)            | 635.0       | (2)   | (2)     | (2)            |
| <b>SPECIALIZED SECONDARY SCHOOLS</b>   |            |       |         |                |            |         |         |                |             |       |         |                |
| 1950.....                              | 426.3      | 349.5 | 15.6    | 61.2           | 1,298.0    | 1,065.0 | 52.0    | 181.0          | 313.7       | 279.0 | 4.7     | 30.0           |
| 1954.....                              | 594.8      | 452.5 | 57.0    | 85.3           | 1,838.7    | 1,440.4 | 163.3   | 235.0          | 332.3       | 299.1 | 11.1    | 22.1           |
| 1955.....                              | 587.5      | 423.9 | 54.8    | 108.8          | 1,960.4    | 1,469.8 | 204.1   | 286.5          | 387.8       | 345.1 | 16.0    | 26.7           |
| 1958.....                              | 584.1      | 363.7 | 75.2    | 145.2          | 1,876.0    | 1,125.0 | 303.0   | 448.0          | 551.2       | 463.2 | 37.5    | 50.5           |
| 1960.....                              | 769.3      | 415.0 | 130.0   | 224.3          | 2,060.0    | 1,091.0 | 370.0   | 599.0          | 483.5       | 348.1 | 57.9    | 77.5           |
| 1961.....                              | 871.1      | 451.3 | 139.1   | 280.7          | 2,370.0    | 1,203.0 | 431.0   | 736.0          | 429.5       | 285.0 | 54.0    | 90.5           |
| 1962.....                              | 905.6      | 466.3 | 141.4   | 297.9          | 2,668.0    | 1,310.0 | 489.0   | 869.0          | 452.2       | 290.3 | 56.8    | 105.1          |
| 1963.....                              | 955.0      | 500.8 | 146.1   | 308.1          | 2,983.0    | 1,474.0 | 536.0   | 973.0          | 510.7       | 288.8 | 91.0    | 130.9          |
| 1964.....                              | 1,038.7    | 532.2 | 156.6   | 349.9          | 3,326.0    | 1,634.0 | 586.0   | 1,106.0        | 558.3       | 313.3 | 88.7    | 156.3          |
| 1965.....                              | 1,099.7    | 581.8 | 170.1   | 347.8          | 3,659.0    | 1,835.0 | 628.0   | 1,196.0        | 621.5       | 332.8 | 104.7   | 184.0          |
| 1966.....                              | 1,215.6    | 717.0 | 187.2   | 311.4          | 3,994.0    | 2,111.0 | 677.0   | 1,206.0        | 685.2       | 370.4 | 108.9   | 205.9          |
| 1967.....                              | 1,233.3    | 736.0 | 181.2   | 316.1          | 4,167.0    | 2,249.0 | 716.0   | 1,202.0        | 805.9       | 459.4 | 113.8   | 232.7          |
| 1968.....                              | 1,264.6    | 770.6 | 172.0   | 322.0          | 4,262.0    | 2,332.0 | 729.0   | 1,201.0        | 902.8       | 532.8 | 125.1   | 244.9          |
| 1969.....                              | 1,312.0    | (2)   | (2)     | (2)            | 4,300.0    | (2)     | (2)     | (2)            | 1,035.0     | (2)   | (2)     | (2)            |
| 1970 (plan).....                       | 1,500.0    | 910.0 | (2)     | 590.0          | 5,300.0    | (2)     | (2)     | (2)            | 1,045.0     | (2)   | (2)     | (2)            |

<sup>1</sup> Plan figure.  
<sup>2</sup> Residual.  
<sup>3</sup> Not available.

Source: Ann S. Goodman, *Estimates and Projections of Specialized Manpower in the U.S.S.R.: 1960-75* (U.S. Bureau of the Census, International Population Reports, Series P-91, No. 21), Washington, D.C., 1970, and *Izvestia*, January 25, 1970, p. 2., and July 22, 1970, p. 3.

TABLE 3.—*Graduates of higher educational institutions in the population and labor force of the U.S.S.R. and the United States: 1950-68*

[In thousands, as of Jan. 1. Figures may not add to totals due to rounding]

| Year      | U.S.S.R.                               |                    |              |          |                        | United States                          |                    |              |          |                        |
|-----------|--|--------------------|--------------|----------|------------------------|--|--------------------|--------------|----------|------------------------|
|           | Total population with higher education | In the labor force |              |          | Not in the labor force | Total population with higher education | In the labor force |              |          | Not in the labor force |
|           |  | Total              | Armed forces | Civilian |                        |  | Total              | Armed forces | Civilian |                        |
| 1950..... | 1,915                                  | 1,755              | 312          | 1,443    | 160                    | 5,777                                  | 3,998              | 52           | 3,946    | 1,779                  |
| 1953..... | 2,439                                  | 2,262              | 414          | 1,848    | 177                    | (1)                                    | (1)                | 165          | (1)      | (1)                    |
| 1955..... | 2,838                                  | 2,577              | 393          | 2,184    | 261                    | (1)                                    | (1)                | 264          | (1)      | (1)                    |
| 1956..... | 3,055                                  | 2,652              | 312          | 2,340    | 403                    | (1)                                    | (1)                | 252          | (1)      | (1)                    |
| 1957..... | 3,285                                  | 2,897              | 264          | 2,633    | 388                    | 7,769                                  | (1)                | (1)          | 5,542    | (1)                    |
| 1958..... | 3,519                                  | 3,064              | 258          | 2,806    | 455                    | (1)                                    | (1)                | (1)          | (1)      | (1)                    |
| 1959..... | 3,778                                  | 3,271              | 244          | 3,027    | 507                    | 8,470                                  | 6,201              | 211          | 5,990    | 2,269                  |
| 1960..... | 4,087                                  | 3,459              | 224          | 3,236    | 628                    | 8,232                                  | 6,186              | 202          | 5,984    | 2,046                  |
| 1961..... | 4,415                                  | 3,748              | 203          | 3,545    | 667                    | (1)                                    | (1)                | (1)          | (1)      | (1)                    |
| 1962..... | 4,717                                  | 4,082              | 258          | 3,824    | 635                    | 9,708                                  | (1)                | (1)          | 7,180    | (1)                    |
| 1963..... | 5,000                                  | 4,294              | 244          | 4,050    | 706                    | (1)                                    | (1)                | 238          | (1)      | (1)                    |
| 1964..... | 5,300                                  | 4,506              | 224          | 4,283    | 794                    | 10,160                                 | 7,739              | 255          | 7,484    | 2,421                  |
| 1965..... | 5,600                                  | 4,761              | 214          | 4,548    | 839                    | 10,640                                 | 8,214              | 263          | 7,951    | 2,426                  |
| 1966..... | 6,000                                  | 5,106              | 215          | 4,891    | 894                    | 11,251                                 | 8,397              | 266          | 8,131    | 2,854                  |
| 1967..... | 6,400                                  | 5,445              | 218          | 5,227    | 955                    | 11,620                                 | 8,789              | 288          | 8,501    | 2,831                  |
| 1968..... | 6,686                                  | 5,783              | 218          | 5,565    | 903                    | 12,371                                 | 9,351              | 342          | 9,009    | 3,020                  |

† Not available.

Source: Goodman, *op. cit.*, p. 31.

TABLE 4.—*Graduates of higher educational institutions employed in the civilian economy of the U.S.S.R., by major field of study: 1950-75*

[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  |
| 1952.....   | 1,724.0 | 445.6     | 128.2  | 83.4                                  | 6.4                       | 31.4    | 258.6                           | 712.4   | 58.0  |
| 1953.....   | 1,848.0 | 482.5     | 130.9  | 88.0                                  | 7.0                       | 35.5    | 268.1                           | 780.1   | 55.0  |
| 1954.....   | 2,008.5 | 530.2     | 134.5  | 96.0                                  | 7.8                       | 40.7    | 280.4                           | 867.8   | 51.1  |
| 1955.....   | 2,184.0 | 597.8     | 146.8  | 105.2                                 | 8.6                       | 47.1    | 299.0                           | 906.4   | 73.1  |
| 1956.....   | 2,340.0 | 640.6     | 158.2  | 113.9                                 | 9.4                       | 50.4    | 309.6                           | 979.5   | 78.4  |
| 1957.....   | 2,633.1 | 721.0     | 179.5  | 130.2                                 | 11.0                      | 56.5    | 329.4                           | 1,116.7   | 88.8  |
| 1958.....   | 2,805.5 | 832.2     | 177.0  | 145.2                                 | 12.3                      | 57.8    | 346.0                           | 1,144.9   | 90.1  |
| 1959.....   | 3,027.0 | 921.1     | 191.0  | 161.9                                 | 14.4                      | 61.8    | 362.8                           | 1,213.9   | 100.1 |
| 1960.....   | 3,235.7 | 1,004.8   | 204.2  | 177.6                                 | 16.3                      | 65.5    | 378.6                           | 1,278.9   | 109.8 |
| 1961.....   | 3,545.2 | 1,135.0   | 222.3  | 197.7                                 | 19.3                      | 69.8    | 400.6                           | 1,378.1   | 122.4 |
| 1962.....   | 3,824.0 | 1,236.0   | 243.8  | 218.3                                 | 21.6                      | 74.0    | 424.2                           | 1,473.8   | 132.3 |
| 1963.....   | 4,049.7 | 1,325.1   | 255.2  | 235.8                                 | 24.1                      | 76.6    | 441.9                           | 1,548.0   | 143.0 |
| 1964.....   | 4,282.6 | 1,420.5   | 267.1  | 252.7                                 | 26.1                      | 77.8    | 460.1                           | 1,629.1   | 149.2 |
| 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.....   | 6,043.0 | 2,168.0   | 360.0  | 410.0                                 | 51.0                      | 99.0    | 558.0                           | 2,190.0   | 207.0 |
| PROJECTIONS |         |           |  |                                       |                           |         |                                 |   |       |
| 1970.....   | 6,197.0 | 2,217.9   | 369.3  | 415.9                                 | 51.2                      | 102.6   | 573.2                           | 2,253.7   | 213.2 |
| 1971.....   | 6,579.9 | 2,349.7   | 392.3  | 437.0                                 | 53.2                      | 110.1   | 609.5                           | 2,400.9   | 227.2 |
| 1972.....   | 6,977.1 | 2,486.2   | 416.1  | 458.8                                 | 55.3                      | 117.8   | 647.4                           | 2,553.6   | 241.9 |
| 1973.....   | 7,387.9 | 2,627.0   | 440.9  | 481.1                                 | 57.4                      | 125.9   | 686.5                           | 2,712.1   | 257.0 |
| 1974.....   | 7,799.7 | 2,768.0   | 465.6  | 503.2                                 | 59.4                      | 134.1   | 725.7                           | 2,871.5   | 272.2 |
| 1975.....   | 8,241.2 | 2,919.1   | 492.1  | 526.9                                 | 61.6                      | 142.9   | 767.8                           | 3,042.2   | 288.6 |

Sources: Goodman, *op. cit.*, p. 27.

TABLE 5.—*Graduates of specialized secondary schools employed in the civilian economy of the U.S.S.R., by major field of study: 1950-75*

[In thousands as of Jan. 1]

| Year        | Total    | Technicians | Agronomists,<br>zootechnicians,<br>veterinary<br>feldshers, and<br>veterinary<br>technicians | Planners and<br>statisticians | Merchandising<br>specialists | Legal<br>personnel | Medical<br>workers<br>(including<br>dentists) | Teachers and<br>library,<br>cultural, and<br>informal<br>education<br>workers | Other |
|-------------|----------|-------------|--|-------------------------------|------------------------------|--------------------|---|---|-------|
| 1950.....   | 1,811.1  | 507.1       | 144.9  | 90.6                          | 18.1                         | 18.1               | 452.8   | 507.1   | 72.4  |
| 1951.....   | 2,035.0  | 569.8       | 162.8  | 101.7                         | 20.4                         | 20.4               | 508.7   | 569.8   | 81.4  |
| 1952.....   | 2,227.0  | 623.6       | 178.2  | 111.3                         | 22.3                         | 22.3               | 556.7   | 623.5   | 89.1  |
| 1953.....   | 2,431.0  | 680.7       | 194.5  | 121.6                         | 24.3                         | 24.3               | 607.7   | 680.7   | 97.2  |
| 1954.....   | 2,628.4  | 730.7       | 213.5  | 131.7                         | 26.7                         | 24.7               | 645.8   | 763.2   | 93.1  |
| 1955.....   | 2,949.1  | 822.6       | 236.7  | 152.8                         | 33.3                         | 23.2               | 731.1   | 818.6   | 130.8 |
| 1956.....   | 3,213.0  | 911.4       | 259.6  | 173.2                         | 38.6                         | 23.1               | 797.2   | 863.8   | 146.1 |
| 1957.....   | 3,624.4  | 1,049.8     | 295.4  | 205.0                         | 46.9                         | 23.0               | 900.2   | 934.3   | 169.8 |
| 1958.....   | 4,016.1  | 1,278.0     | 289.3  | 237.4                         | 57.2                         | 20.4               | 980.3   | 971.5   | 182.0 |
| 1959.....   | 4,449.0  | 1,518.6     | 316.4  | 272.6                         | 74.6                         | 19.1               | 1,059.2                                       | 998.0   | 190.5 |
| 1960.....   | 4,781.1  | 1,703.1     | 337.1  | 299.6                         | 88.0                         | 18.1               | 1,119.7                                       | 1,018.4   | 197.1 |
| 1961.....   | 5,238.5  | 1,956.8     | 356.3  | 337.5                         | 106.7                        | 17.2               | 1,187.3                                       | 1,061.9   | 215.8 |
| 1962.....   | 5,609.1  | 2,156.9     | 389.4  | 379.1                         | 127.0                        | 16.5               | 1,222.5                                       | 1,096.6   | 221.1 |
| 1963.....   | 5,906.1  | 2,292.7     | 409.6  | 414.9                         | 145.6                        | 16.2               | 1,251.9                                       | 1,143.3   | 231.9 |
| 1964.....   | 6,200.9  | 2,446.4     | 410.6  | 451.6                         | 165.2                        | 15.2               | 1,294.4                                       | 1,178.8   | 238.7 |
| 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                                       | 1,320.2   | 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 |
| PROJECTIONS |          |             |  |                               |                              |                    |   |   |       |
| 1970.....   | 9,608.9  | 4,117.7     | 589.8  | 844.9                         | 349.4                        | 18.5               | 1,820.1                                       | 1,509.2   | 359.3 |
| 1971.....   | 10,390.9 | 4,471.0     | 637.1  | 911.3                         | 376.8                        | 17.9               | 1,968.7                                       | 1,620.3   | 387.8 |
| 1972.....   | 11,219.7 | 4,846.9     | 687.0  | 981.6                         | 405.9                        | 17.4               | 2,126.2                                       | 1,737.7   | 418.0 |
| 1973.....   | 12,090.7 | 5,240.8     | 739.5  | 1,055.3                       | 436.5                        | 16.7               | 2,291.7                                       | 1,860.5   | 449.7 |
| 1974.....   | 12,989.6 | 5,649.1     | 793.6  | 1,131.3                       | 468.0                        | 15.9               | 2,462.7                                       | 1,988.7   | 482.3 |
| 1975.....   | 13,959.7 | 6,090.0     | 852.0  | 1,213.3                       | 501.9                        | 14.9               | 2,647.1                                       | 2,122.9   | 517.6 |

Source: Goodman, *op cit.*, p. 28.

## CONSUMER WELFARE

By DAVID W. BRONSON and BARBARA S. SEVERIN

The forward momentum achieved in the mid-1960's in improving consumer welfare slowed in 1968 and 1969. According to Soviet data, real income per capita (which includes wages, farm income-in-kind, and transfer payments) rose slightly more than 6 percent in 1968, and 5 percent in 1969, in contrast to 6½ percent annually during 1966-67. The slowdown in the growth of consumption per capita in 1968-69 was even more marked—4½ percent and 3½ percent, respectively, compared to an average rate of 6 percent during 1966-67. Some let-down in 1968 in the rate of growth of consumption was anticipated after the all-out effort by the regime in 1967, occasioned by the 50th anniversary jubilee year celebration, to give the consumer a better shake. However, the continued decline in 1969 was not expected and was in part explained by a poor agricultural year. As a result, the upward trend in improving the quality of the Soviet diet was reversed; per capita consumption of some quality foods such as meat was lower in 1969 than in 1968.

As in the past several years, consumers continued to salt away much of their excess purchasing power in savings banks. For the fifth year in a row, savings deposits rose by about 20 percent in 1969. The increment of 6 billion rubles was equivalent to approximately two-thirds of the increase in personal income. At the end of 1969, total deposits amounted to more than one-fifth of that year's personal income, compared with one-seventh in 1960. The excess purchasing power was also reflected in rising prices in both 1968 and 1969 in the collective farm market, the only organized free market in the U.S.S.R. Prices for perishable foods in Moscow collective farm markets rose sharply during the second half of 1968, reaching levels 8½ percent above those of the second half of 1967. The upward price spiral continued throughout 1969—the average level for the year was 10 percent above that of 1968.

### TRENDS IN CONSUMPTION

#### A. THE PERIOD 1968-69

The acceleration in growth of per capita consumption of goods and services achieved in 1966-67 was not sustained during 1968-69. By 1969 growth in per capita consumption had declined to approximately half the 1967 rate (see table below) and was the lowest posted under the Brezhnev-Kosygin regime. In addition to the overall slowdown, the rates of improvement among the various categories of consumption differed considerably in both years. In 1968, the durable goods, personal services, and health and education components grew at more rapid rates than during 1967; the food and soft goods components grew markedly slower. In 1969, growth of all categories declined to rates below those achieved in 1967.

*U.S.S.R.: Average annual rates of growth in per capita consumption by major component, 1956-68*<sup>1</sup>

[In percent]

|                                    | 1956-60 | 1961-65 | 1966 | 1967 | 1968 | 1969 |
|------------------------------------|---------|---------|------|------|------|------|
| Total consumption per capita.....  | 4.0     | 3.0     | 5.2  | 6.6  | 4.6  | 3.7  |
| Food.....                          | 2.8     | 2.3     | 4.5  | 5.1  | 3.3  | .8   |
| Soft goods.....                    | 4.8     | 1.4     | 6.5  | 7.9  | 7.3  | 6.8  |
| Durables.....                      | 13.5    | 8.0     | 10.9 | 8.0  | 8.5  | 4.2  |
| Personal services.....             | 5.9     | 5.5     | 6.1  | 7.2  | 8.1  | 6.2  |
| Health and education services..... | 3.8     | 5.4     | 4.6  | 2.9  | 5.7  | 2.7  |

<sup>1</sup> See footnote 1 of table 2 and notes to tables on consumption. The base year for the calculations shown in each column is the year before the stated initial year of the period, i.e., the average annual rate of increase for 1956-60 is computed by relating consumption in the year 1960 to base year 1955.

Per capita consumption of food, which comprises over half of per capita consumption in the U.S.S.R. increased by nearly 3½ percent in 1968. Moreover, as a result of the boost in farm supplies of meat and milk in 1967 and early 1968, the quality of the diet improved. The situation changed sharply in 1969; food consumption grew by less than 1 percent. Furthermore, a decline in supplies of meat, fresh fruit, and vegetables forced consumers to substitute less desirable starchy foods in order to maintain the daily level of calorie intake. Indeed, annual per capita consumption of meat and vegetables in 1969 was 5 percent below 1968 levels. Although the average calorie intake of the population has fluctuated narrowly over the past decade—about 3,100 to 3,200 calories a day—there had been a steady decline in the share of calories provided by basic foods such as potatoes and grain products, along with an increase in the share of calories provided by quality foods such as meat and milk until 1969. The share of calories derived from starchy foods, the so-called starchy-staple ratio, dropped from 62 percent in 1960 to 54 percent in 1968. However, it increased to 55 percent in 1969.

Although the rate of growth of per capita consumption of soft goods has been falling off since the 1967 peak, it is still far above the rate registered during the first half of the decade—a period noted for consumer resistance to the low quality and lack of variety of clothing, fabrics, and shoes in the market. Steady growth of domestic production, emphasis on quality improvement, and continuing imports—primarily readymade clothing and shoes—from both Eastern and Western Europe have resulted in substantially higher rates of increase in recent years. In contrast, after nearly two decades of rapid growth, the rate of growth of per capita production and sales of durable goods dropped sharply in 1969. The decline reflects a fall-off in the rates of growth of production of some goods, particularly refrigerators and washing machines, and sales of others, particularly television sets. Although households have rapidly increased their holdings of durable goods, available stocks remain low, and a pent-up demand for many types of durables still exists. Long delays in retail availability are common; for example, orders taken in 1963 for a specific brand of refrigerator were being filled in 1969. On the other hand, the large differential between the rates of increase in output of television sets—up 15 percent over 1968—and retail sales—no increase over 1968—



suggests that the backlog of consumer demand for at least one major durable has been filled (at the relatively high and fixed level of retail prices).<sup>1</sup>

Improvement in housing conditions continued to be slow. The quantity of housing constructed in both 1968 and 1969 was below that in 1967. Nevertheless, for the 2-year period as a whole, the stock of available housing increased by 5½ percent, providing a slight increase in per capita living space. The current per capita availability of 77 square feet is still far short of the official standard Soviet authorities have set as a minimum for health and decency (97 square feet per capita). Nevertheless, the current level does represent an increase in space per capita of 20 percent since 1960 and has been accompanied by an appreciable improvement in individual privacy—fewer people per room and more apartments with private kitchens and baths.

In 1968 and 1969, consumers also reaped some benefits from the accelerated efforts in the past several years to modernize the grossly inadequate domestic trade network, and to construct public buildings and municipal facilities to meet the needs of growing urbanization. Personal services during 1968–69 grew by 8.1 and 6.2 percent, respectively. Even more welcome to consumers was the substantial expansion in the supply of state-provided everyday services (ranging from barber shops and public baths to shoe and clothing repair and cleaning). The backlog of needs in all of these long-neglected areas of personal and communal services is still enormous, however.

#### B. UNITED STATES-SOVIET COMPARISON

In 1968 Soviet consumption per capita was about 33 percent of the U.S. level (see Table 1), up slightly from 32 percent in 1967. Per capita consumption of food in the U.S.S.R. was about 57 percent of that in the United States; per capita consumption of soft goods, about 18 percent; durable goods, about 9 percent; health and education services, about 57 percent; and other services, 27 percent (see Table 2). Daily food consumption in the U.S.S.R. in 1968 is compared with that in the United States in 1909–13 in Table 3. Stocks of selected home appliances in the U.S.S.R. are compared with those in the United States in Table 4. As shown in Table 5, the Soviet Union has made rapid advances in health and education services. The supply of these services, in terms of available medical and teaching personnel, has exceeded levels in the United States since the mid-1950's.

#### TRENDS IN MONEY INCOME

During 1968–69 total money income of the Soviet population increased by nearly 25 billion rubles to an annual level of more than 170 billion rubles (see Table 6). On a per capita basis, the increase of disposable incomes amounted to about 9½ percent in 1968 and 5 percent in 1969. The great disparity in the growth rates in the 2 years resulted largely from an unusually large increase in the average earnings of wage and salary workers in 1968—7.5 percent, compared to less than 4 percent in 1969. The main reason for the sharp rise in money wages during 1968 was the implementation of wage reforms, which raised wage rates substantially for 1.5 million machine tool

<sup>1</sup> But price reductions on selected—unpopular—models in recent years have not increased their sales significantly.

operators, increased the general minimum wage by 50 percent (from 40 to 60 rubles a month), and reintroduced longevity payments for workers in remote regions.

The growth rates of collective farm wage payments in 1968 and in 1969 were even more disparate than were the growth rates of earnings of wage and salary workers. After rising by 11½ percent in 1968, total collective farm money wages rose by less than 4 percent in 1969. During 1966-68 collective farmers enjoyed the benefits of a series of earnings reforms and good harvests. The culmination of these reforms in 1968 and a generally poor agricultural year in 1969 largely accounts for the more pedestrian pace of earnings of collective farmers in 1969.

In most Western countries living standards are conventionally measured by the total income of the population adjusted for price changes. In the Soviet Union, however, central planning and price controls have prevented the producing sectors of the economy from responding fully to the higher incomes by increasing the quantity of goods and services or raising prices. As a result, in recent years income gains have outpaced gains made in levels of living. The rapid rise in personal savings held in state banks is an indication of the gap between incomes and consumption. Since 1965 total personal savings have more than doubled (see Table 7). The average size account in 1968 equalled more than 4-months wages of the average worker and in 1969, for each additional 10 rubles of income nearly 7 rubles were set aside in savings. At the same time, long queues still exist for many goods and services indicating that savings are more a result of shortages than of satiation of demand.

## NOTES TO TABLES ON CONSUMER WELFARE

### A. CONSUMPTION

The international comparisons shown in the following tables are subject to both statistical and conceptual limitations. Nevertheless, it is believed that the quantitative results are fairly reliable. With respect to nonquantitative factors, however, the comparisons undoubtedly are biased in favor of the U.S.S.R. Although every effort has been made to match goods of identical quality in the two countries, precise matching has not always been possible. In housing and health services, in particular, the allowances for differences in quality are probably inadequate. Furthermore, there are two characteristic deficiencies in the Soviet pattern of consumption that could not be measured, but they are undoubtedly significant: first, the observable lack of balance between supplies of particular kinds of goods and the demand for them that continues to be endemic; and second, the lack of variety and diversity and the resulting lack of choice on the part of consumers.

Differences between the figures presented in Tables 1 and 2 below, and those given in U.S. Congress, Joint Economic Committee, *Soviet Economic Performance: 1966-67*, Washington, U.S. Government Printing Office, 1968, pages 92-93, are due to the following:

- (1) There are five component indexes (food, soft goods, durables, personal services, and health and education services) instead of three.
- (2) The U.S.S.R. indexes of consumption have been changed as follows:
  - (a) the base year weights for 1955 have been further revised;
  - (b) the volume indexes of these components have undergone further revision.
- (3) Further adjustments have been made in the 1955 ruble/dollar price ratios. Based on a review of new evidence concerning prices and relative qualities of goods and services, some downward adjustment was carried out in the ruble/dollar ratios for food, and some upward adjustment in the price ratios for health and education services.
- (4) In the 1968 publication, 1955 ruble/1966 dollar price ratios were used to convert each of the components of consumption from rubles to dollars or from

dollars to rubles; in the tables below, 1955 ruble/1968 dollar price ratios were employed. Because of the divergency in price trends of the major components the calculated shares will differ somewhat.

(5) The slight differences in U.S. consumption indexes result largely from the use of 1968 price weights, instead of 1966 relative prices, in aggregating the several components included in each index. In most cases the differences are caused by rounding.

### B. MONEY INCOMES

The U.S.S.R. does not publish estimates of personal disposable money income. However, with the publication, beginning in 1965, of average monthly wages for wage and salary workers and, beginning in 1968, of the total wage bill for collective farmers estimates for the components covering approximately 95 percent of the total disposable income can now be derived directly from official Soviet statistics. In constructing estimates for the remaining components, it is necessary to use Soviet data appearing in a number of different sources and in some cases, independent estimates.

TABLE 1.—*U.S.S.R. and United States: Total consumption per capita, 1955, 1958, 1960, 1962-69*

|  | 1955 | 1958 | 1960 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 |
|--|------|------|------|------|------|------|------|------|------|------|------|
| U.S.S.R. <sup>1</sup> (1960=100).....  | 82   | 93   | 100  | 105  | 107  | 109  | 116  | 122  | 130  | 136  | 141  |
| United States <sup>2</sup> (1960=100).....                                     | 93   | 96   | 100  | 104  | 107  | 111  | 116  | 121  | 124  | 128  | (*)  |
| U.S.S.R. consumption per capita as percent of United States <sup>3</sup> ..... | 27   | 30   | 31   | 31   | 31   | 30   | 31   | 31   | 32   | 33   | (*)  |

<sup>1</sup> Composite index of five major categories—food, soft goods, durables, personal services, and health and education services.

<sup>2</sup> Based on data of the U.S. Department of Commerce. In addition, estimates of current public expenditures on health and education are included. Data to permit calculation of U.S. consumption in 1969 are not published until mid-1970.

<sup>3</sup> The datum for 1955 is derived in the same way as U.S. Central Intelligence Agency, *A Comparison of Consumption in the U.S.S.R. and the United States*, January 1964, p. 15. However, some adjustment in the 1955 ruble/dollar price ratios changed U.S.S.R. consumption per capita as a percent of U.S. slightly (see note above). Data for the remaining years are obtained by moving the datum for 1955 by the indexes presented in table 2, below.

<sup>4</sup> Not available.

TABLE 2.—*U.S.S.R. and United States: Consumption per capita by major component 1955, 1958, 1960, 1962-69<sup>1</sup>*

|   | 1955 | 1958 | 1960 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 |
|---|------|------|------|------|------|------|------|------|------|------|------|
| <b>Food products:</b>                                   |      |      |      |      |      |      |      |      |      |      |      |
| U.S.S.R. (1960=100).....                                | 87   | 96   | 100  | 102  | 104  | 105  | 112  | 117  | 123  | 127  | 128  |
| United States (1960=100).....                           | 98   | 99   | 100  | 101  | 101  | 103  | 106  | 107  | 107  | 109  | (*)  |
| U.S.S.R. as percent of United States <sup>2</sup> ..... | 43   | 47   | 48   | 49   | 50   | 49   | 51   | 53   | 56   | 57   | (*)  |
| <b>Soft goods:</b>                                      |      |      |      |      |      |      |      |      |      |      |      |
| U.S.S.R. (1960=100).....                                | 79   | 91   | 100  | 105  | 105  | 106  | 107  | 114  | 123  | 132  | 141  |
| United States (1960=100).....                           | 94   | 96   | 100  | 104  | 107  | 112  | 117  | 124  | 126  | 129  | (*)  |
| U.S.S.R. as percent of United States <sup>2</sup> ..... | 15   | 17   | 18   | 18   | 18   | 17   | 17   | 17   | 18   | 18   | (*)  |
| <b>Durable goods:</b>                                   |      |      |      |      |      |      |      |      |      |      |      |
| U.S.S.R. (1960=100).....                                | 53   | 73   | 100  | 114  | 122  | 132  | 147  | 163  | 176  | 191  | 199  |
| United States (1960=100).....                           | 105  | 88   | 100  | 106  | 114  | 124  | 138  | 146  | 147  | 161  | (*)  |
| U.S.S.R. as percent of United States <sup>2</sup> ..... | 4    | 6    | 7    | 8    | 8    | 8    | 8    | 8    | 9    | 9    | (*)  |
| <b>Personal services:</b>                               |      |      |      |      |      |      |      |      |      |      |      |
| U.S.S.R. (1960=100).....                                | 75   | 89   | 100  | 111  | 116  | 123  | 131  | 139  | 149  | 161  | 171  |
| United States (1960=100).....                           | 91   | 97   | 100  | 103  | 107  | 110  | 114  | 117  | 120  | 124  | (*)  |
| U.S.S.R. as percent of United States <sup>2</sup> ..... | 17   | 19   | 20   | 23   | 23   | 23   | 24   | 24   | 26   | 27   | (*)  |
| <b>Health and education services:</b>                   |      |      |      |      |      |      |      |      |      |      |      |
| U.S.S.R. (1960=100).....                                | 63   | 92   | 100  | 108  | 113  | 118  | 130  | 136  | 140  | 148  | 152  |
| United States (1960=100).....                           | 81   | 93   | 100  | 107  | 110  | 117  | 122  | 130  | 138  | 144  | (*)  |
| U.S.S.R. as percent of United States <sup>2</sup> ..... | 57   | 55   | 55   | 56   | 57   | 56   | 60   | 58   | 56   | 57   | (*)  |

<sup>1</sup> Indexes for the U.S.S.R. were obtained using the basic procedures presented in U.S. Congress, Joint Economic Committee, *New Directions in the Soviet Economy*, Washington, U.S. Government Printing Office, 1966, pp. 520-522 (hereafter referred to as *New Directions*). Indexes for the United States are based on data from the U.S. Department of Commerce.

<sup>2</sup> Not available.

<sup>3</sup> See footnote 3, table 1, above.

TABLE 3.—U.S.S.R. and United States: Availability of food products for human consumption, by major food group, selected years, 1953-68

[Calories per capita per day]

|  | U.S.S.R. <sup>1</sup> |       |       |       | United States        |                   |                   | U.S.S.R.<br>1968 as<br>percent of<br>United<br>States<br>1900-13 |
|--|-----------------------|-------|-------|-------|----------------------|-------------------|-------------------|--|
|  | 1953                  | 1958  | 1962  | 1968  | 1900-13 <sup>2</sup> | 1962 <sup>3</sup> | 1968 <sup>4</sup> |  |
| Grain products, potatoes, and pulses.....        | 2,169                 | 2,031 | 1,931 | 1,729 | 1,560                | 833               | 832               | 111  |
| Fats and oils, including butter.....             | 209                   | 246   | 288   | 346   | 408                  | 502               | 562               | 85   |
| Sugar.....                                       | 168                   | 229   | 292   | 354   | 408                  | 509               | 530               | 87   |
| Meat and fish.....                               | 139                   | 170   | 186   | 224   | 555                  | 593               | 660               | 40   |
| Milk and milk products, excluding<br>butter..... | 220                   | 320   | 305   | 353   | 328                  | 399               | 380               | 108  |
| Vegetables, fruit, eggs, and other<br>foods..... | 195                   | 204   | 198   | 194   | 231                  | 284               | 286               | 84   |
| Total.....                                       | 3,100                 | 3,200 | 3,200 | 3,200 | 3,490                | 3,120             | 3,250             |  |

<sup>1</sup> Consumption of food in the U.S.S.R. was estimated as described in *New Directions*, pp. 520-521, and was converted to calorie values with factors from U.N. Food and Agriculture Organization, *Food Composition Tables for International Use*, Rome, 1954. The average daily intake of 3,200 calories is based on *Kommunist* Vol. 40, no. 4, March 1964, p. 38, and other Soviet sources. It is, of course, an arbitrary parameter within which consumption of individual products is distributed according to production and utilization data. The difference between the total calories derived from foods for which reasonably reliable production and utilization are available and about 95 percent of the estimated daily per capita intake is estimated to have been made up by grain products. The remaining 5 percent is estimated to have been derived from vegetables, fruit, eggs, and other foods.

<sup>2</sup> U.S. Department of Agriculture, Economic Research Service, *Food Consumption, Prices, Expenditures*, (Agricultural Economic Report, No. 138) Washington, 1968, pp. 94-95.

<sup>3</sup> U.S. Department of Agriculture, Economic Research Service, *Food Consumption, Prices, Expenditures*, (Supplement to Agricultural Economic Report, No. 138) Washington, January 1970, pp. 31-32.

TABLE 4.—U.S.S.R. and United States: Household stocks of selected durables, selected years, 1955-68

[Units per thousand persons]

|                       | U.S.S.R.          |                   |                   | United<br>States,<br>1968 <sup>3</sup> | U.S.S.R. as<br>percent of<br>United<br>States<br>in 1968 |
|-----------------------|-------------------|-------------------|-------------------|--|--|
|                       | 1955 <sup>1</sup> | 1960 <sup>2</sup> | 1968 <sup>2</sup> |  |  |
| Sewing machines.....  | 31                | 107               | 154               | <sup>4</sup> 136                       | 113  |
| Refrigerators.....    | 4                 | 10                | 58                | 244                                    | 14   |
| Washing machines..... | 1                 | 13                | 106               | 207                                    | 51   |
| Radios.....           | 66                | 129               | 186               | <sup>5</sup> 1,450                     | 13   |
| Television sets.....  | 4                 | 22                | 112               | <sup>6</sup> 420                       | 27   |
| Automobiles.....      | 2                 | <sup>7</sup> 13   | <sup>8</sup> 5    | <sup>7</sup> 412                       | 1  |

<sup>1</sup> U.S. Congress, Joint Economic Committee, *Soviet Economic Performance 1966-67*, Washington, U.S. Government Printing Office, 1968, p. 94.

<sup>2</sup> U.S.S.R. Tsentral'noe statisticheskoe upravlenie, *Narodnoe khoziaistvo SSSR v 1968 godu*, Moscow, 1969, p. 596 (hereafter referred to as *N.kh. 1968* or for other years in the series of official Soviet statistical year-books).

<sup>3</sup> Based on data from U.S. Bureau of the Census, *Statistical Abstract of the United States, 1969*, Washington, 1969, pp. 35, 326. Number of refrigerators and washing machines may be understated because they are based on numbers of households with 1 or more. Hence, if a household has more than 1 refrigerator, it is tabulated as "1 unit."

<sup>4</sup> For 1963, electric machines only.

<sup>5</sup> *Electronic Industries Yearbook 1969*, Washington, Electronic Industries Association, 1969, p. 6. The number of radios is adjusted to include radio-television combination sets; the number of television sets includes color sets.

<sup>6</sup> Based on data for production, imports, exports, and estimated retirements.

<sup>7</sup> *Automobile Facts and Figures 1969*, Detroit, p. 19.

TABLE 5.—U.S.S.R. and United States: Comparative indicators of health and education services, selected years, 1950–68

|   | U.S.S.R.          |                   |                   | United States 1968    |
|---|-------------------|-------------------|-------------------|-----------------------|
|   | <sup>1</sup> 1950 | <sup>1</sup> 1958 | <sup>2</sup> 1968 |                       |
| Doctors (per 10,000 persons).....                 | 13.2              | 16.8              | 22.5              | <sup>3</sup> 15.5     |
| Hospital beds (per 10,000 persons).....           | 56.0              | 74.0              | 105.0             | <sup>4</sup> 83.0     |
| School enrollments (thousands) <sup>5</sup> ..... | 34,732.0          | 31,483.0          | 49,195.0          | <sup>6</sup> 44,769.0 |
| Number of teachers (thousands) <sup>5</sup> ..... | 1,475.0           | 1,900.0           | 2,345.0           | <sup>6</sup> 1,973.0  |
| Number of students per teacher.....               | 23.6              | 16.6              | 21.0              | 22.7                  |

<sup>1</sup> *New Directions*, p. 503.<sup>2</sup> *N.kh. 1968*, pp. 669, 673, 729, 730.<sup>3</sup> U.S. Bureau of the Census, *Statistical Abstract of the United States, 1969*, Washington, 1969, p. 65. Data are for 1967.<sup>4</sup> *Hospitals* (Journal of the American Hospital Association), Aug. 1, 1969, pt. 2, p. 474.<sup>5</sup> Elementary and secondary. In the U.S.S.R. elementary and secondary includes grades 1 to 10 for the years given; in the United States, it includes grades 1 to 12.<sup>6</sup> Public schools only. U.S. Bureau of the Census, *Statistical Abstract of the United States, 1969*, Washington, 1969, p. 112.TABLE 6.—U.S.S.R.: Personal disposable money income, 1950, 1960, 1965–69 <sup>1</sup>

|   | [In billions of rubles] |       |                   |        |        |        |        |
|---|-------------------------|-------|-------------------|--------|--------|--------|--------|
|   | 1950                    | 1960  | 1965              | 1966   | 1967   | 1968   | 1969   |
| 1. Total money income to the population <sup>2</sup> .....      | 46.98                   | 86.05 | 124.83            | 135.69 | 145.56 | 160.95 | 170.53 |
| 2. Gross earnings of wage and salary workers <sup>3</sup> ..... | 31.13                   | 60.00 | 89.07             | 95.85  | 103.37 | 114.99 | 123.41 |
| 3. Collective farm wage payments.....                           | 1.18                    | 4.94  | 9.01              | 10.88  | 11.65  | 13.00  | 13.49  |
| 4. Other earnings <sup>4</sup> .....                            | 9.89                    | 9.66  | 10.86             | 11.56  | 11.84  | 12.01  | 12.01  |
| 5. Transfer payments <sup>5</sup> .....                         | 4.78                    | 11.45 | 15.89             | 17.40  | 18.70  | 20.95  | 21.62  |
| 6. Total state deductions <sup>6</sup> .....                    | 6.50                    | 5.95  | <sup>7</sup> 8.11 | 8.90   | 9.80   | 11.04  | 11.68  |
| 7. Total disposable money income <sup>7</sup> .....             | 40.48                   | 80.10 | 116.72            | 126.79 | 135.76 | 149.91 | 158.85 |
| PER CAPITA  |                         |       |                   |        |        |        |        |
| 8. Disposable money income (rubles) <sup>8</sup> .....          | 224.8                   | 373.9 | 506.2             | 543.9  | 576.2  | 630.4  | 661.3  |
| 9. Average annual increase (percent).....                       |                         | 5.5   | 6.3               | 7.4    | 5.9    | 9.4    | 4.9    |

<sup>1</sup> The contents of this table are based on the procedures presented in *New Directions*, pt. II-B, pp. 525–28. Figures for 1969 are preliminary estimates.<sup>2</sup> Sum of lines 2 through 5.<sup>3</sup> Product of average annual number of state workers and 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 nonwage fund sources. Estimates in this table have been adjusted accordingly.<sup>4</sup> Other earnings include net household incomes from sale of farm products, profit distributed to cooperative members, and military pay and allowances.<sup>5</sup> Transfer payments include pensions and grants, stipends to students, loan service, insurance payments less premiums, and net borrowing.<sup>6</sup> Total state deductions include direct taxes on the population, local taxes, fees and fines, and state loans.<sup>7</sup> Line 1 minus line 6.<sup>8</sup> Line 7 divided by total population as estimated in *New Directions*, pt. III, p. 657.

TABLE 7.—U.S.S.R.: Personal savings held in state banks, 1950, 1960, and 1965–69

|   | 1950             | 1960  | 1965  | 1966  | 1967  | 1968  | 1969             |
|---|------------------|-------|-------|-------|-------|-------|------------------|
| 1. Total savings (billion rubles) <sup>1</sup> .....                        | 1.9              | 10.9  | 18.7  | 22.9  | 26.9  | 32.4  | 38.4             |
| Urban.....  | 1.6              | 8.7   | 14.0  | 17.0  | 19.8  | 23.8  | ( <sup>2</sup> ) |
| Rural.....  | .2               | 2.2   | 4.7   | 6.0   | 7.1   | 8.6   | ( <sup>2</sup> ) |
| 2. Average size account (rubles).....                                       | 124.0            | 209.0 | 326.0 | 377.0 | 419.0 | 473.0 | ( <sup>2</sup> ) |
| Urban.....  | 151.0            | 228.0 | 332.0 | 380.0 | 421.0 | 474.0 | ( <sup>2</sup> ) |
| Rural.....  | 52.0             | 157.0 | 309.0 | 370.0 | 413.0 | 470.0 | ( <sup>2</sup> ) |
| 3. Share of additional disposable income saved (percent) <sup>3</sup> ..... | ( <sup>2</sup> ) | 20.7  | 24.8  | 41.7  | 44.6  | 38.9  | 67.1             |

<sup>1</sup> 1950, 1960, 1965–67: U.S.S.R. Tsentral'noe statisticheskoe upravlenie, *Narodnoe khoziaistvo SSSR v 1967 g.*, Moscow, 1968, p. 699. 1968: *Narodnoe khoziaistvo SSSR v 1968 g.*, Moscow, 1969, p. 597. 1969: *Prada*, Jan. 25, 1970, p. 2.<sup>2</sup> Not available.<sup>3</sup> Line 1 increments from preceding year divided by the additions to disposable income derived from table 6, line 7.

## FOREIGN TRADE OF THE U.S.S.R.

By ROBERT S. KOVACH and JOHN T. FARRELL

### A. TRENDS IN TRADE

Soviet foreign trade almost doubled in the period 1960-69—from \$11.2 billion to almost \$22 billion. The average annual rate of 7.6 percent during the period was comparable to that of world trade. Performance, however, has been uneven over the period with a sharp decline in the growth rate in 1956-66 and a growth in 1967-69 in excess of the longer term average. Trade in 1968 was up \$1.86 billion or 10.2 percent over the 1967 level, the largest percentage increase since 1962. Growth in 1969 was even greater than in 1968, exceeding \$1.9 billion and almost 11 percent above the previous year's level.

[In millions of U.S. dollars]

|  | 1960   | 1961   | 1962   | 1963   | 1964   | 1965   | 1966   | 1967   | 1968   | 1969   |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Exports.....                                 | 5,564  | 5,998  | 7,030  | 7,272  | 7,683  | 8,175  | 8,841  | 9,652  | 10,634 | 11,665 |
| Imports.....                                 | 5,628  | 5,828  | 6,455  | 7,059  | 7,736  | 8,058  | 7,913  | 8,537  | 9,410  | 10,327 |
| Turnover.....                                | 11,192 | 11,826 | 13,486 | 14,331 | 15,420 | 16,233 | 16,754 | 18,189 | 20,044 | 21,982 |
| Percentage increase over preceding year..... | 6.4    | 5.7    | 14.0   | 6.3    | 7.6    | 5.3    | 3.2    | 8.6    | 10.2   | 11.0   |

Among the principal causes of the fluctuations in the growth rate of Soviet foreign trade in the 1960's were the changes in intra-CEMA foreign trade prices in 1965-66 which reduced the value of Soviet traded goods. Soviet trade with Eastern Europe hardly increased as a result of the price changes; in 1967-69, however, this trade grew substantially. Another significant factor has been Sino-Soviet relations. Trade with China declined drastically in the 1960's, plunging from more than \$2 billion and almost 20 percent of Soviet trade in 1959 to about \$57 million in 1969, or less than three-tenths of a percent of total Soviet trade.

### B. DISTRIBUTION AND COMPOSITION OF TRADE

In 1960 the share of the Communist world in Soviet foreign trade was about three-fourths, but in recent years the Free World's share has risen to roughly one-third, largely as the result of the rapid growth in trade with the industrial West (see Table 1 in Appendix). The decline in trade with China also was an important factor in the reduced share of the Communist world. Eastern Europe's share has not changed significantly over the decade, but such countries as Cuba and Yugoslavia have become more important in Soviet trade.

Soviet exports have been dominated by fuels, raw materials, and semifinished materials throughout the 1960's (see Table 2 in Appendix). Exports of machinery and equipment, however, have increased significantly—from \$1.1 billion in 1960 to \$2.3 billion in 1968.<sup>1</sup> Most Soviet exports of machinery and equipment have gone to Eastern Europe, and virtually all of the remainder goes to other Communist countries and to the less developed countries of the Free World. Oil exports doubled in the period 1960–68 but they occupied only a slightly greater share in 1968, when they were valued at \$1.3 billion, than in 1960. The growth in exports of oil during 1965–68 resulted largely from substantially increased exports to the industrial West. In 1969, however, Soviet exports of oil apparently increased negligibly, with the industrial West importing less than in 1968. Food exports have now regained their former importance after grain exports fell sharply in 1964–66. Annual grain exports averaged more than \$400 million in 1967–68 compared with \$250 million in 1965–66. The U.S.S.R. is again a net exporter of grain, achieving a net surplus of 3.8 million tons in 1968 following a 1966 import surplus of 4.2 millions tons.<sup>2</sup>

Soviet imports since 1960 have featured machinery and equipment as well as consumer goods (see Table 3 in Appendix). Imports of machinery and equipment—almost three-fourths of which originate in Eastern Europe and most of the remainder in the industrial West—increased from \$1.7 billion in 1960 to almost \$3.5 billion in 1968. Imports of consumer goods, valued at \$3 billion in 1968, have grown little in recent years because of a decline in food imports, particularly wheat in 1967–68. Manufactured consumer goods have figured more importantly in Soviet imports in the last few years, rising from \$1.1 billion in 1965 to more than \$1.8 billion in 1968. Most of these products originate in Eastern Europe, but the industrial West has provided substantial quantities since 1966.

### C. TRADE BY REGION

#### (1) COMMUNIST WORLD—EASTERN EUROPE

Soviet foreign trade with the Communist countries of Eastern Europe grew at an average annual rate of 8.5 percent in the period 1960–69, increasing from \$5.9 billion in 1960 to an estimated \$12.2 billion in 1969. The 8-percent increase in 1969 was a drop from the 11 percent growth rate in 1967–68 but the decline was insignificant compared with 1965–66 when intra-CEMA foreign trade prices were revised. Soviet-Eastern European trade increased only 3 percent in 1965 and declined by 1 percent in 1966—the first decline in this trade since 1955.<sup>3</sup> Despite the slower growth in 1969, Eastern Europe continues to account for well over half of Soviet total foreign trade and more than four-fifths of Soviet trade with the Communist countries.

<sup>1</sup> Detailed data available only through 1968.

<sup>2</sup> Excluding wheat flour.

<sup>3</sup> The price revisions took effect in late 1965, but had their greatest effect in 1966. According to official Soviet data, the volume of Soviet trade with Eastern Europe increased 4 percent in 1966. Soviet export prices declined more than import prices in both 1965 and 1966 so that the Soviet terms of trade worsened in those years.

East Germany has been the U.S.S.R.'s largest trading partner in Eastern Europe and in the world during the period 1960-69 and now accounts for more than 15 percent of total Soviet trade. When viewed in terms of growth, however, Soviet trade with Bulgaria and Poland has been more dynamic; trade with Romania has been the most sluggish (see tabulation below).

*Soviet trade turnover with individual Eastern European Communist countries*

[In millions of U.S. dollars]

|                     | 1960  | 1963  | 1966  | 1967   | 1968   | 1969   |
|---------------------|-------|-------|-------|--------|--------|--------|
| Total.....          | 5,869 | 8,310 | 9,154 | 10,131 | 11,280 | 12,210 |
| Bulgaria.....       | 628   | 940   | 1,351 | 1,536  | 1,841  | 1,949  |
| Czechoslovakia..... | 1,283 | 800   | 1,813 | 1,950  | 2,028  | 2,224  |
| East Germany.....   | 1,981 | 2,618 | 2,645 | 2,829  | 3,112  | 3,368  |
| Hungary.....        | 560   | 867   | 1,016 | 1,183  | 1,344  | 1,419  |
| Poland.....         | 877   | 1,277 | 1,536 | 1,815  | 2,082  | 2,323  |
| Rumania.....        | 541   | 309   | 792   | 819    | 873    | 926    |

Generally speaking, the commodity composition of Soviet-East European trade has shown little variation over time. Industrial and agricultural raw materials, semifinished products, and fuels have dominated Soviet exports to Eastern Europe (see table 4 in Appendix). The bulk of these exports are shipped to East Germany, Czechoslovakia, and Poland, which are heavily dependent on such goods. Soviet exports of ores, metals, and fuels—the basic raw materials for industry—have accounted for approximately 40 percent of total exports to the area for a number of years.

Prior to the 1963 grain crisis, the U.S.S.R. had supplied a large quantity of grain to Eastern Europe. After 1963, grain exports to Eastern Europe declined sharply, reaching a low of 2.9 million tons in 1966, a substantial decline from the 4.9 million tons exported in 1962. Improved Soviet crops enabled the U.S.S.R. to expand its exports of grain to Eastern Europe in 1968 to 3.8 million tons (\$277 million) (see Table 4 in Appendix).

During this period, particularly in recent years, there has been increased Soviet pressure on Eastern Europe to take more Soviet machinery and equipment. As a result, Soviet exports of machinery and equipment to the Eastern European countries have grown at an average rate of more than 15 percent during the period and as a share of total Soviet exports to the area rose from nearly 13 percent in 1960 to nearly 22 percent in 1968. In 1968, such exports were valued at roughly \$1.2 billion, featuring, as usual, transport equipment (chiefly motor vehicles), complete plants, and agricultural equipment. The major share of these exports continues to be sent to the less developed Eastern European countries, particularly Bulgaria, which normally accounts for one-third of the total exported to Eastern Europe by the U.S.S.R.

Soviet imports from Eastern Europe have been dominated by machinery and equipment and manufactured consumer goods (see Table 5 in Appendix). Transport equipment normally accounts for about one-third of the machinery and equipment imported (mainly railroad rolling stock and ships). As might be expected, East Germany



has been the largest supplier of machinery to the U.S.S.R. for a number of years. Imports of East German machinery in 1968 were valued at more than \$900 million, more than one-third of the value of all Soviet imports of machinery and equipment from Eastern Europe and more than the U.S.S.R. bought from the entire West. Another \$500 million worth of machinery and equipment was imported from Czechoslovakia.

Consumer goods have become increasingly important in Soviet imports from Eastern Europe. In 1968, they totaled more than \$1.6 billion, up by about \$1 billion since 1960. The largest and the fastest growing share of consumer goods imported is made up of manufactured goods, growing from about \$475 million in 1960 to almost \$1.3 billion in 1968. More than half of the 1968 total consisted of clothing and footwear.

## (2) CEMA

The Council of Mutual Economic Assistance (commonly known as CEMA or Comecon) behind its indispensable facade of unanimity is as far as ever from adopting a program for the "economic integration" of Eastern Europe. There is no evidence that CEMA in its 20 years has contributed much to the economic integration of its members. Trade among them has been bilaterally planned and for the most part bilaterally balanced, as is their trade with nearly all countries. Trade between CEMA countries has grown rapidly but not more rapidly than their trade with the rest of the world or with Western Europe.

The increase in trade among EEC countries since the initiation of the Common Market has been nearly twice the increase in intra-CEMA trade over the same period. Eastern Europeans have been impressed with the rapid technological development and the high level of efficiency in Western Europe—especially in the Common Market—which they attribute in good part to "economic integration." Various proposals for cooperation in CEMA to emulate these achievements have been under consideration for months. None, however, has much prospect of adoption, which under CEMA rules can be done only by unanimous consent.

The Soviet leadership favors "economic integration" in Eastern Europe through closer coordination of plans largely as a means of binding the smaller states closer to Moscow. The U.S.S.R. has not been pushing any specific proposal and has put aside the idea of "supranational planning," an approach suggested by Khrushchev in 1962 but quickly rejected by the Eastern Europeans. There has been little enthusiasm in Eastern Europe for closer plan coordination for fear of more outside interference in national economic policy. Only Poland has supported this approach.

The U.S.S.R. would like to see further cooperation among CEMA members, and apparently would back "selective integration" in relatively new and expanding industries—such as chemicals and electronics—that require heavy investment for development. Such joint ventures can help to surmount the problems of the limited resources and small markets of the Eastern European countries and can be arranged within the present framework of bilateralism. These joint ventures would also contribute to the economic cohesion of the Eastern European countries—politically desirable to the U.S.S.R.—without infringing on their economic sovereignty. In any event the

U.S.S.R. will not accept any formula which effectively diminishes its economic and political control over Eastern Europe or significantly increases the costs of maintaining such control.

### (3) COMMUNIST CHINA

Soviet trade with China grew rapidly in the 1950's and has featured a large Soviet surplus each year through 1955 as the result of Soviet aid in building the Chinese economy. Trade continued to increase after 1955, reaching a peak in 1959 of more than \$2 billion, but the U.S.S.R. had a deficit each year as China started paying off its huge aid bill (estimated at roughly \$1.8 billion). Repayments were completed in 1965. The Sino-Soviet split in 1960 brought a precipitous decline in trade throughout the 1960's, climaxed in 1969 when trade turnover was reduced to about \$57 million. Neither the U.S.S.R. nor China, however, has indicated a desire to terminate trade entirely, despite the intensity of the ideological conflict.

The principal Soviet exports to China have been machinery and metals and Soviet imports have been primarily manufactured consumer goods. The value of such imports and exports had declined steadily since 1959.

#### *Soviet trade with Communist China, selected years*

[In millions of U.S. dollars]

|                | 1958  | 1959  | 1960  | 1963 | 1965 | 1966 | 1967 | 1968 | 1969 |
|----------------|-------|-------|-------|------|------|------|------|------|------|
| Exports .....  | 634   | 955   | 817   | 187  | 192  | 175  | 50   | 59   | 28   |
| Imports .....  | 88    | 1,100 | 848   | 413  | 226  | 143  | 57   | 37   | 29   |
| Turnover ..... | 1,515 | 2,055 | 1,665 | 600  | 417  | 318  | 107  | 96   | 57   |

### (4) OTHER COMMUNIST COUNTRIES

#### *Soviet trade with other Communist countries*

[In millions of U.S. dollars]

| Country             | 1960 | 1963 | 1966 | 1967 | 1968 | 1969 |
|---------------------|------|------|------|------|------|------|
| Yugoslavia .....    | 108  | 183  | 407  | 513  | 506  | 473  |
| Cuba .....          | 178  | 564  | 766  | 936  | 902  | 856  |
| North Vietnam ..... | 48   | 92   | 94   | 169  | 177  | 206  |
| North Korea .....   | 114  | 170  | 178  | 218  | 293  | 328  |
| Mongolia .....      | 139  | 166  | 220  | 249  | 247  | 249  |
| Albania .....       | 68   | 0    | 0    | 0    | 0    | 0    |

Trade with Yugoslavia has increased steadily in the 1960's, seemingly unaffected by political and ideological differences as was the case in the previous decade. The slight decline in 1968 probably was a function of supply and demand rather than political differences, but the latter may be a factor in the current development of Soviet-Yugoslav trade. Cuba has continued as the leading Soviet trade partner in this group of countries. This trade is sustained to a significant degree by Soviet economic assistance. The 1968 total of \$902 million was a decline from the all time high of \$936 million in 1967 and reflected a decrease in Soviet imports of sugar of about \$100 million. Increased Soviet aid apparently offset this decline to a large degree. Soviet trade with Cuba may have declined further in 1969.

Soviet trade with North Vietnam increased steadily in the early 1960's but as the conflict in Vietnam expanded, Soviet trade and aid became the major prop to the North Vietnam economy and war efforts. The sharp increases in trade in 1967-68 reflect Soviet exports—largely aid goods—while imports from North Vietnam have declined. In 1968 Soviet exports totaled \$159 million and imports \$18 million. Trade with North Korea has increased substantially in recent years. These increases, after a number of years of stagnation, reflect a slight thaw in political relations as North Korean relations with Communist China have worsened. Soviet exports, in part reflecting economic aid, increased \$62 million in 1968 to a level of \$172 million. Soviet trade with Mongolia to a considerable extent has been generated by an extensive Soviet aid program, with exports typically exceeding imports two to three times. Soviet exports approached the \$200 million mark in 1968.

#### (5) FREE WORLD (HARD CURRENCY TRADE)

Well over half of the U.S.S.R.'s trade with the Free World and more than 90 percent of its trade with the industrial West is conducted in hard currencies. The U.S.S.R. attaches special importance to this trade because of its need for Western equipment and technology and other materials which are in short supply in the U.S.S.R. Until recently the failure of the U.S.S.R. to generate sufficient hard currency earnings through exports led to disequilibrium in Soviet hard currency trade, characterized by substantial annual deficits and sizable sales of gold to finance these deficits.

The Soviet gold reserve had been husbanded carefully during Stalin's time, but Khrushchev did not believe in "sitting on sacks of gold" and used it freely to help finance growing imports of Western equipment and technology. Gold sales averaged well over \$200 million during this period 1959-62, and increased to more than \$500 million annually during 1963-65 to help pay for about \$1.7 billion in wheat imported from hard currency countries during 1963-66. Annual gold production—about \$160 million in 1963 and increasing to roughly \$200 million in 1968<sup>4</sup>—was considerably less than sales and the Soviet gold reserve was consequently reduced.

The deficits<sup>5</sup> were considerably less than might have been expected, however, averaging about \$335 million annually during 1963-66 despite wheat imports of about \$400 million annually (see tabulation below). This result was realized by reducing imports of industrial goods, including machinery and equipment from Western Europe and Japan, and expanding exports after 1964, particularly oil, cotton, logs, and food. In addition, short-term credit facilities were employed more extensively to finance the deficit, especially in 1966 when the U.S.S.R. sold little, if any, gold. In 1967 the U.S.S.R. achieved a hard currency surplus for the first time in about a decade, resulting from both expansion of exports and a reduction of imports of wheat rather than industrial goods. The return to a deficit position in 1968 resulted from a large increase in imports, particularly machinery and equipment from Western Europe, but the deficit was small relative to those

<sup>4</sup> Based on U.S. Bureau of Mines estimates.

<sup>5</sup> Merchandise trade is one—albeit the largest—element in the current account of a country's balance of payments. In most cases the Soviet hard currency payments deficit has been larger than the trade deficit, as was the surplus in 1967. Other current account elements include freight, insurance, interest, tourism and others.

incurred in earlier years. In 1969, however, the Soviet deficit was about \$310 million, once again resulting from a large increase in imports, both from Western Europe and from Japan and the United States.

*Soviet hard currency trade, imports of wheat, and sales of gold, 1960-69*

[In millions of U.S. dollars]

| Year                    | Exports | Imports | Balance | Imports of wheat <sup>1</sup> | Sales of gold <sup>2</sup> |
|-------------------------|---------|---------|---------|-------------------------------|----------------------------|
| 1960.....               | 745     | 1,015   | -270    | (3)                           | 200                        |
| 1961.....               | 865     | 1,060   | -195    | 31                            | 300                        |
| 1962.....               | 915     | 1,180   | -265    | (3)                           | 215                        |
| 1963.....               | 960     | 1,280   | -320    | 187                           | 550                        |
| 1964.....               | 1,010   | 1,545   | -535    | 570                           | 450                        |
| 1965.....               | 1,325   | 1,545   | -220    | 409                           | 550                        |
| 1966.....               | 1,480   | 1,745   | -265    | 495                           | (3)                        |
| 1967.....               | 1,690   | 1,600   | +90     | 147                           | 15                         |
| 1968.....               | 1,895   | 1,990   | -95     | 110                           | 12                         |
| 1969 <sup>4</sup> ..... | 2,105   | 2,425   | -320    | 30                            | (3)                        |

<sup>1</sup> Including wheat flour; excluding transportation costs.

<sup>2</sup> Based on value of \$35 per troy ounce.

<sup>3</sup> Not available.

<sup>4</sup> Preliminary estimates.

The Soviet response in 1964-66 to what it considered a threat to its financial position seems sensible. The major cost of the retrenchment was in the imports of Western capital goods foregone and, as a consequence, perhaps some slowdown in the growth of domestic output. It seems fairly evident that Soviet gold stocks were rapidly dwindling; otherwise it would be difficult to explain why the U.S.S.R. felt it necessary to curb imports of high priority goods and to pay high interest charges for the use of Western funds to help finance its deficits.

#### (6) INDUSTRIAL WEST

Soviet trade with the industrial West in the period 1960-69 grew at a rate of 9.6 percent and in 1969 increased almost 13 percent. Trade in 1969 was more than \$4.7 billion, compared with \$4.2 billion in 1968. This trade with the West is conducted largely with Western European countries, which have accounted for the major share of this trade throughout this period. They now account for more than three-fourths of Soviet trade with the West. This pattern had been altered somewhat during the period 1964-66, when the U.S.S.R. imported large quantities of wheat from Canada, the United States, and Australia, but by 1967 it was restored when wheat imports declined sharply.

Soviet trade with the industrial West is typically an exchange of Soviet fuels, raw materials, and semimanufactures for Western machinery and other manufactures (see tables 6 and 7 in appendix). Soviet exports have continued to feature oil, coal, wood, cotton, metals and food despite Soviet efforts to diversify the range of products and increase the sale of manufactured goods. Thus the most notable successes in expanding exports in recent years have still been among the old Soviet standbys—oil, sawn logs, vegetable oils, cotton, diamonds, and other goods of the raw or semiprocessed variety. Oil alone represents nearly one-fourth of all Soviet exports to the West, totaling more

than \$500 million in 1968. Wood and wood products—chiefly lumber and logs—account for about one-sixth of the total, providing the U.S.S.R. with almost \$340 million in export earnings in the West.

Machinery and equipment have made up a large part of Soviet imports from the West, typically accounting for roughly one-third to two-fifths of the total. The substantial imports of wheat in 1964–66 brought a decline in imports of machinery—from an average of about \$600 million in 1962–64 to about \$500 million in 1965. Machinery again assumed greater importance when wheat imports declined in 1967. In 1968 Soviet imports of machinery and equipment reached an alltime high of almost \$900 million. Imports of metals from the West also declined during the period of large wheat imports; they may have regained their former importance in 1969 when the U.S.S.R. imported substantial quantities of Western steel.<sup>6</sup> Wheat imports from the West, which had risen from nothing in 1962 to almost one-fourth of total Soviet imports from the West in 1966, declined to less than 6 percent of these imports in 1968 and to 1 percent in 1969.

Meanwhile, a new element in Soviet imports from the West has appeared in the form of manufactured consumer goods, mostly clothing and footwear. As a result, the pattern of imports from the West now strongly resembles that of Soviet imports from Eastern Europe. The increased attention to consumer welfare in the U.S.S.R., reflected in the expanded imports of consumer goods in the last year or two, is also shown in the increased imports from the West of consumer-oriented plants and machinery such as textile- and shoe-manufacturing equipment. This pattern may continue because the U.S.S.R. is continuing to place orders in the West for substantial quantities of clothing and footwear.

#### (7) LESS DEVELOPED COUNTRIES

Soviet trade with the less developed countries rose slightly in 1968 to slightly more than \$1.8 billion, following a decline in 1967. This trade had remained at about the same level since 1965, and this failure to grow in recent years was attributable in part to the reduced level of Soviet economic aid deliveries. In 1969, however, this trade increased by almost \$450 million, rising to about \$2.3 billion. Most of the sudden spurt resulted from increased exports to Middle Eastern and North African countries.

The commodity composition of Soviet trade with the less developed countries has not undergone any fundamental changes in the last few years (see tables 8 and 9 in appendix). The dominant element of developmental aid is reflected in exports of machinery and equipment which account for roughly one-half of all Soviet exports to the area, and about three-fifths of that category is composed of complete plants. Exports of food, normally an unimportant element in Soviet exports to these countries, rose sharply in 1967, largely as a result of large wheat sales to the United Arab Republic, but fell off somewhat in 1968.

<sup>6</sup> Imports of metals fell from about \$300 million in 1962 to less than \$100 million in 1964; they were valued at \$157 million in 1968.

Textile fibers—especially cotton—natural rubber, and food make up the bulk of Soviet imports from the less developed countries. Imports of cotton, however, have been declining since 1965, particularly from the United Arab Republic. Natural rubber imports fell in 1967 and 1968. Food imports also fell in 1967 but increased again in 1968, reflecting larger Soviet imports of various food products, particularly cocoa from Nigeria. The year 1968 also marked the import of \$9 million in natural gas from Afghanistan—the first major Soviet purchase of energy resources from a less developed country.

## APPENDIX TABLES

TABLE 1.—*U.S.S.R. geographic distribution of trade, 1960, 1963, 1966-69*

[In millions of U.S. dollars and percent of total]

| Area                           | 1960   |         | 1963   |         | 1966   |                  | 1967   |                  | 1968   |                  | 1969             |                  |
|--------------------------------|--------|---------|--------|---------|--------|------------------|--------|------------------|--------|------------------|------------------|------------------|
|                                | Value  | Percent | Value  | Percent | Value  | Percent          | Value  | Percent          | Value  | Percent          | Value            | Percent          |
| Total <sup>1</sup> .....       | 11,192 | 100.0   | 14,331 | 100.0   | 16,754 | 100.0            | 18,189 | 100.0            | 20,044 | 100.0            | 21,982           | 100.0            |
| Communist countries.....       | 8,190  | 73.2    | 10,086 | 70.4    | 11,137 | 66.5             | 12,322 | 67.8             | 13,502 | 67.4             | 14,378           | 65.4             |
| Eastern Europe.....            | 5,869  | 52.4    | 8,310  | 58.0    | 9,154  | 54.6             | 10,131 | 55.7             | 11,280 | 56.3             | 12,210           | 55.5             |
| China.....                     | 1,665  | 14.9    | 600    | 4.2     | 318    | 1.9              | 107    | 0.6              | 96     | .5               | 57               | .3               |
| Other <sup>2</sup> .....       | 655    | 5.9     | 1,175  | 8.2     | 1,664  | 9.9              | 2,084  | 11.5             | 2,125  | 10.6             | 2,112            | 9.6              |
| Free world.....                | 3,002  | 26.8    | 4,245  | 29.6    | 5,617  | 33.5             | 5,866  | 32.2             | 6,543  | 32.6             | 7,604            | 34.6             |
| Industrial West.....           | 2,063  | 18.5    | 2,618  | 18.3    | 3,453  | 20.6             | 3,667  | 20.2             | 4,195  | 20.9             | 4,725            | 21.5             |
| LDC's.....                     | 903    | 8.1     | 1,416  | 9.9     | 1,790  | 10.7             | 1,768  | 9.7              | 1,831  | 9.1              | 2,286            | 10.4             |
| Hong Kong.....                 |        |         |        |         | 3      | ( <sup>3</sup> ) | 3      | ( <sup>3</sup> ) | 4      | ( <sup>3</sup> ) | ( <sup>3</sup> ) | ( <sup>3</sup> ) |
| Unspecified <sup>4</sup> ..... | 37     | .3      | 212    | 1.5     | 371    | 2.2              | 429    | 2.4              | 513    | 2.6              | 593              | 2.7              |

<sup>1</sup>Because of rounding, components may not add to the totals shown.

<sup>2</sup>Includes Cuba.

<sup>3</sup>Negligible.

<sup>4</sup>Composed primarily of trade with the less developed countries.

<sup>5</sup>No record.

TABLE 2.—U.S.S.R. commodity composition of exports, 1960, 1963, 1965-68

[In millions of U.S. dollars and percent of total]

| Commodity                                       | 1960  |         | 1963  |         | 1965  |         | 1966  |         | 1967  |         | 1968   |         |
|---|-------|---------|-------|---------|-------|---------|-------|---------|-------|---------|--------|---------|
|   | Value | Percent | Value | Percent | Value | Percent | Value | Percent | Value | Percent | Value  | Percent |
| Total exports <sup>1</sup> .....                | 5,564 | 100.0   | 7,272 | 100.0   | 8,175 | 100.0   | 8,841 | 100.0   | 9,652 | 100.0   | 10,634 | 100.0   |
| Machinery and equipment.....                    | 1,141 | 20.5    | 1,435 | 19.7    | 1,636 | 20.0    | 1,838 | 20.8    | 2,063 | 21.1    | 2,302  | 21.6    |
| Complete plants.....                            | 569   | 10.2    | 555   | 7.6     | 614   | 7.5     | 641   | 7.3     | 721   | 7.5     | 819    | 7.7     |
| Fuels, lubricants, and related materials.....   | 902   | 16.2    | 1,289 | 17.7    | 1,386 | 17.0    | 1,430 | 16.2    | 1,527 | 15.8    | 1,675  | 15.8    |
| Coal and coke.....                              | 242   | 4.4     | 377   | 5.2     | 384   | 4.7     | 359   | 4.1     | 351   | 3.6     | 341    | 3.2     |
| Petroleum and petroleum products.....           | 658   | 11.8    | 910   | 12.5    | 999   | 12.2    | 1,064 | 12.0    | 1,156 | 12.0    | 1,307  | 12.3    |
| Ores and concentrates.....                      | 243   | 4.4     | 291   | 4.0     | 310   | 3.8     | 302   | 3.4     | 326   | 3.4     | 351    | 3.3     |
| Iron ore.....                                   | 175   | 3.1     | 236   | 3.2     | 251   | 3.1     | 242   | 2.7     | 262   | 2.7     | 290    | 2.7     |
| Base metals and manufactures.....               | 838   | 15.1    | 1,013 | 13.9    | 1,330 | 16.3    | 1,346 | 15.2    | 1,339 | 13.9    | 1,449  | 13.6    |
| Ferrous metals.....                             | 643   | 11.6    | 794   | 10.9    | 998   | 12.2    | 965   | 10.9    | 975   | 10.1    | 1,013  | 9.5     |
| Rolled ferrous metals.....                      | 429   | 7.7     | 551   | 7.6     | 659   | 8.1     | 633   | 7.2     | 644   | 6.7     | 663    | 6.2     |
| Nonferrous metals.....                          | 195   | 3.5     | 219   | 3.0     | 332   | 4.1     | 380   | 4.3     | 365   | 3.8     | 436    | 4.1     |
| Aluminum.....                                   | 45    | 0.8     | 80    | 1.1     | 111   | 1.4     | 119   | 1.3     | 121   | 1.3     | 138    | 1.3     |
| Chemicals.....                                  | 150   | 2.7     | 193   | 2.7     | 245   | 3.0     | 278   | 3.1     | 325   | 3.4     | 372    | 3.5     |
| Wood and wood products.....                     | 305   | 5.5     | 414   | 5.7     | 594   | 7.3     | 622   | 7.0     | 626   | 6.5     | 680    | 6.4     |
| Lumber.....                                     | 183   | 3.3     | 235   | 3.2     | 312   | 3.8     | 308   | 3.5     | 283   | 2.9     | 292    | 2.7     |
| Textile raw materials and semimanufactures..... | 359   | 6.4     | 338   | 4.6     | 421   | 5.2     | 460   | 5.2     | 451   | 4.7     | 476    | 4.5     |
| Cotton fiber.....                               | 289   | 5.2     | 244   | 3.3     | 335   | 4.1     | 368   | 4.2     | 373   | 3.9     | 404    | 3.8     |
| Consumer goods.....                             | 899   | 16.2    | 1,156 | 15.9    | 994   | 11.1    | 1,046 | 11.8    | 1,358 | 14.1    | 1,334  | 12.5    |
| Food.....                                       | 693   | 12.5    | 908   | 12.5    | 664   | 8.1     | 786   | 8.9     | 1,081 | 11.2    | 1,030  | 9.7     |
| Grain.....                                      | 468   | 8.4     | 424   | 5.8     | 270   | 3.3     | 232   | 2.6     | 450   | 4.7     | 383    | 3.6     |
| Other consumer goods.....                       | 206   | 3.7     | 263   | 3.4     | 240   | 2.9     | 260   | 2.9     | 277   | 2.9     | 304    | 2.9     |
| Other merchandise.....                          | 210   | 3.8     | 226   | 3.1     | 240   | 2.9     | 310   | 3.5     | 306   | 3.8     | 379    | 3.6     |
| Unspecified.....                                | 516   | 9.3     | 917   | 12.6    | 1,108 | 13.6    | 1,210 | 13.7    | 1,297 | 13.4    | 1,617  | 15.2    |

<sup>1</sup> Because of rounding, components may not add to totals shown.



TABLE 3.—U.S.S.R. commodity composition of imports, 1960, 1963, 1965-68

[In millions of U.S. dollars and percent of total]

| Commodity                                     | 1960  |         | 1963  |         | 1965  |         | 1966  |         | 1967  |         | 1968  |         |
|---|-------|---------|-------|---------|-------|---------|-------|---------|-------|---------|-------|---------|
|   | Value | Percent | Value | Percent | Value | Percent | Value | Percent | Value | Percent | Value | Percent |
| Total imports <sup>1</sup> .....              | 5,628 | 100.0   | 7,050 | 100.0   | 8,058 | 100.0   | 7,913 | 100.0   | 8,537 | 100.0   | 9,410 | 100.0   |
| Machinery and equipment.....                  | 1,675 | 29.8    | 2,466 | 34.9    | 2,692 | 33.4    | 2,565 | 32.4    | 2,917 | 34.2    | 3,474 | 36.9    |
| Transportation equipment.....                 | 660   | 11.7    | 847   | 12.0    | 990   | 12.3    | 944   | 11.9    | 927   | 10.9    | 1,031 | 11.0    |
| Fuels, lubricants, and related materials..... | 237   | 4.2     | 202   | 2.9     | 199   | 2.5     | 184   | 2.3     | 186   | 2.2     | 178   | 1.9     |
| Coal and coke.....                            | 94    | 1.7     | 97    | 1.4     | 123   | 1.5     | 127   | 1.6     | 135   | 1.6     | 122   | 1.3     |
| Petroleum and petroleum products.....         | 144   | 2.6     | 105   | 1.5     | 75    | .9      | 57    | .7      | 51    | .6      | 47    | .5      |
| Ores and concentrates.....                    | 314   | 5.6     | 292   | 4.1     | 316   | 3.9     | 300   | 3.8     | 314   | 3.7     | 187   | 2.0     |
| Base metals and manufactures.....             | 546   | 9.7     | 465   | 6.6     | 393   | 4.9     | 308   | 3.9     | 355   | 4.2     | 452   | 4.8     |
| Ferrous metals.....                           | 374   | 6.6     | 340   | 4.8     | 317   | 3.9     | 249   | 3.2     | 295   | 3.5     | 375   | 4.0     |
| Rolled ferrous metals.....                    | 179   | 3.2     | 169   | 2.4     | 136   | 1.7     | 99    | 1.3     | 145   | 1.7     | 203   | 2.2     |
| Pipe.....                                     | 159   | 2.8     | 137   | 1.9     | 155   | 1.9     | 125   | 1.6     | 118   | 1.4     | 154   | 1.6     |
| Nonferrous metals.....                        | 172   | 3.1     | 125   | 1.8     | 75    | .9      | 58    | .7      | 60    | .7      | 77    | .8      |
| Copper.....                                   | 72    | 1.3     | 62    | .9      | (?)   | (?)     | 8     | .1      | 1     | (?)     | 11    | .1      |
| Tin.....                                      | 35    | .6      | 17    | .2      | 21    | .3      | 16    | .2      | 18    | .2      | 22    | .2      |
| Chemicals.....                                | 149   | 2.7     | 285   | 4.0     | 375   | 4.7     | 398   | 5.0     | 467   | 5.5     | 536   | 5.7     |
| Rubber and rubber products.....               | 196   | 3.5     | 213   | 3.0     | 199   | 2.5     | 207   | 2.6     | 183   | 2.1     | 172   | 1.8     |
| Wood and wood products.....                   | 105   | 1.9     | 119   | 1.7     | 150   | 1.9     | 152   | 1.9     | 187   | 2.2     | 201   | 2.1     |
| Textile raw materials and semifinances.....   | 365   | 6.5     | 339   | 4.8     | 358   | 4.4     | 375   | 4.7     | 343   | 4.0     | 368   | 3.9     |
| Cotton fiber.....                             | 180   | 3.2     | 170   | 2.4     | 162   | 2.0     | 140   | 1.8     | 113   | 1.3     | 119   | 1.3     |
| Wool fiber.....                               | 118   | 2.1     | 89    | 1.3     | 100   | 1.2     | 118   | 1.5     | 89    | 1.0     | 109   | 1.2     |
| Consumer goods.....                           | 1,572 | 27.9    | 2,113 | 29.9    | 2,657 | 33.0    | 2,725 | 34.4    | 2,859 | 33.5    | 3,004 | 31.9    |
| Food.....                                     | 612   | 10.9    | 873   | 12.4    | 1,511 | 18.8    | 1,444 | 18.2    | 1,238 | 14.5    | 1,165 | 12.4    |
| Wheat and wheat flour.....                    | 10    | .2      | 237   | 3.4     | 425   | 5.3     | 515   | 6.5     | 151   | 1.8     | 125   | 1.3     |
| Other consumer goods.....                     | 960   | 17.1    | 1,240 | 17.6    | 1,146 | 14.2    | 1,281 | 16.2    | 1,621 | 19.0    | 1,839 | 19.5    |
| Other merchandise.....                        | 376   | 6.7     | 409   | 5.8     | 480   | 6.0     | 479   | 6.1     | 480   | 5.6     | 467   | 5.0     |
| Unspecified.....                              | 93    | 1.7     | 156   | 2.2     | 239   | 3.0     | 220   | 2.8     | 240   | 2.9     | 371   | 3.9     |

<sup>1</sup> Because of rounding, components may not add to totals shown.

<sup>2</sup> Negligible.

TABLE 4.—U.S.S.R. commodity composition of exports to Eastern European Communist countries, 1960, 1963, 1965–68

[In millions of U.S. dollars and percent of total]

| Commodity                                     | 1960  |         | 1963  |         | 1965  |         | 1966  |         | 1967  |         | 1968  |         |
|---|-------|---------|-------|---------|-------|---------|-------|---------|-------|---------|-------|---------|
|   | Value | Percent | Value | Percent | Value | Percent | Value | Percent | Value | Percent | Value | Percent |
| Total exports <sup>1</sup> .....              | 3,074 | 100.0   | 4,163 | 100.0   | 4,553 | 100.0   | 4,692 | 100.0   | 5,039 | 100.0   | 5,636 | 100.0   |
| Machinery and equipment.....                  | 389   | 12.7    | 735   | 17.7    | 787   | 17.3    | 960   | 20.5    | 1,102 | 21.9    | 1,230 | 21.8    |
| Complete plants.....                          | 96    | 3.1     | 184   | 4.4     | 213   | 4.7     | 246   | 5.2     | 276   | 5.5     | 301   | 5.3     |
| Fuels, lubricants, and related materials..... | 413   | 13.4    | 655   | 15.7    | 738   | 16.2    | 715   | 15.2    | 735   | 14.6    | 796   | 14.1    |
| Coal and coke.....                            | 171   | 5.6     | 265   | 6.4     | 265   | 5.8     | 243   | 5.2     | 226   | 4.5     | 204   | 3.6     |
| Petroleum and petroleum products.....         | 240   | 7.8     | 388   | 9.3     | 470   | 10.3    | 466   | 9.9     | 489   | 9.7     | 567   | 10.1    |
| Ores and concentrates.....                    | 207   | 6.7     | 264   | 6.4     | 271   | 6.0     | 254   | 5.4     | 273   | 5.4     | 296   | 5.3     |
| Iron ore.....                                 | 171   | 5.6     | 230   | 5.5     | 243   | 5.3     | 231   | 4.9     | 248   | 4.9     | 274   | 4.9     |
| Base metals and manufactures.....             | 579   | 18.8    | 755   | 18.1    | 928   | 20.4    | 917   | 19.5    | 952   | 18.9    | 1,042 | 18.5    |
| Ferrous metals.....                           | 448   | 14.6    | 598   | 14.4    | 718   | 15.8    | 700   | 14.9    | 723   | 14.4    | 766   | 13.6    |
| Rolled ferrous metals.....                    | 326   | 10.6    | 448   | 10.8    | 524   | 11.5    | 512   | 10.9    | 525   | 10.4    | 536   | 9.5     |
| Nonferrous metals.....                        | 132   | 4.3     | 156   | 3.7     | 210   | 4.6     | 217   | 4.6     | 229   | 4.5     | 276   | 4.9     |
| Aluminum.....                                 | 31    | 1.0     | 51    | 1.2     | 72    | 1.6     | 66    | 1.4     | 75    | 1.5     | 97    | 1.7     |
| Chemicals.....                                | 64    | 2.1     | 92    | 2.2     | 123   | 2.7     | 135   | 2.9     | 144   | 2.9     | 171   | 3.0     |
| Wood and wood products.....                   | 99    | 3.2     | 139   | 3.3     | 186   | 4.1     | 200   | 4.3     | 220   | 4.4     | 249   | 4.4     |
| Lumber.....                                   | 59    | 1.9     | 83    | 2.0     | 101   | 2.2     | 100   | 2.1     | 102   | 2.0     | 113   | 2.0     |
| Textile raw materials and semifinances.....   | 282   | 9.2     | 274   | 6.6     | 322   | 7.1     | 332   | 7.1     | 290   | 5.8     | 306   | 5.4     |
| Cotton fiber.....                             | 234   | 7.6     | 201   | 4.8     | 255   | 5.6     | 266   | 5.7     | 235   | 4.7     | 258   | 4.6     |
| Consumer goods.....                           | 564   | 18.3    | 607   | 14.6    | 424   | 9.3     | 465   | 9.9     | 584   | 11.6    | 574   | 10.2    |
| Food.....                                     | 490   | 15.9    | 520   | 12.5    | 353   | 7.8     | 390   | 8.3     | 500   | 9.9     | 471   | 8.4     |
| Grain.....                                    | 346   | 11.3    | 297   | 7.1     | 200   | 4.4     | 188   | 4.0     | 271   | 5.4     | 277   | 4.9     |
| Other consumer goods.....                     | 75    | 2.4     | 86    | 2.1     | 71    | 1.6     | 75    | 1.6     | 84    | 1.7     | 103   | 1.8     |
| Other merchandise.....                        | 94    | 3.1     | 121   | 2.9     | 129   | 2.8     | 152   | 3.2     | 173   | 3.4     | 182   | 3.2     |
| Unspecified.....                              | 383   | 12.5    | 522   | 12.5    | 645   | 14.2    | 562   | 12.0    | 563   | 11.2    | 789   | 14.0    |

<sup>1</sup> Because of rounding, components may not add to totals shown.

TABLE 5.—U.S.S.R. commodity composition of imports from Eastern European Communist countries, 1960, 1963, 1965-68

[In millions of U.S. dollars and percent of total]

| Commodity  | 1960  |         | 1963  |         | 1965             |         | 1966            |         | 1967  |         | 1968             |         |
|--|-------|---------|-------|---------|------------------|---------|-----------------|---------|-------|---------|------------------|---------|
|  | Value | Percent | Value | Percent | Value            | Percent | Value           | Percent | Value | Percent | Value            | Percent |
| Total imports <sup>1</sup> .....                       | 2,795 | 100.0   | 4,147 | 100.0   | 4,673            | 100.0   | 4,462           | 100.0   | 5,092 | 100.0   | 5,644            | 100.0   |
| Machinery and equipment.....                           | 1,209 | 43.2    | 1,859 | 44.8    | 2,114            | 45.2    | 1,926           | 43.2    | 2,185 | 42.9    | 2,509            | 44.5    |
| Transportation equipment.....                          | 531   | 19.0    | 670   | 16.2    | 729              | 15.6    | 678             | 15.2    | 755   | 14.8    | 848              | 15.0    |
| Fuels, lubricants, and related materials.....          | 208   | 7.4     | 182   | 4.4     | 189              | 4.1     | 175             | 3.9     | 176.  | 3.5     | 160              | 2.8     |
| Coal and coke.....                                     | 91    | 3.3     | 94    | 2.3     | 119              | 2.6     | 127             | 2.8     | 134   | 2.6     | 122              | 2.2     |
| Petroleum and petroleum products.....                  | 117   | 4.2     | 88    | 2.1     | 70               | 1.5     | 48              | 1.1     | 42    | .8      | 38               | .7      |
| Ores, concentrates, base metals, and manufactures..... | 197   | 7.0     | 249   | 6.0     | 274              | 5.9     | 217             | 4.9     | 212   | 4.2     | 238              | 4.2     |
| Ores and concentrates <sup>2</sup> .....               | 26    | .9      | 32    | .8      | 14               | .3      | 14              | .3      | 8     | .2      | 14               | .2      |
| Base metals and manufactures <sup>2</sup> .....        | 95    | 3.4     | 165   | 3.7     | 129              | 2.8     | 96              | 2.2     | 78    | 1.5     | 113              | 2.0     |
| Ferrous metals.....                                    | 80    | 2.9     | 145   | 3.5     | <sup>2</sup> 107 | 2.3     | <sup>2</sup> 89 | 2.0     | 77    | 1.5     | <sup>2</sup> 102 | 1.8     |
| Rolled ferrous metals.....                             | 21    | .8      | 50    | 1.2     | 30               | .6      | 25              | .6      | 17    | .3      | 53               | .9      |
| Nonferrous metals <sup>2</sup> .....                   | 14    | .5      | 10    | .2      | 22               | .5      | 7               | .2      | 1     | (*)     | 11               | .2      |
| Chemicals.....   | 73    | 2.6     | 171   | 4.1     | 198              | 4.2     | 213             | 4.8     | 256   | 5.0     | 292              | 5.2     |
| Rubber and rubber products.....                        | 22    | .8      | 25    | .6      | 28               | .6      | 31              | .7      | 40    | .8      | 39               | .7      |
| Wood and wood products.....                            | 44    | 1.6     | 45    | 1.1     | 39               | .8      | 37              | .8      | 42    | .8      | 41               | .7      |
| Consumer goods.....                                    | 646   | 23.1    | 1,075 | 25.9    | 1,189            | 25.4    | 1,276           | 28.6    | 1,532 | 30.1    | 1,636            | 29.0    |
| Food.....  | 170   | 6.1     | 262   | 6.3     | 305              | 6.5     | 290             | 6.5     | 353   | 6.9     | 364              | 6.4     |
| Other consumer goods.....                              | 476   | 17.0    | 812   | 19.6    | 884              | 18.9    | 986             | 22.1    | 1,180 | 23.2    | 1,272            | 22.5    |
| Other merchandise.....                                 | 120   | 4.3     | 184   | 4.4     | 171              | 3.7     | 162             | 3.6     | 181   | 3.6     | 187              | 3.3     |
| Unspecified.....                                       | 275   | 9.8     | 366   | 8.6     | 472              | 10.1    | 425             | 9.5     | 468   | 9.2     | 541              | 9.6     |

<sup>1</sup> Because of rounding, components may not add to totals shown.

<sup>2</sup> Excluding Soviet imports of ores and metals from Czechoslovakia, which amounted to \$75,600,000, \$714,700,000, \$130,900,000, \$106,700,000, and \$105,200,000, \$110,400,000 in

1960, 1963, 1965, 1966, and 1967-68 respectively.

\* Negligible.

TABLE 6.—U.S.S.R. commodity composition of exports to the industrial West, 1960, 1963, 1965-68

[In millions of U.S. dollars and percent of total]

| Commodity                                       | 1960  |         | 1963  |         | 1965  |         | 1966  |         | 1967  |         | 1968  |         |
|---|-------|---------|-------|---------|-------|---------|-------|---------|-------|---------|-------|---------|
|   | Value | Percent | Value | Percent | Value | Percent | Value | Percent | Value | Percent | Value | Percent |
| Total exports <sup>1</sup> .....                | 983   | 100.0   | 1,218 | 100.0   | 1,438 | 100.0   | 1,711 | 100.0   | 1,886 | 100.0   | 2,051 | 100.0   |
| Fuels, lubricants, and related materials.....   | 253   | 25.7    | 371   | 30.5    | 391   | 27.2    | 466   | 27.2    | 549   | 29.1    | 609   | 29.7    |
| Coal and coke.....                              | 57    | 5.8     | 98    | 8.1     | 100   | 7.0     | 100   | 5.8     | 104   | 5.5     | 100   | 4.9     |
| Petroleum and petroleum products.....           | 196   | 19.9    | 273   | 22.4    | 291   | 20.2    | 366   | 21.4    | 445   | 23.6    | 506   | 24.7    |
| Ores and concentrates.....                      | 33    | 3.4     | 26    | 2.1     | 37    | 2.6     | 47    | 2.7     | 49    | 2.6     | 52    | 2.5     |
| Manganese ore.....                              | 15    | 1.5     | 8     | .6      | 8     | .6      | 10    | .6      | 8     | .4      | 6     | .3      |
| Base metals and manufactures.....               | 112   | 11.4    | 113   | 9.3     | 203   | 14.1    | 246   | 14.4    | 204   | 10.8    | 210   | 10.2    |
| Ferrous metals.....                             | 72    | 7.3     | 81    | 6.6     | 120   | 8.3     | 125   | 7.3     | 110   | 5.8     | 92    | 4.5     |
| Pig iron.....                                   | 35    | 3.5     | 42    | 3.4     | 51    | 3.5     | 61    | 3.6     | 55    | 2.9     | 40    | 2.0     |
| Rolled ferrous metals.....                      | 21    | 2.2     | 28    | 2.3     | 29    | 2.0     | 25    | 1.5     | 22    | 1.2     | 22    | 1.1     |
| Nonferrous metals.....                          | 40    | 4.1     | 33    | 2.7     | 83    | 5.8     | 122   | 7.1     | 94    | 5.0     | 117   | 5.7     |
| Aluminum.....                                   | 7     | .7      | 15    | 1.2     | 30    | 2.1     | 40    | 2.3     | 34    | 1.8     | 32    | 1.6     |
| Wood and wood products.....                     | 158   | 16.1    | 211   | 17.3    | 297   | 20.7    | 298   | 17.4    | 322   | 17.1    | 338   | 16.5    |
| Lumber.....                                     | 100   | 10.2    | 125   | 10.3    | 165   | 11.5    | 155   | 9.1     | 141   | 7.5     | 138   | 6.7     |
| Textile raw materials and semimanufactures..... | 70    | 7.2     | 48    | 4.0     | 75    | 5.2     | 102   | 6.0     | 126   | 6.7     | 113   | 5.5     |
| Cotton fiber.....                               | 50    | 5.1     | 30    | 2.4     | 59    | 4.1     | 80    | 4.7     | 108   | 5.7     | 102   | 5.0     |
| Consumer goods.....                             | 169   | 17.1    | 216   | 17.8    | 169   | 11.8    | 204   | 11.9    | 237   | 12.6    | 229   | 11.2    |
| Food.....                                       | 118   | 12.0    | 138   | 11.3    | 91    | 6.3     | 115   | 6.7     | 144   | 7.6     | 139   | 6.8     |
| Grain.....                                      | 85    | 8.7     | 70    | 5.8     | 20    | 1.4     | 3     | .2      | 31    | 1.6     | 37    | 1.8     |
| Other consumer goods.....                       | 51    | 5.2     | 78    | 6.4     | 78    | 5.4     | 89    | 5.2     | 93    | 4.9     | 90    | 4.4     |
| Furs and pelts.....                             | 44    | 4.5     | 67    | 5.5     | 54    | 3.8     | 63    | 3.7     | 55    | 2.9     | 54    | 2.6     |
| Other merchandise.....                          | 148   | 15.1    | 133   | 10.9    | 121   | 8.4     | 166   | 9.7     | 195   | 10.3    | 210   | 10.2    |
| Unspecified.....                                | 39    | 3.9     | 99    | 8.1     | 144   | 10.0    | 183   | 10.7    | 203   | 10.8    | 290   | 14.1    |

<sup>1</sup> Because of rounding, components may not add to totals shown.

TABLE 7.—U.S.S.R. commodity composition of imports from the industrial West, 1960, 1963, 1965-68

[In millions of U.S. dollars and percent of total]

| Commodity                                       | 1960  |         | 1963  |         | 1965  |         | 1966  |         | 1967  |         | 1968  |         |
|---|-------|---------|-------|---------|-------|---------|-------|---------|-------|---------|-------|---------|
|   | Value | Percent | Value | Percent | Value | Percent | Value | Percent | Value | Percent | Value | Percent |
| Total imports <sup>1</sup> .....                | 1,082 | 100.0   | 1,400 | 100.0   | 1,601 | 100.0   | 1,742 | 100.0   | 1,782 | 100.0   | 2,144 | 100.0   |
| Machinery and equipment.....                    | 465   | 42.9    | 589   | 42.0    | 510   | 31.9    | 560   | 32.1    | 670   | 37.6    | 896   | 41.8    |
| Chemical equipment.....                         | 135   | 12.5    | 124   | 8.9     | 110   | 6.9     | 147   | 8.4     | 177   | 9.9     | 204   | 9.5     |
| Transportation equipment.....                   | 119   | 11.0    | 163   | 11.7    | 196   | 12.2    | 194   | 11.1    | 130   | 7.3     | 136   | 6.3     |
| Base metals and manufactures.....               | 302   | 27.9    | 188   | 13.4    | 116   | 7.2     | 91    | 5.2     | 130   | 7.3     | 157   | 7.3     |
| Ferrous metals.....                             | 251   | 23.2    | 137   | 9.8     | 105   | 6.6     | 81    | 4.6     | 112   | 6.3     | 124   | 5.8     |
| Rolled ferrous metals.....                      | 134   | 12.4    | 76    | 5.4     | 25    | 1.6     | 21    | 1.2     | 63    | 3.5     | 73    | 3.4     |
| Pipes.....                                      | 102   | 9.4     | 49    | 3.5     | 71    | 4.4     | 50    | 2.9     | 37    | 2.1     | 44    | 2.1     |
| Nonferrous metals.....                          | 51    | 4.7     | 50    | 3.6     | 10    | .6      | 11    | .6      | 18    | 1.0     | 33    | 1.5     |
| Wood and wood products.....                     | 52    | 4.8     | 67    | 4.8     | 100   | 6.2     | 104   | 6.0     | 133   | 7.5     | 136   | 6.3     |
| Chemicals.....                                  | 44    | 4.0     | 87    | 6.2     | 140   | 8.7     | 142   | 8.2     | 166   | 9.3     | 191   | 8.9     |
| Textile raw materials and semimanufactures..... | 73    | 6.8     | 88    | 6.3     | 89    | 5.6     | 103   | 5.9     | 125   | 7.0     | 129   | 6.0     |
| Wool fiber.....                                 | 48    | 4.4     | 42    | 3.0     | 38    | 2.4     | 47    | 2.7     | 34    | 1.9     | 50    | 2.3     |
| Staple fiber, artificial and synthetic.....     | 13    | 1.2     | 45    | 3.2     | 30    | 1.9     | 24    | 1.4     | 28    | 1.6     | 23    | 1.1     |
| Consumer goods.....                             | 45    | 4.2     | 249   | 17.8    | 487   | 30.4    | 571   | 32.8    | 400   | 22.4    | 413   | 19.3    |
| Wheat and wheat flour.....                      |       |         | 187   | 13.4    | 366   | 22.9    | 413   | 23.7    | 147   | 8.2     | 121   | 5.6     |
| Other merchandise.....                          | 84    | 7.8     | 93    | 6.7     | 125   | 7.8     | 126   | 7.2     | 110   | 6.2     | 98    | 4.6     |
| Unspecified.....                                | 17    | 1.6     | 38    | 2.7     | 33    | 2.1     | 43    | 2.5     | 46    | 2.6     | 124   | 5.8     |

<sup>1</sup> Because of rounding, components may not add to totals shown.

TABLE 8.—*U.S.S.R. commodity composition of exports to the less developed countries, 1960, 1963, 1965-68*

[In millions of U.S. dollars and percent of total]

| Commodity                             | 1960  |         | 1963  |         | 1965  |         | 1966  |         | 1967  |         | 1968  |         |
|---------------------------------------|-------|---------|-------|---------|-------|---------|-------|---------|-------|---------|-------|---------|
|                                       | Value | Percent | Value | Percent | Value | Percent | Value | Percent | Value | Percent | Value | Percent |
| Total exports <sup>1</sup> .....      | 338   | 100.0   | 752   | 100.0   | 911   | 100.0   | 886   | 100.0   | 960   | 100.0   | 947   | 100.0   |
| Machinery and equipment.....          | 125   | 37.1    | 357   | 47.5    | 472   | 51.8    | 426   | 48.1    | 448   | 46.7    | 479   | 50.6    |
| Complete plants.....                  | 69    | 20.3    | 221   | 29.4    | 284   | 31.2    | 245   | 27.7    | 274   | 28.5    | 293   | 30.9    |
| Transportation equipment.....         | 22    | 6.5     | 72    | 9.6     | 103   | 11.3    | 100   | 11.3    | 104   | 10.8    | 117   | 12.4    |
| Petroleum and petroleum products..... | 53    | 15.7    | 74    | 9.8     | 132   | 14.5    | 121   | 13.7    | 93    | 9.7     | 80    | 8.4     |
| Rolled ferrous metals.....            | 24    | 7.1     | 23    | 3.1     | 40    | 4.4     | 43    | 4.9     | 39    | 4.1     | 47    | 5.0     |
| Wood and wood products.....           | 35    | 10.4    | 34    | 4.5     | 54    | 5.9     | 62    | 7.0     | 49    | 5.1     | 51    | 5.4     |
| Food.....                             | 41    | 12.2    | 97    | 12.9    | 65    | 7.1     | 74    | 8.4     | 185   | 19.3    | 115   | 12.1    |
| Other merchandise.....                | 53    | 15.7    | 70    | 9.3     | 94    | 10.3    | 98    | 11.1    | 102   | 10.6    | 105   | 11.1    |
| Unspecified.....                      | 6     | 1.8     | 96    | 12.8    | 54    | 5.9     | 63    | 7.1     | 43    | 4.5     | 69    | 7.3     |

<sup>1</sup> Because of rounding, components may not add to totals shown.TABLE 9.—*U.S.S.R. commodity composition of imports from the less developed countries, 1960, 1963, 1965-68*

[In millions of U.S. dollars and percent of total]

| Commodity                        | 1960  |         | 1963  |         | 1965  |         | 1966  |         | 1967  |         | 1968  |         |
|----------------------------------|-------|---------|-------|---------|-------|---------|-------|---------|-------|---------|-------|---------|
|                                  | Value | Percent | Value | Percent | Value | Percent | Value | Percent | Value | Percent | Value | Percent |
| Total imports <sup>1</sup> ..... | 564   | 100.0   | 665   | 100.0   | 845   | 100.0   | 904   | 100.0   | 805   | 100.0   | 884   | 100.0   |
| Cotton fiber.....                | 139   | 24.7    | 159   | 23.9    | 162   | 19.2    | 140   | 15.5    | 113   | 14.0    | 119   | 13.5    |
| Natural rubber.....              | 152   | 26.9    | 163   | 24.6    | 137   | 16.2    | 152   | 16.8    | 119   | 14.8    | 117   | 13.2    |
| Food.....                        | 113   | 20.0    | 155   | 23.4    | 288   | 34.0    | 305   | 33.7    | 264   | 32.8    | 323   | 36.5    |
| Nonferrous metals.....           | 33    | 5.9     | 20    | 3.0     | 12    | 1.4     | 15    | 1.7     | 6     | .7      | 4     | .5      |
| Other merchandise.....           | 126   | 22.4    | 165   | 24.9    | 243   | 28.8    | 287   | 31.7    | 280   | 34.8    | 305   | 34.5    |
| Unspecified.....                 | 1     | .1      | 2     | .3      | 4     | .5      | 5     | .6      | 23    | 2.9     | 17    | 1.9     |

<sup>1</sup> Because of rounding, components may not add to totals shown.

# SOVIET ECONOMIC ASSISTANCE TO THE LESS DEVELOPED COUNTRIES OF THE FREE WORLD

*By* ORAH COOPER

## RECENT SHIFTS IN THE AID PROGRAM

Since 1954 the U.S.S.R. has extended about \$6.8 billion of economic assistance to 38 non-Communist less developed countries.<sup>1</sup> In spite of the increase in annual aid undertakings since the end of 1964—from an average of almost \$370 million between 1954–64 to about \$560 million during 1965–69—annual disbursements have not increased. This leveling-off in deliveries, together with a lack of vigorous new Soviet aid initiatives, and the generally harder terms associated with many recent Soviet credits, suggest that the present leadership has adopted a more conservative approach to foreign aid. During the first decade of the aid offensive, Moscow was willing to extend assistance to almost any less developed country that requested it. Large lines of credit (“umbrella credits” not committed to specific uses) were extended for economic development which, because of the accompanying propaganda, the timing, and the kinds of projects undertaken, often produced a political impact that was out of proportion to the amount of aid or its ultimate economic benefits. Moreover, early Soviet aid agreements often were formalized without prior study of the proposed investments, either as they related to the recipients’ absorptive capacity or the feasibility of specific program assistance. As a consequence much of the aid remained unutilized; in some cases completed projects operated far below optimum capacities.

During the past few years, however, the U.S.S.R. has modified its foreign aid program so as to make it more effective, both politically and economically. Assistance is being concentrated in fewer countries, as discussed in the next three paragraphs. Recent Soviet aid commitments also have shown a diversity in terms and content which suggests that Soviet aid officials are paying greater attention to local conditions and individual requirements than in the past. The U.S.S.R. undertakes extensive feasibility surveys before aid is extended to specific projects, and repayment terms vary with the type of aid extended.

From the beginning, Soviet aid was highly concentrated in a few countries, especially in the Near East and South Asia. To some extent this early concentration was a reflection of the greater willingness of certain less developed countries to accept assistance from the Soviet

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<sup>1</sup> Soviet extensions of military assistance to the less developed countries bring this figure up to somewhat more than \$11 billion. Less military aid was extended in 1969 than in 1965–68, as an annual average. The decline in 1969 reflects smaller aid pledges to Arab countries, which had largely restored their inventories to pre-war levels following the June 1967 war with Israel.

Union rather than any Soviet strategy for penetrating particular areas. By the mid-1960's, as more developing nations discarded their former inhibitions against accepting Soviet assistance, the U.S.S.R. was able to use aid more directly to promote its foreign policy objectives. Although the U.S.S.R. continues to extend at least token assistance to all Free World areas, its aid program has become more highly targeted as Khrushchev's successors apply location criteria to their aid determinations more systematically than before. These criteria identify Soviet interests in the Arab World and Moscow's desire to reinforce its foothold in the Near East including, in particular: Turkey, Iran, Pakistan, India, and Afghanistan; they also reflect the U.S.S.R.'s growing concern with China, and the desire to strengthen Soviet relationships with nations along its own and Communist China's southern borders. Thus in most recent years, a larger part of new commitments has been earmarked for Near Eastern and South Asian countries. Out of total Soviet assistance extended to developing nations between 1965 and 1969, some 82 percent was allocated to the Near East and South Asia, compared with 62 percent during 1960-64. Meanwhile Africa's share of the total fell from 28 to 11 percent and the share of East Asia and Latin America, together, fell to about 7 percent.

The emergence of Iran, Pakistan, and Turkey as major aid recipients since 1965 is one of the most significant indicators of intensified Soviet interest in the Near East-South Asian region. With the extension of aid to these Central Treaty Organization countries, the U.S.S.R. has created an unbroken chain of foreign aid clients with borders contiguous to its own or Communist China's. As a group, the six nations along the U.S.S.R.'s southern periphery have received commitments of about \$3.5 billion, almost 60 percent of which has been extended since January 1965. Aid extended to these "border" states comprises one-half of total Soviet economic aid extended to all less developed countries since the inception of the aid program in 1954 and about two-thirds of the total provided the Near East and South Asian countries.

The U.S.S.R. has extended aid to 12 African countries since 1964, but the amount extended to each recipient usually has been smaller than before. The reduced participation of African countries in the Soviet aid program demonstrates not only the shifting geographic focus of the program; it also is a reflection of the inability of some African nations to absorb effectively the aid provided to them in the past.

To an increasing extent, the U.S.S.R. is extending assistance that will provide mutual benefits both to aid recipients and to the U.S.S.R. For example, Soviet aid extended for developing petroleum resources in several Middle Eastern countries may help these countries to establish independent national industries and also to enable them to repay Soviet credits in crude oil. Soviet-aided natural gas development in Afghanistan is supplying part of Afghanistan's local power requirements. Its natural gas exports to the U.S.S.R., which eventually will average 3.5 to 4 billion cubic meters annually, will help Afghanistan to pay off a large part of its debt to the U.S.S.R. These exports also will help to satisfy Soviet requirements for natural gas. The Soviet-aided pipeline being built from Iran to the Soviet border will allow Iran to capitalize on a former waste product while providing the



U.S.S.R. with natural gas that it needs. Other examples of mutually advantageous projects are the transborder roads and railroads that have been included in Soviet aid to a number of border countries; the expansion of port facilities in less developed countries that can also be used by Soviet vessels; and Soviet aid to the developing countries' fishing industries that will provide facilities for use by the farflung Soviet fishing fleet. Joint borderland economic complexes—such as the dam being built on the Aras River, a natural boundary between the U.S.S.R. and Iran—also offer prospects for future technical cooperation.

#### AID EXTENDED

During 1969 the U.S.S.R. extended \$462 million of economic assistance, slightly more than the amount extended in the previous year (see table 1). Each of the major commitments in 1969—made to Turkey, Iraq and Guinea—was designated for an industrial undertaking. In Turkey, \$166 million of credits was allocated to a steel plant already under construction with Soviet aid; in Iraq, the aid was for petroleum exploration and development; and in Guinea it was for bauxite mining. Other smaller credits were extended to Sudan, Pakistan and Uruguay. The latter, a trade credit allowing repayment over an 8-year period, was the first aid Uruguay had received from the U.S.S.R. Afghanistan and Iran, which rank third and fourth, respectively, on the scale of Soviet economic aid recipients, were provided with aid in 1968 for their current development plans. Pakistan also received assistance for its Fourth Plan which begins July 1970.

The amount of aid extended by the U.S.S.R. has varied widely from year to year, from a low of about \$50 million in 1962 to record extensions of \$1.2 billion in 1966. Recent fluctuations in annual aid undertakings do not appear to be related to the changes in post-Khrushchev aid policy. Such fluctuations are expected in a program whose commitments are to projects and development plans that often require several years for implementation. For the most part, recent peak years have reflected the extension of aid to countries that are initiating new development plans; the low years often mean that major aid recipients are working off credits previously extended (see Table 2). The amount of aid extended for forthcoming plans is conditioned largely on the feasibility of proposed projects and the developing nation's progress in drawing down aid allocated for previous plans. In general, the U.S.S.R. has been unwilling to expand significantly its commitments to countries that have large undrawn balances on credits previously extended. At the end of 1969 these undrawn balances amounted to an estimated \$3.7 billion.

#### IMPLEMENTATION

Soviet aid deliveries totaled about \$3.1 billion by the end of 1969, a slowdown of about 49 percent of the total aid extended during 1954–68. The ratio between cumulative drawings and extensions, which averaged about 25 percent in earlier years, has been relatively stable since 1963 (see Table 3). Afghanistan, India, and the United Arab Republic which together have received almost one-half of total Soviet aid commitments, have had the best implementation record. By the end of 1969, these three countries probably had drawn as much as 60 percent of the aid extended to them, compared with an average rate for all

other aid recipients of about one-third. In general, the countries of the Near East and South Asia have drawn Soviet aid more rapidly than other areas. Their rate of drawdown has been two to three times faster than that of African countries.

Nevertheless, implementation of the Soviet program as a whole has been slow. Drawings for recent years are estimated at about \$350 million annually, still somewhat below the peak level drawings of 1964. By the end of 1967, the less developed countries had drawn down credits equivalent to the amount of aid extended during the first 7 years of the program (1954-60), showing an average lag in drawings of about 7 years. Lengthy delays, however, are hardly unique to the Soviet program, although the character of this program makes it more susceptible to these lags. Generally, the U.S.S.R. has refused to cover local projects costs, which the less developed countries often are unable to provide. Although the developing countries' share of the undertaking runs as high as 50 percent of total cost, thus far the U.S.S.R. has provided only about 5 percent of its total aid in the form of commodities, whose sale is intended to generate currency to finance the local costs. Other aid donors have tried to reduce the effect of local problems by helping to defray a larger share of these costs and by accepting greater responsibility for constructing the physical plant and putting it into operation. Except for gift installations (such as hospitals and cultural institutions), the U.S.S.R. is known to have assumed full responsibility for implementing projects only in a few cases. The Assab refinery in Ethiopia, started in 1961, was built as a turnkey project.<sup>2</sup> In 1963, the U.S.S.R. formed a Soviet organization in Guinea that assumed responsibility for local Soviet projects, and in 1968 the U.S.S.R. took over the management of local labor forces in Algeria that were working on Soviet-aided dams and irrigation projects. Although the U.S.S.R. did not act as the contractor for the Aswan Dam in the U.A.R., it did provide management assistance to direct its construction.

From the beginning the Soviet Union has recognized that shortages of technical skills and trained administrative and managerial personnel would obstruct the effective implementation of its economic assistance program. To combat this problem, the U.S.S.R. has dispatched technicians to the less developed countries and provided training for personnel from the developing nations. In 1969, there were approximately 10,000 Soviet economic technicians in the less developed countries. In addition to technical training which the U.S.S.R. is providing to large numbers of personnel from the less developed countries in the U.S.S.R., Moscow also is building technical institutions in the developing countries to train local personnel. On-the-job training at the site of Soviet-aided construction projects also has been provided to more than 150,000 persons.

In spite of problems encountered in putting Soviet aid to use, the U.S.S.R. has contributed significantly to the development plans of some less developed nations. In Afghanistan, for example, about 50 percent of its aid requirements in recent years have been met through Soviet assistance. In India, Soviet-aided steel capacity will

<sup>2</sup> Also referred to as a "locked" agreement, under which the donor country assumes full responsibility for plant construction and its initial operation.

represent approximately 70 percent of total output when capacity operations are reached. In the U.A.R., Soviet-aided projects will increase electric power capacity 2½ times and steel output 4 to 5 times.

### OUTLOOK

The U.S.S.R. almost certainly considers the position of influence it has gained in less developed countries, at least partially through its economic aid program, to have outweighed the costs, the frustrations and the occasional setbacks. It will probably continue to extend assistance where it believes its long- or short-run political and economic objectives will be promoted. At the moment, there is no reason to expect a major departure in Soviet aid policy, either with regard to geographic distribution or the annual volume of deliveries. Present patterns may be accentuated in some years, however, as Arab countries and those in strategic border areas approach new plan periods and the U.S.S.R. provides them with additional aid. The U.S.S.R. will continue to press recipient countries to draw down more quickly aid previously extended, and the level of drawings may rise somewhat over the next few years as Soviet training programs provide larger pools of skilled labor and less developed countries develop the skills and resources needed to absorb capital investment more rapidly.

TABLE 1.—U.S.S.R.: Economic credits and grants extended to less developed countries 1954-69

[In millions of U.S. dollars]

| Country                  | 1954-69 | 1968 | 1969 |
|--------------------------|---------|------|------|
| Total.....               | 6,825   | 374  | 462  |
| Africa.....              | 993     | (1)  | 135  |
| Algeria.....             | 232     |      |      |
| Cameroon.....            | 8       |      |      |
| Congo (Brazzaville)..... | 9       |      |      |
| Ethiopia.....            | 102     |      |      |
| Ghana.....               | 89      |      |      |
| Guinea.....              | 165     |      | 92   |
| Kenya.....               | 44      |      |      |
| Mali.....                | 56      |      | 1    |
| Mauritania.....          | 3       |      |      |
| Morocco.....             | 44      |      |      |
| Nigeria.....             | (1)     | (1)  |      |
| Senegal.....             | 7       |      |      |
| Sierra Leone.....        | 28      |      |      |
| Somalia.....             | 66      |      |      |
| Sudan.....               | 64      |      | 42   |
| Tanzania.....            | 20      |      |      |
| Tunisia.....             | 34      |      |      |
| Uganda.....              | 16      |      |      |
| Zambia.....              | 6       |      |      |
| East Asia.....           | 411     | 0    | 0    |
| Burma.....               | 14      |      |      |
| Cambodia.....            | 25      |      |      |
| Indonesia.....           | 372     |      |      |
| Latin America.....       | 207     | 2    | 20   |
| Argentina.....           | 45      |      |      |
| Brazil.....              | 85      |      |      |
| Chile.....               | 55      |      |      |
| Colombia.....            | 2       | 2    |      |
| Uruguay.....             | 20      |      | 20   |

<sup>1</sup> Not available.

TABLE 1.—U.S.S.R.: *Economic credits and grants extended to less developed countries, 1954-69—Continued*

[In millions of U.S. dollars]

| Country                       | 1954-69 | 1968  | 1969  |
|-------------------------------|---------|-------|-------|
| Near East and South Asia..... | 5,214   | 372   | 307   |
| Afghanistan.....              | 697     | 127   | ..... |
| Ceylon.....                   | 30      | ..... | ..... |
| Greece.....                   | 84      | ..... | ..... |
| India.....                    | 1,593   | ..... | ..... |
| Iran.....                     | 508     | 178   | ..... |
| Iraq.....                     | 305     | ..... | 121   |
| Nepal.....                    | 20      | ..... | ..... |
| Pakistan.....                 | 265     | 67    | 20    |
| Syria.....                    | 233     | ..... | ..... |
| Turkey.....                   | 376     | ..... | 166   |
| United Arab Republic.....     | 1,011   | ..... | ..... |
| Yemen.....                    | 92      | ..... | ..... |

Source: U.S. Department of State, Bureau of Intelligence and Research annual publication on Communist aid and trade (1970 ed., to be published).

TABLE 2.—*Soviet economic aid extended to current economic development plans of selected aid recipients, 1964-69*

| Recipient country | Current economic plan dates                 | Soviet economic aid extended for current plan |                      |
|-------------------|---|---|----------------------|
|                   |   | Date extended                                 | Million U.S. dollars |
| Afghanistan.....  | March 1967 to March 1972.....               | 1968  | 127                  |
| India.....        | April 1969 to March 1974 <sup>1</sup> ..... | 1965  | 225                  |
|                   |   | 1966  | 555                  |
| Iran.....         | March 1968 to March 1973.....               | 1966  | 289                  |
|                   |   | 1968  | 178                  |
| Iraq.....         | January 1966 to December 1970.....          | 1969  | 121                  |
| Pakistan.....     | July 1970 to June 1975.....                 | 1968  | 67                   |
|                   |   | 1969  | 20                   |
| Syria.....        | January 1970 to December 1974.....          | 1966  | 133                  |
| Turkey.....       | April 1968 to March 1973.....               | 1967  | 200                  |
|                   |   | 1969  | 166                  |
| U. A. R.....      | July 1970 to June 1974 <sup>2</sup> .....   | 1964  | 324                  |
| Total.....        |   |   | 2,405                |

<sup>1</sup> The starting date for the 4th plan, originally scheduled for April 1966, was delayed until April 1969.

<sup>2</sup> Tentative.

TABLE 3.—U.S.S.R.: *Economic credits and grants to less developed countries, extended and drawn, 1954-69*

[Dollar amounts in millions of current U.S. dollars]

| End of year  | Cumulative |                    | Percentage drawn <sup>2</sup> |
|--------------|------------|--------------------|-------------------------------|
|              | Extended   | Drawn <sup>1</sup> |                               |
| 1954-60..... | 2,460      | 383                | 18                            |
| 1961.....    | 3,007      | 557                | 23                            |
| 1962.....    | 3,060      | 785                | 26                            |
| 1963.....    | 3,296      | 1,061              | 35                            |
| 1964.....    | 4,036      | 1,433              | 43                            |
| 1965.....    | 4,476      | 1,788              | 44                            |
| 1966.....    | 5,720      | 2,093              | 47                            |
| 1967.....    | 5,989      | 2,435              | 43                            |
| 1968.....    | 6,363      | 2,785              | 47                            |
| 1969.....    | 6,825      | * 3,135            | 49                            |

<sup>1</sup> Data derived from annual issues of U.S.S.R. Ministerstvo vneshnei trgovli, *Vneshniaia torgovlia Sotuzu S.S.R.*, Moscow, Mezhdunarodnye otnosheniia. Export of equipment and material for complete plants (listed under category 16 in *Vneshniaia torgovlia SSSR*) is estimated to comprise 80 percent of total drawings. The remaining 20 percent includes: technical services that are not included under category 16; machinery and equipment other than complete plants; grant aid not included in Soviet export figures; and commodities exported to the less developed countries to generate local currency for Soviet-aided projects.

<sup>2</sup> The ratio of cumulative drawings at year's end to cumulative extensions at the beginning of the year. This is thought to be the most appropriate method of computing the percentages since large outlays on project undertakings could not be expected in the year that aid is extended.

<sup>3</sup> Estimated.

# STRUCTURE AND ORGANIZATION OF DEFENSE-RELATED INDUSTRIES

*By* ANDREW SHEREN

## INTRODUCTION

Very little has been published on the organization of the Soviet military-industrial sector. Enough information is known, however, to permit a brief description of the principal agencies involved in strictly military production. The following sections present available information on the organizational structure and production responsibilities of the ministries that would comprise the bulk of the "defense-industrial complex" in the Soviet economy.

## STRUCTURE OF THE DEFENSE-INDUSTRIAL COMPLEX

Available information permits the identification of eight ministries that are currently responsible for producing most of the military equipment, including space-related equipment, in the U.S.S.R. These ministries are.

(a) Ministry of Defense Industry (Ministerstvo Oboronnoi Promyshlennosti—MOP);

(b) Ministry of Aviation Industry (Ministerstvo Aviastionnoi Promyshlennosti—MAP);

(c) Ministry of Shipbuilding Industry (Ministerstvo Sudostroitel'noi Promyshlennosti—MSP);

(d) Ministry of Electronics Industry (Ministerstvo Elektronnoi Promyshlennosti—MEP);

(e) Ministry of Radio Industry (Ministerstvo Radiopromyshlennosti—MR);

(f) Ministry of General Machine Building (Ministerstvo Obshchego Mashinostroeniia—MOM);

(g) Ministry of Medium Machine Building (Ministerstvo Srednego Mashinostroeniia—MSM);

(h) Ministry of Machine Building (Ministerstvo Mashinostroeniia—MM).

Not all military production takes place in these ministries, nor do the plants under the jurisdiction of these ministries produce only military goods. For example, some military transportation equipment is produced in plants under the jurisdiction of the Ministry of Automobile Industry, and some plants of the Ministry of Radio Industry produce radios for civilian use. Moreover, ministries other than those listed above undoubtedly manufacture products for the military establishment.

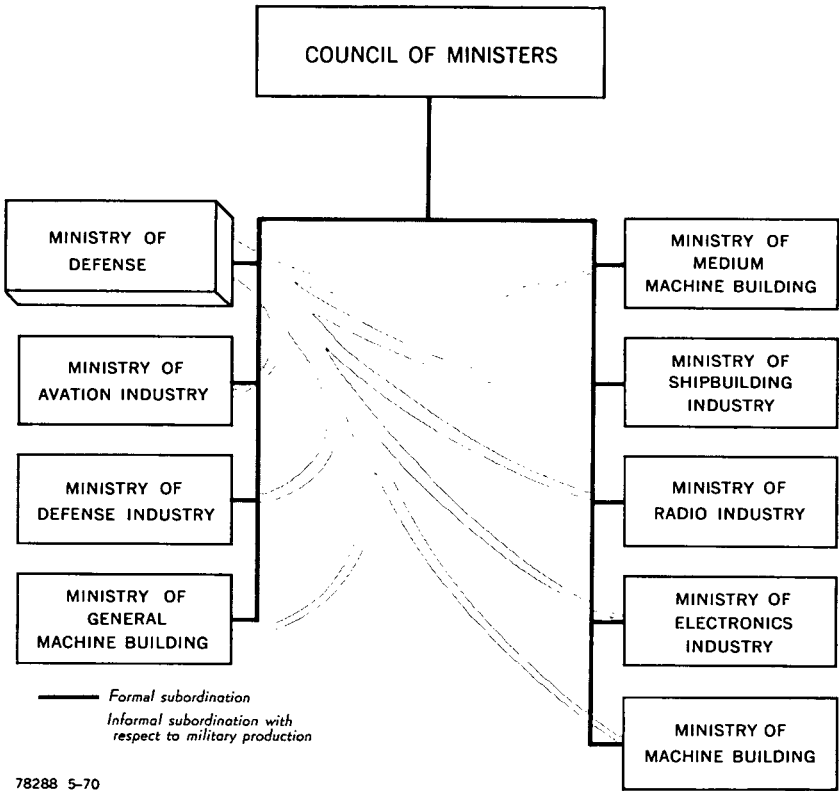
The eight ministries listed above are all-union ministries responsible directly to the Council of Ministries (see Figure 1). Because of the nature of their production, however, the Ministry of Defense plays

a major role in supervising the production of the plants subordinate to these eight ministries.

Control of the defense-industrial ministries is highly centralized. The top overseer is Dmitrii Fedorovich Ustinov, a secretary of the Central Committee of the Communist Party and a candidate member of the Politburo. Ustinov has spent his entire career in the military production area, first as an armament and rocket specialist, later as the chief government executive in the defense industry field. Although he no doubt deals directly with individual ministries and the Ministry of Defense, an intermediary group may actually control defense-industrial affairs. Such a group might be composed of representatives of the defense-industrial ministries, the Ministry of Defense, and any other organizations concerned with military research, development, testing and production.

Figure 1

**Structure of the Defense-Industrial Sector of the USSR**



Military production is closely monitored, in terms of both physical security of production facilities and quality of product. Production facilities are located in secure or semi-secure areas. A plant producing military goods usually is assigned a small team of military engineers, technicians, and office personnel who represent the Ministry of Defense. Sometimes the commander of the military team is a field grade officer equal in experience and status to the plant manager. The major function of the team is to maintain quality control at each step in the production process and to insure that the product meets prescribed specifications. The plant officials retain control over production methods, rate of output, and other related functions.

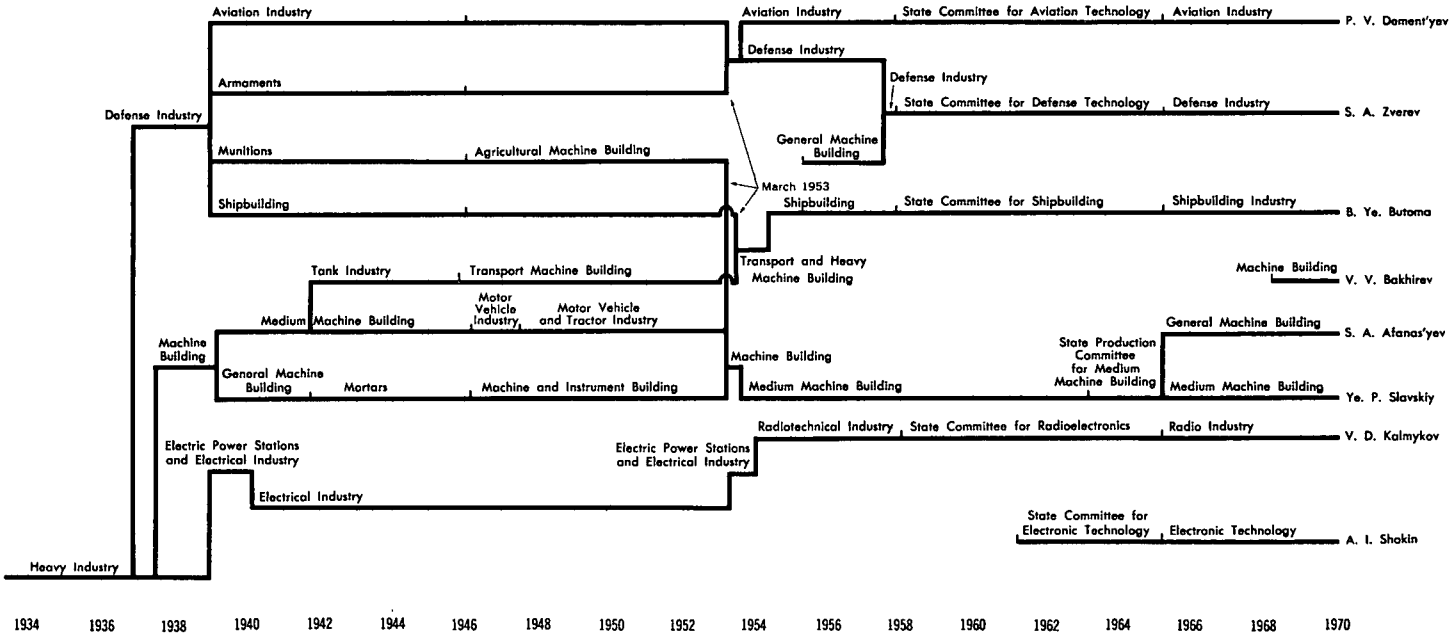
#### EVOLUTION OF THE DEFENSE-INDUSTRIAL COMPLEX

The structure of the defense-industrial complex has been modified over time primarily in conjunction with major overhauls of the ministerial system. Before 1957 the U.S.S.R. administered and directed the operation of most industrial enterprises—including the entire defense-industrial structure—through a number of ministries organized along functional lines. This system was abolished in 1957 and replaced by a system of regional economic councils (*sovmarkhozy*) organized along geographic lines. This regional decentralization, however, did not extend to the defense-industrial sector. As shown in Figure 2, the defense-industrial ministries were indeed abolished in 1957, but were replaced by “state committees”, which continued to report directly to the U.S.S.R. Council of Ministers and remained outside the authority of the *sovmarkhozy*. When another general overhaul restored the ministerial system in 1965, the state committees were replaced by a series of ministries.



Figure 2

# EVOLUTION OF THE EIGHT DEFENSE-INDUSTRIAL MINISTRIES OF THE USSR\*



\* All organizations listed in this chart, except state committees, were known before 15 March 1946 as People's Commissariats. After that date they have been known as Ministries.

In addition to these "name changes," the structure of the defense-industrial complex has been modified in response to changes in technology. The rapid growth of the electronics industry, for example, resulted in 1961 in the formation of a separate State Committee for Electronic Technology. This committee absorbed some of the functions and facilities of the State Committee for Radio Electronics, and in 1965 evolved into a separate ministry—the Ministry of Electronics Industry. Also, the sudden appearance of the Ministry of Machine Building in 1968 with no explanation whatsoever of its functions suggests an expansion and reorganization of one or more of the original defense-industrial ministries.

#### MINISTRY OF DEFENSE INDUSTRY

The major function of the Ministry of Defense Industry (MOP) is the production of armaments and ammunition. MOP output includes such weapons as artillery, tanks, armored vehicles, small arms and small arms ammunition, fuses, primers, propellants, explosives, and possibly some tactical guided missiles. MOP is also responsible for the production of optical equipment for both military and civilian markets.

Although the U.S.S.R. does not publish data of any kind concerning production in the defense-industrial ministries, the press often exhorts the military establishment to produce more for civilian consumption. It is reasonable to suppose that MOP plants have the capacity to produce such items as tractors, agricultural equipment, blasting supplies and cartridges, arms and ammunition for sportsmen, and other civilian hardware and equipment.

The Minister of MOP, Sergei Alekseevich Zverev, has over 30 years experience in optics and armaments production; his comings and goings are almost never mentioned in the Soviet press.

#### MINISTRY OF AVIATION INDUSTRY

As its title indicates, the major function of the Ministry of Aviation Industry (MAP) is the production of aircraft and aircraft parts. It probably also supervised the aerodynamic missile programs. MAP produces aircraft and components for the military forces and for Aeroflot, the Soviet national airline. Production for Aeroflot, however, is not uniquely civilian, because its aircraft can be adapted for military use with only minor modifications. In addition MAP produces a variety of consumer products, especially consumer durables. For example, in 1968 the planned output in the ministry included 300,000 refrigerators, 240,000 washing machines, and 585,000 vacuum cleaners.

A key leader and organizer in aviation since 1941, the minister of MAP, Petr Vasil'evich Dement'ev, deserves much of the credit for the U.S.S.R.'s front rank position in world civil and military aviation. Unlike most Soviet defense-industrial leaders, he has traveled extensively in Western countries.

#### MINISTRY OF SHIPBUILDING INDUSTRY

The Ministry of Shipbuilding Industry (MSP) designs and builds ships of all types for the Soviet Navy as well as for the maritime and fishing fleets. It also is responsible for the construction and maintenance

nance of shipyards, electrical assembly plants, research and development centers, refitting yards, and associated facilities. MSP produces all Soviet naval vessels and about one-third of the new ships added annually to the maritime and fishing fleets; the remaining two-thirds are imported from other countries. In addition to ships of all types, Soviet shipyards probably produce such items as storage tanks, pipe, boilers, barrels, and chain. In 1963, the Soviet press reported that two shipyards would produce equipment for the chemical program. It is possible also that bridges and other large structural assemblies for general use throughout the economy, are constructed at shipyards.

The Minister of MSP, Boris Evstaf'evich Butoma, is an experienced administrator who got his start as a fitter in a Sevastopol ship repair works while still in his teens.

#### MINISTRY OF ELECTRONICS INDUSTRY

The major function of the Ministry of Electronics Industry (MEP) is the production of electronic components and parts. Although plants subordinate to the ministry may produce subassemblies, there is no evidence that they are major producers of finished electronic equipment. Because MEP plants produce electronic components and parts, and not finished products, their major customers would be other ministries rather than the Ministry of Defense. The nature of the goods produced suggests that they are sold primarily to plants of the military-oriented Ministry of Radio Industry. Other ministries purchasing electronic components from MEP plants would include the plants of the Ministry of Communications producing some civil communications items; plants of the Ministry of Instrument Building, Means of Automation and Control Systems producing computers, electronic instruments and other electronic equipment; and plants of the Ministry of the Electrotechnical Industry producing tape recorders.

Aleksandr Ivanovich Shokin, the Minister of MEP, has served for over 30 years as a major executive in the radio engineering industry.

#### MINISTRY OF RADIO INDUSTRY

The Ministry of Radio Industry (MR) supervises the production of electronic systems and end-equipment in the radiotechnical field. Because of its sizable non military responsibilities, more information is available for this ministry than for any other ministry in the defense-industrial complex. It is estimated that about 70 percent of radio-electronics production in the U.S.S.R. flows into military uses. The MR plants in conjunction with those of MEP manufacture practically all the electronic systems needed by the defense sector, including radio and communications equipment of all types, radar equipment, navigation aids, antennas, and computers designated for uniquely military or space applications.

Like other ministries in the defense-industrial complex, the MR has lately been accused of neglecting the civilian sector in the design and development of new products. To satisfy such demands the Minister of MR, Valerii Dmitrievich Kalmykov, has promised new and better television sets, tape recorders, radios, and other primarily civilian products.

### MINISTRY OF GENERAL MACHINE BUILDING

The formation of the Ministry of General Machine Building (MOM) was announced in February 1965, without explanation as to its functions or responsibilities. A ministry of the same name existed during 1955–57, when its basic functions resembled some of the current functions of the Ministry of Defense Industry. The Ministry of General Machine Building that existed at that time may have been involved in missile production, but the available evidence is inconclusive.

Western analysts agree that today MOM is probably primarily responsible for the development and production of strategic ballistic missiles and space vehicles, except for aerodynamic missiles; the latter are the responsibility of the Ministry of Aviation Industry (see above).

The Minister of MOM, Sergei Aleksandrovich Afanas'ev, at 51 is the youngest of the defense-industrial ministers. He was one of the first high-ranking Soviet government officials to publicly endorse (in 1964) measures proposed by Soviet economist Evsei G. Liberman to make profit rather than plan fulfillment the measure of economic performance in Soviet industry.

### MINISTRY OF MEDIUM MACHINE BUILDING

The Ministry of Medium Machine Building (MSM), despite its innocuous name, is believed to run the Soviet atomic energy program. It supervises the production of fissionable materials and the fabrication of nuclear devices and warheads. Insofar as the Soviet nuclear energy program as a whole is concerned, MSM shares responsibility with the State Committee for the Utilization of Atomic Energy (Gosudarstvennyi Komitet po Ispol'zovaniuu Atomnoi Energii—GKAE), which concerns itself with civilian uses and industrial applications of atomic energy. GKAE, rather than MSM, is also probably responsible for research and development in certain areas of applied nuclear energy and for official contacts with other nuclear powers on such applications.

In many respects MSM resembles the U.S. Atomic Energy Commission. Under the direction of Efim Pavlovich Slavskii, the Ministry appears to supervise everything from the mining of the uranium ore through the fabrication of weapons. Slavskii has received nine Orders of Lenin, which makes him perhaps the most decorated civilian in the Soviet Union.

### MINISTRY OF MACHINE BUILDING

The Ministry of Machine Building (MM), established in February 1968, is the newest member of the defense-industrial complex. The title of the ministry is vague and no information has been released concerning its responsibilities or subordination. Speculations about its specific functions have rested either on the backgrounds of the men identified with the ministry or on the need for such functions in the U.S.S.R. One possibility is that the responsibility for missiles and space has been divided leaving MOM (see above) with ballistic missiles and giving MM the space program. Another is that MM has assumed some of the functions previously assigned to the Ministry of Defense Industry.

The ministry's chief Viacheslav Vasil'evich Bakhirev, is a little-publicized executive whose entire career appears to have been spent in the defense-industrial complex—with an emphasis on armaments. He was publicly associated with high level defense production in 1965 when he was made Deputy Minister of the Ministry of Defense Industry.

### OUTPUT IN THE DEFENSE-INDUSTRIAL MINISTRIES

There is no way of measuring the share of the defense-oriented ministries in total industrial production because of the lack of published information. Accepting Dr. Stanley Cohn's estimates of Soviet military expenditures<sup>1</sup> and utilizing Soviet input/output data for 1959, it would appear that procurement for military-space needs accounted for at most one-tenth of all industrial deliveries to the final demand categories of consumption, investment, defense, administration, and exports in that year.<sup>2</sup> Judging by the relative rates of growth of Dr. Cohn's estimates and the index of civilian industrial production after 1959, the share of defense and space may be slightly higher now.

Another very rough indicator of probable trends in production in the defense-industrial ministries can be developed by comparing rates of growth of gross output published for civilian-oriented ministries in the machinery (machine building and metalworking) sector with the rates of growth reported for the machinery branch as a whole.<sup>3</sup> Since 1965 the reported rate of increase in gross output of the machinery sector as a whole has remained steady at 12 percent. However, in most of the civilian oriented ministries the rate of growth of gross output declined, suggesting that the rate of growth accelerated in those ministries (mostly military-oriented) whose production is not reported.

*Reported percentage rates of growth of gross output, 1966-first half of 1969*

|  | 1966 | 1967 | 1968 | 1969 |
|--|------|------|------|------|
| All machine building and metal-working.....                                | 12   | 12   | 12   | 12   |
| Ministry of—   |      |      |      |      |
| Heavy, Power, and Transport Machine Building.....                          | 8    | 9    | 6    | 7    |
| Electrotechnical Industry.....   | 10   | 9    | 10   | 9    |
| Chemical and Oil Refining Machinery.....                                   | 10   | 11   | 12   | 10   |
| Machine Tool Building and Tool Industry.....                               | 10   | 11   | 11   | 9    |
| Instrument Building, Means of Automation and Control Systems.....          | 16   | 17   | 18   | 19   |
| Motor Vehicle Industry.....  | 14   | 13   | 11   | 10   |
| Tractors and Agricultural Machinery.....                                   | 10   | 9    | 7    | 8    |
| Construction, Road, and Communal Machine Building.....                     | 12   | 11   | 11   | 11   |
| Machine Building for Light and Food Industry and Household Appliances..... | 15   | 14   | 9    | 11   |

<sup>1</sup> See p. 168, above.

<sup>2</sup> Dr. Cohn's estimate of all outlays excluding military pay would be about 8 billion rubles in 1959. Dr. Vladimir Trembl's reconstruction of the 1959 Soviet input-output table (U.S. Congress, Joint Economic Committee, *New Directions in the Soviet Economy*, Part II-A, p. 268 ff.) puts the value of industrial deliveries to final demand categories at 101 billion rubles. Assuming that all military-space outlays excluding pay originated in industry and netting out turnover tax, the share of defense and space would be about 10 percent of total deliveries to final demand.

<sup>3</sup> The "civilian-oriented" ministries are considered to be so because of the basic nature of their production profile. Nevertheless, many of these ministries sell some output to the military establishment. And, as has been noted, some part of the production of the defense-oriented ministries flows into civilian uses.

A comparison of growth rates in the civilian-oriented machinery ministries with the growth of machinery output as a whole also suggests that the percentage gains in output in the missing (mostly military related) ministries may have exceeded the average for all machinery. Thus, output in 3 of the 9 civilian-oriented ministries grew faster than for machinery as a whole in 1966, but in 1969, only one ministry registered such growth. However, these indications might not depict the actual trend in procurement of military hardware very accurately because (1) the defense-oriented ministries may have taken on an increasing share of civilian production, and (2) gross output tends to grow faster than final output or value added in the machinery sector.<sup>4</sup>

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<sup>4</sup> See, for example, M. R. Eidel'man, *Mezhotraslevoi balans obshchestvennogo produkta*, Moscow, Statistika, 1966, p. 303; and N. S. Malorova, "Pokazateli ob'ema promyshlennoi produkttsii—glavnye v otsenkakh otraslevoi strukturi promyshlennosti," *Ocherki po sovremennoi sovetskoi i zarubezhnoi ekonomiki*, v. 5, Moscow, Ekonomika, 1967, p. 107 ff.

## SOVIET DEFENSE-ASSOCIATED ACTIVITIES OUTSIDE THE MINISTRY OF DEFENSE\*

*By* J. T. REITZ

Whereas the preceding section deals with the industrial ministries within the Ministry of Defense, headed by Dmitrii F. Ustinov and charged with the procurement of goods for the regular military complex, this section is concerned with elements that provide military augmentation or other services to the Soviet Ministry of Defense forces. This paper represents a summarized treatment of selected aspects of the organization, function, capabilities, and characteristics of a number of additional state-operated activities within the governmental structure of the Soviet Union that impact on Soviet military capabilities. All these enterprises basically provide services rather than the manufacture or production of goods. It is only through an understanding of these varied but related service activities that one can be fully aware of the complexity of the Soviet military and the full impact of military requirements and control upon the economy.

The economic significance of these defense-associated activities may be viewed in the broad context of the regime's choice between control and economic incentives and the intrusion of military as well as party control into areas normally civilian in nature. The KGB border troops and the MVD troop units, at least in part, represent the first choices; that is, the use of internal security measures to control the Soviet society. The various transport facilities and public health represent examples of the quasi-military character of functions in most countries primarily civilian in character. These activities require substantial skilled labor forces. Were the Soviet society less controlled or militarized a part of this labor force could be released to relieve labor force deficiencies elsewhere in the economy. Moreover, these paramilitary activities are subject to preemption by military during times of crises, that is, Czechoslovakia. These activities may indicate both strength and weaknesses of the Soviet military, strength in that normally civilian activities may be militarized, weakness in that it may be necessary to rely on these quasi-military organizations rather than integral military service support.

The Soviet activities that are examined in this section are listed in Table 1.

Some of the elements discussed herein are fully trained troop units in every sense of the word, but subordinate to the Committee of State Security (Komitet gosudarstvennoi bezopasnosti—KGB) or the Ministry of Internal Affairs (Ministerstvo vnutrennikh del—MVD) rather than to the Ministry of Defense (as are the Soviet Army and Navy). Other activities considered are security, service, and transport elements that facilitate the routine functioning of regular Ministry of Defense forces in peacetime, or have made direct contributions to the

\*References in brackets are to numbered sources at end of paper.

military effort in combat. Many of these activities are wholly, or partly, militarized, with one or more of the following characteristics:

- (a) They are armed.
- (b) They have a military type of structure and rank system.
- (c) They are subject to strict laws, regulations and discipline.

TABLE 1.—*Soviet defense-associated activities*

| Activity  | Transliterated Soviet nomenclature  | Estimated current strength (thousands) |
|---|---|--|
| <b>Security activity:</b>   |   |  |
| KGB border troops.....  | Pogranichnye voiska KGB.....  | 150 to 250.                            |
| Government signal troops.....   | Voiska pravitel'stvennoi svyazi KGB.....  | 15+.                                   |
| Other KGB troops.....   | Unknown.....  | (1).                                   |
| MVD internal troops.....  | Vnutrennie voiska MVD.....  | 75 to 150.                             |
| The federalized civil police (MVD).....                                       | Militsia MVD.....   | 800 to 1,000.                          |
| The federalized fire command (MVD).....                                       | Pozharnaya komanda MVD.....   | 350 to 500.                            |
| The national counterintelligence and security system.....                     | Kontrrazvedyvatel'noe upravlenie KGB.....   | 600 to 1,000.                          |
| <b>Transportation and communications:</b>                                     |   |  |
| The national railway system.....  | Zheleznodorozhnaya set' <sup>2</sup> .....  | 3,400 to 3,900                         |
| The federalized highway transport operation and road construction system..... | Automobil'nyi transport, Dorozhnoe stroitel'stvo.....   | 1,800 to 2,300                         |
| The national merchant marine.....   | Morskoi flot.....   | 275 to 350.                            |
| The federalized river fleet system.....                                       | Rechnoi flot.....   | 350 to 400.                            |
| The national civil aviation system.....                                       | Grazhdanskaya aviatsiya, Aeroflot.....  | 350 to 450.                            |
| The national POL pipeline system.....   | Nefteprovodnyi transport <sup>2</sup> .....   | (1)                                    |
| The national communications system.....                                       | Obshechegosudarstvennaya set' svyazi (OGSS).....  | 650 to 750.                            |
| <b>Public health:</b>   |   |  |
| The public health system.....   | No exact translation. The system is usually administered or coordinated by the Ministry of Health (Ministerstvo Zdravookhraneniya). | 4,500 to 5,000.                        |
| Total labor force <sup>3</sup> .....  | Rabochaya sila <sup>2</sup> .....   | 125,000 to 126,000.                    |
| Army and Navy (including Air forces).....                                     | Armiya i voenno-morskoi flot.....   | <sup>4</sup> 3.3 to 3.8.               |

<sup>1</sup> Unknown.

<sup>2</sup> Expressions thus marked are not official Soviet nomenclature and may not be found in Soviet literature in exactly this way but perhaps in a related way.

<sup>3</sup> Including armed forces.

<sup>4</sup> In millions.

(d) They have a wartime mission to assist the Defense Ministry forces.

(e) Some are fully military elements, although outside the Defense Ministry; others are militarized. All are state operated.

(f) The wholly militarized ones are distinguished by uniforms, and rank, grade, and organization structure similar to military organization.

(g) Most of them have a separate professional school system, codes of discipline and conduct more strict than normal civil law, and their own medical housing, recreational, and even dependent school system. It is fairly difficult to leave one of these activities for other employment.

(h) Many demand the strictest political reliability from their personnel and have a built-in system of full-time political officers (in addition to line officers) to insure this.

(i) All of them, along with virtually every other important phase of Soviet life and economy, are subject to the scrutiny of full-time attached KGB personnel to further insure reliability and performance.

(j) All the military and some of the militarized activities are under the peacetime direction of active military officers. Others are reputed to have military reserve status.



(k) Important segments of some, particularly in the transport and communication areas, were directed by military chiefs in World War II.

(l) Some, although retaining their essential civilian character, nevertheless have an assigned wartime mission to augment the military mission or to turn over large amounts of their equipment and personnel to the military (either in a military status or under military direction).

(m) In World War II, many participated in combat and combat support roles; others furnished essentially civilian units that operated under military law and military control.

(n) All the activities concerned are well-organized, well-staffed, fully functioning entities. Their convertibility to a military support role is preplanned in detail and they can be energized momentarily.

(o) Several were called upon to participate in the series of maneuvers leading up to, and presumably including, the Czechoslovakian invasion.

(p) Much of the full Soviet logistic base, including those sectors external to the Defense Ministry, is either now under or may be expected to come under wartime military control.

In a society disdaining services in its Marxian calculations and purportedly guarded against military influence, it is paradoxical that so many of the Soviet service activities listed above are either military, militarized or under military influence.

#### TROOPS OF THE KGB AND MVD

The KGB and MVD troops, generally referred to as Border Troops and Internal Troops, have existed in some form for more than 50 years, ever since the Soviet regime took power. They have always been under the aegis of one or two security agencies and administratively juxtaposed to the Army as an additional insurance of regime stability. They have been used to seal the state borders and to keep down restiveness and disorder among the populace, including the Army, if need be. From 1924 to 1934, when the Soviet regular Army and Navy numbered, by law, 562,000, the Border Troops and the International Troops had a reported strength of 100,000 and 150,000 respectively. In World War II the strength of these security troops reportedly grew to over 700,000. [25] They served, along with the Army, on all fronts as shock troops, stiffening detachments and rear area security troops and in a number of other assignments.

Early postwar unclassified U.S. estimates of these security troops dropped to 400,000 in the late 1940's or early 1950's and remained there through 1958. Since that time, no known unclassified U.S. figure is available, but the British Institute of Strategic Studies carried these security troops at 350,000 in 1959, and in the period 1967-69 reported them at a strength of 250,000. [2, 4]

Several other unofficial estimates put the overall security troop strength at two to three times the more conservative holdings cited above. [6]

In view of the World War II-era addition of nearly 25 million new Soviet citizens (of non-Russian extraction), the postwar growth of the Soviet population by 40 more millions, the 800,000 more square km of new land area annexed, and the tremendous qualitative increases in the capabilities of the Soviet Army, Navy, and Air Forces (against

which the security forces are established as a potential counterweight), it is suggested that recent figures of 250,000 are very possibly the low side of a personnel-strength range for the security troops.

The Border and Internal Troops, like the Soviet Army, each have a regular officer cadre with a sizable stiffening of long-service career enlisted men, mostly NCO's. In addition to line officers, they each have various officer specialists medical, finance, veterinary, intendance, engineer, and the like. Most Border and Internal Troop soldiers, however, like those of the other armed services, are conscripts called up in annual levies.

Records of the incoming draftees are thoroughly reviewed and the young men interviewed by security troop representatives. "In this way, the best and most carefully selected section of the draftees is designated for the MVD [and KGB] troops—Soviet patriots, the most literate, the healthiest, those with clean records." [22] Allegedly the Navy and various air components come next and the Army brings up the rear.

Pay and allowance norms for KGB and MVD troops have been reported both as equal to and higher than the Army and they are reputedly housed, fed and clothed better, have more privileges and enjoy slightly better treatment. [5]

Both the KGB Troops and the MVD Troops have a hierarchy of organic political officers as well as attached KGB counterintelligence personnel, although the former are themselves a KGB troop element. Each have their own school system.

#### KGB BORDER TROOPS

These troops have the responsibility of physically checking all border crossers and apprehending illegal travelers. They are a highly trained body under the Chief of the Main Directorate of Border Troops, one of several KGB main directorates (Glavnoe upravlenie pogranichnykh voisk—GUPV). The present Border Troop Chief is a colonel general. Both his chief of staff and political deputy are lieutenant generals. The Border Troops appear heavy with rank. (An incomplete list from Soviet press sources over the last 3 years reveals three other Border Troop lieutenant generals, one vice admiral and 11 major generals. Many of these are district commanders and district political deputies.) [11] Organizationally, the Soviet Border Troops are distributed along the perimeter of the country in 15 to 20 border districts.

Each district reportedly has a detachment of light aircraft, including helicopters. [10] Border Troop maritime squadrons are believed assigned directly to districts with water areas.

Border Troop equipment apparently consists of small arms, heavy machine guns, armored personnel carriers and other light tanks, some light artillery and mortars. The Border Troops are described by some of their senior generals as fully motorized.

Border Troop aircraft patrol many vast stretches of border terrain. Horse-mounted, vehicular and foot patrols are used in other areas. The small, fast, lightly armed cutters patrol border river, lake and offshore ocean areas. A whole network of other electronic and visual observation and detection means and barriers is in use along the border. The entire 60,000 km border length is patrolled on the ground,

on the water or through the air around the clock day-in and day-out. [7, 12]

Unclassified estimates of the Soviet Border Troop strength are few. One good Western source puts it during much of the 1920's and 1930's at 100,000. However, every recent Soviet sources put the Border Troop numbers in the 1939-41 period just along the western boundaries at "about 100 thousand." [14] No Border Troop Strength figures are available for the World War II era and for many years thereafter. Not until 1962 did a former Border Troop officer, estimate their strength at between 350 to 400,000 men.

In the interim, several other fairly good unofficial sources have additional pertinent comment. The Institute of Strategic Studies has carried the overall Soviet security troop total as around 250,000 from 1964 until the present, inferring a Border Troop strength considerably less than this figure. Another private British source in 1956 reported Border Troop strength as 200,000. [13]

Presumably the extremely tense situation along the Sino-Soviet border in the last few years would warrant a sizeable Border Troop increase there (along with possible Soviet Army troop increases).

In the prewar period 1939-41, the Border Troops are reported killing or wounding over 8,000 border violators including thousands of alleged German agents. When the all-out German attack came, Border Troops took the first blows and many of their units were literally wiped out.

Border Troop units reportedly fought around Moscow, Kiev, Odessa, Sevastopol, Pskov, on the Karelian isthmus, around Murmansk, in Byelorussia, and later at Belgrade, Koenigsberg, Budapest, Warsaw, Prague, Sofia, Vienna, and Berlin.

The 29th, 30th and 31st Armies were wholly and the 70th Army mostly constituted of Border Troops. [24]

Allegedly, upwards of 20,000 Border Troop snipers on various fronts killed over 150,000 of the enemy. [23]

Border Troops of three Border Districts assaulted Japanese positions without warning in August 1945 to kick off the Soviet Army's offensive.

#### OTHER KGB TROOPS

The KGB has possibly two other types of troops in addition to the Border Troops. One purposely obscure element rarely mentioned is the Government Signal Troops organized in WWII apparently to improve both military and other communications security, and perform some signal intelligence duties. Through these troops goes the most important government civil and military communications traffic. In WWII, they were thought to consist of about 15,000 men. [1]

Another very obscure aspect of KGB troop activity concerns the possible existence of a body of troops similar to the MVD Special Objective Guards, although there are no precise data on them. The most noticeable of these guards are the beautifully uniformed soldiers who guard Lenin's tomb and other Kremlin posts around the clock. They wear the KGB royal blue flashings and piping and may run to several thousands. Until early 1968, a KGB lieutenant general (Vedenin) had been Kremlin commandant for years. Many experts think that KGB Guard Troops provide security for Party and perhaps government headquarters at oblast and republic levels as well.

Another activity possibly assigned to such KGB Guard Troops is the handling and storage of nuclear and other special munitions. Little is known of this but it would seem more logical to have these items in the hands of specially trained KGB troops than under more civil-oriented KGB counterintelligence personnel. (This would be in the World War II tradition of the manning of the first multiple rocket launchers called "Katiushas" or "Stalin's organs" by specially trained NKVD troop units to insure complete security and surprise.) [20]

Virtually no open information is available about the strength, source of personnel, schooling, and equipment of the Government Signal Troops and the various other elite KGB troops, although there must be several thousand of each variety. It is a certainty—with the sensitivity of mission—that these troops have built-in both political and counterintelligence officers.

#### MVD INTERNAL TROOPS

The MVD Internal Troops are visible to Western visitors in considerable numbers in almost any large Soviet city but paradoxically little is known about them. Currently, the Internal Troops Chief is a lieutenant general. The Internal Troops have been called "an elite body superior to the regular armed forces in training, equipment, and indoctrination," and a trustworthy force that can act as "a counter-pose to the [regular] armed forces in the unlikely event that the armed forces should attempt to compete with the Party for power." [4]

The exact post-World War II development of these troops remains murky. There is general agreement, however, that they have included the following types of troops, more or less continuously, since World War II: Operational Troops; Special Designation Troops; Special Objective Guards; and Convoy Troops.

MVD Internal Troop strength seems an extremely moot question. Authoritative Western writers list pre-World War II Internal Troop strength at 150,000 in seven mobile rifle divisions. [16, 17] In 1962, a knowledgeable Soviet officer defector estimated that there were 400,000 to 500,000 Internal Troops. Conversely, if one considers the current Institute for Strategic Studies estimates of about 250,000 for all Soviet security troops, obviously the MVD troop total must be smaller.

Internal Troop units, especially the Special Designation units, are well equipped with at least light armor, artillery, and transport, and reportedly light aviation and naval units. During World War II, the MVD operational troop division, allegedly 15,000 men strong, had tank and other strength equivalent to a "Red Army Mechanized Corps."

During World War II, two separate Internal Troop armies were reported as stationed in the Moscow and Central Asian areas to maintain internal stability. An MVD army spearheaded the Soviet counter-attack in the Caucasus. Several separate MVD divisions were reported in Western front fighting. [5]

#### THE PLACE OF KGB AND MVD TROOPS WITHIN THE CENTRAL MVD AND KGB STRUCTURES

The MVD Internal Troops discussed in the foregoing pages and two other federalized elements—the civil police and firemen—are

organized together in a ministerial framework with some other elements with an MVD colonel general at the head of the Moscow-based Soviet Union's MVD which also oversees R.S.F.S.R.'s MVD matters directly. It is assumed that the remaining 14 subordinate republics have MVD ministers with proportionate military rank and staffs to direct the various semiautonomous components of the republic MVDs.

The system of MVD ministries probably has some other activities, e.g., political officers and attached KGB counterintelligence operatives, some procurement, communications and schooling common to all MVD components.

The previously discussed elite KGB troop units—Border, Signal, and possibly Guard troops—plus a huge aggregate of counterintelligence operatives, and a large number of positive intelligence operatives all operate under a large central KGB staff in Moscow and, to some extent, under subordinate KGB staffs at republic level. The various major KGB components may have some activities in common, such as schooling, procurement, and communications, as well as each having some autonomous capability in these areas.

Both MVD and KGB troops have a long record of loyalty to the regime both in peacetime (when they have repressed literally millions of their luckless countrymen) and in wartime when they meted out punishment to the invading German forces and again to many of their own countrymen (including many of the regular forces) deemed errant in their ways. According to one Border District commander, almost 99 percent of the Border Guards are Party members or Young Communists. MVD Troop membership in these two organizations is probably at a similar level. [21]

Both arms control and disarmament negotiators and military planners need to remain constantly aware that these fully armed, fully trained combat units exist outside the framework of the Soviet Army, and that they can be used to immediately implement and/or make more easy any task assigned that Army. As a very pertinent case in point, most, if not all of the Soviet units thus far involved in the recent Ussuri and Amur River and Sinkiang border clashes with the Chinese seemingly have been KGB Border Troops. (Conversely, it must be appreciated that while these units are part of the active Soviet military aggregate, although not part of the Army, they are also a further drain on the economy insofar as military requirements are concerned.)

#### POLICE AND FIREFIGHTING FORCES OF THE MVD

Two other nationwide functions of the MVD are the civil police or militia and the Fire Guard. Both bodies act under the general supervision of the U.S.S.R. MVD Ministry, although each republic except the R.F.S.F.R., has its own subordinate MVD.

The Soviet militia is an armed, militarized group headed by the Chief of the Main MVD Militia Directorate in Moscow. Militia directorates also exist in MVD ministries of the 14 smaller republics, with R.S.F.S.R. militia matters directed by the U.S.S.R. MVD ministry.

The militia organization is a dual one in that there are territorial police units within each municipal or rural entity and often institutional or departmental police, as well. The departmental militia

perform police and security functions for industrial and other enterprises. Thus, there are railway police who patrol stations, yards, and important junctions, supervise public order on trains, and prevent sabotage and thievery (a thriving Soviet industry). [7]

Territorial police bodies maintain vital statistics; enforce the nationwide internal passport system affecting all Soviet citizens; and license autos, firearms, printing equipment, and many other items. They control traffic, enforce public order, and operate a huge informant system. A plainclothes element works in the criminal investigation area.

Unclassified data on the strength of Soviet militia are virtually non-existent but they are, without doubt, a very large body. Moscow, for example, is described by Western visitors as one of the most heavily policed cities in the world. Approximately 10,000 militia officials have been reported "elected" as members of national, regional, and local municipal executive bodies throughout the Soviet Union (an indicator that many times that number make up the militia). [26]

In another recent case, the militia directorate chief of the Moscow Railroad, one of twenty-odd Soviet railroads, was identified in the Soviet press as "a General of Internal Service of the 3rd Rank." One *oblast* militia chief is a "Commissar of Militia of the 3rd Rank" (equivalent to major general). With similar equivalents throughout the administration, transport, and industry, this command element becomes a formidable body, perhaps numbering in the hundreds. [27]

1965 data prepared by the U.S. Department of Commerce indicate approximately 400,000 paid police officials in the United States. A strength of 800,000 to 1 million Soviet militia is not deemed out of line, in view of the larger Soviet population, far greater Soviet police activities and the Soviet penchant for featherbedding.

The militia have political officers, built-in KGB surveillance, a separate school system, a rank and grade structure, and uniform insignia similar to the MVD Internal Troops. Thousands of militia men participated in WWII fighting, including whole police units.

#### THE FIRE COMMAND

Little is known about the militarized MVD Fire Command. They are uniformed just like MVD troop units but far less smartly. They are reportedly mostly enlisted volunteers, possibly former servicemen, may apparently have some small arms, get some riot control and anti-guerrilla and other rudimentary military training. [31]

They are under a MVD "General of the Internal Service of the Third Rank," and are organized into units with standard Soviet military nomenclature equivalent to battalion, company, and platoon, respectively. They are subject at least to a variant of the military laws governing MVD troop units and the militia. They are thought to have political officers and attached KGB counterintelligence personnel; they have their own school system.

MVD Fire Command strength is unknown but fire houses are numerous in large Soviet cities, in a ratio roughly equivalent to that in the United States.

WWII MVD Fire Guard experience has been described briefly by the Soviet Fire Guard Chief, General Obukhov. [31]. Their chief duty, apparently, was the fire protection of important defense plants,

transportation junctions, bases, warehouses, etc., with the help of "formations" of the fire fighting service of the Local air defense (Mestnaia protivovozdushnaia oborona—MPVO) another WWII vintage MVD-supervised civil defense organization. In some areas, overrun by the Germans, other Soviet firemen, relying on previous military, semimilitary and antiguerrilla training, helped form various Soviet partisan bands.

Regarding the Fire Guard role in any future conflict, we have only Obukhov's terse statement that his organization "maintains working contact with civil defense staffs, participates in various studies" in damage prevention and damage control work under nuclear warfare conditions.

### SOVIET TRANSPORT ENTERPRISES

Some areas of the organization and activities of the Soviet state-owned, federalized transport systems—civil air, the railroads, highway transport, the merchant marine, the river fleet system, the POL (petroleum, oil and lubricants) pipeline system are discussed in the next few pages. Most of these activities are militarized to some degree with hierarchical rank and organization structures. Most have their own professional school system, some have political officers like the armed forces, and all, undoubtedly, have the familiar built-in KGB counterintelligence apparatus.

These activities are staffed by some 7 million transport workers (according to Soviet sources). [18] Personnel of several of the activities are uniformed and governed by strict labor discipline akin to military law. Many are quite regimented in that each has its own housing, clubs, sanatoria, newspapers, professional school system, medical service, and other similar internal activities. Some, like the merchant marine and the civil air fleet, virtually have the status of a military reserve component.

These elements participate to an extent in support of the day-to-day peacetime operation of the Soviet military forces and all participated heavily in the logistical support of the Soviet Army in WWII. Many merchant marine, river fleet, and civil aviation elements took part in active fighting, and civil rail and highway components, brigaded with military rail and highway units, operated under military control, often under fire.

### RAILWAYS

Most important of these modes from the standpoint of volume of freight and passenger turnover are the nation's railroads. Transportation experts point out that "the Soviet economy before, during, and since the Second [World] War has been dominated by rail transport." [19] The operating length of the system is now about 85,000 miles. The Soviet railway system, although smaller than that of the United States, is the world's largest under one management. It moves about 80 percent of the country's domestic freight and intercity passenger traffic. It bulks hugely in routine Soviet peacetime military operation and supply, and is an absolutely essential element to the success of any major Soviet combat venture.

A reported 3.5 million people were employed in all phases of Soviet rail transport in recent years (with several times the number of employees per mile of track as on U.S. roads). The size of the railway

labor force, a large percentage of which are women, has not changed markedly in 20 years, although operating personnel ratios have increased.

The Railway Ministry is organized on a semimilitary footing and has its own code of military law, a rank structure with commissioned grades, uniforms and rank insignia and strict control of its personnel insofar as leaving railway service is concerned. It has a schooling system embracing about 95 institutions, elaborate medical and communications systems and even its own segregated housing. [8]

The Soviet railway system apparently has some ministerial police and other uniformed armed guards, all possibly MVD personnel. These guards watch specific shipments, rail and marshalling yards, station platforms, large bridges, tunnels, and occasionally switches, round the clock and the guard varies in size with installation importance. [3]

In WWII the railway system was operated by the Chief of the Soviet Army Rear Services, General of the Army Khrulev, working in large part through the Military Transport Directorate of the General Staff. He doubled as Minister of Transport for several years until 1948. [9] Large units of specially organized railway troops and special civil railway reconstruction, repair, and other units operated in the combat areas, initially under separate direction, with the civil elements being attached to the fronts. Soviet sources claim that nearly 60,000 miles of track were restored by combined troop and civilian rail units working under military control during WWII. [8]

The Soviet rail system is densest in southern European Russia, south of a line Leningrad-Gor'kii. East of the Volga River, rail density thins out greatly in the rest of Soviet Europe and much more in Soviet Asia. Not only has trackage increased about 25 percent since pre-war days, but about two-thirds (54,000 miles) is now electrified or dieselized against almost none in 1940. Passengers and passenger-miles logged have roughly doubled, and freight tonnages and ton-mileages have increased fivefold. Rolling stock has greatly improved and considerable automation in many phases of railroading has been introduced.

The continuing close cooperation between military and civil railway authorities was recently remarked upon in the Soviet military press, which lauded the Belorussian civil rail administration for its help during the large Soviet maneuver, "Dnepr," in the fall of 1967.[28] Soviet military rail transport and construction personnel, and civil railway administrators were cited for having worked in preplanned harmony. Later, during the 1968 Czechoslovakian invasion, there were numerous reports of Soviet trains, hauling troops and equipment, being misdirected because Czechoslovakians moved signs.

While the rail system was tested to the utmost of its endurance during WWII, the experience factors gained by Soviet authorities then, plus very significant improvements in the system since, may well combine to make the Soviet railways' contribution to any future wartime effort an even greater one in any protracted conflict. (It is virtually accepted that the Soviet Chief of the Military Rear Services would again take over rail transport.)

The dependence on railways for logistical support is possibly more marked in the Soviet armed forces than in any other armed forces. Virtually every station of any consequence has a military comman-



dant's office to coordinate expeditious handling of military traffic with civil rail authorities. Any major Soviet military operation has to be based on rail capability. While the rail system could probably provide major logistical support to a war effort, the civilian economy would, as in past wars, be very seriously disrupted. [29]

#### ROAD CONSTRUCTION AND MOTOR TRANSPORT

Surface highway transport is of far lesser strategic importance to the Soviet military effort, but is of growing tactical significance in the shorthaul field (and thus an important supplement to the rail system).

The great bulk of Soviet motor transport operation and road construction and maintenance is carried out by a series of motor transport and highway construction ministries or directorates in each republic, rather than by a Moscow-based all-Union directorate. Motor transport administration seems almost completely decentralized to the republics where it is divided into common carrier service and departmental transport. Departmental transport comprises many autonomous fleets belonging to various republican ministries, large industrial trusts and even local enterprises. [36]

Departmental transport probably constitutes most of the motor transport; common carrier pools are operated by individual republics for hauling for the general public. Private vehicles are an infinitesimally small proportion of the total.

The 15 republics have analogous structures for road construction, motor transport operations, road and vehicle repair, and schools. A few years back, development and administration of certain national and defense highways of all-Union significance were, however, supervised from Moscow by an MVD element called the Main Directorate of Highway Construction although this element might now be under some other aegis.

While there are nearly 1.5 million km. of Soviet roads (outside cities and towns) reported, more than a million are either unimproved or improved dirt roads. About 250,000 km are graveled and less than 10 percent are fixed-surface hard-top. Most surfaced roads are located in central and western European Russia with about six main arteries radiating out from Moscow, in a pattern similar to the basic rail net. (There is no true extensive good roadway network in the remainder of the entire country).

The latest vehicular inventory data available (about 5 years old) indicate about 2.9 million trucks and 1 million passenger vehicles in the country [32] and available data on the numbers of Soviet highway transport operation and road building personnel are only approximate at best. As of 1967, Soviet sources murkily admit, there were perhaps over 1.8 million people employed in motor transport hauling operations [18]. The number of people involved in road construction and repair, previously a very low-priority and inefficient operation, is unknown but undoubtedly huge.

In the immediate postwar years, perhaps up to several million forced laborers (mostly political prisoners), plus several hundred thousand POW's, worked on the roads under MVD supervision. In addition, through the 1950's, all men and women between the ages of 18 and 40 were theoretically liable for 6 days' labor on the roads annually.

In World War II, motor transport operations and road construction and maintenance facilities—all state functions—were immediately converted to support the military effort. Soviet pre-World War II mobilization directives outline how motor and horse drawn vehicles were to be made available. [15] With the war's onset, a "considerable part of the automotive park" with its operating personnel was "mobilized for the Army" with the result that the "park left to serve the needs of the civil economy was decidedly truncated."

Enormous damage was done to the road system during the fighting, but military road construction units and civil road builders, the latter then under a "Special Directorate of Military Road Works . . . of the NKVD," are credited with building or repairing 140,000 km of motor roads in the World War II era. [8]

Although highway hauling still accounts for only 5 percent of freight turnover, Soviet planners forecast a short range increase of about 30 percent in highway hauling and a 20 percent increase in improved road mileage in the next 3 to 5 years. [33] However, if plans to double truck production to 600,000 annually and increase yearly passenger car production to perhaps 750,000 are accomplished, they may force a better road program (already being called for by some farsighted planners). [30]

Meanwhile, in mid-1968, the Soviet military apparatus, implementing their time-honored system, called up thousands of trucks, bulldozers, road scrapers, and other equipment from the national economy to participate in operation "Niemen," the largest peacetime Soviet rear services exercise ever. The Soviet press at the time justified the exercise [37] even though it came at a time of annual harvest and great need by the economy. Growing, "Niemen", under General of the Army Mariakhin, the new Soviet Armed Forces Rear Services Chief, became a Warsaw Pact exercise and, along with other communications and air defense exercises, evolved into the Czechoslovak invasion.

Mariakhin wrote that the equipment was called up with reservist operators to implement existing units and permit the play of the exercise (and perhaps the invasion).

These most recent developments considered together would indicate considerable improvement in the immediate future in the Soviet highway transport and construction field, and a continued intention on the part of the Government to tap that capability to fulfill military necessities.

#### THE MERCHANT MARINE

According to Jane's Fighting Ships, "the U.S.S.R. regards her merchant fleet not only as an essential element of the national economy at all times, but as a vital fourth arm of defense in emergency." "Moreover, the Soviet Navy draws freely from the mercantile pool when it is in the interest of the fighting services." [34]

Although initially it would seem that maritime (and river fleet) activities would have a more direct application to the support of a naval effort, it must be noted that the Soviet merchant marine would probably have to participate in logistical support of any large-scale joint operation against, for example, Scandinavia or Southern Europe, using the Baltic and Black Sea-Mediterranean approaches. Any combat or logistic operation in territory not contiguous to the U.S.S.R. would obviously require heavy Soviet merchant marine participation.

In the last decade or so, the Soviet Government has made a herculean effort to improve the size and quality of the nation's merchant marine. In tonnage alone, the Soviet merchant marine has grown from 12th to fifth or sixth among the world's merchant fleets. Qualitatively, about four-fifths of Soviet merchant shipping is less than 10 years old. The majority of it is faster than 14 knots and is diesel-powered, and the Soviets are ahead of many of their Western competitors in shipboard-automation procedures. [39]

This effort to expand and improve the fleet continues and, if the present plans are carried through, by 1980 the U.S.S.R. will overtake Great Britain as the possessor of the world's largest merchant fleet. In the interim, the Soviet merchant fleet has become a formidable arm of Soviet foreign trade and implementor of foreign policy, reportedly calling at more than 800 ports in over 90 countries. [38] The Soviet merchant marine was a prime mover in the high pressure move which led to the 1962 Cuban missile crisis. It has played a major role in distributing billions of dollars of military and economic aid. This includes some of the aid to the East European satellites, to North Korea, and especially—before the split—to Communist China. The capability of North Vietnam to maintain a military effort without Soviet aid by sea is highly questionable.

In addition, the merchant marine has played the largest carrier role in the Soviet military and economic aid and trade programs with the "Third World" since those programs began after Stalin. (This is particularly true of India, the UAR, Algeria, Yemen, and Indonesia.) [40, 41] Compared to the other transport modes, the merchant marine now handles nearly 20 percent of all Soviet freight turnover, as opposed to less than 5 percent just before World War II. Prior to Stalin's demise, the bulk of Soviet maritime activity was involved in domestic trade; by 1965, only 15 percent was. [18] In the absence of rail and road nets, however, seagoing transport will remain for a long time the only means of bulk supply of much of the Soviet northern and Far Eastern coasts.

The Soviet Merchant Marine Ministry, based in Moscow, controls the general operation of the vast new fleet and the functions of both ship and port construction and repair and ship procurement. However, it farms out shipping operations to a number of individual steamship companies.

Recent Soviet data indicate about 75,000 people engaged in actual hauling operations, that is, possibly merchant seamen. Another 200,000 are reported in ancillary Ministry of Merchant Marine endeavors. The merchant marine seamen are uniformed and have a system of rank and insignia similar to that of the Soviet Navy.

The Merchant Marine Ministry appears to have its own separate housing, schools, medical care, and clubs. It also appears to have a political officer directorate of sorts, and special attached KGB watchdogs.

In World War II, the Merchant Marine became virtually fully militarized "carrying out tasks which had been (previously) assigned it by the military high command. A mobilization and military restructuring of maritime transport were introduced—discipline and military-type regulations were introduced—all efforts were subordinated to wartime needs." Merchant vessels allegedly participated in amphibious

combat operations, in supply of besieged cities, and as armed merchantmen plying between the U.S.S.R. and her Western allies, sometimes under extremely adverse combat conditions without escort. [8, 43]

In 1966, the Soviet merchant marine was credited with around 1,000 dry cargo ships with a reported capacity effort of from 4.7 to 5.3 million tons. Over 400 more at 3.5 million d.w.t. were on order. A few years back (1964) more than 250 Soviet tankers were reported in service, many quite small. In recent years, the U.S.S.R. has been building and buying larger and newer tankers and as of 1966 was reported to have 122 tankers of nearly 2 million d.w.t. on order or under construction. For troop carrying, the U.S.S.R. has 135,000 tons of pre-World War II German liners plus 20 or more newer vessels ranging from 20,000 down to 3,000 tons.

At the end of 1966, the Soviet Union allegedly had nearly 1,250 merchant vessels of 1,000 tons or larger. In 1967, a Soviet publication reported over 1,600 vessels, with a tonnage of 11.3 million. Merchant Marine Minister Bakaev in mid-1967 claimed only 1,300 vessels, totaling nearly 9.5 million deadweight tons apparently leaving out many smaller vessels. A recent Georgetown University study reports nearly 1,450 vessels of 11 million d.w.t. as of early 1968. [4]

The fishing fleet, highly modernized, is put at roughly 3,200 to 4,000 seagoing vessels of nearly 6 million gross register tons and the oceanographic fleet at between 150 and 200 vessels. Both elements, reputedly the world's largest in each category, are widely deployed to every ocean of the world. A concerned Canadian admiral recently stated that the Soviet Atlantic and Pacific fishing fleets operate "as navies are operated" with over 800 vessels in the western Atlantic alone, involving more than 20,000 men "working very close to our shores." The fishing fleets consist of trawlers, factory ships, supply ships, and all of the needed logistic support. [44]

As with Aeroflot, the opportunity for intelligence collection among the Soviet merchant, fishing and oceanographic fleets is tremendous. Soviet naval specialists have been reported assigned to merchant and other civil shipping for the collection of strategic, electronic, photographic, hydrographic and other intelligence, and the possibilities for support of subversive activity through the Soviet merchant and other fleets are significant. They operate under rigid naval-like regulations and their discipline is semimilitary. [44]

The Soviet maritime fleet nearly doubled in size from 1945 to 1960, redoubled in the next 5 years, and is scheduled to nearly redouble again by 1970, i.e., from 2.5 million tons in 1945 to 15 to 18 million tons in 1970. [45]

Many smaller, more shallow draft vessels, both dry-cargo and tankers are planned for the next 5 years. "These are designed for sailing on both seas and rivers \* \* \*" giving the capability of commercial penetration, at least, of the rivers of many underdeveloped countries. Conversely, the Soviets are also now building and buying larger vessels than heretofore—tankers in the 50,000–100,000 ton class and cargo ships of 36,000 tons displacement. [35]

Soviet tonnage is being added at the rate of nearly 1 million deadweight tons yearly. For example, in mid-1967, Minister Bakaev forecast an increase in merchant marine tonnage of 3.5 million tons by

1970. He boasts that by 1975-1980, the Soviet merchant marine will be the world's largest.

Along with a continuing expansion of shipping, goes also a program of improving port facilities, plus planned qualitative improvement and quantitative growth in the numbers of both port and seagoing personnel of the merchant fleet.

#### THE RIVER FLEET

Although little publicized, inland waterway transport has nevertheless been a highly developed method of transport in the U.S.S.R. throughout the Soviet era. Until the mid-1950's, river transport was second only to rail transport in volume of freight turnover, that is, ton kilometers.

Since then, however, it has been outstripped in percentage of freight turnover by the maritime fleet and shaded by motor transport and oil pipelines, as well. While its proportionate importance appears diminished, the system is actually carrying four times the bulk of pre-war days and still remains an important supplement to the heavily burdened rail system, particularly in long hauls of bulk commodities.

Waterway improvements have, in many cases, been specifically aimed at diverting freight from the rail net in specific areas and critical points.

In terms of passengers and bulk cargo tonnages, Soviet river transport still handles, respectively, 5- and 2-times as much traffic as the Soviet maritime fleet. The average maritime haul is five to six times longer, however.

Total length of Soviet rivers is about 2.5 million kilometers, of which one-half million can be adapted to navigation. About 140,000 kilometers of natural waterways augmented and improved by some 1,500 kilometers of canals, locks, and other forms of manmade waterways are in use. [46, 47]

The European Russian river/canal system roughly parallels the rail net, fanning out from Moscow not unlike the railroads. A postwar improvement of strategic importance is the tying together of the Black, White, Baltic, Azov, and Caspian Seas by the Volga-Don and Volga-Balt Canals, making inland Moscow a "port of five seas." About 75 to 80 percent of all Soviet river traffic is carried on in the European U.S.S.R. Over half of all Soviet inland waterborne traffic is conducted along the Volga. Extensions of this system which reach the Caspian, Black, Baltic, and White Seas and even serve port cities in the Ural foothills, carry almost another quarter.

Over the last 15 years, many locks have been built or modernized and automated and a system of regulating dams and huge reservoirs has been constructed permitting greater control of water levels. [49] Most of the locks and dams are in European Russia.

After years of low postwar priority, the Soviet river fleet and port facilities have also been improved and modernized. While little current specific data is available on river craft, the Soviets have greatly increased the numbers of river vessels in the past decade. The immediate postwar fleet consisted of powered vessels, totaling about 0.6 million horsepower, and unpowered barges, totaling 4 million tons. A decade later, horsepower total had tripled and the nonpowered barge fleet

capacity had doubled. At that time, the Soviet river fleet reportedly had up to 3,500 tugs and a river tanker fleet capacity of 2.5 million tons. [42]

Organizationally, each republic controls its own river traffic, with the large R.S.F.S.R. River Fleet Ministry providing much common service for the smaller republics which have analogous smaller river fleet organizations. Since 1955, river fleet personnel strength has apparently leveled off at around 350,000, about one-third of whom move freight and people, with the rest employed in overhead, waterways maintenance, shipbuilding, repairs, etc.

The river fleet system has a personnel rank and grade structure and insignia somewhat similar to that of the merchant fleet, but the whole operation seems somewhat slacker. Reportedly, 9,000 engineers and 22,000 technicians were turned out by river transport schools between 1959 and 1965. The river fleet system also has its own medical facilities, housing, and undoubtedly, the ubiquitous KGB surveillance.

In WWII, the river fleet was assigned to support the war effort early. Later, at Stalingrad, the Volga proved a major strategic barrier to the invaders and served the Soviets as a valuable means of transporting men and combat materiel. The war "required a basic restructuring of river fleet work [and] \* \* \* much of it worked directly within the area of military activity." Many craft were armed and "accomplished hundreds of crossings \* \* \* in military operations," particularly in the Leningrad and Stalingrad areas. The river fleet played a "large role" in transporting petroleum from the Caspian area around the clock to supply "the front and the economy." More than 4,300 craft and hundreds of wharves and ports were reported destroyed or captured during the fighting. [8]

Concerning possible future military utility, the Volga River system has been described as the densest single Soviet transport artery, equal in capacity to many mainline railroads of equal length. Secondly, the Soviets are introducing a new river/sea class of shallow draft vessels of 5,000 tons to eliminate cargo transfers from maritime to river vessels. Mostly motor ships, these "will transform the main rivers \* \* \* into transport conveyor belts" and "carry cargo from Soviet river ports to European cities," ostensibly by sea.

Lastly, the inland system has been used for some years to transfer smaller naval vessels, including destroyers and submarines among the peripheral European seas. [48]

#### THE PETROLEUM, OIL AND LUBRICANTS (POL) PIPELINE SYSTEM

The Soviet POL pipeline system is a comparatively late-developing transport medium that has been rapidly acquiring greater strategic significance.

The greater use of POL pipelines (as well as greatly increased oil production) dates from the opening in the middle 1950's of the huge new Volga-Ural fields, called by the Soviets "a second Baku." [8] Until 1950, less than 1 percent of Soviet freight turnover (in ton-miles) moved through pipelines. However, within 15 years POL pipeline flow had surpassed the total turnover of all types of motor or river freight, each of the three accounting for approximately 5 percent of national freight turnover.

Little is known about the organization of POL pipelines except that their operation is under the Ministry of the Gas Industry. World War II utilization of POL pipelines was slight because of the comparatively short mileage available (4,000 km.). One of twin lines between the Caspian and Black Seas was relaid north along the Volga to more efficiently aid the fighting fronts. Another short line was laid from Sakhalin to the Siberian mainland to provide a more localized POL source and free the overloaded Trans-Siberian railroad from hauling as much POL from Europe.

Soviet POL pipeline mileages have increased about sevenfold since 1950 and now total about 40,000 kilometers. About three-quarters of this mileage is in European Russia. Pipeline diameters have also increased considerably. For years the Soviets were unable to make or buy large POL pipes and heavy pumping equipment and had to fall back on the heavily burdened rail system to carry the bulk of POL products at a far higher cost. The situation is improving and Soviet literature is claiming a 49-inch POL pipeline capability by 1970, with a capacity of 65 to 70 million tons per year. [50]

Of extreme significance to any military action in Europe is the "Druzhba" pipeline, running more than 5,000 kilometers from the Volga-Ural oil fields deep into Central Europe, with branches into Hungary, Czechoslovakia, Poland, and East Germany. A planned extension of the system will run northwest to Baltic seaports. Plans are also underway to double the "Druzhba" line into Czechoslovakia from the Volga-Ural fields with Czechoslovak financing of a "pipeline larger than 36 inches." [51] According to Soviet sources, nearly 78 million tons of POL were pumped to the four northern satellites in the period 1962-1968 through the "Druzhba" system.

Soviet planners forecast that POL pipelines lengths will increase to 60,000 kilometers by 1980 and the nearly all POL products will move by this means, freeing the railroads of a great burden. POL tonnage at that time will be a projected 15 percent of all Soviet freight. [52]

#### CIVIL AVIATION

Soviet civil aviation ranks last in gross freight turnover, hauling only about 0.5 percent of total freight volume. However, from the standpoint of convertibility to immediate military use for comparatively long-haul troop lift, it has very definite strategic and tactical significance. Many Civil Air Fleet special activities have direct military application—spraying, air ambulance and rescue work, aerial photography, and mapping, to mention a few. [53]

The Soviet Civil Air Ministry is a militarized uniformed element with a rank structure, full-time political officers, and no doubt a KGB element to ensure reliability. It has been headed for almost 10 years by the same active Soviet Army Air Forces (SAAF) officer, a strategic bombardment expert recently promoted to the rank of Marshal of Aviation; several of his principal deputies are also active list SAAF generals (his two immediate predecessors as Civil Air Ministers were also active Soviet Marshals of Aviation).

The Soviet Civil Air Fleet, or Aeroflot, is the world's largest single airline and has its own maintenance and supply system. Aeroflot has been estimated by Western commercial aviation experts in recent years as employing from 300,000 to nearly 400,000 people, including

unknown thousands of pilots. [54] An active SAAF colonel general and first civil air deputy has admitted grudgingly only that Aeroflot employed "several hundred thousands" [55] of people. Aeroflot also builds and operates all civil air facilities to include its own communications and uses (or shares with SAAF) more than 1,000 airfields of all types from major international airports to hundreds of grass fields. Many of these are used only rarely or are on standby.

Civil aircraft numbers are estimated variously by the same Western experts at from 1,500 aircraft (including hundreds of small fixed-wing craft and helicopters) to 2,000 multiengine transport aircraft (plus unknown numbers of lighter fixed-wing aircraft and several hundred helicopters.) [55].

Many Aeroflot personnel are SAAF veterans and almost all are graduates of a widespread Aeroflot air and ground school system, as well. Like SAAF, Aeroflot also benefits from preinduction training given to members of DOSAAF (Vsesoiuznoe dobrovol'noe obshchestvo sodeistviia armii, aviatsii i flotu SSSR—All-Union Voluntary Society for Assistance to the Army, Air Force and Navy of the U.S.S.R.) Most Aeroflot members are former DOSAAF members.

In WWII, Aeroflot was placed under the State Defense Committee, and its whole organization was devoted principally to war objectives. Not only were Aeroflot aircraft and personnel organized into large military formations, but even before the war, SAAF took over much of the Civil Air Fleet and its training system for combat training of SAAF personnel. [56] Some Aeroflot planes were used for critical supply of defense plants. Much of civil aviation was under SAAF operational control and was used as needed for airborne troop lift, search and rescue work, troop air resupply and bombardment missions. They even refueled Soviet armor on some deep penetrations by the latter. Aeroflot pilots "flew four-and-one-half million hours, transported more than 2.3 million people, among them 330,000 wounded," flew 40,000 partisan support missions and dropped 37,000 paratroopers behind enemy lines; 15,000 pilots, crewmen, and political workers of the Civil Air Fleet were decorated and six Aeroflot units were awarded the "Guards" title. [58] In WWII, the Soviets squeezed just about all that was possible out of their civil transport. Its close integration with the rest of the Red Army made the job of the Soviet strategist and commander much easier." [57]

Soviet airline route miles have nearly quadrupled since the 1940's; the number of passengers carried annually has gone up fiftyfold and airfreight tonnage has increased ten times in the same period. Aeroflot has conducted training programs for many Soviet satellites, other communist neighbors, and many underdeveloped countries and has supplied aircraft and facilities for these countries.

Like the maritime fleet, Aeroflot has become an instrument of foreign policy and influence, flying to about 50 countries. It is reasonably certain that Aeroflot, in so doing, has also been providing support to the farflung Soviet intelligence effort. [59]

The Soviets intend to continue expanding their civil aviation facilities and improving them qualitatively in the years ahead. From 1967 to 1970, they forecast a rise of nearly one-third in passenger numbers and freight cargo ton-miles as well as one-sixth in freight cargoes. Passenger forecast totals for 1980 are four times the 1967 figures.



As to planes, the new long-range Il 62 and An 22; the midrange Tu's 154, 144, and 134 and the short range Yak 40 should be making their appearance in quantity. Additionally, from a facility standpoint, 40 new major and 200 new local airports are planned by 1970. [60, 61]

While some of the newer, larger planes may reduce overall inventory numbers, civil aviation will probably still maintain several hundred larger transport aircraft, many of which are commercial versions of medium and light bombers. The airliner projected for widest use in the 1970's will have a seating capacity of 250.

In the event of future military conflict, it is expected that Aeroflot would again be utilized to augment the regular military air effort. Application of Aeroflot to military operations was most recently reflected by reports from Czechoslovakia in 1968 wherein the former Aeroflot manager at Prague allegedly returned with and guided in the initial aircraft, the first several of which were Aeroflot rather than SAAF. [62]

### OTHER MINISTRIES

The next few pages concern aspects of two nationwide public service elements—the telecommunications service and public health—that impact on Soviet military capabilities.

Like the diverse preceding activities discussed, these two elements fit into the multifaceted nondefense complex whose contributions greatly support Soviet military endeavor (and whose contribution should be viewed from the standpoint of a military requirement on the economy).

Personnel strength of the communications and public health systems could aggregate more than 5 million people. Like the personnel of other activities previously described, these individuals are fairly highly regimented. Both activities have a professional school system, a nationwide organizational structure, a system of awards and medals, their own publication houses, and the like.

### TELECOMMUNICATIONS

The first area—telecommunications—is administered in the main by the Soviet Ministry of Communications (MOC). The state-owned basic telecommunications system is primarily designed to serve the Party and government in administration and control of the country; individual convenience comes far down the list.

The basic communications network referred to in Soviet literature as the General Government Communications System is administered by the MOC in Moscow and 14 subordinate ministries in the smaller republics. MOC supervises communications in the R.S.F.S.R. directly. [63]

The system is quite well developed and widespread, and the military, transport, and some other organizations have separate sub-systems somewhat paralleling the public system. The complex includes extensive wire and radio transmission networks, radio, wire and TV broadcast installations, telex, telegraph, facsimile service, and even the use of tropospheric scatter equipment and communications satellites. Underground cable has largely replaced open wire as a primary means in the last decade or so, and the automation of many procedures is being strongly pushed. Radio telegraphy, radio telephony and

sophisticated forms of multichannel wire carrier system are also in fairly widespread use. Total length of telegraph lines is reported at about 9 million miles, and in the last decade television has become available to perhaps half of the population. [63]

The bulk of communications equipment and facilities, as might be expected, is concentrated in the southern three-quarters of European Russia south of a line, Leningrad-Perm-Sverdlovsk, the site of the bulk of the Soviet population, industry and government centers. Moscow is the Soviet terminus of almost all of the international and intrabloc communications media and is the hub of in-country communications. [64]

MOC either makes or supervises the manufacture of all Soviet made communications, possibly on behalf of the defense establishment and other agencies. Much of the latest automated equipment is either of satellite or Western make.

Recently it was reported that there were about 24,000 engineers, nearly 80,000 technicians, and perhaps 700,000 other communications workers in the overall Soviet communications field.

The MOC maintains an elaborate school system with more than 80,000 full time evening and correspondence students. MOC personnel have their own departmental medical service including a number of large hospitals, and may well have other departmental arrangements, like separate housing.

The Ministry of Defense uses the civil, or public, wire system from—defense headquarters down to the military district level, in addition to maintaining its own radio nets,[4] The transport ministries, including the railways, the maritime and river fleets, and the Civil Air Fleet, all seem to maintain their own communications nets. Other governmental agencies presumably having their own organic smaller communications nets include the MVD and the KGB.

Telecommunications and postal security is tight. All international transmissions are monitored, censored and filtered through government channels (which are the only channels). KGB officials can be expected in the communications area of any major governmental department or enterprise as well as within MOC itself. The MOC also has numbered militarized detachments, whose function is not clear.

#### *World War II Role*

The World War II experiences of the Soviet Communications Ministry parallels that of many other civil ministries, According to one very comprehensive source, "its personnel were placed under full military discipline in World War II"[1] and the current Communications Minister writes "The Great War was a grave experience . . . completely new tasks confronted the national communications system." [63] The establishment of uninterrupted communications under wartime conditions became a prime requirement and there was an extraordinary growth in the normal load on all communications modes.

Two segments of the ministry, under deputies, were evacuated from Moscow to the east; these elements supported the economy and the civil functions of the government. A third element under the wartime Minister, Peresykin, directed the organization of communications for the fighting fronts and the military rear areas west of Moscow. Later the Minister became Chief Signal Officer of the Red Army while continu-

ing his ministerial duties. He remains a Chief Marshal of Signal Troops to the present, although no longer Minister of Communications.

Much of the military-oriented work was done through a Central Military Directorate of the MOC. Not only did the MOC maintain the normal communications under wartime stress, but it installed quantities of new communications in command posts, defense plants, and hospitals and established widespread air raid alarm systems.

As of 1965, the U.S.S.R. had a reported 70,000 odd telegraph installations, many fully automatic and 30,000 urban and rural telephone stations. Nearly half of the local telephone exchanges were reportedly automatic. Direct distance dialing had become possible in or among several large Soviet cities, including Moscow.[18] The number of telephone stations has tripled, telegraph installations have more than doubled, and radio transmitting stations have quintupled. The automation of telephone and telegraph stations represent a new capability since World War II as do the television facilities. Major television centers have grown in the last decade from less than 100 in number to over 200, and intrabloc TV reception, like intrabloc telephone and telegraph services has become a reality.

Although planned communications improvements are not available in flat figures, large increases in percentages of telephones, inter-city telephone channels and lengths of telephone lines increased TV coverage, more automation, and the like are in the offing. At least the following increases are planned during the 1966-70 timeframe:[65]

|   | <i>Percent</i> |
|---|----------------|
| Capacity of intercity telephone channels..... | 150            |
| Capacity of telephone stations.....           | 80             |
| Number of telephones.....                     | 100            |
| Length of intercity lines.....                | 150            |

Construction of approximately 120 more major TV stations covering areas inhabited by 60 percent of the Soviet population is envisaged in the same period for a total of 300 major and 900 other TV stations. Qualitatively, additional automation, further use of troposcatter and communications satellites, further and more sophisticated multichannel wire and cable systems are also projected.

Recently the Soviets have characterized their communications as "an enormous complex of electronic instruments, communication and control devices and computers."

A peculiar Soviet phenomenon is the mass use of slaved wire broadcast receivers tuned to central broadcasting points to maintain communications with the great bulk of the population, particularly rural. Approximately 35 million of these units are currently installed and some 40 million are projected for 1970. [63]

Since the nation's peacetime military operation utilizes large areas of the public communication system, extremely high-level Defense and civil government matters being routinely transacted through special KGB Government Signal Troops, it is certain that the peacetime cooperation between the MOC and the nation's armed forces and other security elements will expand by the amount necessary in any future conflict to meet the military needs. There are some indications that the present Minister may retain the active rank of colonel general of Soviet Army Signal Troops.

## PUBLIC HEALTH SERVICE

The medical and health complex, like every other significant Soviet activity, is state-operated. It consists primarily of the nationwide network of the Ministry of Health (MOH) of the U.S.S.R., which supervises the national health policies, and fifteen subordinate republic health ministries. However, it is augmented by the medical services of the Ministry of Defense, the MVD, and the KGB, and the medical services of several transport (and probably other) branches of the economy. Thus, the Railway, Civil Air, Maritime Transport, Communications, Agriculture, and Food Processing ministries and many other large industrial ministries have their own medical, sanitary, veterinary and/or industrial health services operating fairly independently or jointly with MOH. [66] The Soviet MOH operates the pharmaceutical and medical equipment industries and controls health and medical research [157].

Preventive medicine is heavily emphasized in order to maintain a healthy national labor force and population and compliance within any countrywide measures is mandatory. [67].

In the overall system are nearly 700,000 physicians and surgeons and perhaps 4 million other lesser medical personnel: nurses, therapists, and other technicians. More than 500,000 of these are *fel'dshers*, a category of medical aid personnel with perhaps less than half the training of a full-fledged physician. The majority of the MOH personnel are women.

Soviet sources claim a nearly fourfold increase in both medical personnel and bed space since the end of World War II. While it is difficult to quantify capability just on numbers, the Soviets apparently now have about four times the number of surgeons and dentists, five times the number of medical doctors, and about three times the number of middle medical personnel and nurses as in 1940. Soviet sources also report 2.4 million hospital beds for 1968, and predict 2.7 million for 1970. [68.]

Medical training is conducted in a system of nearly 100 higher educational institutions with a student body of over 250,000. Over 600 specialized secondary schools with an enrollment of more than 400,000 train various kinds of medical technicians and nurses. [68]

Perhaps two-thirds of the medical installations, bed spaces, and personnel are in the southern three-quarters of European U.S.S.R., i.e., about one third of the country.

At the lowest level in the hierarchy of Soviet medical care are several "voluntary" multimillion member mass organizations and programs. All of them including civil defense organizations, DOSAAF, the Komsomol and Young Pioneer organizations, operating jointly under the MOH and other government and party sponsorship teach, among other things, first aid, personal hygiene, physical fitness and sanitary controls but the highly organized Red Cross and Red Crescent Societies, with reported memberships in the "tens of millions," concentrate almost exclusively on mass medical and health aspects.

Soviet public health and military medicine have close working relations going back several decades. Before 1929, military medical facilities were subordinate to the forerunners of both the Health and Defense Ministries. "Inclusion of the military medical department in the overall system of the People's Commissariat of Health" was held

of primary significance for the "successful development of Soviet military medicine at that stage" and "was a clear expression of the organizational unity of public health." [69]

In 1929, a Military Medical Service was constituted which could draw on the public health organization for personnel, training facilities, and equipment and order civil health authorities to carry out certain sanitation and anti-epidemic measures "in the national interest." [70] "The general principle was that military medicine was allowed to draw freely on . . . civil medicine but not vice versa."

In WWII, besides furnishing huge numbers of medical reservists to the combat forces, the MOH predecessor organization was responsible for the care in civil hospitals of military sick and wounded evacuated through the medical organizations at the front.[71]

Two-thirds of all Soviet military medical personnel in WWII were women, including many company aid personnel and surgeons. In addition, there were some 200,000 part-time civilian "nurses", Red Cross- and Red Crescent-trained, working in rear hospitals. The close wartime cooperation between civil and military medicine continued after the war. As a prime example of this cooperation, the first Soviet heart transplant operation—on a civilian female in 1968—was done by a combined military-civilian team headed by military surgeons.[73]

This doctrine was most recently followed in the 1968 Rear Service "Niemen" maneuvers preceding the Czechoslovakian invasion, when evacuation of seriously wounded to MOH hospitals in the "deep rear" was simulated. This was borne out by "Niemen", where medical reservists were among "thousands" called up, and comprised "a good half" of military medical personnel in the maneuver.[72]

## COUNTERINTELLIGENCE AND SECURITY ACTIVITIES OF THE KGB

In the area of counterintelligence and security, the KGB wields inordinately important influence and control over all other elements of Soviet activity, including KGB, MVD, and Ministry of Defense ground troops, air and naval forces, police, fire and other MVD elements, all branches of industry, agriculture, transport and commerce, all branches of education, culture, and social intercourse, the governmental machine itself, and even the Party, except for a very small Party elite at the very pinnacle, in whose behalf the KGB influence is wielded.

For this reason, while KGB troop units were discussed earlier, the ubiquitous and ever-present counterintelligence elements are discussed last.

The KGB counterintelligence element consists of a huge, widespread mechanism, semi-military in form, with a system of rank and grades. It insures the surveillance of all foreigners within the U.S.S.R., and the detection of any trend among Soviet citizens determined as anti-Soviet. It also carries out clandestine intelligence and subversive operations, as well as propaganda and misinformation campaigns designed to forward Soviet objectives.

While much of this huge mechanism is devoted to combating foreign intelligence, the overwhelming proportion of it is turned inward on all phases of Soviet society with at times a psychopathic intensity. [83]

The previously described KGB troops, the security elements described here, and the positive intelligence elements (not described in this study) share a common staff at the Moscow summit, currently under a civilian chairman. Many of his known deputies carry military titles. Thus the ranking first deputy is a colonel general of KGB. Another colonel general is the Ukrainian KGB head, with two major generals as deputies. Two other major generals head republic KGBs, one in Latvia, one in Uzbekistan (indicating this possible rank for heads of other small republic KGBs). [81]

The KGB is repeatedly referred to in anti-Soviet literature as "a grasping, bloodthirsty octopus" whose tentacles reach out to "penetrate into all sectors of government, administration, the Armed Forces, and into every corner" of the nation. Stalin called it, briefly and succinctly, "the punitive organ of the Soviet." [74]

Although the post-Stalin policy has been to curb the openly flagrant and brutal excesses of the state security machine, the mechanism remains.

With the troop units invading Czechoslovakia in 1968 there allegedly arrived several hundred plainclothes Soviet security agents, carefully equipped with false documents, speaking the languages of the country, and cooperating with the pro-Soviet elements of Czechoslovak security. Meanwhile, at home inside the Soviet Union, there is an ever-growing wave of arrests, trials, and imprisonments of prominent Soviet intellectuals, writers, dissidents, and nationalists. KGB officials often appear as court witnesses. Such activity indicates that the KGB may again be emerging from a period of comparative quietude.

#### COUNTERINTELLIGENCE ORGANIZATION AND FUNCTION

Reportedly the KGB is responsible for all counterintelligence and security measures and for the physical security of many government and Party leaders and of important installations. It keeps under close surveillance all industrial, agricultural, and commercial achievements, personnel, and performance. It operates, in effect, a national censorship of the disseminated printed and spoken word and the mails. [84]

To perform these various functions, the KGB has a number of Main Directorates and lesser support elements. The various main directorates enumerated below have been reported over the years as having slightly different names, but in essence, they are thought to still exist in much the same general format: [75, 76, 85]

(a) Directorate of Counterintelligence (Kontrazvedyvatel'noe upravlenie—KRU): counters foreign intelligence and sets and supervises general counterintelligence policy for other directorates.

(b) Secret Political Directorate (SPU): keeps under surveillance the bulk of the Party and government structure, all social and cultural organizations, and the general civil population. It is the SPU personnel who impinge on the life of the average Soviet citizen and to keep the ruling elite continuously informed of the political mood of the country. SPU is reputedly the largest KGB counterintelligence directorate.

(c) Main Directorate of [Military] Counterintelligence (Glavnoe upravlenie kontrazvedki—GUKR): The function of GUKR is to protect the nation's armed forces against espionage, sabotage, and subversion from without, but probably more of its time is spent in

the eradication of real or imagined anti-Soviet activity or thought and behavior among Soviet military personnel. GUKR allegedly has separate sections for army, navy, and aviation matters. KGB and MDV troops also have these counterintelligence elements (as do the militia and probably the militarized MVD firemen). Counterintelligence or special section agents or informers are found at every major unit level down to possibly squad. [77] "The Soviet armed forces are placed under closer scrutiny of the secret police than any other group. As a cross section of the population bearing arms, the army has always been considered as dangerous by the regime." [86]

(d) Economic [Counterintelligence] Directorate (Ekonomicheskoe upravlenie—EKU): may still surveil all branches of industry, domestic and foreign trade, and agriculture with the ostensible mission of protection against economic espionage, sabotage and "wrecking." Once reportedly the largest counterintelligence directorate, it watchdogged the national economy, collated economic data from the myriad levels and branches of industry and agriculture and prepared installation, regional, and eventually, national economic mobilization plans. Functions and personnel may have been absorbed by other directorates, particularly SPU.

(e) Road Transport Directorate (Dorozhno-transportnoe upravlenie—DTU): keeps under surveillance all forms of transport operation. Centralized transport performance data and prepared mobilization plans for transport media. (May also have been absorbed by EKU and/or SPU.)[5]

(f) Guards Directorate: provides physical security for Party and government VIP's and strategically important installations. Personnel protected presumably include the C.P.S.U. Secretariats, Presidium and Central Committee and the Council of Ministers. The security provided includes both uniformed armed guards, and overt and undercover security surveillance for both personnel and installations. This protection may even extend down to the *oblast* level. [79]

(g) Foreign [Intelligence] Directorate (Inostrannoe upravlenie—INU): conducts all phases of positive intelligence operations abroad, except military intelligence. (Since KGB conducts all military counterintelligence operations, including those within military intelligence, either INU or GUKR are privy to Defense military intelligence operations.)

Each of the national level Main Directorates maintains analogous elements at lower administrative levels throughout the country. Thus KRU, GUKR, SPU, EKU, DTU, and the Guards Directorate—or current equivalents—are represented at republic, and possibly *oblast* and regional levels where warranted.

In addition, below this level, each large institution—educational, social or scientific—within the purview of an *oblast* Secret Political (SPU) element, for example, has a Special Section which controls institution guards, firemen, maintenance personnel, communication facilities, duplication facilities, personnel files, safes and even locks and keys and a secret informant net throughout the plant.

KGB (EKU) representation also has a functional distribution. For example, the steel industry and the Food Processing Industries Ministry will each have KGB representation from top to bottom—in their Moscow headquarters, in area headquarters, and in the individual enterprise, be it steel mill or meat packing plant. Each of the 20-odd rail lines has an attached KGB (DTU) element equivalent

as does each river basin directorate, Aeroflot region and maritime steamship company. Subordinate to these are smaller DTU elements at important railway stations, piers and airports.

In this way a coverage is obtainable from all phases of activity laterally in a given geographic area, and functional coverage of a given industry is available vertically from top to bottom. [78]

#### STRENGTH, OTHER PERSONNEL MATTERS

Personnel of the various KGB counter-intelligence elements are militarized and have (but do not always wear) a distinctive uniform. [80] They are no doubt issued arms. Those assigned to troop units wear the unit uniform. KGB operational personnel, to a man, are highly regarded Party members. Many are volunteer military veterans. The KGB operational security elements have the same rank system that the various Soviet troop units do but reputedly are promoted faster, draw extra pay, and have other extra privileges not enjoyed even by KGB troop officers.

As many as 20 KGB generals (other than Border Troop generals) have been identified in Soviet periodicals in the last few years. At least three of these are colonel generals.

The strength of the KGB security structure is a closely guarded secret, although it has been unofficially estimated by several close students of the system at from 5 million to "probably under a million." [5, 78] The uniformed top of this iceberg are the KGB personnel at the national, republic, and lower administrative elements in open KGB headquarters. Their numbers are unknown but large. The size of the full-time plainclothes apparatus that operates around them is also unknown. The part-time informant pool which the full-time KGB organization operates through coercion or other means has been estimated (possibly conservatively) at one Soviet citizen in 10.

There are definite geographically oriented KGB headquarters in every oblast, of which there are approximately 110, plus 40 more oblast equivalents. There are also indications of possible full-time KGB representation currently at current regional (raion) and city level. There are approximately 5,500 of these regional entities without considering the great numbers of government offices, institutions, enterprises, schools, transport facilities with internal assigned KGB Special Sections personnel.

Thus, while even a range of KGB strength is difficult to project some appreciation of the enormous reach and quality of KGB operational agent network coverage can be gained.

#### WORLD WAR II

At the start of World War II the present counterintelligence and security directorates were part of the NKVD. In 1943, the NKVD was subdivided with the new NKGB (later MGB and then KGB) taking over operational security, intelligence and counterintelligence functions, censorship, and the physical security of government and Party VIP's and installations. The NKGB was given status as one of the Armed Forces.

During both the combat and occupation phases, the greatly expanded military counterintelligence organs—alternately know as OO (Osobyi otdel—Special Section) GUKR, and "Smersh" (Smert'



shpionam—Death to Spies)—were not only responsible for eradicating any anti-Soviet trends among the troops, but also operated among the civil populace in their parent units assigned area. [5, 76]

#### OPERATING PHILOSOPHY, TECHNIQUES

The KGB officers in a plant, institution, or military unit, segregate themselves from other areas of the activity to discourage familiarity and to inspire apprehension. [79]

Attached KGB officers are not accountable to the director, commanding officer, or supervisor, nor to the unit political element, and report on them as well. They have the right of access to all files, plans, meetings, documents and areas. The reporting process is one-way and officials of the enterprise or activity under surveillance learn only what is intended for them to know.

Neither local VIP's nor ordinary individuals go to KGB Special Section (OO) offices unless sent for. Conversely, continuous furtive meetings at odd hours occur here or at other places between the OO officers and their secret informants.

In the military, counterintelligence officers apparently comment independently on the capabilities of both line and political officers and no officer is promoted or selected for schooling without OO approval; the political officers cooperate and report to the OO.

Among other extraordinary powers granted the local operational/counterintelligence elements of the KGB has been their right to assume control of local MVD and KGB troops elements and of militia and firemen, and sometimes even of Army units in case of local disorder, disasters, and emergencies. Repeatedly, in Western and émigré literature (and occasionally and more obliquely in Soviet literature) the theme occurs that curbing disorders or any purging or resettlement is always done by KGB, MVD, Army troops or police under KGB security control. In the past, implementation of such measures has amounted to some very sizable and prolonged operations, such as stamping out large sectional insurgencies or carrying out mass dislocations of whole populations of minority enclaves. [5]

A system with so much power could not function without a check, and in spite of the high political reliability requirement for KGB personnel from a Party viewpoint, individual reliability is not enough. It is very probable that the KGB, in addition to internal Party organization, also has its built-in political officer system. Further, in KGB counterintelligence, there are unknown individuals who watch their own comrades. The editor of *The Red Army* characterized this aspect very succinctly thus, "The secret police who spy on the secret police are most carefully selected \* \* \* the persons who watch the police who spy on the police are most deeply hidden." [82] Some of the most prominent victims of the Soviet State Security system over the years have been many of the highest ranking Chekists. Security Ministers Yezhov, Yagoda, and Beria were all executed, as were scores of other KGB general officers.

The lack of humaneness of the KGB operation and the tremendous drain it must make on national resources aside, there is no doubt that this organization represents a first-class instrument for the implementing of mass control and what the Soviets call "prophylaxis" measures, and one against which it is extremely difficult to mount any sizable successful opposing operation.

## RANGES OF PERSONNEL INVOLVED

The numbers of personnel involved in the enterprises described in this section literally run into the millions, although anything like precise quantification is impossible, mostly because of the Soviet near-mania for security in anything that impinges, however slightly, on defense matters.

The armed forces of the KGB and MVD total at least 250,000 according to conservative Western calculations. Other unofficial estimates from knowledgeable sources are double or triple this figure. These are uniformed troops with light crew-served weapons, armor, artillery, and light air and naval support.

The federalized civil militia and Fire Command may run to 1.5 million. These individuals have some small arms, some tactical formations, and are mainly ex-servicemen.

The personnel of the state-operated Soviet transport enterprises by the Soviets' own figures total more than 7 million, all state employees and trained and regimented transport workers—land, sea, river, and air. Medical and telecommunications workers may aggregate another 6 or 7 million.

Full-time security and counterintelligence operatives of the KGB may easily total from 500,000 to 1 million or more people.

It should be obvious that the full resources of all the areas or ministries touched on in this section will not necessarily be immediately thrown into a major wartime effort. Some of them may well be, however, and great numbers of reservist personnel of the other enterprises will undoubtedly be called to the colors to function as active military in their specialties; the basic framework and structure is there, and through it and the training of necessary replacement specialists, these enterprises will continue to make the same or even greater contributions to Soviet military capabilities that they make in peacetime.

Moreover, military requirements will take immediate priority without the tortuous negotiation on enabling legislation that is so often necessary in the West.

Meanwhile an understanding of the peace-time contribution to Soviet Ministry of Defense structure of the activities described in the section is deemed essential if a full appreciation of Soviet military capability is to be gained. Conversely, no really complete assessment of the cost of the Soviet military effort to the total economy can be arrived at without some assessment of defense costs against the military support activities of each of the activities discussed in the preceding section.

This short foregoing account does not consider to any great extent the huge part-time efforts in the premilitary training fields, mandatory for students; the civil defense programs, mandatory for almost all citizens; or the mass, multimillion-man labor reserve programs that were mandatory from World War II until the mid-fifties. It does not even consider (in these days of bitter debate about the U.S. military-industrial complex) the vast resources of the Ministries of Defense Industry, Aviation Industry, Automobile Industry, Ship-building Industry, or the Transport Construction Industry and a host of others where military and military-associated hardware-building may be hidden, since this review is primarily concerned with organizations providing services rather than hardware.

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20. Edgar O'Ballance, *The Red Army; A Short History*, New York, Praeger, 1964.
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22. Richard F. Staar, "The East European Alliance System," *U.S. Naval Institute Proceedings*, v. 90, No. 9, pp. 26-39.
23. Individual marksmanship prowess is apparently a Border Troops tradition. *Pogranichnye voiska v gody Velikoi Otechestvennoi voiny, 1941-1945* (Border Troops in the years of the Great Fatherland war, 1941-1945), Moscow, Nauka, 1968, lists by number the citations awarded some 28 numbered Border Troop regiments and equivalent units, often—citing campaigns and battles.

24. A. Tsvetkov and L. Kozlov, "Sovetskie pogrannichniki v Velikoi Otechestvennoi voine (Soviet Border Troops in the Great Fatherland War)," *Voенно-istoricheski zhurnal*, v. 10, No. 6, June 1968, pp. 80-83.)
25. Former NKVD troop officers have put the overall NKVD wartime figure at two million; this included the militia (civil police), militarized camp guards, and militarized transport guards in addition to regular security troop units.
26. "Police in Moscow Face Sullenness," *New York Times*, Aug. 18, 1968. A recent article states that police strengths "are not disclosed, but foreigners visiting here say Moscow is one of the most heavily policed cities in the world. A five minute drive down a main street is likely to turn up . . . 15 policemen . . . along the route. They are even seen in the countryside, miles outside the city. . . . The police stand . . . outside embassies and new apartment buildings assigned foreigners . . . diplomats say the police are really there to keep curious Soviet citizens from making contact . . . The policemen also . . . guard trains and riverboats . . . The typical Moscow policemen smartly dressed in a blue uniform with bright red trim, look and act tough."
27. The title of "commissar of the 3rd rank" is equivalent at least to the rank of major general. Prior to WWII, a commissar of the 3rd rank allegedly ranked with an Army colonel general. KGB and MVD troop ranks were equated in postwar days and uniforms and insignia were standardized with those of the Ministry of Defense. As an imprecise and incomplete idea of the rank structure in territorial militia elements, the following is offered: Gor'kii oblast (population 3 million plus) has a commissar of militia of the 3rd rank, i.e., a general officer, as its chief. The police chief of Tiflis, Georgia (population 900,000), is a colonel of militia. The chief of Stalingrad (population 750,000) is a colonel of militia. The chief of a Moscow precinct (*raion*) (or 29 precincts) is a lieutenant colonel of militia. See *Krasnaia zvezda*, No. 197, Aug. 21, 1964, p. 4, and No. 178, Aug. 1, 1968, p. 4, for pictures and identifications of several high-ranking militia and other officers.
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32. Holland Hunter, "The Soviet Transport Sector," in U.S. Congress, Joint Economic Committee, *New Directions in the Soviet Economy*, Washington, U.S. Government Printing Office, 1966, pt. II, p. 587 (569-591).
33. Moscow, Akademiia obshchestvennykh nauk, *Povyshenie effektivnosti transporta v SSSR (The Rise of Effectiveness of Transport in the U.S.S.R.)* (T.S. Khachaturov, ed.), Moscow, Mysl', 1966, pp. 82, 87.
34. *Jane's Fighting Ships*, New York, McGraw-Hill 1965-66, pp. iv, vi; and *ibid.*, 1966-67, pp. v-vi.
35. Radio Moscow, April 1, 1966. (U.S. Foreign Broadcast Information Service, *Daily report: U.S.S.R. and East Europe*, No. 64, April 4, 1966, p. CC3.)
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  43. Nikolai Alekseevich Piterskii, ed., *Boevoi put' Sovetskogo voenno-morskogo flota (Combat path of the Soviet Navy)*, Moscow, Voenizdat, 1964.
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  47. Konstantin Stepanovich Liakhov and K.P. Chentsov, *Prakticheskoe posobie dispelcheru rechnogo flota*, Moscow, Rechnoi transport, 1963.
  48. V. P. Petrov, "Soviet Canals," *U. S. Naval Institute Proceedings*, v. 93, no. 7, pp. 32-44.
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# THE ECONOMIC BURDEN OF SOVIET DEFENSE OUTLAYS

By STANLEY H. COHN

## SUMMARY

Even more intensively than in the United States there has been strenuous resource contention between defense and civilian uses, particularly investment, in the Soviet Union. This competition has been intimated in official declarations and can be verified by analysis of Soviet product and income flows.

Soviet defense expenditure trends have been decidedly irregular with a sharp increase during the Korean War, a plateau for the remainder of the decade, rapid increases during the early sixties, some levelling out in the mid-sixties, and renewed rapid growth since 1965. The composition of military outlays has shifted from a position of over half of all spending on personnel expenditures in the early fifties, to a decline in such outlays for the past fifteen years, with considerably greater offsets in the burgeoning of research and development and procurement expenditures for complex aerospace and nuclear weaponry.

The Korean War defense surge led to a sharp decline in the rate of increase in investment, especially of equipment; while the expenditure plateau from 1952 to 1960 permitted rapid rises in investment. The 1960-63 defense upsurge again depressed investment growth, particularly in construction of housing and consumer goods plants. Defense trends since 1963 have had less discernible displacement effects, but they have set an apparent ceiling on the proportion of national product used for growth purposes.

A noteworthy exception to these displacement patterns has been that of machinery industry investment. Since this branch of industry includes military production, its parallel movement with defense trends is to be expected. Trends in defense spending have also affected the quality of investment in terms of the capital-output ratio. Again machinery is the glaring exception to the tendency for surges in defense spending to increase capital-output ratios. There is no correlation between trends in defense expenditures and trends in consumption. Given the relatively low income of the Soviet citizen, his market basket is largely oriented toward items of agricultural origin with consequent dependence on production trends in that sector.

On the basis of demonstrable technological analogy with the United States, the principal material inputs into complex weapons find their alternative uses in capital investment, further verifying the drain on both the volume and quality of investment imposed by burgeoning defense outlays. Similarly a rising share of engineering graduates has been absorbed into research and development and are composed of those engineering specialities most appropriate to rapid development of aerospace and nuclear technology. Finally, the defense sectors have been favored organizationally by both planners and political leaders in the effective competition for scarce type of human and material resources.

It is through restraint on increases in the productivity of manpower and capital that defense outlays impose their principal burden on the Soviet economy. The defense programs sequester resources that would otherwise contribute to the improvement of civilian-oriented technology and be used in civilian production. Some illustrative calculations indicate that a change in defense expenditures would have only a minor impact on growth through the transfer of resources to investment but a substantially larger effect through repercussions on the productivity of both the labor force and fixed capital.

The controversy over economic priorities, as between military and civilian oriented claims, is high on the public policy agenda in the United States. Although the temper of the controversy has been more muted publicly in the U.S.S.R., there is ample evidence of its paramount importance there, too. While Soviet politicians have not forth-



rightly acknowledged nor economists measured the economic burden of their large defense effort, policy statements have alluded to the drain which expanding defense programs were imposing.

In the summer of 1962, Khrushchev explained the decision to raise meat prices in terms of a required increase in peasant incentives. The alternative to higher prices was a larger scale investment commitment in animal husbandry, which would be at the cost of reduced industrial investment and a reduced defense expenditure effort.<sup>1</sup>

In explaining the reduced rate of economic growth for a later period, a Soviet economist noted:

In the reduction of the growth rate there appeared the poor harvests of 1963 and 1965. Worsening international relations in subsequent years compelled the diversion of additional resources into the strengthening of the country's defenses, which also led to a reduced rate of growth of national output.<sup>2</sup>

Even more recently another Soviet economist has noted that—

The worsening of international conditions will not allow the implementation of designated allocations for investments in agricultural production. The planned allocations for 1969 are higher than the 1968 level, but will not reach the volume established in the Directives of the XXII Congress of the CPSU for development of the national economy in 1966–1970.<sup>3</sup>

The purpose of this study is to evaluate in quantitative fashion the economic impact of trends in Soviet defense expenditures since 1950. Once a time series for defense expenditures in its major composition has been established, various techniques will attempt to estimate the likely resource trade-offs between defense and other uses of national product. The measures will proceed by increasing degree of disaggregation. Whenever possible the resource trade-offs will be measured in terms of Soviet data, but when the necessary information is lacking, the conclusions will be based on analogy with the U.S. economy.

## TRENDS IN DEFENSE EXPENDITURES

An evaluation of the economic burden of defense expenditures in the U.S.S.R. requires a knowledge of the trends in both the total value of Soviet defense expenditures and their composition.

The basis of the estimates of Soviet defense expenditures that are used in this study is set out in appendix A. The uncertainty of these estimates must be kept in mind in the analysis that follows. Essentially, the estimates represent reported Soviet budget allocations for defense and science, deflated by reported Soviet price indexes. Therefore, the estimates do not reflect changes in the degree of disclosure of military outlays, changes in the share of military research in the total science budget, or possible divergencies in the price trends of military and civilian goods. General trends are thought to be approximately correct, but individual years may be substantially in error.

The estimated trends in Soviet defense expenditures since 1950 have been marked by conspicuous cycles and turning points (table 1). After a rapid rise during the Korean war, defense spending remained on a plateau for the remainder of the decade with some minor reduction in the late fifties. Following the accelerated development of space and nuclear technology and the mobilization following the erection of the

<sup>1</sup> Jerry F. Hough, "Enter N. S. Khrushchev," *Problems of Communism*, v. 13, No. 4, July–August 1964, p. 31 (28–33).

<sup>2</sup> Petr Tarasovich Morozov, *Zadachi i organizatsiia planirovaniia narodnogo khoziaistva v SSSR*, Moscow, Mysl', 1967, p. 7.

<sup>3</sup> V. Semenov, "Sel'skomu khoziaistvu—prochnuiu ekonomicheskuiu osnovu," *Finansy SSSR*, v. 43, no. 3, Mar. 1969, p. 16 (14–23).

Berlin Wall there was a sharp increase of about 50 percent between 1960 and 1963. After a leveling out between 1963 and 1965, defense outlays have risen rapidly through 1968 and are contemplated to rise further in 1969.<sup>4</sup> Trends in total defense expenditures conceal significant movements in the real value (constant rubles) of major components of defense (table 2). The Korean war splurge was conspicuously large in terms of personnel outlays, reflecting a rapid increase in armed forces strength. Although aggregate defense outlays were nearly constant between 1952 and 1960 the large reduction in personnel costs arising from demobilization were offset by increases in weapons procurement and a burgeoning of the research and development effort. During the rapid overall increase from 1960 to 1963 personnel costs declined slightly, but procurement outlays increased over 90 percent and research and development by over half. The accuracy of the defense expenditures estimate in this period is particularly dubious. In 1961 the announced 2.1-billion ruble increase may have been in part a propaganda response to the U.S. increase announced earlier the same year. This could have been easily handled in the budget accounting by shifting hidden defense items into the explicit defense item. The brief leveling of total expenditures from 1963 to 1965 saw some decline in procurements and in personnel costs, but continual rapid growth of research and development spending. The renewed rapid increase since 1965 has been limited to the two nonpersonnel categories. Whereas personnel costs claimed half of the total defense budget in 1950 and research and development barely a twentieth; in 1967 personnel costs were less than a quarter, procurement was over half of the total, and research and development about a quarter (table A-2).

<sup>4</sup> Current ruble outlays are planned at 17.7 billion rubles in 1969 compared with 16.7 billion in 1968. *Pravda*, Dec. 11, 1968.

TABLE 1.—*Soviet defense expenditures*<sup>1</sup>

| Year      | Current rubles (billions) | Constant rubles (billions) | Index (1960 equals 100) |
|-----------|---------------------------|----------------------------|-------------------------|
| 1950..... | 8.8                       | 8.5                        | 75.2                    |
| 1952..... | 11.5                      | 11.3                       | 98.3                    |
| 1955..... | 11.5                      | 11.3                       | 98.3                    |
| 1958..... | 11.2                      | 11.2                       | 96.6                    |
| 1960..... | 11.6                      | 11.5                       | 100.0                   |
| 1961..... | 14.3                      | 14.3                       | 124.2                   |
| 1962..... | 15.8                      | 15.7                       | 136.5                   |
| 1963..... | 17.3                      | 17.2                       | 149.6                   |
| 1964..... | 17.2                      | 17.3                       | 150.4                   |
| 1965..... | 16.9                      | 17.1                       | 148.7                   |
| 1966..... | 17.9                      | 18.4                       | 160.0                   |
| 1967..... | 19.4                      | 19.9                       | 173.0                   |

<sup>1</sup> See appendix A for derivation of estimates.

TABLE 2.—*Changes in expenditures for major defense budgetary components*<sup>1</sup>

| Period       | Percentage change |             |         | Total |
|--------------|-------------------|-------------|---------|-------|
|              | Personnel         | Procurement | R. & D. |       |
| 1950-52..... | 40.0              | 24.1        | 20.1    | 32.9  |
| 1952-55..... | -18.6             | 33.3        | 33.3    | 0     |
| 1955-60..... | -31.6             | 10.4        | 187.5   | 1.8   |
| 1960-63..... | -7.7              | 90.6        | 52.2    | 49.6  |
| 1963-65..... | -2.8              | -8.9        | 22.9    | -0.7  |
| 1965-67..... | 0                 | 20.4        | 20.9    | 16.3  |

<sup>1</sup> See appendix A, table A-2, columns 4, 9, 12, and 13.

## DEFENSE AND THE CHANGING COMPOSITION OF GNP

The most aggregative approach to appraising the economic impact of defense expenditures is to analyze the changing composition of the uses of national resources—the proportions of GNP used for consumption, investment, defense and government administrative expenditures (Table 3). The years selected are those which represent major turning points in defense expenditure policies.

TABLE 3.—*Expenditure composition of Soviet GNP*<sup>1</sup>

| Use                 | [Share of total in percent] |      |      |      |      |      |      |      |
|---------------------|-----------------------------|------|------|------|------|------|------|------|
|                     | 1950                        | 1952 | 1955 | 1958 | 1960 | 1963 | 1965 | 1967 |
| Consumption.....    | 62.4                        | 60.1 | 59.6 | 58.9 | 58.1 | 56.3 | 56.9 | 56.5 |
| Investment.....     | 21.2                        | 21.4 | 24.3 | 28.1 | 29.9 | 29.1 | 30.0 | 30.2 |
| Defense.....        | 12.3                        | 14.7 | 13.2 | 10.4 | 9.6  | 12.2 | 10.6 | 10.6 |
| Administration..... | 4.1                         | 3.8  | 2.9  | 2.6  | 2.4  | 2.4  | 2.5  | 2.7  |

<sup>1</sup> See appendix B for derivation. Concept excludes minor uses of GNP, mainly inventory investment, amounting to little more than 1 percent of the total.

The increased relative claim of defense arising during the Korean War upsurge in military spending occurred primarily at the cost of a reduced consumption effort. What is more dramatic and obvious was the very large increase in the relative allocation to investment during the long period of reduced emphasis on defense between 1952 and 1960. The consumption share also declined, but proportionately less than that of defense. The impact of the sharp acceleration in the defense effort between 1960 and 1963 is less discernible. There was a minor reduction in the resource share allocated to investment and a larger one for consumption. The brief relaxation in the rapid expansion of the defense effort between 1963 and 1965 redounded mainly in favor of both alternative claimants, while the renewed upsurge since 1965 has adversely affected consumption. One long-term effect that is apparent is that the heavier emphasis on military spending since 1960 has apparently set a ceiling on the proportion of resources available for investment purposes and reduced that available for the consumer.

As a first approximation, the influence of fluctuating defense expenditures on growth is reflected in the comparison of growth rates for defense and for GNP in the selected periods (Table 4). Since the mid-fifties there has been inverse correlation in the movements of the two variables, with wide variations in degree. Intuitively in a fully employed economy one would expect such a relationship.

In order to determine the reasons for such an inverse relationship and for its wide range of variation, it is necessary to disaggregate GNP into its principal expenditure components and compare their trends with those of defense. Only in this way may the nature of the possible tradeoffs among the alternative uses of national product be clarified. The relationship between trends in defense and investment will be examined first and be followed by that between defense and consumption.

TABLE 4.—*Expenditure trends for defense GNP and principal components of investment*

(Annual average growth rates in percent)

| Use                 | 1950-52 | 1952-55 | 1955-60 | 1960-63 | 1963-65 | 1965-67 |
|---------------------|---------|---------|---------|---------|---------|---------|
| Defense.....        | 15.3    | (0)     | 0.4     | 14.4    | -0.3    | 7.9     |
| Investment.....     | 13.8    | 11.6    | 12.8    | 4.8     | 8.6     | 6.8     |
| Equipment.....      | 4.6     | 15.6    | 12.0    | 11.8    | 10.3    | 7.1     |
| Construction.....   | 15.1    | 10.6    | 13.2    | 1.2     | 7.3     | 7.7     |
| Housing.....        | 16.3    | 11.5    | 18.3    | -2.3    | 3.5     | 8.7     |
| Nonresidential..... | 14.6    | 10.3    | 12.1    | 3.2     | 9.0     | 7.4     |
| GNP.....            | 6.9     | 7.0     | 6.5     | 4.0     | 7.0     | 5.7     |

Defense: See Table 1.

## Sources

Investment and its components: U.S.S.R., Tsentral'noe Statisticheskoe Upravlenie (T. S.U.) *Kapital'noe stroitel'stvo v SSSR*, Moscow, Gosstatizdat, 1961, pp. 34, 36, 37, 164; Ts.S.U. *Narodnoe khoziaistvo SSSR v 1962 godu*, p. 433; *Narodnoe khoziaistvo SSSR v 1967 godu*, pp. 613, 615; *Narodnoe khoziaistvo SSSR v 1965 godu*, p. 528; U.S. Congress, Joint Economic Committee, *Dimensions of Soviet Economic Power*, Washington, U.S. Government Printing Office, 1962, p. 135. Abraham S. Becker, *Soviet Military Outlays Since 1955* (RM-3886-P-R) Santa Monica, Calif., Rand Corp. 1964, p. 86.

GNP: See appendix on Derivation of Index of Soviet GNP in section on "General Growth Performance of the Soviet Economy," this volume, p. 15.

## SIGNIFICANT TRENDS IN PRINCIPAL COMPONENTS OF INVESTMENT

The most important division within fixed investment is that between equipment (producer durables) and construction. Within construction the important distinction is that of housing and of nonresidential construction. At first approximation, it would seem that the material requirements of equipment investment most closely match those of defense, particularly in weapons procurement. As for construction, the nonhousing variety would more closely resemble the fixed facility element in research and development or in military construction. If rates of change in defense spending are compared with those for the principal investment components for significant periods, an interesting, but inconclusive picture emerges (Table 4).

The impact of the Korean war defense spending surge fell mainly on the equipment component of investment. Similarly the relaxation in the defense effort through the middle and late fifties rebounded to the benefit primarily of investment in equipment. Curtailment of the housing investment effort was apparently precluded, as reconstruction from the devastation of World War II had not been completed. Toward the end of the decade there was a considerable acceleration in housing construction. A very different picture emerged in the defense buildup in the early sixties. In the period 1960-63, the rate of growth of equipment investment was sustained, but that of the construction component fell drastically. For housing the growth rate was negative and for nonresidential construction it was reduced by three-fourths. In the brief respite in the upward trend in military spending from 1963 to 1965 there was partial recovery of the earlier construction growth rate. The most recent period of rapid growth in defense expenditures has been accompanied by a considerable slowdown in the upward trend in equipment investment with little change in the slope of the construction trend. Within construction there has been a shift in priorities back toward housing.

Without further disaggregation of both the composition of investment by sectors of the economy and of the composition of major inputs into the principal categories of defense expenditure, it is not possible to explain the economic relevance of the response of the two major types of investment expenditure to defense spending trends.

## SIGNIFICANT INVESTMENT TRENDS AMONG ECONOMIC SECTORS

The impact of defense expenditures on investment can be further clarified by observation of trends in investment for various economic sectors and for branches of industry (Table 5). Data deficiencies have limited comprehensive coverage to years subsequent to 1955. The sharp deceleration in investment during the defense buildup between 1960 and 1963 was widespread throughout the economy, with only the agricultural sector not sharing in the retrenchment. The industrial investment rate fell by over half and that of transportation and communication by over 60 percent. The heaviest brunt was borne by the consumer with negative trends in the investment rates for both consumer goods and housing.

TABLE 5.—*Investment trends for selected economic sectors and branches of industry*  
[Annual average growth rates in percent]

| Sector or branch                            | 1955-60 | 1960-63 | 1963-65 | 1965-67 |
|---|---------|---------|---------|---------|
| Industry.....                               | 11.5    | 5.5     | 8.9     | 5.1     |
| Ferrous.....                                | 16.4    | 6.0     | 4.8     | 7.1     |
| Coal.....                                   | 3.5     | nil     | 11.6    | 3.0     |
| Oil and gas.....                            | 12.2    | 11.2    | 18.1    | 5.6     |
| Electric power.....                         | 5.6     | 7.3     | 8.5     | 4.4     |
| Machinery.....                              | 9.7     | 10.8    | 7.4     | 11.5    |
| Chemicals.....                              | 25.4    | 17.4    | 17.0    | -2.6    |
| Construction materials.....                 | (1)     | -1.7    | -4.3    | 2.9     |
| Consumer goods.....                         | 15.2    | -3      | 7.2     | 9.8     |
| Agriculture.....                            | 6.5     | 10.5    | 14.5    | 8.2     |
| Construction.....                           | (1)     | 1.5     | 11.3    | 16.6    |
| Transportation and communication.....       | 18.3    | 7.1     | 7.2     | 3.8     |
| Commerce, communal and health services..... | (1)     | 10.2    | 8.0     | 15.0    |
| Science and education.....                  | (1)     | 10.2    | 9.1     | 10.9    |
| Housing.....                                | 18.3    | -2.3    | 3.5     | 8.7     |
| Economy.....                                | 12.8    | 4.8     | 8.6     | 7.9     |
| Nonagricultural.....                        | 15.0    | 4.3     | 7.4     | 7.9     |

<sup>1</sup> Not available.

Sources: Ts.S.U., *Kapital'noe stroitel'stvo v SSSR, 1961*, pp. 67, 68. Ts.S.U., *Narodnoe khoziaistvo SSSR v 1961 godu*, pp. 541 and 545. *Narodnoe khoziaistvo SSSR v 1963 godu*, pp. 452 and 455. *Narodnoe khoziaistvo SSSR v 1964 godu*, pp. 513-514 and 516. *Narodnoe khoziaistvo SSSR v 1965 godu*, pp. 531-532 and 534. *Narodnoe khoziaistvo SSSR v 1967 godu*, pp. 619 and 622.

In the following 2 years of comparatively unchanged defense spending, the overall investment rate recovered about half of its loss, as did that for industry. The agricultural investment rate continued to increase and both the consumer goods and housing turned positive, recovering about half of their reductions. The renewed defense expenditure growth effort of 1965-67 had a minor impact on investment as a whole, but the industrial rate fell back to a postwar low. This time the major burden was not shouldered by the consumer, as the investment rates in both consumer goods and housing continued to increase, as did that for commerce, health, and communal services. Apparently the Kosygin-Brezhnev regime seems determined to maintain its increased sensitivity to consumer demands. Most likely they perceptively realized the connection between adverse trends in labor productivity and availability of goods and services upon which to spend rapidly rising money incomes. Both the agricultural and transportation investment growth rates have fallen sharply.<sup>5</sup>

There is a revealing contrary trend within the industrial sector. The stringency imposed on investment during the defense spending surge

<sup>5</sup> See introductory passages for official admission of agricultural investment cutbacks.

of 1960-63 conspicuously spared the machinery branch, which even experienced an acceleration in its investment trend. The consumer goods branches (light and food) particularly bore the brunt of investment curtailment. Conversely during the partial restoration in the industrial investment growth rate between 1963 and 1965, the machinery investment growth rate moved against the general trend. This inverse behavior of machinery branch investment was evidenced yet a third time during the most recent industrial investment slowdown from 1965 to 1967.

A plausible explanation of the machinery branch investment pattern relates directly to the nature of Soviet defense spending since the mid-fifties. Included in machinery branch investment are capital outlays for facilities which produce military hardware. The concentration of increases in defense outlays on development and on procurement of newly developed weaponry would require the building and equipping of new industrial capacity to produce these products. The inverse behavior of investment in machinery branches would be expected under these circumstances.

### TRENDS IN THE RETURN ON INVESTMENT

Another way in which the competition for resources between defense and investment might be evidenced would be in terms of the qualitative effect on investment, measured in terms of the return on investment. If, as will be discussed later, the innovative energies of scientists, engineers, and managers have been concentrated on advances in military rather than civilian production technology, the economic effect would appear in the form of declining productivity advances for civilian-oriented capital investment. One way of measuring this effect is through changes in the capital-output ratio, i.e., the amount of investment required to obtain an additional unit of output. A rise in the ratio denotes a reduced return on investment (Table 6).

TABLE 6.—Trends in marginal capital-output ratios<sup>1</sup>  
[Changes in capital stock per unit change in value added]

| Sector or branch                      | 1950-52 | 1952-55 | 1955-60 | 1960-63 | 1963-65 | 1965-67 |
|---------------------------------------|---------|---------|---------|---------|---------|---------|
| Industry.....                         | 1.9     | 2.1     | 2.0     | 3.1     | 2.9     | 2.8     |
| Ferrous.....                          | 2.1     | 2.4     | 3.8     | 5.6     | 4.9     | 3.8     |
| Coal.....                             | 1.8     | 1.9     | 2.7     | 5.8     | 2.4     | 5.9     |
| Oil and gas.....                      | 6.3     | 7.8     | 4.3     | 3.5     | 5.2     | 4.9     |
| Electric power.....                   | 7.1     | 5.2     | 3.5     | 7.6     | 7.7     | 8.7     |
| Machinery.....                        | 1.6     | 1.2     | 1.3     | 1.5     | 1.4     | 1.5     |
| Chemicals.....                        | 2.1     | 1.8     | 3.0     | 8.1     | 5.4     | 5.7     |
| Forest products.....                  | 1.4     | 1.4     | 1.6     | 4.2     | 4.3     | 2.4     |
| Construction materials.....           | 1.2     | 1.3     | 1.9     | 3.8     | 2.7     | 1.7     |
| Light.....                            | .9      | 1.1     | 1.5     | 4.0     | 5.9     | 2.1     |
| Food.....                             | 1.4     | 1.5     | 3.0     | 5.7     | 2.6     | 4.8     |
| Agriculture.....                      |         | 2.0     | 3.1     | (2)     | 1.6     | 2.3     |
| Construction.....                     | (3)     | (3)     | (3)     | 2.3     | 1.1     | 1.4     |
| Transportation and communication..... |         | 2.8     | 3.0     | 3.6     | 3.4     | 5.4     |
| Commerce.....                         | (3)     | (3)     | (3)     | 1.8     | 3.8     | 5.5     |
| Services (nondefense).....            |         | 9.5     | 10.1    | 9.8     | 9.6     | 10.9    |
| Economy.....                          |         | 2.6     | 3.1     | 5.4     | 3.4     | 3.8     |
| Nonagricultural.....                  |         | 2.3     | 2.7     | 3.4     | 3.0     | 3.0     |

<sup>1</sup> See app. C for derivation.

<sup>2</sup> Negative.

<sup>3</sup> Not available.

Through the period of the relaxed defense effort in the mid- and late fifties, the industrial capital-output ratio remained steady as did that for transportation. The rise in the agricultural ratio is explained by the stagnation in output in the sector after 1958. Apparently the rise in the ratio for the economy as a whole from 1955 to 1960 is explained by the higher agricultural capital-output ratio.

From 1960 through 1963 the ratio in industry increased by half and that for transportation more than doubled. Since output declined and the agricultural ratio turned negative, the ratio for the entire economy rose by 80 percent. Within industry there were increases in all ratios, but the rise for the favored machinery branch was nominal compared with other branches. Again, the concentration of innovative talent on military production during this period of burgeoning defense spending could have determined the relatively favorable investment productivity for this branch and deprived civilian oriented branches and sectors of significant qualitative improvements in their capital equipment.

In the more relaxed 1963-65 period there was some reduction in the ratios for industry, transportation and construction. These trends together with a resumption in the growth of agricultural output led to a sharp drop in the ratio for the economy. Once again during the higher rate of increased defense spending from 1965-67 the capital-output ratio for the economy rose, though the industrial ratio showed little change. The agricultural ratio increased greatly, principally contributing to the increase in the overall ratio. In this instance the causative factor was the weather cycle in agriculture rather than the diversion of resources into defense.

#### TRENDS IN THE COMPONENTS OF CONSUMPTION

Although the main stress of the economic constraint of defense expenditure has been on investment, aggregative comparisons (Table 3) have indicated some inverse relationships between defense and consumption during the decade of the 1960's. In order to determine if these inverse movements in shares of GNP are the result of direct causality or mere coincidence, it is necessary to disaggregate trends in consumption among its main components (Table 7).

TABLE 7.—*Growth trends in main components of consumption*<sup>1</sup>

[Average annual rates in percent]

| Component              | 1950-52 | 1952-55 | 1955-60 | 1960-63 | 1963-65 | 1965-67 |
|------------------------|---------|---------|---------|---------|---------|---------|
| Food.....              | 7.6     | 7.0     | 4.7     | 2.9     | 4.9     | 5.0     |
| Soft goods.....        | 13.9    | 10.2    | 6.7     | 3.2     | 2.3     | 8.1     |
| Durables.....          | 20.0    | 29.3    | 15.4    | 8.6     | 11.1    | 10.7    |
| Personal services..... | 7.5     | 6.0     | 7.4     | 6.4     | 7.0     | 7.0     |
| Public services.....   | 4.7     | 5.1     | 5.6     | 6.0     | 8.6     | 4.1     |
| All consumption.....   | 8.5     | 7.6     | 5.7     | 3.9     | 4.7     | 5.9     |
| Agriculture.....       | .2      | 5.4     | 3.5     | .7      | 7.3     | 3.7     |

<sup>1</sup> See table in section on "Consumer Welfare" and appendix table A-1 in section on "General Growth Performance of the Soviet Economy," this volume, pp. 94 and 17, respectively.

Analysis of the causative factors effecting growth trends for the separate components of consumption leads to the conclusion that only the durables category would be competitive with defense for

similar resources. The food and soft goods components, which comprise the overwhelming bulk of consumer expenditures are largely functions of agricultural output, although in recent years the rising importance of synthetic fibers would reduce the dependence of soft goods on agricultural production.

Since the mid-fifties fluctuations in the growth in consumption have closely paralleled trends in agricultural output. Except for the 1960-63 period, they have not been appreciably affected by defense expenditure fluctuations. The 1960-63 relationship is explained by the poor performance of agriculture in these years, as evidenced by the sharp deceleration in the growth trend for food production. This conclusion does not deny the assumption that durable goods production is sensitive to trends in defense production. Both the acceleration in the growth of output after 1952 and the sharp deceleration between 1960 and 1963 support this conclusion. However, until the proportion of consumption of purely industrial origin bulks larger in the Soviet consumer's market basket, the possible impact of defense on consumption, short of total mobilization, will continue to be minor.

#### SPECIFIC RESOURCE COMPETITION BETWEEN DEFENSE AND OTHER USES OF GNP

The particular constraints which heavy defense expenditures impose on the Soviet economy may be studied by analogy with U.S. technical relationships. Resort to U.S. experience is made necessary because the published official Soviet data provide no information on either production of defense goods or military consumption.

Analogs between two economies as diverse in their structure and use of resources as those of the United States and the U.S.S.R. are usually highly tenuous. However, in terms of technological comparisons the analogs have a high degree of validity. In a comparison of input coefficients for selected U.S. and Soviet economic sectors, Professor Vladimir Trembl has found a high degree of rank correlation of primary input patterns for the two economies.<sup>6</sup> It would follow, therefore, that such similarity should also prevail in the production of defense goods, perhaps in even higher degree, since technological differences are narrower than in the production of civilian goods.

The official 1958 U.S. input-output table does not differentiate defense expenditures from other final demand of the Federal Government, but specialized studies for several of the most important items of procurement in the defense budget for recent years provide information on at least the first and second round of input requirements. For the examples of two types of missiles, a fighter aircraft, naval vessels, and motor vehicles, the bulk of the inputs are drawn from the following sectors in the 1958 U.S. input-output table:

- 11. Construction.
- 13. Ordnance.
- 53. Electrical Industrial Equipment.
- 56. Radio, television, and communications equipment.
- 57. Electronic equipment and accessories.
- 59. Motor vehicles.

<sup>6</sup> Vladimir G. Trembl, "Structural Similarities in the U.S. and Soviet Economies, Based on Comparisons of Input-Output Data", in John P. Hardt (ed.), *Selected Studies in Soviet Economic Trends, Structure, and Institutions* (RAC-R-30), McLean, Va., Research Analysis Corp., Feb. 1968, p. 182.



- 60. Aircraft and parts.
- 61. Other transportation equipment.
- 62. Scientific and controlling instruments.
- 74. Research and development.
- 77. Nonprofit corporations.

If the personnel and operations and maintenance elements of the defense budget are added, the following input sectors would also become important:

- 27. Chemicals.
- 31. Petroleum refining.
- 43. Engines and turbines.
- 65. Transportation and warehousing.
- 68. Electric, gas, water, and sanitary services.
- 84. Government industry.

However, since the thrust of the changing composition of defense expenditures in both economies is in the direction of procurement and of research and development, it is the former group of input requirements that are of critical economic importance.

The next analytical step is to translate these input sector definitions into their Soviet equivalents and determine the distribution of these inputs among the final demand vectors of the Soviet input-output table. According to calculations of Professor Treml, reconstructed for 38 input sectors from published Soviet data,<sup>7</sup> in the vital transportation equipment (aircraft and shipbuilding), general machinery (ordnance, electrical industrial equipment), industrial instruments (scientific and control equipment) and agricultural machinery and equipment (tanks, armored vehicles) sectors, the overwhelming bulk of final output was used for other than consumption purposes. Only in the machinery, not elsewhere classified sector (communications equipment) do consumption uses become significant, around 21 percent.<sup>8</sup> These would consist of radios and television sets.

The evidence unmistakably points to investment as the resource claimant which competes with the new military technology for vital material inputs. This proposition has previously been verified in the discussion of aggregative substitutions between investment and defense (Table 5) and in the impact of fluctuating defense trends on consequent resource claims on the quality of investment, i.e., the capital-output ratio (Table 6).

Of course, the decision to channel resources into defense rather than growth will have long-run adverse repercussions on consumption, but in the shorter time frame it is primarily investment which must absorb the burden of heavy defense commitments which stress sophisticated weapons development and procurement.

The precise impact of a given allocation of resources to defense instead of investment cannot be determined without information on capital coefficients, the relationships between specific inputs and unit increases in output. Although there may be some spin-offs from the intensive defense research and development effort that would be beneficial to growth and efficiency, the benefits would be immeasurably greater if the focus of the Soviet technological effort were shifted in the direction of nonmilitary activities.

<sup>7</sup> V. Treml, *op. cit.*, p. 128.

<sup>8</sup> These four input sectors comprise the overwhelming share of total costs in the production of missiles, fighter aircraft, tanks, and naval vessels.

## QUALITATIVE ASPECTS OF THE DEFENSE CONSTRAINT: MANPOWER AND MANAGEMENT

Perhaps the most important of the resource drains which the intensive Soviet defense effort imposes upon the economy cannot be measured numerically, but must be evaluated through qualitative analysis. The technological demands upon the economy have been rising rapidly in recent years both in the competition with the United States in space and advanced weaponry and with the exhaustion of easy borrowing opportunities of western technology in the civilian spheres. Indicative of this technological emphasis has been the allocation of highly skilled manpower. The proportion of all engineers employed in science and education more than doubled—from 15.8 percent in 1955 to 33.8 percent in 1966.<sup>9</sup> More than half of all engineering graduates in this period were employed in research, project-design, and educational institutions, with scientific research organizations alone absorbing a third.<sup>10</sup>

This heavy infusion of professional manpower into research and development does not *prima facie* support the assertion that they were being primarily directed into defense-related activities, although the high-priority allotted to defense within the R. and D. effort would do so by implication. Stronger evidence is provided by observation of trends in the composition of engineering graduates (Table 8). Since 1960, while the total number of engineering graduates has risen by 83 percent, the growth in the following specialties has been considerably more rapid: electrical engineering and electro-instrument making, 306 percent; radio technology and communications, 151 percent; and chemical, 121 percent. The growth rate for the machinery specialty just matched the average, while those for all other specialties were lower and some were negative. The proportion of all engineering graduates within the electrical specialty more than doubled over the first 7 years of this decade and that for the three rapidly growing specialties combined rose by two-thirds.

These specialties closely match the group of significant material inputs into sophisticated weaponry and research and development noted in the preceding section. The relationship between electronic and communications equipment and the electrical and communications engineering specialties is clear and presumably engineers trained in the machinery specialty would have major responsibility in aircraft and missile development and production. Furthermore, the small claim made by consumption on these particular inputs would reinforce the point that the energies of the specialists in the rapidly growing engineering specialties have been heavily oriented toward defense. The same disparate trends have occurred among semi-professional specialties.<sup>11</sup>

<sup>9</sup> V. Komarov, "Voprosy ratsional'nogo ispol'zovaniia spetsialistov v promyshlennosti", *Plannoe khoziaistvo*, v. 46, no. 4, Apr. 1969, p. 18 (17-23).

<sup>10</sup> Ts.S.U., *Trud v SSSR*, Moscow, Statistika, 1968, pp. 268-269.

<sup>11</sup> Ts.S.U., *Narodnoe khoziaistvo SSSR v 1967 godu*, p. 790.

TABLE 8.—Engineering graduates by specialties<sup>1</sup>

| Specialty  | 1950            |           | 1960            |           | 1967            |           |
|--|-----------------|-----------|-----------------|-----------|-----------------|-----------|
|  | (Thou-<br>sand) | (Percent) | (Thou-<br>sand) | (Percent) | (Thou-<br>sand) | (Percent) |
| Geology.....   | 1.7             | 5.0       | 3.9             | 3.6       | 3.4             | 1.8       |
| Minerals.....  | 1.4             | 4.1       | 5.3             | 4.9       | 4.2             | 2.2       |
| Power engineering.....                                 | 2.4             | 7.0       | 8.4             | 7.8       | 8.1             | 4.3       |
| Metalurgy.....   | 1.4             | 4.1       | 3.9             | 3.6       | 5.5             | 2.9       |
| Machinery and instruments.....                         | 9.1             | 26.5      | 30.6            | 28.3      | 50.1            | 30.0      |
| Electrical engineering and electro<br>instruments..... | 1.4             | 4.1       | 8.1             | 7.5       | 32.9            | 17.6      |
| Radio and communications.....                          | 1.4             | 4.1       | 6.3             | 5.8       | 15.8            | 8.4       |
| Chemicals.....   | 2.6             | 7.6       | 5.7             | 5.3       | 12.6            | 6.7       |
| Forest products.....                                   | 0.7             | 2.0       | 3.7             | 3.4       | 2.6             | 1.4       |
| Food technology.....                                   | 2.3             | 6.7       | 3.5             | 3.2       | 5.9             | 3.2       |
| Consumer goods.....                                    | 1.2             | 3.5       | 3.1             | 2.9       | 4.1             | 2.2       |
| Construction.....                                      | 4.9             | 14.3      | 17.7            | 16.4      | 23.5            | 12.5      |
| Geodesy.....   | .3              | 0.9       | 0.6             | 0.5       | 0.8             | 0.4       |
| Hydrology.....   | .4              | 1.2       | .7              | .6        | .8              | .4        |
| Transportation.....                                    | 3.1             | 9.0       | 6.6             | 6.1       | 10.9            | 5.8       |
| Total.....   | 34.3            | 100.0     | 108.1           | 100.0     | 187.2           | 100.0     |

<sup>1</sup> Ts.S.U. Narodnoe khoziaistvo SSSR v 1967 godu, p. 798.

Since 1960 defense procurement outlays and research and development expenditures have risen more rapidly than civilian industrial production, implying that defense oriented output has grown at a more rapid rate than its civilian counterpart. In the United States, defense firms have hired four to five times the number of scientists and engineers per dollar of sales volume than have the most technically oriented commercial companies. According to the National Science Foundation the aircraft and missile industries employ more skilled personnel of these two types than the combined total of the chemical, drug, petroleum, motor vehicle, rubber, and machinery industries.<sup>12</sup> Given the high priorities accorded to defense industry in the Soviet Union, such a disparity in employment of high level manpower should also prevail there. If so, a large proportion of the engineering graduates of the sixties would have been channeled into defense industries.

There is also evidence of the superior quality of such skilled manpower in defense industries. According to Academician N. N. Semenov, a vice-president of the U.S.S.R. Academy of Sciences:

But we do have a great number of examples of real planning and coordination where the advantages of the socialist structure have shown up so brightly that they have astonished the world. These included, for example, work on high-speed aviation, space rockets and long range rockets and on controlling atomic energy \* \* \*.<sup>13</sup>

In other and more intangible ways advantages are also accorded to defense industries. Their research and development activities are closely coordinated by the top scientific leadership, while at the same time permitting considerable flexibility on the part of the professional personnel responsible for operational decisions. In a speech to the Party Central Committee in 1962, Khrushchev spoke of the "great experience that has been accumulated in organizing technical leadership in the defense industries" and declared "Owing to this centralization and

<sup>12</sup> Murray Weidenbaum, "The Transferability of Defense Industry Resources to Civilian Use," in Roger E. Bolton (ed.), *Defense and Disarmament: The Economics of Transition*, Englewood Cliffs, N.J., Prentice-Hall, 1966, p. 105.

<sup>13</sup> Quoted from Organization for Economic Cooperation and Development, *Science Policy in the U.S.S.R.*, Paris, 1969, p. 435.

concentration of the R. and D. effort in the appropriate committees of the defense industry, we now have the most advanced military technology.”<sup>14</sup>

The defense industries receive the highest resource priorities. In an account of personal experiences, Iakovlev, the aircraft designer, describes how pressure from the central planners and from leading Party politicians played a crucial part in the rapid development of the first jet fighters in 1946 and in the production of transport helicopters in the mid-fifties.<sup>15</sup> Technological change in these industries is aided by special production facilities for innovation. For example, the aircraft industry, unlike its civilian-oriented counterparts, has separate production facilities for experimental prototypes. These plants are financed directly from the Government budget. They are staffed with approximately double the proportion of engineers and technicians assigned to batch production factories.<sup>16</sup>

### FUTURE IMPACT OF DEFENSE EXPENDITURES

The significance of defense expenditures for the future growth of the Soviet economy will depend on the scale of defense efforts and upon the resource displacement effects. Although no unambiguous tradeoffs between defense and other uses of productive resources have emerged from the foregoing analysis, it seems clear that the critical inputs required by the most rapidly growing components of defense find their alternative uses in capital investment. The most directly affected component of consumption, consumer durables, amounts to only about 4 percent of total private expenditures currently<sup>17</sup> and other elements of consumption would be affected only indirectly through investments in terms of restraints on increases in productive capacity.

Changes in the rate of growth of defense expenditures would affect general economic growth in two ways: (1) through a change in the rate of increase in investment and (2) through a change in the efficiency of utilization, or in the productivity, of the two basic factor inputs—manpower and fixed capital. The first influence was investigated in the discussion of the resource tradeoffs noted in tables 4 and 5. The textual explanation stressed the importance of certain specific inputs into the increasingly sophisticated weaponry in the Soviet arsenal. The second influence reflects the impact of qualitative factors—for example, the preempting by defense of the most talented and innovative manpower, engineers, scientists, and managers as well as the priority given to the defense sector for materials supply and the attention of the highest echelon of planners and Party leaders. The qualitative influence of defense programs, together with the influence of a great number of other factors are reflected in the rising marginal capital-output ratios shown in table 6.

The first influence may be measured by determining the extent of the tradeoff between investment and defense and, through the medium of the marginal capital-output ratio for nonagricultural sectors, the effect on the GNP growth rate. If we assume full employment of productive factors in the overstrained Soviet economy, then a substitution of capital investment for defense spending will not effect

<sup>14</sup> *Ibid.*

<sup>15</sup> *Ibid.*

<sup>16</sup> *Ibid.*, p. 437.

<sup>17</sup> See sources to table 7.

the level of GNP in the period in which the transaction takes place, nor in subsequent rounds of spending as the income multiplier comes into play. The differential benefit of investment expenditure becomes apparent in subsequent years as the capital facilities financed by the investment begin to yield returns.

In 1967, the proportions of GNP used for defense and for fixed investment were 10.6 and 30.2 percent, respectively (table 3). If, for purposes of simplification, we also assume that resources can be transferred between defense and fixed investment without restriction, the ruble value of a 1 percent change in defense expenditures would be equivalent to a .35 percent change in investment. Given the marginal capital-output ratio of 3.8 currently prevailing in the economy (table 6), a 1 percent reduction in defense expenditures would then increase the rate of growth of GNP by only .028 percent.<sup>18</sup>

Thus, if defense expenditures had remained constant instead of rising by an average of 7.9 percent during 1965-67 (table 4), the calculation above would imply that the annual rate of growth of GNP would have been higher by 0.2 percentage points. Even if the marginal capital-output ratio were somehow reduced to the level which prevailed in the early 1950's (2.6) the stimulative effect on growth would amount to only 0.3 percent per year. One must search elsewhere for a significant impact of defense expenditures on recent economic growth.

Statistically, the portion of growth of output which cannot be explained by trends in the growth of factor inputs is termed "productivity," which simply means the change in output per unit of input. This unexplained residual actually represents a combination of changes in unmeasured inputs, changes in the quality of inputs being measured, and changes in the ways in which the recorded inputs are combined. The effect of trends in defense spending on the productivity of fixed capital has been discussed in the examination of trends in capital-output ratios (table 6). The effect of defense spending on labor productivity works indirectly. When defense programs cut into investment, consumer-oriented investment such as housing and investment in the light and food industries generally suffers the most (table 5). The relatively low levels of consumption in the Soviet Union have in turn been singled out as one of the reasons for the low productivity of the labor force. In addition, the combined productivity of labor and capital in the U.S.S.R. very probably is lower than it otherwise might be because of the tendency to channel the highest quality professional manpower and material resources into defense (table 8) and to accord to it the highest priority in planning.

Thus, an increase in the rate of growth of defense expenditures might be expected to dampen the rate of growth of productivity in the Soviet economy. We shall attempt to appraise the influence of defense spending by comparing the extent and timing of changes in defense spending and the combined productivity of labor and capital in the U.S.S.R. since 1950 (table 9). The comparison has been limited to the non agricultural sectors of the economy and the terminal years have been chosen so as to moderate the strong impact that bad weather has had on GNP—especially in 1959, 1963, and 1965. Secondly, the

<sup>18</sup>  $\frac{\Delta \text{GNP}}{\text{GNP}} = \left(\frac{\Delta \text{M}}{\text{M}}\right) \left(\frac{\text{M}}{\text{I}}\right) \left(\frac{\text{I}}{\text{GNP}}\right) \left(\frac{\Delta \text{GNP}}{\text{I}}\right) = (0.1)(.35)(.302)(1/3.8) = .0028$ , where I = expenditure for investment and M = expenditures for defense.

trend of defense expenditures other than armed forces personnel costs is also shown in table 9, since these are more likely to affect productivity.

TABLE 9.—*Comparison of growth in output, inputs, and joint factor productivity in the nonagricultural sector with growth in defense spending—Selected periods, 1950–67*

| Period  | Average annual percentage rates of growth |              |     |               |                                  |                    |               |                        |
|---------|---|--------------|-----|---------------|----------------------------------|--------------------|---------------|------------------------|
|         | Output, nonagricultural GNP               | Inputs       |     |               | Factor productivity <sup>1</sup> |                    | Defense total | Spending, nonpersonnel |
|         |   | Labor inputs |     | Capital stock | Based on employment              | Based on man-hours |               |                        |
|         | Employment                                | Man-hours    |     |               |                                  |                    |               |                        |
| 1950–55 | 7.0                                       | 3.1          | 3.3 | 8.6           | 1.9                              | 2.0                | 5.9           | 9.9                    |
| 1955–60 | 7.7                                       | 4.1          | 1   | 9.9           | 1.8                              | 5.6                | 3             | 6.3                    |
| 1960–64 | 5.9                                       | 3.8          | 4.2 | 9.3           | .5                               | .3                 | 12.5          | 15.9                   |
| 1964–67 | 6.7                                       | 3.7          | 4.0 | 8.7           | 1.4                              | 1.2                | 4.8           | 6.2                    |

<sup>1</sup> An index of factor productivity is derived by dividing an index of nonagricultural GNP by an index of factor inputs. The index of factor inputs is a geometric average of indexes of labor inputs and capital stock (base 1959=100), weighted .7 and .3, respectively.

Sources: GNP—See appendix "Derivation of Index of Soviet Gross National Product" in section on "General Growth Performance of the Soviet economy," this volume, p. 15. Employment—See table 2 in section on "General Growth Performance of the Soviet economy." Capital stock—see table 6.

The first thing that must be said about the comparison in table 9 is that the trend in man-hour factor productivity has been affected by a great number of structural and institutional changes. De-stalinization, the shift to the sovnarkhoz system, Khrushchev's chemical program, and the economic reform, for example, all must have had an impact on productivity. Most importantly, the reduction of the workweek in the years 1956–60 probably had a significant effect. The strenuous bureaucratic effort to carry out the reduction without a loss of output undoubtedly helped to hold up the growth of productivity in 1955–60, but at the expense of productivity in 1961 and later years.

Nevertheless, the decline in the growth of productivity in the 1960–64 period combined with an apparent increase in defense spending (both total and nonpersonnel) is striking. It is very plausible that a surge of spending associated with the rapid deployment of ICBM's and other advanced weapons contributed to the slowing of introduction of new technology into the civilian economy. On the other hand, the extent and timing of the increases of defense spending in this period, especially in the year 1961, is uncertain (see table 9).

Given the uncertainty in the defense series and the influence of other factors, one cannot construct a quantitative relation between the rate of growth of defense and of productivity of the civilian economy. However, the evidence suggests that the release of highly skilled manpower and the rechanneling of other resources might well have a significant impact on productivity and therefore on GNP growth over the long run. It is interesting to note that the qualitative effects through productivity are potentially larger than the direct effect through the volume of investment. It might be noted, however, that since the defense sector has been the recipient of the highest quality scientific, engineering and managerial resources and has enjoyed

superior institutional advantages, the impact of a shift of these resources out of defense on productivity might be greater than would a further shift of priorities toward defense. Conversely a slowdown or decline of total defense spending could occur without affecting defense R. & D or the institutional advantages.

Furthermore, to achieve the full benefit from a reduction in the rate of growth of defense expenditures, the resources, both human and material, which would have gone into defense cannot be transferred into other uses without adequate prior planning. Such a reallocation would require a number of priority steps, such as training engineers in specialities relevant to production of civilian goods. The benefits would be less if high grade human and material resources were shifted suddenly out of defense and into civilian-oriented production, as their capabilities would be too specialized to be as productive in new tasks. Given time for retraining and adaptation, full productivity may be restored, but in the near term, reduced returns would have to be expected.

## APPENDIX A

### DERIVATION OF INDEX OF DEFENSE EXPENDITURES

Soviet official statistics do not provide a comprehensive estimate of defense expenditures. According to a recent 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.<sup>19</sup> 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 NATO. Investment in industrial enterprises producing military hardware is financed from the "financing the national economy" allocation of the state budget and from internal savings of the enterprises.

No official indication is furnished as to the budgetary sources for research and development expenditures, but a substantial case can be made for their coverage from the allocation to science.<sup>20</sup> Not all of budget financed scientific outlays are defense oriented. Offsetting the qualification is the financing of product testing out of funds provided by producing enterprises. It is assumed that these internal sources of finance offset that portion of budgetary scientific expenditures which are oriented toward civilian purposes. Therefore, it will be assumed that the entire state budget allocation to science reflects the military research and development effort.

Western students of Soviet finance have suggested that other undesignated allocations in the budget of a residual nature may also contain military expenditures.<sup>21</sup> However, as is the case with residual calculations, the unexplained remainder undoubtedly incorporates other types of expenditures, errors, and change in definition, as well as the possibility of military outlays. The unsystematic trend of these residuals compels the user to specify ranges rather than single value estimates.<sup>22</sup> For these reasons none of the calculated budgetary residuals are included within the estimates of defense expenditures in this study. It will, therefore, be assumed that total defense expenditures are reflected in the state budgetary allocations to defense and to science (Table A-1).

<sup>19</sup> Vasilii Vasil'evich Lavrov and K. N. Plotnikov (ed.), *Gosudarstvennyi biudzhnet SSSR*, Moscow, Finansy, 1968, p. 341.

<sup>20</sup> Nancy Nimitz, *Soviet Expenditures on Scientific Research*, (RM-3384-PR) Santa Monica, Calif., Rand Corp., Jan. 1963, pp. 12-14.

<sup>21</sup> Abraham S. Becker, *Soviet Military Outlays Since 1955* (RM-3886-PR), Santa Monica, Calif., Rand Corp., July 1964, pp. 13-41.

<sup>22</sup> *Ibid.*

TABLE A-1.—Soviet defense expenditures <sup>1</sup>

(Billions of rubles)

| Year      | Defense allocation | Science allocation | Total current allocation | Year      | Defense allocation | Science allocation | Total current allocation |
|-----------|--------------------|--------------------|--------------------------|-----------|--------------------|--------------------|--------------------------|
| 1950..... | 8.3                | 0.5                | 8.8                      | 1962..... | 12.7               | 3.0                | 15.7                     |
| 1952..... | 10.9               | 0.6                | 11.5                     | 1963..... | 13.9               | 3.4                | 17.3                     |
| 1955..... | 10.7               | 0.8                | 11.5                     | 1964..... | 13.3               | 3.9                | 17.2                     |
| 1958..... | 9.4                | 1.7                | 11.1                     | 1965..... | 12.8               | 4.1                | 16.9                     |
| 1960..... | 9.3                | 2.3                | 11.6                     | 1966..... | 13.4               | 4.5                | 17.9                     |
| 1961..... | 11.6               | 2.7                | 14.3                     | 1967..... | 14.5               | 4.9                | 19.4                     |

<sup>1</sup> U.S.S.R., *Biudzhethnoe Upravlenie, Gosudarstvennyi biudzhel SSSR i biudzhety soizuznykh respublik, 1966*, p. 53; Ts. S. U., *Narodnoe khoziaistvo SSSR v 1967 godu, 1968*, p. 889.

## TREND IN CONSTANT PRICES

In order to determine the impact of defense expenditures upon the economy some notion of the trend in the real drain of resources in a prerequisite. For this purpose it is necessary to derive deflators for current value estimates. The deflation procedure follows this sequence: (1) estimate of personnel expenditures in constant prices, (2) estimate of personnel expenditures in current prices and of nonpersonnel expenditures in current prices, (3) deflation of nonpersonnel expenditures time series, (4) deflation of current value science allocations, and (5) summation of the three constant price time series.

Estimates of personnel expenditures within the defense allocation are based on estimates of personnel strength multiplied by estimated per man pay and subsistence costs in 1958. In order to express the time series in current terms deflators using the general index of wages to deflate pay and of wholesale enterprise prices (excluding turnover tax) to deflate subsistence have been employed. An alternative current value series which assumes no change in rates of pay, and hence no deflation of the constant pay time series, has also been computed. When the alternative current value personnel time series are subtracted from the original defense allocations series, an alternative time series of current value nonpersonnel expenditures are obtained.

It will be assumed that nonpersonnel expenditures consist wholly of procurement of military equipment and armaments, although a small portion would consist of expendable supplies, such as fuel, medical items, tires, and the like. Given the preponderant role of military equipment in total procurement cost, the appropriate deflator is the wholesale enterprise price index for machinery.

The science allocation time series is converted to constant prices using the official wage index for science for the wage element and the wholesale enterprise machinery price index for the equipment purchase portion. The respective weights of the two deflators are one and four, based on the 1957 decomposition of science allocations in the Union budget.<sup>23</sup> Summation of the constant price personnel, nonpersonnel, and science time series yields the overall defense time series. Successive steps in the calculation are shown in table A-2.

The "A" series in Table A-2 (column 13) has been used in the analytical portion of this study. Substitution of the "B" series would not alter the conclusions in any significant way.

<sup>23</sup> Nimitz, *op. cit.*, p. 45.



TABLE A-2.—*Derivation of defense expenditures in constant prices*

[In billions of rubles]

| Year      | De-<br>fense <sup>1</sup><br>allo-<br>cations | Person-<br>nel <sup>2</sup><br>(mil-<br>lions) | Personnel expenditures               |                             |     | Non-personnel expenditures  |      |                              |      | Science<br>expenditures        |                                      | Total defense expenditures   |      |                                 | Index<br>(1960=<br>100) <sup>11</sup> |
|-----------|---|--|--------------------------------------|-----------------------------|-----|-----------------------------|------|------------------------------|------|--------------------------------|--------------------------------------|------------------------------|------|---------------------------------|---------------------------------------|
|           |   |  | Con-<br>stant<br>prices <sup>3</sup> | Current prices <sup>4</sup> |     | Current prices <sup>5</sup> |      | Constant prices <sup>6</sup> |      | Current<br>prices <sup>7</sup> | Con-<br>stant<br>prices <sup>8</sup> | Constant prices <sup>9</sup> |      | Current<br>prices <sup>10</sup> |                                       |
|           |   |  |                                      | A                           | B   | A                           | B    | A                            | B    |                                |                                      | A                            | B    |                                 |                                       |
| (1)       | (2)   | (3)  | (4)                                  | (5)                         | (6) | (7)                         | (8)  | (9)                          | (10) | (11)                           | (12)                                 | (13)                         | (14) | (15)                            | (16)                                  |
| 1950..... | 8.3   | 4.6  | 5.0                                  | 4.4                         | 5.0 | 3.9                         | 3.3  | 2.9                          | 2.5  | 0.5                            | 0.6                                  | 8.5                          | 8.1  | 8.8                             | 73.9                                  |
| 1952..... | 10.9  | 6.4  | 7.0                                  | 6.1                         | 6.7 | 4.8                         | 4.1  | 3.6                          | 3.1  | .6                             | .7                                   | 11.3                         | 10.8 | 11.5                            | 98.3                                  |
| 1955..... | 10.7  | 5.2  | 5.7                                  | 5.2                         | 5.5 | 5.5                         | 5.2  | 4.8                          | 4.5  | .8                             | .8                                   | 11.3                         | 11.0 | 11.5                            | 98.3                                  |
| 1958..... | 9.4   | 3.8  | 4.1                                  | 4.1                         | 4.1 | 5.3                         | 5.3  | 5.3                          | 5.3  | 1.7                            | 1.7                                  | 11.1                         | 11.1 | 11.1                            | 96.5                                  |
| 1960..... | 9.3   | 3.6  | 3.9                                  | 4.1                         | 4.0 | 5.2                         | 6.3  | 5.3                          | 5.4  | 2.3                            | 2.3                                  | 11.5                         | 11.6 | 11.6                            | 100.0                                 |
| 1961..... | 11.6  | 3.8  | 4.1                                  | 4.4                         | 4.2 | 7.2                         | 7.4  | 7.4                          | 7.7  | 2.7                            | 2.8                                  | 14.3                         | 14.6 | 14.3                            | 124.3                                 |
| 1962..... | 12.7  | 3.5  | 3.8                                  | 4.3                         | 4.0 | 8.4                         | 8.7  | 8.8                          | 9.1  | 3.0                            | 3.1                                  | 15.7                         | 16.0 | 15.7                            | 136.5                                 |
| 1963..... | 13.9  | 3.3  | 3.6                                  | 4.2                         | 3.9 | 9.7                         | 10.0 | 10.1                         | 10.5 | 3.4                            | 3.5                                  | 17.2                         | 17.6 | 17.3                            | 149.6                                 |
| 1964..... | 13.3  | 3.3  | 3.6                                  | 4.3                         | 3.9 | 9.0                         | 9.4  | 9.6                          | 10.1 | 3.9                            | 4.1                                  | 17.3                         | 17.8 | 17.2                            | 150.4                                 |
| 1965..... | 12.8  | 3.2  | 3.5                                  | 4.3                         | 3.8 | 8.5                         | 9.0  | 9.3                          | 9.9  | 4.1                            | 4.3                                  | 17.1                         | 17.7 | 16.9                            | 148.7                                 |
| 1966..... | 13.4  | 3.2  | 3.5                                  | 4.4                         | 3.8 | 9.0                         | 9.6  | 10.1                         | 10.8 | 4.5                            | 4.8                                  | 18.4                         | 19.1 | 17.9                            | 160.0                                 |
| 1967..... | 14.5  | 3.2  | 3.5                                  | 4.5                         | 3.8 | 10.0                        | 10.7 | 11.2                         | 12.2 | 4.9                            | 5.2                                  | 19.9                         | 20.9 | 19.4                            | 173.0                                 |

<sup>1</sup> See table A-1.

<sup>2</sup> 1950-1958: John G. Godaire, "The Claim of the Soviet Military Establishment" in U.S. Congress, Joint Economic Committee, *Dimensions of Soviet Economic Power*, Washington, U.S. Government Printing Office, 1962, p. 43.

1960-68: Institute of Strategic Studies, London. *The Military Balance* for the following years: 1960-61, p. 2; 1961-62, p. 2; 1963-64, p. 3; 1964-65, p. 3; 1965-66, p. 2; 1966-67, p. 2; 1967-68, p. 5; and 1968-69, p. 5.

<sup>3</sup> Estimate of pay of 690 rubles and subsistence of 400 rubles per man per year in 1958 made by Abraham Becker in his *Soviet Military Outlays Since 1955*, p. 92.

<sup>4</sup> Personnel pay deflated by general wage index (U.S.S.R., Tsentral'noe Statisticheskoe Upravlenie, *Trud v SSSR*, pp. 137, 139.) Subsistence deflated by wholesale enterprise price index for light and food industries (Ts. S. U. *Narodnoe khozjaistvo SSSR v 1962 godu*, p. 144; *N. Kh. SSSR v 1965 godu*, p. 166, and *N. kh. SSSR v 1967 godu*, p. 226. "A" series assumes personnel pay scales change with general wage index, "B" series assumes person-

nel pay constant, hence only subsistence deflator is applied.

<sup>5</sup> For "A" series col. (2) less col. (5); for "B" series col. (2) less col. (6).

<sup>6</sup> Cols. (7) and (8) deflated by wholesale enterprise price index for machinery For 1950, the 1952 price relative has been used. Sources are same as those for footnote 4.

<sup>7</sup> See table A-1.

<sup>8</sup> Assume that 1957 cost breakdown of four to one ratio between equipment and personnel expenditures has prevailed since that date (Nancy Nimitz, *Soviet Expenditures on Scientific Research*, p. 45. Deflate wage component by index of wages in science (see footnote 4, above, for source) and equipment component by machinery price index (same source as price index in footnote 4).

<sup>9</sup> "A" series is sum of cols. (4), (9), and (12); "B" series sum of cols. (4), (10), and (12).

<sup>10</sup> Sum of cols. (2) and (11).

<sup>11</sup> Values in col. (13) divided by 1960 values.

## APPENDIX B

## TRENDS IN UTILIZATION OF SOVIET GROSS NATIONAL PRODUCT

The calculation of the distribution in the use 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 for each end use, (3) computation of deflators for each end use, (4) conversion of constant into current price values through application of the deflators, and (5) expression of current price ruble values as proportions of GNP. The first two steps are shown in table B-1. The source references for each of the end uses refer to indexes rather than to ruble values.

TABLE B-1.—Trends in Soviet GNP by end use

[Billions of 1955 rubles at factor cost]

| Use                               | 1950 | 1952 | 1955 <sup>1</sup> | 1958  | 1960  | 1963  | 1965  | 1967  |
|-----------------------------------|------|------|-------------------|-------|-------|-------|-------|-------|
| Consumption <sup>2</sup> .....    | 38.5 | 45.4 | 56.6              | 67.0  | 74.6  | 83.6  | 91.6  | 102.8 |
| Investment <sup>3</sup> .....     | 12.8 | 16.6 | 23.1              | 34.6  | 42.3  | 48.6  | 57.4  | 66.8  |
| Defense <sup>4</sup> .....        | 9.4  | 12.5 | 12.5              | 12.3  | 12.7  | 19.0  | 18.9  | 22.0  |
| Administration <sup>5</sup> ..... | 3.3  | 3.3  | 2.8               | 2.9   | 3.0   | 3.3   | 3.6   | 4.1   |
| GNP <sup>6</sup> .....            | 64.0 | 77.8 | 95.0              | 116.8 | 132.6 | 154.5 | 171.5 | 195.7 |

<sup>1</sup> Morris Bornstein and associates, *Soviet National Accounts for 1955*. Ann Arbor, 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 published annual data is lacking prior to 1958.

<sup>2</sup> See table in section "Consumer Welfare."

<sup>3</sup> Ts.S.U., *Kapital'noe stroitel'stvo v SSSR*, pp. 34 and 36; Ts.S.U. *Narodnoe khoziaistvo SSSR v 1967 godu*, p. 613. Coverage includes new fixed investment plus capital repairs in base year. Moved by fixed investment time series.

<sup>4</sup> See table A-2, column 16.

<sup>5</sup> Moved by employment in administration in state, economic, cooperative and social organizations, Ts.S.U., *Trud v SSSR*, pp. 28 and 29.

<sup>6</sup> Summation of columns.

Since price indexes are available only for inputs into the end uses of GNP or for components of expenditure, rather than for the end uses themselves, the computer indexes are based upon weighted price indexes for indicator inputs or outputs comprising each end use. For consumption the approach is to first 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 consumption expenditures has been estimated by Bornstein in the source cited 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, page 9. The weight for income in kind is based on my estimate in *Derivation of 1959 Value-Added Weights for Originating Sectors of Soviet Gross National Product*, page 24. The proportionate weights are, respectively: state retail store sales, 60; collective farm market sales, 4; private consumer services, 9; income in kind, 13; and public consumption, 14.

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; 1964, p. 647; 1965, p. 653; 1967, p. 739. The index for collective farm market sales is obtained from the following editions of the economic handbook: 1958, p. 789; 1960, p. 737; 1962, p. 540; 1965, p. 665; and 1967, p. 763. The price index for income in kind is a weighted average reflecting the proportionate sizes of state retail and collective farm market sales in private consumption as a whole.

The price index for private services and public consumption is weighted 3 to 1 by the price indexes for wages and goods based on the cost structures for the most important private and public services—education, health and culture (Akademiia Nauk SSSR, Tsentral'nyi Ekonomiko-matematicheskii Institut, *Mezhotraslevoi balans proizvodstva i raspredelenie produktsii ekonomicheskogo raiona*, Moscow, Nauka, 1964, p. 199.) The wage index is the general one for workers and employees taken from the *Trud* reference cited in table B-1. The price index for goods is the one for wholesale enterprise prices for all industrial goods obtained from the following official economic yearbooks: 1962, p. 144; 1965, p. 166; and 1967, p. 226. The respective price indexes, therefore, bear the following weights in the consumption deflator: state retail prices, 72; collective farm market prices, 5; wages, 15; and industrial wholesale prices, 8.

For investment, the two basic components of fixed investment, construction, and equipment, are weighted by their average values for the period 1956-60, *Narodnoe khoziaistvo SSSR v 1967 godu*, p. 615. The respective weights are 7 for construction and 3 for equipment. The construction index is the official one for actual construction found in the 1967 statistical handbook, p. 642. The price index for equipment is the official index of wholesale enterprise prices for machinery, found on p. 226 of the same handbook.

The defense price index may be obtained by dividing column 15 of table A-2 by column 13. The deflator for administration is weighted 2 to 1 between personnel and materials expenditures. (Georgii Sergeevich Mergelov, *Planirovanie i finansirovanie raskhodov na upravlenie*, Moscow, Gosfinizdat, 1962, p. 11.) The deflator for the personnel component is the official wage index for administrative personnel found on pages 38 and 39 of *Trud v. SSSR*. The deflator for material inputs is the official wholesale enterprise price index for all industrial output noted above.

The deflators for the four expenditure components of GNP are shown in table B-2.

TABLE B-2.—*Deflators for expenditure components of Soviet GNP (1955=100)*

| Use                 | 1950  | 1952  | 1955  | 1958  | 1960  | 1963  | 1965  | 1967  |
|---------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Consumption.....    | 126.4 | 112.4 | 100.0 | 101.9 | 102.1 | 104.4 | 107.9 | 108.9 |
| Investment.....     | 128.6 | 109.9 | 100.0 | 94.3  | 92.7  | 92.5  | 90.9  | 89.8  |
| Defense.....        | 103.5 | 101.8 | 100.0 | 100.0 | 99.2  | 98.9  | 93.6  | 98.0  |
| Administration..... | 97.9  | 96.2  | 100.0 | 103.2 | 105.3 | 113.2 | 122.0 | 131.9 |

The constant 1955 ruble estimates in table B-1 are converted to current prices by multiplying by the appropriate deflators in table B-2. When the resulting current ruble values are expressed as proportions of GNP, the estimates in table B-3 are obtained.

TABLE B-3.—*Shares of Soviet GNP by end use*

| Use                 | 1950 | 1952 | 1955 | 1958 | 1960 | 1963 | 1965 | 1967 |
|---------------------|------|------|------|------|------|------|------|------|
| Consumption.....    | 62.4 | 60.1 | 59.6 | 58.9 | 58.1 | 56.3 | 56.9 | 56.5 |
| Investment.....     | 21.2 | 21.4 | 24.3 | 28.1 | 29.9 | 29.1 | 30.0 | 30.2 |
| Defense.....        | 12.3 | 14.7 | 13.2 | 10.4 | 9.6  | 12.2 | 10.6 | 10.6 |
| Administration..... | 4.1  | 3.8  | 2.9  | 2.6  | 2.4  | 2.4  | 2.5  | 2.7  |

## APPENDIX C

### DERIVATION OF MARGINAL CAPITAL-OUTPUT RATIOS

Marginal capital-output ratios by definition measure the increase in fixed, capital stock required to obtain an additional unit (ruble) of output. Therefore it is necessary to construct time series for both variables. Capital stock estimates are obtained from official data, while the output estimates represent value-added in the component sectors and industrial branches.

#### VALUE-ADDED ESTIMATES

The basic value added estimates have been calculated from Professor Vladimir Tremli's derivations from the official Soviet 1959 interindustry matrix.<sup>24</sup> Tremli classified sectoral and branch value added into three categories. Labor income, depreciation, and other net income. The third category is a residual including profits, indirect taxes, interest payments on short term loans, fines and penalties, training expenses, and so forth. As such, it includes some payments not properly compensation to factors of production and excludes others which are factor payments. For this reason, only the first two of Tremli's groupings have been included in my value added computations.

Since Tremli's calculations are based upon official estimates computed according to Marxist concepts, they exclude interest payments on fixed assets. Pre-

<sup>24</sup> Vladimir G. Tremli, "Value Added and Final Demand Quadrants in the 1959 Soviet Input-Output Table," *Select Studies in Soviet Economic Trends, Structure, and Institutions*, (RAC-R-30), McLean, Va., Research Analysis Corp. 1968, p. 116.

sumably interest payments on working capital have been included in Tremli's residual, which was discarded for conceptual complexities, and therefore, must be computed separately. A return of 8 percent on both fixed and working capital assets will be assumed. This rate prevailed in U.S. industry for much of the post-war period.<sup>25</sup> A 3-percent rate has been assumed as the return on housing, also based on U.S. experience. These rates are applied to relevant capital stock estimates by sector and branch. Inventory data limitations precluded estimates of return on working capital for industrial branches. Inventory estimates are obtained from official statistics.

Thus, value added by industrial branch consists of the sum of the following factor payments: Labor income, depreciation, and return on fixed assets. For the seven major sectors, the return on working capital is added. (Table C-1)

[Billions of rubles]

| Sector or branch                       | Wage-type incomes | Return on capital |             | Depreciation | Total |
|--|-------------------|-------------------|-------------|--------------|-------|
|  |                   | Fixed             | Inventories |              |       |
| Industry.....                          | 28.6              | 6.5               | 2.3         | 4.4          | 41.8  |
| Ferrous.....                           | 1.57              | .65               | (1)         | .43          | 2.65  |
| Nonferrous.....                        | .99               | .33               | (1)         | .24          | 1.56  |
| Coal.....                              | 3.04              | .60               | (1)         | .31          | 3.95  |
| Oil and gas.....                       | .30               | .44               | (1)         | .32          | 1.06  |
| Electric power.....                    | .43               | .85               | (1)         | .50          | 1.78  |
| Machinery.....                         | 7.10              | 1.10              | (1)         | .89          | 9.09  |
| Chemicals.....                         | 1.00              | .32               | (1)         | .21          | 1.53  |
| Forest products.....                   | 3.22              | .38               | (1)         | .34          | 3.94  |
| Construction materials.....            | 2.03              | .37               | (1)         | .34          | 2.74  |
| Light.....                             | 2.33              | .32               | (1)         | .22          | 2.87  |
| Food.....                              | 2.53              | .45               | (1)         | .17          | 3.60  |
| Agriculture.....                       | <sup>2</sup> 32.7 | 3.4               | .7          | 2.1          | 38.9  |
| Construction.....                      | 10.6              | .4                | .2          | .6           | 11.8  |
| Transportation and communications..... | 6.0               | 3.1               | .1          | 1.2          | 10.4  |
| Commerce.....                          | 3.8               | .6                | 2.6         | .4           | 7.5   |
| Services.....                          | 15.9              | 3.7               | .4          | 3.3          | 23.3  |
| Economy.....                           | 97.6              | 17.7              | 6.3         | 12.0         | 133.7 |

<sup>1</sup> Not available.

<sup>2</sup> Includes 5,600,000,000 rubles of imputed land rent.

Sources: Vladimir G. Tremli, "Value-Added and Final Demand Quadrants of the 1959 Soviet Input-Output Table," *Selected Studies in Soviet Economic Trends, Structure and Institutions (RAC-R-30)* McLean, Va., Research Analysis Corp., 1963.

Stanley H. Cohn, *Derivation of 1959 Value-Added Weights for Originating Sectors of Soviet Gross National Product (RAC-TF-210)* McLean, Va., Research Analysis Corp, 1966, p. 20.

Further adjustments of certain sector net output estimates can be made with the aid of supplementary official data:

**Industry**—In 1959 according to official estimates, 52.3 percent <sup>26</sup> of the national income of 136.2 billion rubles <sup>27</sup> originated in industry. From a total net product of 71.2 billion rubles is deducted 12.5 billion in profits <sup>28</sup> in state industry and probably in producer cooperatives and the portion of turnover tax receipts—30.1 billion rubles <sup>29</sup> levied on industrial enterprises. The remainder of 28.6 billion rubles represent wages, wage supplements, and other undesignated value added in industry.

**Construction**—Total material cost in construction amounted to 14.6 billion rubles.<sup>30</sup> Since no purchases were made from the trade sector and a negligible amount from transportation, no deduction is necessary for these costs. Material outlays comprised 55.7 percent of construction costs, and wages comprised 38 percent.<sup>31</sup> If the wage supplement of 6.2 percent additional to wages for all of material production <sup>32</sup> is applicable to construction, then the wage proportion was

<sup>25</sup> Edward Fulton Denison, *The Sources of Economic Growth in the United States and the Alternatives Before Us*, New York, Committee for Economic Development, 1962, pp. 31 and 33.

<sup>26</sup> Ts. S. U., *Narodnoe khoziaistvo SSSR v 1963 godu*, p. 502.

<sup>27</sup> *Ibid.*, p. 501.

<sup>28</sup> Ts. S. U., *Narodnoe khoziaistvo SSSR v 1962 godu*, p. 527.

<sup>29</sup> Viktor Dantelovich Belkin, *Tseny edinogo urovnia i ekonomicheskie izmerenia na ikh osnove*, Moscow, Izdatel'stvo ekonomicheskoi literatury, 1963, p. 190.

<sup>30</sup> Tremli, *op.cit.*

<sup>31</sup> Ts. S. U., *Narodnoe khoziaistvo SSSR v 1960 godu*, p. 627.

<sup>32</sup> Belkin, *op.cit.*, p. 195.

40.4 percent ( $38.0 \times 106.2 = 40.0$ ). Therefore, wages and supplements amounted to 10.6 billion rubles.

*Agriculture.*—The official wage estimate includes an imputation of the money value of income-in-kind. Incomes-in-kind are valued by weighted averages of compulsory delivery and procurement prices for a representative sample of farm commodities. This valuation understates the value of such incomes since the alternative to such consumption is the purchase of these commodities in state retail outlets or on the collective farm market. Therefore, the weighted averages of higher state retail and collective farm market prices have been used as the basis for valuation. This procedure together with estimates of agricultural money incomes derived from official income flow data yields an agricultural value added estimate of 27.7 billion rubles.<sup>33</sup> To this should be added an estimate for the imputed value of land rent of 5 billion rubles.<sup>34</sup> Thus total value added in agriculture is estimated at 32.7 billion rubles.

*Transportation and communications.*—The Trembl estimates derived from the official inter-industry table exclude net output in passenger transportation and in individually consumed communications. Inclusion of value-added generated in these activities increases the estimate of net output to 60 billion rubles.<sup>35</sup>

*Services.*—The Marxist conceptual framework which Trembl necessarily follows excludes services from its definition of national income. This sector consists of component sub-sectors, the value added of which are derived from official estimates of wages and wage supplements,<sup>36</sup> interest, and depreciation charges.<sup>37</sup>

These base year (1959) value added estimates are moved to other years by means of indexes of output which have been computed for calculation of the Soviet GNP index.<sup>38</sup> The marginal output estimates, of course, are then obtained by calculating the differences between pertinent annual values-added.

#### CAPITAL STOCK ESTIMATES

The basic figures for capital stock estimates are the official year end ones reported in the annual issues of the economic handbook. Some inconsistencies have appeared in successive issues of the handbook, but in such cases the most recent estimates have been used wherever possible. This procedure has subsequently involved some adjustment of data from earlier issues (Table C-2.) The estimates are then converted into annual estimates by interpolation. These annual estimates, in turn, are expressed in appropriate marginal dimensions. These marginal capital stock estimates together with the aforementioned marginal output estimates provide the basic ingredients for the incremental capital-output ratios.

<sup>33</sup> Stanley H. Cohn, *Derivation of 1959 Value-added Weights for Originating Sectors of Soviet Gross National Product* (RAC-TP-210). McLean, Va., Research Analysis Corp., 1966, p. 12.

<sup>34</sup> Cohn, *op.cit.*, p. 19.

<sup>35</sup> *Ibid.*, p. 13.

<sup>36</sup> Ts.S.U., *Narodnoe khoziaistvo SSSR v 1964 godu*, pp. 547 and 545.

<sup>37</sup> Cohn, *op.cit.*, p. 20.

<sup>38</sup> See note on Derivation of Index of Soviet Gross National Product in section on "General Growth Performance of the Soviet Economy." The value-added time series has been computed in Appendix Table 2 of the section on "General Growth Performance of the Soviet Economy" in this volume.

TABLE C-2.—Fixed capital stock estimates

[Billions of rubles]

| Sector or branch                       | Jan. 1, 1950 | Jan. 1, 1951 | Jan. 1, 1952 | Jan. 1, 1953 | Jan. 1, 1955 | Jan. 1, 1956 | Jan. 1, 1958 | Jan. 1, 1959 | Jan. 1, 1960 | Jan. 1, 1961 | Jan. 1, 1962 | Jan. 1, 1963 | Jan. 1, 1964 | Jan. 1, 1965 | Jan. 1, 1966 | Jan. 1, 1967 | Jan. 1, 1968 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Industry.....                          | 27.5         | 29.5         | 34.1         | 37.8         | 50.1         | 55.8         | 68.7         | 72.5         | 80.0         | 88.7         | 100.0        | 111.0        | 124.0        | 137.0        | 150.0        | 163.0        | 176.0        |
| Ferrous.....                           | 2.7          | 3.1          | 3.4          | 3.8          | 4.6          | 5.0          | 6.4          | 6.9          | 7.7          | 8.8          | 10.0         | 11.9         | 13.2         | 14.7         | 15.9         | 17.3         | 18.5         |
| Coal.....                              | 2.5          | 2.8          | 3.1          | 3.3          | 4.3          | 4.7          | 5.8          | 6.5          | 7.0          | 7.5          | 7.9          | 8.3          | 8.8          | 9.3          | 9.8          | 21.4         | 10.8         |
| Oil and gas.....                       | 1.5          | 1.7          | 2.0          | 2.2          | 3.1          | 3.6          | 4.6          | 5.2          | 5.8          | 6.3          | 6.9          | 7.5          | 8.3          | 9.1          | 10.1         | 12.0         | 12.0         |
| Electric power.....                    | 3.8          | 4.7          | 5.2          | 5.8          | 7.2          | 7.4          | 8.6          | 9.3          | 9.5          | 10.8         | 13.3         | 14.9         | 17.6         | 19.9         | 22.4         | 25.0         | 26.9         |
| Machinery.....                         | 7.3          | 8.2          | 8.8          | 9.6          | 11.1         | 11.9         | 14.0         | 14.9         | 16.2         | 17.7         | 20.0         | 22.3         | 24.4         | 27.0         | 28.5         | 31.7         | 34.7         |
| Chemicals.....                         | 1.3          | 1.4          | 1.5          | 1.7          | 2.1          | 2.3          | 3.0          | 3.8          | 3.9          | 4.6          | 5.2          | 7.2          | 9.1          | 10.7         | 12.5         | 13.7         | 15.7         |
| Forest products.....                   | 2.0          | 2.2          | 2.4          | 2.7          | 3.2          | 3.4          | 4.1          | 4.4          | 4.7          | 5.3          | 5.7          | 6.5          | 7.2          | 7.8          | 8.4          | 8.9          | 9.3          |
| Construction materials.....            | 1.6          | 1.8          | 1.9          | 2.1          | 2.4          | 2.7          | 3.0          | 3.3          | 3.6          | 3.9          | 4.6          | 4.8          | 5.2          | 6.0          | 6.6          | 7.1          | 7.7          |
| Light.....                             | 1.6          | 1.8          | 1.9          | 2.1          | 2.4          | 2.7          | 3.0          | 3.3          | 3.6          | 3.9          | 4.6          | 4.8          | 5.2          | 6.0          | 6.6          | 7.1          | 7.7          |
| Food.....                              | 3.0          | 3.4          | 3.6          | 3.9          | 4.5          | 4.7          | 5.8          | 6.6          | 7.3          | 8.1          | 10.2         | 10.3         | 11.4         | 12.5         | 13.8         | 14.8         | 15.7         |
| Agriculture.....                       | 21.4         | 21.4         | 21.4         | 22.2         | 22.2         | 31.6         | 38.8         | 41.9         | 46.0         | 48.0         | 53.0         | 57.0         | 62.0         | 66.0         | 69.0         | 74.0         | 74.0         |
| Construction.....                      | 2.3          | 2.3          | 2.3          | 3.0          | 4.1          | 5.2          | 6.3          | 6.3          | 7.0          | 7.0          | 8.0          | 9.0          | 11.0         | 12.0         | 14.0         | 14.0         | 14.0         |
| Transportation and communications..... | 18.4         | 18.4         | 18.4         | 23.7         | 25.3         | 27.1         | 31.1         | 35.0         | 28.8         | 42.3         | 45.0         | 50.0         | 54.0         | 57.0         | 67.0         | 72.0         | 71.0         |
| Commerce.....                          | 6.2          | 6.2          | 6.2          | 6.2          | 6.2          | 6.2          | 7.4          | 8.2          | 9.0          | 10.0         | 10.0         | 10.0         | 11.0         | 13.0         | 17.0         | 20.0         | 21.0         |
| Services.....                          | 62.7         | 62.7         | 62.7         | 70.2         | 81.9         | 87.8         | 117.0        | 122.5        | 146.3        | 145.0        | 167.0        | 180.0        | 180.0        | 193.0        | 206.0        | 218.0        | 231.0        |
| Economy.....                           | 130.7        | 138.4        | 148.8        | 160.4        | 191.2        | 210.3        | 253.6        | 275.5        | 296.5        | 342.6        | 354.0        | 397.0        | 434.0        | 471.0        | 518.0        | 555.0        | 594.0        |

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# THE TECHNOLOGICAL BASE OF SOVIET MILITARY POWER

By MICHAEL BORETSKY\*

## CONTENTS

|   | Page |
|---|------|
| Introduction.....   | 190  |
| I. Total output of engineering (machinery and machinery-like) products: U.S.S.R. versus the United States, major West European countries and Japan..... | 193  |
| Technical note regarding the nature and reliability of the estimates presented in tables 2 and 3.....   | 197  |
| II. The technological base of Soviet military power in a narrow sense.....  | 209  |
| III. The problem of quality and the quest for progress.....   | 220  |
| Appendix tables.....  | 125  |

## TEXT TABLES

|  |     |
|--|-----|
| 1. Manpower in the armed forces of the U.S.S.R. and the United States, selected years, 1950-68.....  | 191 |
| 2. Estimated comparative levels of the total value of output of engineering products (machinery and machinery-like products) in 1964 U.S. dollars: U.S.S.R. versus the United States, major European countries and Japan, selected years, 1955-67..... | 195 |
| 3. Comparative growth rates in the total value of output of engineering products (machinery and machinery-like products): U.S.S.R., the United States, major West European countries and Japan, selected periods, 1955-67, percent per year.....       | 196 |
| 4. Dollar-ruble price ratios (wholesale level) in machinery and related products in 1955 and extrapolations to 1964.....   | 200 |
| 5. Estimates of the Soviet output of engineering products relative to the United States compared with relative major input expenditures, selected years, 1958-68.....  | 206 |
| 6. Comparison of the total value of sales (output) of engineering products and products made of metal (metal fabricates) by end use: U.S.S.R. in 1965 and the United States in 1963.....   | 211 |
| 7. Comparative output and end uses of engineering products (machinery and machinery-like products only): U.S.S.R. versus the United States, selected years, 1958-68.....   | 216 |
| 8. Comparative growth rates in output and the defined end-use categories of engineering products in the U.S.S.R. and the United States, selected periods in 1958-68.....   | 217 |
| 9. Comparative structure of the defined end-use categories of engineering products in 1958, 1962, and 1968: The U.S.S.R. versus the United States.....   | 218 |
| 10. Idling of machinery and equipment in the U.S.S.R.....  | 222 |
| 11. Estimated employment of qualified scientists and engineers (QSE) in research and development (R. & D.) in U.S.S.R. and the United States, selected years, 1962-68.....   | 224 |

## FIGURES

|   |     |
|---|-----|
| 1. Approximate value of total Soviet output of engineering products relative to the United States, major European countries and Japan, 1955-70..... | 196 |
| 2. Approximate value of total Soviet output of engineering products by end use relative to the United States, 1958-68.....                          | 215 |

\*In the research leading to this paper I received valuable assistance from Murray Feshbach and Rob. Jt McKibben.

## APPENDIX TABLES

|  | Page |
|--|------|
| A-1. Percentage distribution of Soviet gross value of output of products of machine-building and metalworking by end-use-----  | 225  |
| A-2. Percentage distributions of the cost of materials input in Soviet machine-building and metalworking industries, selected years, 1959-1970-----                  | 226  |
| A-3. Estimating the total Soviet output of machine-building products, net of intra-industry sales, and determination of its end uses, selected years, 1955-1968----- | 227  |
| A-4. U.S. output and end-uses of engineering products in 1958 and 1963-----  | 230  |
| A-5. Indexes used in estimating U.S. total output and end-uses of engineering products from 1963 to other years-----   | 230  |
| A-6. Estimating the value of output of engineering products of four major west European countries and Japan, selected years, 1955-1967---                            | 231  |

## INTRODUCTION

Trying to prevent a further shift of the balance of power in the international arena in favor of socialism, imperialist states headed by the U.S.A. speeded up the arms race, initiated "the cold war," intensified provocations against socialist states and struggled against national liberation movements.

The Soviet government took urgent measures to put an end to the consequences of World War II that caused international tension. \* \* \*

The Soviet government made great efforts to solve the problem of disarmament and banning nuclear weapons. Trying to achieve quicker agreement on these questions, our country accepted many proposals, of the Western states. However, the U.S.A., Britain and France—not willing to disarm—refused to live up to their own proposals.\* \* \*

(Current)—"History of the U.S.S.R."

As quoted by Susan Jacoby in the *Washington Post*, July 5, 1970.

The public debate that has been underway since the early part of 1968 concerning U.S. expenditures for military and space purposes has also generated interest in the level and trend of Soviet efforts in these areas. However, while the U.S. spending is generally an "open book" proposition for all policy-oriented purposes, and, I might add, for quite a few not so general purposes, the Soviet spending is not. In an effort to break through the Soviet secrecy barrier, analysts relying on overt sources of information have used two approaches or a combination thereof:

(1) Scrupulous analysis of the Soviet government's budget with an effort to uncover or estimate the concealed military expenditures;

(2) Analysis of changes in the basic components of Soviet GNP over time with an effort to uncover the kind of changes that would indicate a diversion of resources for military purposes.

Followers of the *budget-analysis* approach have recently produced a number of estimates of overall Soviet expenditures for military purposes and all of these show that the U.S.S.R. has a substantially smaller level of military effort than does the United States. As Abraham Becker, the RAND Corporation's expert on these matters, painstakingly argued about a year ago, however, it is impossible to break the secrecy of the Soviet budget and derive from it accurate—in any sense—estimates of the expenditures nor is it possible to correlate the expenditures that are traceable with what they buy.<sup>1</sup>

The followers of the *change-in-GNP-to-defense* approach have not come up with any formal propositions as to the level of the Soviet

<sup>1</sup> See Abraham S. Becker, *Soviet National Income 1958-64: National Accounts of the USSR During the Seven Year Plan Period*, Berkeley, University of California Press, 1969, Chapter 7.



defense effort relative to the United States though some, notably Stanley Cohn, trace a definite increase in this effort in recent years. Informally, however, there seems to be a widespread opinion among the followers of this approach that although the Soviet Union may be spending a somewhat larger proportion of its GNP on defense than does the United States, the amount of resources which it devotes to defense is much smaller in absolute terms than the amount devoted for this purpose by the United States. Since no analysis of facts has ever been offered in support of this view, it cannot be regarded as anything more than speculation based on the fact that the Soviet GNP is still very much smaller than that of the United States and the assumption that this smaller GNP would make it impossible for Soviet leaders to devote as great an amount of resources in absolute terms to defense as the United States' GNP permits.

In this paper I propose to consider the problem of the level of U.S. and USSR defense efforts, and their changes over time, on the basis of the size of manpower each country maintains in its armed forces and the level of technology (combat and transport equipment, means of communication, etc.) with which each equips its manpower. This might be regarded as a sample approach for determining comparative expenditures since each country's defense effort consists of many more elements than these two, but these two are unquestionably the most essential and most costly. In the case of the United States, the cost of these two defense "inputs" (manpower and technology) represents about  $\frac{1}{3}$  of the Department of Defense's entire budget. Moreover, it seems also fairly safe to assume that in both countries all the other important defense *inputs*, especially construction and oil and petroleum products, are closely correlated with these two. Reasonably accurate knowledge about the two countries' relative defense effort in terms of these two inputs might therefore be regarded as practically synonymous with the relative total defense efforts.

To develop the argument it is necessary to focus on the technology input only since the size of manpower each country has in its armed forces, although subject to some imprecision in the case of the U.S.S.R., is by and large common knowledge. The available estimates of the comparative manpower in the armed forces are reproduced in Table 1. As is apparent from this table, the size of manpower which each country has had in its armed forces in recent years has not been very different despite the U.S. involvement in Vietnam.

TABLE 1.—*Manpower in the Armed Forces of the U.S.S.R. and the United States*

[In thousands]

| Year | U.S.S.R.         | United States | U.S.S.R. as<br>percent of the<br>United States |
|------|------------------|---------------|--|
| 1950 | 4,600            | 1,650         | 279  |
| 1955 | ( <sup>1</sup> ) | 3,049         | -----  |
| 1960 | 3,300            | 2,514         | 131  |
| 1965 | 3,150            | 2,723         | 116  |
| 1966 | 3,165            | 3,123         | 101  |
| 1967 | 3,220            | 3,446         | 93   |
| 1968 | 3,220            | 3,535         | 91   |

<sup>1</sup> Not available.

Sources: U.S.S.R.—The Institute for Strategic Studies (London) and Murray Feshbach's contribution "Population Trends," Table 1, which also appears in this publication.

U.S.—*Economic Report of the President*, January 1969, p. 252.

My determination of the comparative inputs of technology into the defense effort of each country, which I verbally describe as the technological base of military power, proceeds via analysis of comparative output and the end-uses (disposition) of what Europeans and the Soviets describe as *engineering* or machine-building products. In terms of the U.S. statistical commodity classification, the Soviet concept of the machine-building or engineering products comprises power boilers (SIC 3443), non-electrical machinery (SIC 35), electrical machinery and apparatus (SIC 36), transportation equipment (SIC 37), instruments and controls (SIC 38), and machinery-like products of ordnance (SIC 19). In Soviet terminology the industry that manufactures all these products is described as "machine-building". In addition to the stated products, their concept of the machine-building industry also includes processes which manufacture the prefabricates and components used exclusively or almost exclusively in the manufacture of engineering products, namely ferrous and non-ferrous foundries (SIC 332 and SIC 336), stampings (SIC 3461), ferrous and non-ferrous forgings (SIC 3391 and SIC 3392), manufacturers of fasteners and other screw-machine products (SIC 345), manufacturers of steel springs (SIC 3493), and valves other than those used in plumbing (SIC 3494).

The rationale of using this approach is that whether in the USSR, the United States, or any other country, the industry or rather the set of industries manufacturing these (engineering) products is also the sole producer of military (and space) *hardware* and the data problem, although not entirely absent, is, in contrast to the *budget-analysis* approach, far from the kind that would make a useful analysis impossible.

The paper consists of three analytical sections and an appendix.

Section I is devoted to a comparison of the level of Soviet total output of engineering products with such of the United States, four major West European countries (the United Kingdom, France, West Germany, and Italy), and Japan in 1955, 1962, and 1967. The primary purpose of these comparisons is to set the stage for the analysis in Section II in which the U.S.S.R.'s and the U.S. "technological base of military power" is defined. However, since the engineering products industries are not only producers of military *hardware*, but also producers of the bulk of civilian technology (indeed, Japan, West Germany and Italy produce nothing or very little of military nature), these comparisons are crudely instructive about the changes in the respective countries' levels of technological capabilities at large.

Section II provides estimates of the comparative value of engineering products procured for military (and space) purposes by the U.S.S.R. and the United States in selected years between 1958 and 1968, which I, as noted, equate with the technological bases of military power. The analysis focuses on the relative levels as well as the trends.

Section III discusses some of the more apparent disparities between the general quality of the Soviet and American engineering products and, hence, perhaps the quality disparities between the Soviet and American military *hardware*, as well as the Soviet government's effort for progress.

Most of the data on which this study is based are presented in the text, but some, along with documentation and explanation of estimating procedures used in their derivation, are set forth in the appendix.

Both in concept and data usage I draw heavily on two of my earlier studies.<sup>2</sup> The data that became available since these studies were published put some of my earlier ideas on much firmer ground though some, which shall be specifically noted, had to be revised.

### I. TOTAL OUTPUT OF ENGINEERING (MACHINERY AND MACHINERY-LIKE) PRODUCTS: U.S.S.R. VERSUS THE UNITED STATES, MAJOR WEST EUROPEAN COUNTRIES, AND JAPAN

As noted in Introduction, in this paper I define a country's technological base of military power (of the U.S.S.R., United States, or any other country) as the amount or value of combat, transportation and communication equipment (*hardware*) which the country furnishes its armed forces in a year. Since the U.S.S.R. does not publish data on this value (in fact such information appears to be, or at least to have been, a most closely guarded secret) the only way in which it can be determined, or at least roughly approximated, is through a comprehensive analysis of the total output and end-uses of the engineering products industry—the producer of such equipment. It is quite natural, therefore, to start the analysis with the total output.

Many readers may argue that my definition of the "technological base of military power" as the value of military hardware with which a country equips its armed forces at a given point in time is too narrow. And for certain conditions I would have to agree with them. However, as I see it the most sensible way to broaden this definition would be to equate the concept with the amount of military equipment a country could produce on a short notice, i.e., in case of a sudden war on warlike emergency, not with the amount or value of hardware with which it equips its armed forces at a given time. The statistical proxy for such a broader definition probably would have to be either some portion of the country's total output of engineering products or perhaps even the total itself on the grounds that on short notice the best a country could do would be to convert facilities manufacturing civilian engineering products to the manufacture of military hardware. Although there is a great technological similarity in the manufacture of all kinds of engineering products, military and civilian, no country could convert all its capacity to produce engineering products to the production of military hardware on short notice, but perhaps this (total) capacity might be considered an outer limit. Readers wishing to view data on the total Soviet output of engineering products in that light will have no difficulty doing so.

The analytical value of the broad comparisons (of total output), however, goes much beyond military considerations since the totals of engineering products include not only all military hardware, but also all industrial and business equipment, and all consumer appliances and automobiles—in short, all means of modern production and modern living. In relative terms, therefore, the per capita output of all these products by any country is perhaps the best single indicator of its relative level of overall technological advancement or "sophistication" that one could design.

<sup>2</sup> Michael Boretzky, "The Soviet Challenge to U.S. Machine Building" in U.S. Congress, Joint Economic Committee, *Dimensions of Soviet Economic Power*, Washington, U.S. G.P.O. 1962, pp. 69-143 (published in 1963 by the U.S. Department of Commerce as a separate publication); and "Comparative Progress in Technology, Productivity, and Economic Efficiency: U.S.S.R. Versus U.S.A.," in U.S. Congress, Joint Economic Committee, *New Directions in the Soviet Economy*, Washington, U.S. G.P.O., 1966, vol. II-A, pp. 133-256.

Because of these broader considerations I found it desirable and possible to compare the total Soviet output of engineering products, not only with that of the United States (as in the case of the analysis of the two countries' comparative base of military power in a narrow sense) but also with that of four major West European countries—United Kingdom, France, West Germany, Italy—and with Japan.

The highlights of these comparisons are presented in Tables 2 and 3, and Figure 1. The comparisons in Table 2 focus on the level of the Soviet and the other countries total output of engineering products in 1955, 1962, and 1967—all valued in 1964 U.S. dollars. Table 3 explicitly states the average annual growth rates implicit in each country's estimates as given in Table 2, focusing on 1955-62, 1962-67, and 1955-67. Figure 1 graphically portrays the actual changing position of Soviet output relative to the other countries over the stated 12 year period as well as the probable position the Soviets will have relative to the other countries at the end of 1970. The latter was crudely estimated on the basis of fragmentary data.

TABLE 2.—Estimated comparative levels of the total value of output of engineering products (machinery and machinery-like products) in 1964 U.S. dollars: U.S.S.R. versus the United States, major European countries and Japan, selected years, 1955-67

[Dollars in millions]

| Country                                  | 1955     |                     |                          | 1962     |                     |                          | 1967      |                     |                          |
|--|----------|---------------------|--------------------------|----------|---------------------|--------------------------|-----------|---------------------|--------------------------|
|  | Amount   | Percent of U.S.S.R. | Percent of United States | Amount   | Percent of U.S.S.R. | Percent of United States | Amount    | Percent of U.S.S.R. | Percent of United States |
| U.S.S.R.....                             | \$26,870 | 100                 | 30                       | \$69,663 | 100                 | 73                       | \$111,353 | 100                 | 82                       |
| United States.....                       | 88,625   | 330                 | 100                      | 95,425   | 137                 | 100                      | 135,815   | 122                 | 100                      |
| United Kingdom.....                      | 14,696   | 55                  | 17                       | 18,100   | 26                  | 19                       | 20,530    | 18                  | 15                       |
| France.....                              | 9,442    | 35                  | 11                       | 11,686   | 17                  | 12                       | 16,548    | 15                  | 12                       |
| West Germany.....                        | 10,498   | 39                  | 12                       | 19,424   | 28                  | 20                       | 23,902    | 21                  | 18                       |
| Italy.....                               | 2,780    | 10                  | 3                        | 5,566    | 8                   | 6                        | 8,181     | 7                   | 6                        |
| Four West European countries, total..... | 37,416   | 139                 | 42                       | 54,776   | 79                  | 57                       | 69,161    | 62                  | 51                       |
| Japan.....                               | 3,135    | 12                  | 4                        | 15,818   | 23                  | 17                       | 31,988    | 29                  | 24                       |

<sup>1</sup> Average for 1960-68.

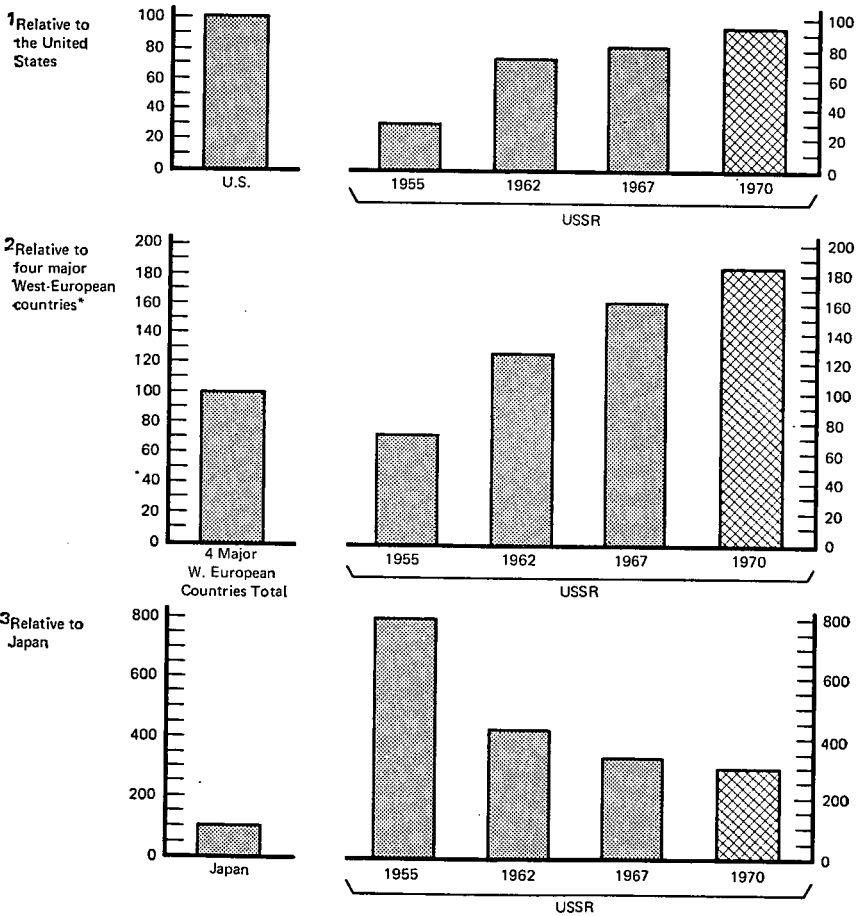
Source: Appendix, tables A-3 through A-6 and text table 4.

TABLE 3.—Comparative growth rates in the total value of output of engineering products (machinery and machinery-like products): U.S.S.R., the United States, major West European countries and Japan, selected periods, 1955-67, percent per year

| Country                                       | 1955-62 | 1962-67 | 1955-67 |
|---|---------|---------|---------|
| U.S.S.R.                                      | 14.6    | 9.8     | 12.6    |
| United States                                 | 1.1     | 7.3     | 3.6     |
| United Kingdom                                | 3.1     | 2.6     | 2.8     |
| France  | 3.1     | 7.2     | 4.8     |
| West Germany                                  | 9.2     | 4.2     | 7.1     |
| Italy   | 10.4    | 8.0     | 9.4     |
| The 4 listed West European countries, average | 5.6     | 4.5     | 5.3     |
| Japan   | 26.0    | 15.1    | 21.4    |

Source: Estimated from Table 2.

Figure 1  
APPROXIMATE VALUE OF  
TOTAL SOVIET OUTPUT OF ENGINEERING  
PRODUCTS RELATIVE TO THE UNITED STATES,  
MAJOR EUROPEAN COUNTRIES  
AND JAPAN, 1955-70



\*Great Britain, France, West Germany and Italy

As is quite evident from these comparisons, Soviet gains in the total output of engineering products over the 12-year period in the past were profound, to say the least, against both the United States and the European countries. And, in all probability, this gain continues.

Back in 1955 the dollar value of the Soviet output (estimated at about \$26.9 billion in 1964 prices) represented only 30 percent of U.S. output. By 1962, the ratio of Soviet output to that of the United States increased 2.4 times—to 73 percent. By 1967 it had further increased to 82 percent despite a very rapid growth (by U.S. standards) of U.S. industry at the time. By the end of 1970, after considerable growth in the United States in 1968, but little and virtually no growth in 1969 and 1970, respectively, I expect the Soviet output to reach a level about 96 to 97 percent of that of the U.S., which, of course, might be considered to be as good as parity.

Relative to the aggregate output of the four West European countries the Soviet output represented only about 72 percent in 1955, but in 1962 it was already larger by about 27 percent, by 1967 over 60 percent larger, and by the end of 1970 it is likely to be larger by some 85 percent.

Relative to Japan, however, Soviet output did not gain—it lost ground. In 1955 the Soviet output was about eight times as large as that of Japan, in 1962 about 4.4 times as large, in 1967 about 3.5 times as large, and by the end of 1970 it is likely to be only three times as large.

In purely statistical terms the reason for the dramatic gain in U.S.S.R.'s total output relative to both the United States and the European countries is much higher growth. As shown in Table 3, the U.S.S.R.'s average annual growth rate was about 13 times as high as that of the United States in 1955–62, 1.3 times as high in 1962–67, and 3.6 times as high in the entire 12-year period (1955–67). Throughout the 12-year period the growth of Soviet output was also more than twice as high as that of the European countries. Relative to Japan, however, the growth in Soviet output was smaller by some 45 percent in 1955–62, 35 percent in 1962–67, and about 40 percent throughout the 12-year period.

Considering what is behind these figures, the implication of these changes for the United States, Western Europe and, for that matter, the world could hardly be exaggerated. It seems rather natural, therefore, that before drawing final conclusions many if not all readers will want to know quite a bit about the nature of the underlying estimates and, in particular, how good they are. On this, at least some answers will be found in the following technical note.

#### TECHNICAL NOTE REGARDING THE NATURE AND RELIABILITY OF THE ESTIMATES PRESENTED IN TABLES 2 AND 3

(1) In any analysis of the engineering products industries of various countries the greatest difficulty lies in defining a reasonably reliable measure of output. This difficulty is due not so much to the multitude of products, although this difficulty is formidable, as to the international differences in the organizational structure of these industries. Throughout the world most manufacturers of engineering (machinery and machinery-like) products are assemblers of parts and components some of which are produced on their own premises

(plants) and others elsewhere. The degree to which they rely on their own components varies immensely from manufacturer to manufacturer within any country and even more so between various countries. The result of these differences is that such a commonly used measure of an industry output as *value of shipments* is practically useless in the analysis of the engineering products industries since the proportion of multiple counting in a country's *value of shipments* might be greatly different than in others. Moreover, the degree of multiple counting changes over time. The measure of *value added* for this purpose is not much better, since the concept (in terms of what is included and what is excluded) also differs, although probably less than the value of shipments. Moreover, value-added data are available only for a very few foreign countries.

As in my 1962 study of the Soviet and U.S. engineering (machine-building) industries,<sup>3</sup> the estimates presented in Table 2 (which underlie the estimates of growth rates in Table 3) refer to the respective countries' total sales of engineering products (on a commodity basis) *net of intraindustry (or intrasector) sales* of the industry (actually a set of industries) specializing in the manufacture of such products. Conceptually this output measure is equivalent to the value-added *plus* the cost of materials, energy and services purchased for the production of these products from industries other than itself (the engineering products industry).

In my judgment this measure assures a maximum feasible comparability of output. It is short of ideal only by the value of replacement parts and components sold by one engineering products manufacturer to another for purposes of their current *equipment repair* (but not incorporation into the products to be sold to outside sectors). In each country the aggregate value of such sales is relatively small and, I assume, represents more or less the same proportion of the total output. This might not be so, but the incomparability of the total output arising from such sales cannot be significant.

(2) As I already alluded, the estimates refer to the respective countries' total output of engineering products *on a commodity basis* that is, irrespective of whether they are produced in the industry specializing in the manufacture of engineering products or other industries manufacturing such products as a secondary activity. In terms of input/output analysis parlance, reference is to the "primary commodity flow" of relevant industries, which excludes these industries' secondary products and includes products produced in other industries which are primary to the relevant industry but secondary to those which actually produce them.

(4) At least in the case of the U.S.S.R. and the United States the product coverage is assumed to be identical. In terms of the U.S. statistical classification, as explained in Introduction to this paper, these products include SIC 35, nonelectrical machinery; SIC 36, electrical machinery and apparatus; SIC 37, transportation equipment; SIC 38, instruments and related products; SIC 19, ordnance; SIC 3443, steam boilers; and manufacture of various components and prefabricates which are exclusively or prevailingly used in the manufacture of the above products (valves, springs, castings, forgings, etc.). It is conceivable that the estimates for the European countries and Japan do not fully include the prefabricating processes—foundries,

<sup>3</sup> "The Soviet Challenge to U.S. Machine Building," *op. cit.*



forging shops, stamping shops, etc., but, if so, this would not significantly affect the totals given in the table since the bulk of the sales of these prefabricates is within the engineering products industry and, hence, would not appear in the totals shown in Table 2.

(5) The estimates in Table 2 are stated in *U.S. dollars of 1964 purchasing power in machinery and related products* in the U.S. domestic market. For the European countries and Japan these estimates required estimating the value of output net of intraindustry sales in domestic currencies of 1964 purchasing power (prices) converting these estimates into U.S. dollars by means of official exchange rates, *and then making an adjustment for the difference between the United States and these countries' price levels in machinery and related products.* In making the conversion of the European countries' estimates in "official-exchange-rate dollars" into "purchasing-power-equivalent dollars" I assumed, in line with the recent National Bureau of Economic Research (NBER) study of the international price competitiveness of U.S. products, that in 1964 these countries' prices in machinery and related products were on the average about 10 percent lower than in the United States. And for Japan, partly in line with the NBER study and partly in consultation with industry people who have had first-hand experience in the matter of Japanese prices relative to United States in the machinery area, I assumed that Japanese prices were on the average 25 percent lower than U.S. prices.

The estimates for the U.S.S.R., finally, represent the values of output, net of intraindustry sales, in 1955 rubles converted into 1964 U.S. dollars at the rate of \$2.75 per ruble.

TABLE 4.—Dollar-ruble price ratios (wholesale level) in machinery and related products in 1955 and extrapolations to 1964

| Item   | Number of ratios (observations) | Unweighted means of the observed ratios (dollars per ruble) | Approximate proportion of relevant value added in 1953-59 |             | Ratios in col. (2) weighted with the proportion of value added (col. 3 and 3a) |              | Average of col. 4 and 4a |
|--|---------------------------------|---|---|-------------|--|--------------|--------------------------|
|  |                                 |   | U.S.S.R. (1959)   | U.S. (1958) | U.S.S.R. weights   | U.S. weights |                          |
|  |                                 |   | (3)   | (3a)        | (4)  | (4a)         |                          |
| (1)  | (2)                             | (3)   | (3a)  | (4)         | (4a)   | (5)          |                          |
| <b>I. Dollar-ruble price ratios, by product group, in 1955 unadjusted for "temporary" Soviet prices of serially produced new products:</b> |                                 |   |   |             |  |              |                          |
| 1. Energy generating equipment.....  | 24                              | 1.72  | 0.027   | 0.066       | -----  | -----        | -----                    |
| 2. Farm machinery and tractors.....  | 24                              | 1.54  | .132  | .036        | -----  | -----        | -----                    |
| 3. Construction, mining and oil field machinery.....   | 65                              | 2.70  | .086  | .045        | -----  | -----        | -----                    |
| 4. Metal-cutting and woodworking machine tools.....  | 99                              | 5.56  | .027  | .018        | -----  | -----        | -----                    |
| 5. Metal-forming and foundry equipment.....  | 25                              | 2.86  | .015  | .008        | -----  | -----        | -----                    |
| 6. Special industry machinery.....   | 14                              | 2.70  | .040  | .040        | -----  | -----        | -----                    |
| 7. General-purpose industrial machinery.....   | 101                             | 2.56  | .037  | .097        | -----  | -----        | -----                    |
| 8. Electrotechnical products, excluding measuring and control instruments, radios and electronic components.....                           | 212                             | 3.52  | .190  | .209        | -----  | -----        | -----                    |
| 9. Motor vehicles and related equipment.....   | 9                               | 1.23  | .152  | .274        | -----  | -----        | -----                    |
| 10. Transportation equipment (other than motor vehicles and aircraft).....   | 12                              | 2.70  | .103  | .060        | -----  | -----        | -----                    |
| 11. Precision instruments, controls, and related equipment.....  | 59                              | 2.94  | .191  | .146        | -----  | -----        | -----                    |
| A. All groups.....   | 644                             | 3.32  | 1.000   | 1.000       | 2.57   | 2.43         | 2.50                     |
| B. All groups, except motor vehicles.....  | 635                             | 3.35  | 1.000   | 1.000       | 2.81   | 2.88         | 2.85                     |
| C. All groups, except motor vehicles, farm machinery and tractors.....   | 611                             | 3.42  | 1.000   | 1.000       | 3.05   | 2.95         | 3.00                     |
| <b>II. Overall and selected group ratios in 1955 of sec. I adjusted for "temporary" Soviet prices of serially produced new products:</b>   |                                 |   |   |             |  |              |                          |
| A. All groups.....   | 644                             | 2.97  | 1.000   | 1.000       | 2.31   | 2.17         | 2.25                     |
| B. All groups, except motor vehicles.....  | 635                             | 3.00  | 1.000   | 1.000       | 2.52   | 2.57         | 2.55                     |
| C. All groups, except motor vehicles, farm machinery and tractors.....   | 611                             | 3.06  | 1.000   | 1.000       | 2.74   | 2.64         | 2.70                     |
| D. Metal-cutting machine tools.....  | 90                              | 4.95  | -----   | -----       | -----  | -----        | -----                    |
| E. Motor vehicles.....   | 9                               | 1.10  | -----   | -----       | -----  | -----        | -----                    |
| <b>III. The 1955 ratios of sec. II extrapolated to 1964:</b>   |                                 |   |   |             |  |              |                          |
| A. All groups.....   | 644                             | 3.46  | 1.000   | 1.000       | 2.69   | 2.82         | 2.75                     |
| B. All groups, except motor vehicles.....  | 635                             | 3.53  | 1.000   | 1.000       | 2.96   | 3.02         | 3.00                     |
| C. All groups, except farm machinery and tractors.....   | 611                             | 3.57  | 1.000   | 1.000       | 3.20   | 3.10         | 3.15                     |
| D. Metal-cutting machine tools.....  | 90                              | 6.65  | -----   | -----       | -----  | -----        | -----                    |
| E. Motor vehicles.....   | 9                               | 1.25  | -----   | -----       | -----  | -----        | -----                    |

## SOURCES AND EXPLANATIONS

Sec. I.—Dollar-ruble price ratios by product in 1955 unadjusted for "temporary" Soviet prices of serially produced new products:

Except for metal-cutting machine tools, all ratios (col. 2) were derived from Abraham S. Becker, *Prices of Producers' Durables in the United States and the U.S.S.R. in 1955* (RM-2432), Santa Monica, Calif., the Rand Corp., Aug. 15, 1959, app. A, pp. 59-292. The ratio for metal-cutting machine tools is the result of my own comparisons based on price and specifications data for Soviet machine tools which were published in the familiar handbook of the coal industry (*Materialy i oboordovanie priminaemye v ugolnoi promyshlennosti, Spravochnik*, vol. 11, pt. II. Ugletekhizdat 1957, pp. 274-345) and U.S. prices of comparable products furnished by U.S. machine tool builders which I prepared in 1962 for the Metalworking Equipment Division of the U.S. Department of Commerce's Business and Defense Services Administration. This ratio, adjusted for U.S. price changes from 1955 to 1958, was published in my study "The Soviet Challenge to U.S. Machine Building," in U.S. Congress, Joint Economic Committee, *Dimensions of Soviet Economic Power*, Washington, D.C., U.S. G.P.O. 1962 (also published separately by the U.S. Department of Commerce in 1963).

The grouping of the ratios in this table is somewhat different from Becker's because of the necessity to make them concordant with the grouping of the Soviet output of machinery products from which the value-added weights (relative importance) can be estimated. The difference, however, is not great.

Estimates of the value-added weights for the U.S.S.R. (col. 3) are based on Prof. Vladimir Tremli's estimates of the gross value of output (value of shipments) by fairly detailed product groups in 1959 and the relationship of the gross value of output to the value added for somewhat broader groups of products in which the narrower products are included. Both of these were published in his study *The 1959 Soviet Intersectoral Flow Table*, vol. I and II (technical paper RAC-TP-137). McLean, Virginia, Research Analysis Corporation, November 1964.

► The U.S. weights (col. 3a) were estimated from data in U.S. Bureau of the Census, *Census of Manufactures, 1958*.

Due to insufficient detail in Tremli's estimates of the Soviet output of various groups of machinery, the product coverage in the estimates underlying the weights is, in a few cases, somewhat broader than the coverage of price ratios. In most cases, however, the "excess" coverage in the weight estimates is small and, at least for the U.S.S.R., the commodities involved are generally of the same broad "production-scale" and, which in the U.S.S.R. appears to be even more important, of the same "social priority" category as those covered in the price ratio samples. Therefore, the smaller than "ideal" concordance between the coverage in the samples of price ratios, on one hand, and that in the estimates underlying the weights, on the other, might be presumed to exert no, or at worst very little, impact on the values of the weighted averages (items A, B and C). The following lists in detail the coverage underlying both estimates:

1. *Energy generating equipment.*—The 24 price ratios cover power boilers (in the U.S. classification part of SIC 3443), steam turbines (part of SIC 3511) and internal combustion engines (SIC 3510) while the estimates underlying the value added weights also include hydro- and gas turbines (also part of SIC 3511).

2. *Farm machinery and tractors.*—The 24 price ratios cover more or less the entire scope of farm machinery (SIC 3522) and so do the weights.

3. *Construction, mining, and oil field machinery.*—The 65 price ratios cover the stated types of machinery (SIC 3531-3533), except track-laying equipment (SIC 35312-3), while

the weights also include rolling mill equipment (SIC 35481). At least in the United States, the proportion of rolling mill equipment in this group is very small (not quite 12 percent).

4. *Metal-cutting and woodworking machine tools.*—The sample of 99 price ratios cover the stated types of equipment (SIC 3541 and 3553) and so do the weights.

5. *Metal-forming and foundry equipment.*—The 25 price ratios cover the stated types of equipment (SIC 3542 and SIC 35592) and so do the weights.

6. *Special industry machinery.*—Both the price ratios and weights cover food processing machinery (SIC 3551), textile machinery (SIC 3552), printing industry machinery (SIC 3555) glassmaking machinery (SIC 3559551), other special industry machinery equipment, except chemical equipment and apparatus (SIC 3559111), and foundry equipment (SIC 35592).

7. *General purpose machinery.*—Both the price ratios and the weight estimates cover pumps and compressors (SIC 3561), refrigeration equipment (SIC 3585), hoisting and materials handling equipment (SIC 3534-3537), chemical equipment and apparatus (SIC 3559111), fans and blowers (SIC 3564), fuel-fired industrial furnaces and ovens (SIC 3567), and other general industrial machinery (SIC 3569).

8. *Electrotechnical products.*—Both the price ratios and weights cover the broad area of electrical machinery and apparatus and electrical cable products (SIC 36), except electrical measuring instruments (SIC 3611), industrial controls (SIC 3622) and radios, electronic components and telecommunication equipment (SIC 3651, SIC 366, and SIC 367).

9. *Motor vehicles and related equipment.*—The price ratios cover motor vehicles and parts (SIC 3713 and 3717), while the weights also include motorcycles (SIC 3751013), truck trailers (SIC 3715), and trailer coaches (SIC 3791). The relative value of these "extras" is nil.

10. *Transportation equipment.*—The price ratios cover railroad equipment (SIC 3741 and 3742) while the weight estimates also include ships and boats (SIC 372), track-laying and off-highway transportation equipment (35312-3).

11. *Precision instruments, control and related equipment.*—The price ratios cover scientific mechanical measuring and optical instruments (SIC 3811-3831), electrical measuring instruments (SIC 3611) and electric industrial controls (SIC 3622), while the weight estimates also include photographic equipment (SIC 3861), precision measuring tools (SIC 35452), watches and clocks (SIC 387), and computing and calculating equipment (SIC 3571).

Sec. II.—Overall and selected group ratios in 1955 of sec. I adjusted for "temporary" Soviet prices of serially produced new products.

Both Becker's and my own comparisons focused exclusively on firmly established or "regular" Soviet prices. However, as was partially known then and is fully known now, most if not all new but already serially produced products in the Soviet machine-building industry have been subjected to so-called "temporary" prices. These "temporary" prices are substantially higher than "regular" prices—permitting quick recovery of the cost of development of these products, to cover the higher initial cost of their production which is caused by "debugging," the "mastering" of new technology and other factors associated with the introduction of new products, and a profit of about 10 percent (see Akademiia Nauk SSSR, Institut Ekonomiki, *Nauchno-tekhnicheskie progress i khozstvennaya reforma*, Moscow, 1969, p. 189). After "mastering" the problems, the "temporary" prices are replaced with usually lower "permanent" prices, but their

### SOURCES AND EXPLANATIONS—Continued

place is taken by the "temporary" prices of other new products. The temporary prices are, therefore, a permanent phenomenon. This practice is not common in the United States. (Custom-built items for DoD, NASA, etc. have usually cost-plus prices, but so do such items in the U. S. S. R. This is an entirely different matter.) The price ratios which do not take the Soviet practice of temporary prices of new products into account (and, to my knowledge, none that we have been using for years have taken this into account) are biased.

As of 1964, 32 percent of all *serially* produced products by the Soviet machine-building industry had "temporary" prices (see, e.g., Ia. Kvasha, "K pereotsenke osnovnykh fondov," *Voprosy ekonomiki*, no. 3, March 1969, p. 34). Inasmuch as their incidence is a function of the introduction of new products, the comparison of the index of the introduction of new products in machine-building (the data for which are regularly published in the statistical handbook *Narodnoe khoziaistvo SSSR*) and the index of real growth of the machine-building industry, which I have estimated for the purpose of this study, indicate that the proportion was about the same in 1955.

As to the margin by which the temporary prices exceed regular prices numerous references in the Soviet press suggest a range between 30 and 70 percent with the most pointing to an average of about 50 percent (G.M. Glagoleva, e.g., in her chapter "Nekotorye ekonomicheskie voprosy razvitiia opytно-eksperimental'nogo proizvodstva" in the above cited *Akademiia Nauk* publication, p. 182, states that the overhead cost of new products is 2 to 2.5 times higher than in "mastered" production. Since in "mastered" conditions the overhead costs represent some 35 to 40 percent of total cost, an increase of these costs by 100 to 150 percent implies that the total cost increases by 35 to 60 percent. In addition, the introduction of new products, as noted earlier, is also accompanied by some increase

in direct cost). In the adjustments I made in the table (sec. II, items A, B, C, D, and E) it is assumed that the average is 50 percent. This implies that in such Soviet prices the dollar-ruble ratio is only  $\frac{2}{3}$  as high as in "regular" prices.

The adjustment was performed by means of the formula:

$$R' = (0.69 \cdot R) + 0.32 (0.67 \cdot R)$$

Where:

$R'$  = 1955 dollar-ruble ratio adjusted for temporary prices of new products.

$R$  = 1955 dollar-ruble ratio unadjusted for temporary prices (sec. I of the table),

0.68 = ratio of "regular" prices in the total,

0.32 = ratio of temporary prices in the total,

0.67 = reciprocal of the ratio of the level of Soviet regular prices to that of the temporary ones.

Sec. III.—The 1955 ratio of sec. II extrapolated to 1964.

The wholesale (enterprise) price indexes for machinery and metal fabricates (products made of metal) published in the official Soviet statistical handbook show some decline in the price level from 1955 to 1964, but numerous writers have emphatically stated (see, e.g., Ia. Kvasha's article, *op. cit.*, p. 34) that there was no significant revision in the price of machinery and equipment from the price reform in 1955 to the middle of 1967. At the latter date machinery prices were increased by about 2 percent. From this I assume that from 1955 to 1964 the Soviet wholesale prices of machinery were unchanged, although those of metal fabricates might have declined. Therefore, the extrapolations of the adjusted 1955 dollar-ruble ratios given in sec. II to 1964 merely required that they be multiplied by a ratio of the appropriate BLS wholesale price index (WPI) in 1964 to that in 1955.

(6) The \$2.75 per ruble conversion factor is based on a rather extensive reassessment and updating of all relevant information that we have in this country on ruble versus dollar prices for machinery and related products. A summary of this reassessment is presented in Table 4. In this table, the \$2.75 per ruble conversion factor appears in Section III, line A, column 5 and represents the weighted dollar/ruble price ratio of all eleven machinery groups in 1955 adjusted for "temporary" Soviet prices of *serially* produced machinery products (this was not done in the earlier prepared ratios which we have used for years), and for U.S. price increases in the 1955-1964 period.

(7) While considering this overall conversion factor (\$2.75 per ruble) a comment is in order regarding its usability for dollar valuation not only of the total Soviet output of engineering products, but also for the valuation of specific end products, particularly consumer durables and military hardware, which are analyzed in Section II. Regarding this, one must consider the 1955 ratios for individual machinery groups in Table 4 and especially the selected ratios given below (some of which do not appear separately in Table 4):

|                                       | Unweighted mean of 1955 price ratios |              |
|---------------------------------------|--------------------------------------|--------------|
|                                       | Ruble/dollar                         | Dollar/ruble |
| Electrical control apparatus.....     | 0.11                                 | 9.09         |
| Power boilers and steam turbines..... | 0.12                                 | 8.33         |
| Metal-cutting machine tools.....      | 0.18                                 | 5.56         |
| Railroad equipment.....               | 0.37                                 | 2.70         |
| Farm machinery and tractors.....      | 0.65                                 | 1.54         |
| Motor vehicles.....                   | 0.81                                 | 1.23         |

On surface these individual ratios simply show a tremendous heterogeneity. As Abraham Becker suggested, however, closer analysis points out a pattern. Based on the tremendous relative inefficiency which is implicit in the ruble/dollar price ratio in motor vehicles and some other considerations, Becker theorized that the heterogeneity was due, at least in large measure, to differences in the relative scale of output between the two countries.<sup>4</sup> To me the relative scale of production has been of some importance, but far from decisive. If the scale factor were all-important, the *ruble/dollar* ratio in farm machinery and tractors would have been one of the lowest rather than one of the highest since the scale of production of farm equipment is at least as large in the USSR as it is in the United States. Neither is relative scale a convincing explanation of the much lower than average ruble/dollar ratios in electric power-generating equipment and machine tools since the relative scales of production of these products, although somewhat larger in the USSR than in the U.S., are not that much different. In my judgment 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.

The Soviet automotive industry has always been very low on the priority list (the most recent evidence for this is the Fiat project and

<sup>4</sup> Cf. Becker, *op. cit.*, pp. 47-48.

the many other Soviet efforts to obtain foreign technology for their automobile manufacturing); farm machinery has probably enjoyed somewhat higher priority than automobiles, but far from "high," but the electric power generating equipment (power boilers, turbines and electrical control apparatus) and metalcutting machine tools have always enjoyed the highest—just as the selected price ratios listed above would suggest.

Applying this (relative priority) criterion to the problem of dollar valuation of various end-product groups of the Soviet output, I am inclined to think that while the use of the overall (average) dollar/ruble conversion factor of \$2.75 per ruble is likely to yield reasonably good dollar approximations of the total value of output, the output of intermediate products (spare and replacement parts), investment goods and exports, its use for valuing the Soviet output of consumer durables and military and space hardware would yield unrealistic results.

In valuing consumer durables we will probably do much better by using either the conversion factor applicable for motor vehicles (\$1.25 per ruble) or the average of that of motor vehicles and farm equipment and tractors (about \$1.40 per ruble). The appropriateness of such a deviation from the average in principle might be judged by the following description of the conditions in which consumer durables are produced in the U.S.S.R. by a *Gosplan* staffer:

\* \* \* in machine-building there is a great difference between the technical level of production of investment goods, on one hand, and consumer durables, on the other. The production of many household appliances and tools is scattered in enterprises of many ministries and administrations. Frequently it is carried on in auxiliary shops, inappropriate buildings and in small volumes. Thus, in 1965 washing machines were being produced in 40 enterprises. Although the aggregate production of these machines amounted to 3.4 million units, only two enterprises produced more than 100 thousand units apiece. Almost the same conditions prevail in the production of household refrigerators and other appliances. Small production volumes are preventing the introduction of mechanization and automation, as well as inhibit progressive organization of labor force and other forms of progressive technology.

Growth in output of consumer durables is also inhibited by inadequate investments in that area, inadequate supply of materials, inadequacy of modern technological equipment, etc.<sup>5</sup>

For the dollar valuation of military (and space) hardware, in turn, this reasoning suggests the use of the conversion factor based on the high-priority product lines, such as electric power generating equipment and/or metal-cutting machine tools rather than the overall average since this, too, is undoubtedly a high priority area. Inasmuch as military hardware is by now an extremely diverse product group (this is true in the United States and there is no reason to believe that it would be different in the U.S.S.R.), and since in this matter prudence requires me to be on the "conservative" side, however, I prefer to use for this purpose the conversion factor based on all the ratios except motor vehicles and farm equipment and tractors (\$3.15 per ruble as shown in Table 4, Section III, item C, column 5). Use of the overall average for valuation of military hardware, \$2.75 per ruble, would yield dollar estimates that should be considered as the most conservative.

<sup>5</sup> Cf. N.M. Oznobin et al., ed., *Sovershenstvovanie struktury promyshlennogo proizvodstva* (Improvement of the Structure of Industrial Production), Moscow, *Ekonomika* 1968, p. 131.

(8) The preceding comments probably explain the technical aspects and the contents of the estimates of total outputs (Table 2 and 3) as fully as professional readers would wish to have. On the question of their general reliability or "goodness" I would like to note the following:

(a) The estimates for the United States are probably as realistic as will ever be produced. In preparing them I made use of not only published statistics, but also of working material underlying the published data. The most important among the latter were detailed flow tables underlying the Office of Business Economics' published input/output tables for 1958 and 1963 which permitted me to make estimates that refer strictly to commodities rather than to industries. Perhaps I should also note here (see footnote *h* in Table 7 below) that the U.S. totals as presented in the table exclude the value of *basic and applied research* (the *R* part of R & D) performed by the engineering products industries for the Department of Defense and NASA on the grounds that in other countries, and particularly the U.S.S.R., such research is most probably performed in specialized institutions which are not part of the engineering products industry. The value of development, evaluation and testing new products for DoD and NASA (the *D* part of R & D), however, is included in the estimates.

(b) The estimates for the European countries and Japan might contain some understatements, as noted earlier, but in general they also should be fairly realistic.

(c) The estimates for the U.S.S.R., as far as I can judge, represent the best that can be produced from the data which are available in this country, both primary and secondary, including a substantial amount of relevant information from the Soviet input/output tables for 1959, 1965, and 1970 (the latter, ex-ante) and the reassessed dollar/ruble price ratios discussed earlier. Despite this, and for reasons generally known to people who have worked with Soviet statistics, they could be subject to a greater margin of error than those for the United States or other countries. To develop an idea as to how large this margin might be I compared the estimated U.S.S.R./U.S. relative dollar values of output in selected years between 1958 and 1968 with what I regard as *critical* (output-determining) input expenditures—basic metals (castings, forgings and rolled steel), the stock of metal-cutting and metalforming machine tools, and labor.

The results are presented in Table 5. Based on the analysis of comparative levels of expenditures of these inputs in the various years as shown in Table 5 and what I know from other sources about the effectiveness with which these inputs have and are being utilized in both countries, it appears to me that although the output estimates in question might lack the kind of precision we would like to have, the margins of error, in *either* the level of output achieved so far or the rate of growth, they could hardly be of the size that would materially change the broad relative orders of magnitude which I suggest in the analysis. A few comments with reference to Table 5 should make it clear why.

TABLE 5.—Estimates of the Soviet output of engineering products relative to the United States compared with relative major input expenditures, selected years 1958-68

| Item  | 1958              | 1963   | 1967   | 1968   |
|---|-------------------|--------|--------|--------|
| I. Value of the total Soviet output of engineering products in 1964 U.S. dollars as a percent of the United States..... | 1.54              | 78     | 82     | 85     |
| II. Consumption of basic metals (castings, forgings, and rolled steel), thousands of short tons:                        |                   |        |        |        |
| 1. U.S.S.R.....   | 31,400            | 53,600 | 65,800 | -----  |
| 2. United States.....   | 36,600            | 50,600 | 60,000 | -----  |
| 3. U.S.S.R. as a percent of the United States.....  | 86                | 106    | 110    | -----  |
| 4. U.S.S.R.'s input per dollar's worth of output relative to the United States.....                                     | <sup>1</sup> 1.59 | 1.36   | 1.34   | -----  |
| III. Use of machine tools (total stock), thousands of units:  |                   |        |        |        |
| 1. U.S.S.R.....   | 2,310             | 3,100  | -----  | 3,930  |
| 2. United States.....   | 2,540             | 3,350  | -----  | 3,470  |
| 3. U.S.S.R. as a percent of the United States.....  | 91                | 93     | -----  | 113    |
| 4. U.S.S.R.'s input per dollar's worth of output relative to the United States.....                                     | 1.69              | 1.19   | -----  | 1.33   |
| IV. Use of manpower:  |                   |        |        |        |
| A. Workers, thousands:  |                   |        |        |        |
| 1. U.S.S.R.....   | 3,682             | 5,113  | 6,114  | 6,364  |
| 2. United States.....   | 3,666             | 4,057  | 5,139  | 5,174  |
| 3. U.S.S.R. as a percent of the United States.....  | 100               | 126    | 119    | 123    |
| 4. U.S.S.R.'s input per dollar's worth of output relative to the United States.....                                     | 1.85              | 1.62   | 1.45   | 1.45   |
| B. Workers' man-hours, millions:  |                   |        |        |        |
| 1. U.S.S.R.....   | 8,310             | 10,349 | 12,270 | 12,740 |
| 2. United States.....   | 7,229             | 8,339  | 10,440 | 10,549 |
| 3. U.S.S.R. as a percent of the United States.....  | 115               | 124    | 118    | 121    |
| 4. U.S.S.R.'s input per dollar's worth of output relative to the United States.....                                     | 2.13              | 1.59   | 1.44   | 1.42   |

<sup>1</sup> In my 1962 study this relative was estimated at 60 percent largely because it did not account for the production of secondary products in either the Soviet or the American industries and a somewhat biased dollar/ruble conversion factor (which did not take into account the temporary Soviet prices of new products). As of 1959 the value of secondary products in the Soviet machine-building and metalworking industry, which I assume to have been spread in proportion to the value of primary products of these two segments, was about 8 percent of the total, whereas in the United States (in 1958) it amounted to about 2 percent.

<sup>2</sup> In the 1962 study I estimated the Soviet per-dollar's worth expenditure of basic metal to have been 40 percent higher than the United States in 1958. Since the present estimate is based on practically given tonnage information, it is undoubtedly better than the earlier one.

#### SOURCES

I. Comparative value of output: See table 7 below

II. Comparative consumption of basic metals:

U.S.S.R.—Estimated on the basis of the apparent total consumption of ferrous metals in the machine building and metalworking industry in 1958-62 and the index of growth of such consumption in only the machine-building between 1950 and 1967. Information on the apparent consumption in the 1958-62 period, stated in terms of tonnage of scrap (*otkhody*) generated in the machine building and metalworking industry and the percentage relationship of this scrap to the total consumption of these metals, comes from L. D. Iudina, et. al., *Tekhniko-ekonomicheskie issledovaniia v chernoi metallurgii* (Technico-Economic Research Study of Ferrous Metallurgy), Moscow, Metallurgija, 1965, pp. 164-171. Based on this information the machine-building and metalworking industry consumed 31.7 million metric tons in 1958. This consumption is net of heavy forgings made of ingots and, hence, somewhat understated. I assumed that about 90 percent of this, 28.5 million tons, was consumed in machine-building proper since the Soviet "metalworking" segment of the industry, accounting for about 20 percent of the total value, consists largely of machine repair facilities rather than the "fabrication of metal products" and the bulk of the replacement parts used by the "machinery repair" facilities is supplied by the machine-building proper. The index of the growth in the consumption of basic metals in the machine-building proper between 1958 and 1967 (1958=100, 1960=114.6, 1963=171.4, 1967=209.7) comes from V. S. Bialkovskala and G. A. Brianski, *Ekonomicheskie voпросы razvitiia mezhotraslevykh proizvodstv* (Economic Problems in Development of the Inter-Sectoral Production), Moscow, Ekonomika, 1969, p. 39.

United States—Census of Manufactures 1954, 1958, 1963, and 1967; *Facts for Industry*, Series M33A (Ferrous castings), Series M33E (non-ferrous castings), and Series M33C (Forgings). In the U.S. tonnage some heavy forgings are included, but not all. The resultant incomparability due to this is negligible.

III. Use of machine tools (total stock)

U.S.S.R.—*Narodnoe khoziaistvo SSSR.*, 1964, 1967, and 1968.

United States—*American Machinist Inventory of Metalworking Equipment, 1963 and 1968*, New York, McGraw-Hill.

IV. Use of manpower

U.S.S.R.—The estimated figures are derived from data on total employment of workers in machine-building and metalworking industry in 1960 reduced by 27.3 percent to delete production of secondary products (about 8 percent, as in 1959) and metalworking other than machine-building proper (about 20 percent) and the index of total employment in machine-building proper which is implicit in the indexes of output (gross value) and the index of productivity in this industry published regularly in *Narodnoe khoziaistvo SSSR*. The man-hours are estimated from the workers' man-years in machine-building on the assumption that they worked the same number of hours per year as workers in all industry.

United States—Data from *Census of Manufactures* and *Annual Survey of Manufactures*, adjusted (slightly reduced) for consistency with the output data, as in the case of the U.S.S.R. estimates.



As shown in the table, production of a dollar's worth of engineering products in Soviet industry required about 60 percent more metal than in the U.S. industry in 1958, and in 1967, nine years later, about 35 percent more.<sup>6</sup> Inasmuch as the tonnage and the trend of Soviet metal consumption in the machine-building industry cannot be seriously questioned, arguments might be advanced to the effect that the estimates of Soviet output presented in Table 2 are too low. As I pointed out in my 1962 study,<sup>7</sup> however, there were many compelling reasons—technological, economic, and organizational—why the Soviet industry really needed much more metal than did U.S. industry to produce the same or similar product back in 1958, and these reasons could hardly have been entirely eliminated by 1967 or now. Moreover, it takes more than metal to produce a machine.

On the other hand, however, I have no valid reason to question the apparent relative progress of Soviet industry in this area. Comparing the Soviet growth of metal input with that of output shown in the table indicates that in the nine-year period the Soviet industry's input of metal grew at an average rate of 8.6 percent per year, whereas output grew by 11.9 percent per year. This implies an annual *metal utilization improvement factor* of about 3 percent per year. Considering the tremendous room for improvement this industry has in this area (as well as many others), such a rate of improvement seems entirely possible to me. Based on U.S. input/output tables I estimated that between 1947 and 1958 the U.S. engineering products industry's metal utilization improvement factor averaged about 4.0 percent per year. Between 1958 and 1963, as is apparent in the table, there was a reversal of the trend (input of basic metals grew faster than the output), but since 1963 the utilization seems to continue to improve although at a much slower pace than in the 1947–58 period.

The comparison of the use of machine tools is somewhat more tentative or cruder than that of metal inputs because the data listed in the table refer to the total stock of machine tools in the two economies rather than to those used only in the engineering products industries, but this does not make the comparison entirely void of meaning since in each country the bulk, and by far, *is* used in the engineering products industry. Apart from this qualification, the comparison is not inconsistent with the output estimates either, although this perhaps is not as obvious here as in the comparison of metal inputs.

As shown in the table, in 1958 the Soviets used about 70 percent more machine tools to produce the same output as did the United States, but in 1968 only about one-third more. Assuming the same degree of machine utilization in both years, this would imply that Soviet machine-tool unit capacity and, hence, technological progress in the machine tool industry, grew at a rate more than twice that in the United States. This might sound startling, but there is nothing

<sup>6</sup> The Soviet economists and officials are aware of this tremendous disparity in metal utilization, though their assessment of its extent is not uniform. For example, S.A. Kheinman, a noted Soviet research economist, estimated that in machine-building and metalworking "the relative consumption (per dollar's worth) of rolled steel is 40–50 percent greater in the U.S.S.R. [than in the United States]." Cf. V. G. Venzher, *et. al.*, *Proizvodstvo, nakoplenie, potreblenie* (Production, Investment, Consumption), Moscow, Ekonomika, p. 222. Had he also considered castings, which are used in the U.S.S.R. relatively more extensively than in the United States, his estimate of the Soviet excess consumption of metal would have been some 60 percent or more, that is, about the same as mine for 1958. On the other hand, A. Poliak, a *Gosplan* metal specialist, estimated that in machine-building the excess Soviet consumption of all ferrous metals was 30–35 percent in 1958 and only about 25 percent in 1965. Cf. *Voprosy ekonomiki* (Problems of Economics) no. 3, March 1969 p. 77. I think that Poliak's estimates for both years understate the actual state of affairs.

<sup>7</sup> "The Soviet Challenge," pp. 20–22.

unusual about it because the phenomenon is fully explainable by the difference in the addition of new vintage machines to the machine tool stocks in the two countries. In the judgment of U.S. machine tool builders and many industrial engineers, a decade-old machine tool is usually at least 40 percent less efficient (less productive) than a new one. And this machine-tool-productivity "law" has now prevailed for at least 25 years.

Back in 1958 the bulk of Soviet machine tools were of pre-World War II vintage and many were of the pre-World War I times. In the United States in that year 40 percent of all machine tools were less than 10 years old<sup>8</sup> and most of the rest—of World War II vintage, that is, about 15 years old. It is quite understandable, therefore, that the average unit capacity of Soviet tools was much smaller than that of the U.S. machines and that many more should have been needed to do the same job.

By 1968, however, the situation had drastically changed. In that year the U.S. machine tools stock contained 36 percent of machines that were under 10 years of age,<sup>9</sup> but in the U.S.S.R., according to my estimates, such machines constituted some 52 to 55 percent of the total stock. In addition, during this 10-year period the Soviets "modernized" some 600 to 650 thousand of their older machines (15 to 17 percent of the entire 1968 stock) which also added substantially to the growth of the average unit capacity. Thus, the twice as large increase in the Soviet aggregate machine tool unit capacity was simply a function of adding twice as large a proportion of new or modernized machine tools to the stock rather than their machine tool industry's twice as fast rate of progress. The latter would seem to have been about the same in both countries.

The estimated values of total Soviet output would seem to have been feasible also on account of the manpower used for the production of this output. In 1958 the Soviets employed for this purpose a virtually identical number of workers and who, by putting in about 15 percent more hours than their counterparts in the United States, produced about 54 percent as much output as the U.S. workers. Per dollar's worth of output the Soviet industry thus required more than twice as many man-hours as did the U.S. industry. The advance of Soviet output to the level of 85 percent of the U.S. level in 1968 was effected by an increase of their work force 23 percent greater than the U.S. increase, and the increase in the total hours worked (actually paid for) by 21 percent more than the U.S. increase. The result of this was that relative to the United States the Soviet *excess* labor input per dollar's worth of output was cut from 85 percent in 1958 to 45 percent in 1968 in terms of man-years, and from about 113 percent to 42 percent in terms of man-hours. To accomplish this, the Soviet workers' hourly productivity had to grow at a rate of about 7 percent per year—slightly more than twice the U.S. rate.

If one wished to be skeptical regarding the actual feasibility of such developments, and thus question the tenability of the output estimates, the skepticism would have to be directed at the feasibility of the growth of Soviet workers' productivity at a *rate* twice as fast as that of U.S. workers and whether the Soviet workers' *level* of hourly productivity in 1968 could be as high as 70 percent of the U.S. level.

<sup>8</sup> See *The Tenth American Machinist Inventory of Metal-working Equipment, 1968*, New York, McGraw-Hill, Inc., 1968, p. 1.

<sup>9</sup> *Ibid.*

However, growth of hourly productivity at some 7 percent per year when beginning from a relatively low base is not unprecedented and therefore it should not be too difficult to accept. The possibility of Soviet workers' productivity having already reached 70 percent of the U.S. level is probably more difficult to accept. However, if we accept the thesis, and we seem to do, that the Soviet GNP is by now some 65 percent of the U.S. level when measured in dollars, we accept the thesis that the *overall* (GNP-level) output per civilian person employed in the Soviet economy is at the level some 45 percent of the U.S. level. Accepting this, we should have less difficulty to accept the thesis that labor productivity in the Soviet *highest-priority* industry, the engineering products industry, might be at the level some 70 percent of the productivity of the U.S. engineering products industry which, in our system, is just another manufacturing industry.

Moreover, there is also a strong possibility that the estimate of Soviet employment in machinebuilding on a *commodity basis* which underlies the estimate of the relative productivity level might be understated. (Regarding these calculations an interesting analytical matter should be noted, however. As is implied in the small difference which the use of either Soviet or American weights exerts on the overall dollar/ruble ratio in engineering products—see Table 4, Section III, Col. 4 and 4a—the value of the Soviet engineering products industry's output relative to that of the United States would differ little whether we measured it in dollars or rubles. In GNP, as is generally known, however, the use of dollars or rubles makes a big difference.)

## II. THE TECHNOLOGICAL BASE OF SOVIET MILITARY POWER IN A NARROW SENSE

Having the background as to the current level and longterm growth of total Soviet output of engineering products relative to the United States, four major West European countries and Japan, we may now turn to a fairly detailed analysis of the Soviet and American end-uses of these products and in the process determine the two countries' comparative inputs of these products into their defense (and space) efforts. The *end-uses* I consider in this analysis are:

(1a) Intermediate products (prefabricates, finished parts and components) used in the industry specializing in the manufacture of engineering products (intra-industry use or sales);

(1b) Intermediate products (parts and components) sold to (used by) industries other than the engineering products industry for replacements as part of a normal maintenance procedure or the repair of equipment, appliances, etc.;

(2) Sales of *final demand* products to private and public consumers;

(2a) Sales of tools, appliances, automobiles and other consumer durables to private consumers;

(2b) Sales of machinery, equipment, automobiles, etc. to public consumers—non-profit organizations and all types of government agencies for purposes other than defense and space exploration;

(3) Gross investment (fixed and inventories);

(4) Exports;

(5) Defense and space programs.

Readers familiar with input/output or sales/purchases matrixes will quickly recognize this classification as a slight modification of the

commonly used breakdown of an individual industry's sales (row flow) in a complete input/output table, the kind that shows not only intra- and inter-industry commodity flows of intermediate products, but also the disposition of final products by major categories of demand.

The chief *virtue* of this classification of uses is that it is *comprehensive* (nothing is left out) irrespective of whether the analysis focuses on *gross* output (value of shipments) or *net* output. The difference between the two lies in intraindustry sales or use of intermediate products (item 1a). From overall economic and the industry's real output points of view, as I explained in Section I, these sales largely represent multiple counting of the value of the same product within the industry (such as a bearing assembly, produced by manufacturer of bearings, sold to a manufacturer of electric motors and incorporated into a motor; then this electric motor, with the bearing assembly, is sold to a manufacturer of control panels of machine tools; then the same bearing assembly, plus electric motor plus control panel is sold to a machine tool builder; then the whole machine tool is sold to one of the final demand categories of users). Knowledge as to the extent of multiple counting in each country's industry is essential for determining the truly comparative net outputs.

For demonstrating the method *and establishment of the reference estimates* of primary interest to this analysis I refer to Table 6. Prior to the analysis of this table it should be noted that its format and the product coverage are different from those in other tables which I presented so far. The reason for this is that the information for the U.S.S.R. contained in this Table required only a minimum *routine-type* of estimating on my part and I wanted to preserve as much as possible the initial form of the *given* Soviet data. The relevant argument, however, shall be quite clear-cut.

TABLE 6.—Comparison of the total value of sales (output) of engineering products and products made of metal (metal fabricates) by end use: U.S.S.R. in 1965 and the United States in 1963

| Item  | U.S.S.R., 1965   |         |                       |         |                       |         | United States, 1963  |         |  |         |
|---|--|---------|-----------------------|---------|-----------------------|---------|--|---------|--|---------|
|   | Purchasers' prices<br>including intrasector<br>sales of intermediate<br>products |         | Producers' prices     |         |                       |         | Including intrasector<br>sales of intermediate<br>products |         | Excluding intrasector<br>sales of intermediate<br>products |         |
|   | Millions<br>of rubles  | Percent | Millions<br>of rubles | Percent | Millions<br>of rubles | Percent | Millions<br>of dollars                                     | Percent | Millions<br>of dollars                                     | Percent |
|   | (1)  | (1a)    | (2)                   | (2a)    | (3)                   | (3a)    | (4)  | (4a)    | (5)  | (5a)    |
| I. Total value of sales (output).....                                   | 58,000   | 100.0   | 53,216                | 100.0   | 41,372                | 100.0   | 165,633  | 100.0   | 117,869  | 100.0   |
| II. End use:  |  |         |                       |         |                       |         |  |         |  |         |
| (1) Sales of intermediate products to all sectors.....                  | 21,518   | 37.1    | 20,532                | 38.6    |                       |         | 74,770   | 45.1    |  |         |
| (1a) Intrasector sales of intermediate products.....                    | 12,412   | 21.4    | 11,844                | 22.3    |                       |         | 47,764   | 28.8    |  |         |
| (1b) Sales of intermediate products to sectors other than itself.....   | 9,106  | 15.7    | 8,688                 | 16.3    | 8,688                 | 21.0    | 27,006   | 16.3    | 27,006   | 22.9    |
| (2) Sales of final demand products to private and public consumers..... | 6,148  | 10.6    | 3,740                 | 7.0     | 3,740                 | 9.0     | 34,200   | 20.6    | 34,200   | 29.0    |
| (2a) Private consumers..  | 4,870  | 8.4     | 2,528                 | 4.8     | 2,528                 | 6.1     | 31,754   | 19.2    | 31,754   | 26.9    |
| (2b) Public consumers..   | 1,278  | 2.2     | 1,212                 | 2.3     | 1,212                 | 2.9     | 2,446  | 1.5     | 2,446  | 2.1     |
| (3) Gross investment.....   | 22,852   | 39.4    | 21,805                | 41.0    | 21,805                | 52.7    | 28,257   | 17.1    | 28,257   | 24.0    |
| (4) Other uses.....   | 7,482  | 12.9    | 7,139                 | 13.4    | 7,139                 | 17.3    | 28,406   | 17.1    | 28,406   | 24.1    |
| (4a) Export.....  | 663  | 1.1     | 633                   | 1.2     | 633                   | 1.5     | 8,419  | 5.1     | 8,419  | 7.0     |
| (4b) Defense and space programs.....                                    | 6,819  | 11.8    | 6,506                 | 12.2    | 6,506                 | 15.7    | 19,987   | 12.1    | 19,987   | 17.1    |

NOTE.—Detailed figures may not add to totals because of independent rounding.

## SOURCES AND EXPLANATIONS

### U.S.S.R.

*Item I.*—The total value of sales in purchasers' prices, 58,000 million rubles, was estimated in the following way:

(1) Items 1, 1a, 2, 3, and 4 of the percentage distribution of the total in column (1a) are given (see Appendix Table A-1);

(2) The ruble value of sales to private and public consumers is given for years 1959 through 1963; 3,814 million rubles in 1959, 4,655 million rubles in 1962, and 5,108 million rubles in 1963 (*Nar. Khoz.*, 1964, pp. 579-583). Based on production and retail sales of the most important consumer appliances (durables) regularly reported in *Nar. Khoz.*, I estimate that in 1965 the sales to private and public consumers probably amounted to about 6,191 million rubles;

(3) Inflating the probable sales to private and public consumers of 6,191 million rubles by .106, the proportion of these sales to the total (item 2 in col. 1a), yields 58,400 million rubles.

(4) For an alternative estimate of the total we know that it differs from the total in (wholesale) enterprise prices by the value of turnover tax included in the sales of consumer durables and utensils to private consumers and the total cost of transportation and distribution of all end products from producers to consumers (users). For making the alternative estimate we know also:

(a) that in 1959 the total output of primary products of this (machine-building and metalworking) industry was about 25,392 million rubles in enterprise prices (see item B, Appendix Table A-3). Applying the index of the total gross value of output of this industry (regularly reported in *Nar. Khoz.*) and allowing for the slightly faster growth in production of primary products versus the secondary ones, we get the 1965 total (in enterprise prices) of about 52,900 million rubles;

(b) the value of turnover tax is determinable from the value of sales of the products under consideration to private consumers and the average rate of turnover tax in these sales. Estimating sales to private consumers the same way as sales to private and public consumers (explained in point 2 above) yields the 1965 value of about 4,900 million.

Applying to this value an average turnover-tax-rate of about 45 percent—in line with Philip Hanson's *The Consumer in the Soviet Economy* (London, Macmillan, 1968, pp. 112-113 and 116)—yields about 2,210 million rubles as the total value of turnover tax. This value is highly tenable on the assumption that the profit rate of the machine-building and metalworking industry was about 10 percent of the value of output in enterprise prices as suggested in the *Akademiia Nauk* publication cited in Section II of the note to Table 4. In 1965 this industry's profit plus turnover tax on its products amounted to 7,029 million rubles (*cf. Nar. Khoz. 1963*, p. 745). Subtracting the 2,210 million rubles of turnover tax leaves 4,819 million rubles for profit, or 9.4 percent of the gross value of sales in enterprise prices;

(b) The cost of transportation, communication and distribution, in turn, constituted 8.5 percent of all material cost (see Appendix, Table A-2) and this I have estimated to be equivalent to about 5.2 percent of the total cost (in 1965 the cost of materials represented about 60.6 percent of the total cost—see *Nar. Khoz.*, 1965, p. 165) and to 4.8 percent of the value of products in wholesale prices. Applying the latter percentage (4.8) to the value of output in wholesale prices, 52,900 million rubles, yields about 2,540 million rubles as the total cost of transportation, communication and distribution.

(c) The alternative estimate of the total value of sales in purchasers' prices thus amounts to 52,900 million rubles (valued in enterprise prices) plus 2,210 million rubles (turnover tax) plus 2,540 million rubles (cost of transportation, communication and distribution), or 57,650 million rubles.

(5) Averaging the 58,400 million rubles obtained in step (2) and the 57,650 million rubles obtained in the alternative estimation results in 58,025 million rubles which I rounded to 58 billion and have posted in the table.

*Item II.*—Distribution of the total value of sales in purchasers' prices by end-use:

(1) As noted above, items 1, 1a, 2, 3, and 4 are given and item 1b, sales of intermediate products to sectors other than itself (sector manufacturing machine-building and metalworking products) as a percent of total sales is obtained inferentially since it amounts to the difference between the percentage of all sales of intermediate products (item 1) and the percent sales of these intermediate products within the industry.

(2) The breakdown of the percentage of sales of final demand products to private and public consumers (item 2) into sales to private consumers (item 2a) and sales to public consumers (item 2b) was obtained in the process of estimating the total value of sales and the value of turnover tax as explained above (points 2 and 3 and 4b).

(3) In the comprehensive scheme of end-use classification used in this table, items 1, 2, and 3 cover all end-uses of the products in question except for export and defense and space programs. Hence, item 4, "other uses" covers only those two categories. Subtracting exports (item 4a) we obtain a residual (4b) which refers exclusively to the use (sales) of these products for defense and space purposes. The estimate of exports given in the table represents Soviet data on the export of machinery, including "complete factories," and fabrications from metal in "foreign trade rubles" regularly reported in *Vneshniaia torgovlia*, adjusted for non-pertinent elements in the export of "complete plants" and conversion of the adjusted value by 2—the estimated ratio of the "foreign trade ruble" to the domestic price ruble in the machinery and equipment market. The rationale of this conversion factor is explained in the note to Appendix Table A-3, Item II/4.

The values and distributions in columns 2-2a and 3-3a are net of turnover taxes and the cost of transporting and distributing the products from producers to users (consumers) and are consistent with the values in column 1.

### United States

The estimates for the United States are based on data developed by the Department of Commerce's Office of Business of Economics for its input/output table of U.S. economy in 1963. To approximate the Soviet concept of "machine-building and metal-working", which also includes specialized machinery and equipment repair facilities, the estimates for the U.S. cover the following U.S. input/output sectors: 13 (ordnance); 39-42 (sectors making all kinds of metal products except machinery and related equipment); 43-63 (sectors manufacturing machinery and related equipment, including transportation equipment); 75 (repair of automobiles), and the following metal-working processes that are parts of other input/output sectors: iron and steel foundries (SIC 332), non-ferrous foundries (SIC 336), iron and steel forgings (SIC 3391), and non-ferrous forgings (SIC 3392).

For reasons of comparability with Soviet data, U.S. totals and the Government's purchases of these products for defense and space programs exclude the estimated value of basic and applied research (R part of R & D) which these industries performed for the Department of Defense and NASA (\$1,337 million) since in the U.S.S.R. such research is presumed to be performed in research institutions which are not part of the machine-building industry. The value of development, evaluation and testing new products for these agencies (the D part of R & D), however, is included in both places.

The estimates of U.S. "public consumption" refer to the procurement by state and local governments and the federal government for purposes other than defense and space exploration.

As in the case of Soviet estimates, U.S. estimates are based on "primary commodity flows" of relevant industries, which exclude these industries' secondary products and include products produced in other industries which are primary to the relevant industries but secondary to those which actually produce them.

Specifically the Table gives a comparison of the three versions of ruble values of total Soviet sales (output) of engineering products and products made of metal (in Soviet parlance—products of machine-building and metalworking) by the specified end-uses in 1965 with two versions of reasonably analogous dollar sales (output) in the United States in 1963. Columns 1 and 1a present Soviet gross sales of these products valued in purchasers' prices; columns 2 and 2a list the same Soviet gross sales, but valued in producers' (enterprise) prices; and columns 3 and 3a list the Soviet distribution of these sales in producers' prices net of intrasector sales (net of multiple counting in the output). Conceptually, the U.S. distribution in columns 4 and 4a matches the Soviet distribution in columns 2 and 2a, and the U.S. distribution in columns 5 and 5a is the counterpart of the Soviet distribution in columns 3 and 3a.

The Soviet distributions are based on data which they developed in the input/output study of their economy for 1965, and the United States—on the input/output study of U.S. economy in 1963.

Of the many figures given in the Table the key one is the ruble value of the Soviet machine-building and metal-working industry's sales to military and space programs in 1965, estimated (item 4b) at 6,819 million rubles in purchasers' prices or 6,506 million rubles in producers' (enterprise) prices.

Judging by U.S. practices (which in all probability are not generally different from the Soviet), almost all of this, over 97 percent, was machinery-like hardware. Applying what I describe as a cautious dollar/ruble conversion factor of \$3.15 per ruble from Table 4 to the figure in item 4b, column 2 (6,506 million rubles) yields \$20.5 billion—compared with \$19,987 million of U.S. purchases, or 2.6 percent more. Applying the dollar/ruble conversion factor of \$2.75 per ruble to that same figure, the use of which I have labeled as the *most conservative*, yields \$17.9 billion—about 10 percent less than comparable U.S. purchases in 1963. In 1965, however, U.S. purchases of military and space hardware were about 1.5 percent smaller than in 1963. This estimate then suggests that as long as 5 years ago the Soviet purchases of military hardware were at most only 10 percent smaller than U.S. purchases and conceivably they were already greater by that much, or more.

As I have previously noted, the estimate in this table is based on Soviet data that required only a routine-type of estimation on my part. The nature and the extent of my estimating are noted in the footnotes to the table. I might add that if I made an error in the estimates of the "unknowns" by as much as 25 percent in either direction, which I do not believe I did, this would have effected the estimated ruble value of Soviet purchases of military hardware by only 2 to 2.5 percent.

In addition to revealing the comparative purchases of military hardware, the comparisons in Table 6 are instructive on a number of exceedingly interesting economic and sociopolitical issues, but I shall postpone the discussion of them until after the problem of comparative defense efforts has been fully explored.

Continuing with the analysis of this problem, our interest is also in the trend in the U.S.S.R.'s and the U.S. procurement of military and space hardware over time, particularly in the more recent years.

For the United States this trend, as is generally known, is readily ascertainable. For the USSR, as I implied in the comment describing

the reasoning for starting this analysis with Table 6, however, the kind of straight-forward historical information as presented in that Table is only available for 1965. The source which furnished this information also published an *ex-ante* (projected) sales distribution of products of machine-building and metalworking for 1970. This projected distribution, probably prepared in 1967 or early 1968, envisaged a small relative increase in sales to *other uses*—from 12.9 percent of the gross output in purchasers' prices in 1965 to 13.1 percent in 1970 (see Appendix, Table A-1). In wholesale (enterprise) prices this is equivalent to an increase from about 13.4 percent in 1965 to 13.6 percent in 1970. As shown in Table 6 (item 4), the *other uses* category consist of exports and defense and space programs, and as of 1965 exports constituted only about 9 percent and defense and space programs about 91 percent of these other uses. (Note: In both countries military *grants* and *aid* to foreign countries are included in defense procurement rather than in exports.) I estimate that in 1970 the *gross* output of Soviet "machine-building and metalworking," on the commodity basis, is likely to reach a value of about 92 billion rubles in 1955 prices, of which, if the *ex-ante* distribution prevailed, 13.6 percent or some 12.5 billion rubles would be sold to *other uses*—export and defense and space programs.

Assuming that the two uses will share this value in the same proportion as in 1965 (9 percent and 91 percent, respectively), the share of defense and space programs would amount to about 11.4 billion rubles. In 1964 dollars this would be equivalent to \$35.9 billion if the ruble is worth \$3.15, and \$31.4 billion if it is worth \$2.75. In 1964 dollars, the U.S. procurement of these products in 1970 will not amount to more than \$25 billion, and possibly considerably less. As noted, however, the Soviet data on the basis of which these calculations are made are (*Gosplan*) projections and not necessarily the facts.

In analyzing the regularly published Soviet data in statistical handbooks, the data published in many publications related to their input/output tables for 1959, 1965, 1966, and some other secondary sources of information, I came to conclusion, however, that it is possible not only to estimate the value of the total output of Soviet engineering products in wholesale (enterprise) prices and net of multiple counting over a long period of time (such as those presented in Table 2), but also to approximate *all* their end-uses, as defined at the beginning of this Section and in Table 6, *except* the sales to defense and space programs. This implies that the Soviet procurement might be estimated as the difference between the value of total output of engineering products and the sum of non-defense uses, in other words a *residual*.

Estimates obtained via residuals are never as convincing as direct data, and sometimes they might prove to be erroneous,<sup>10</sup> but subtrac-

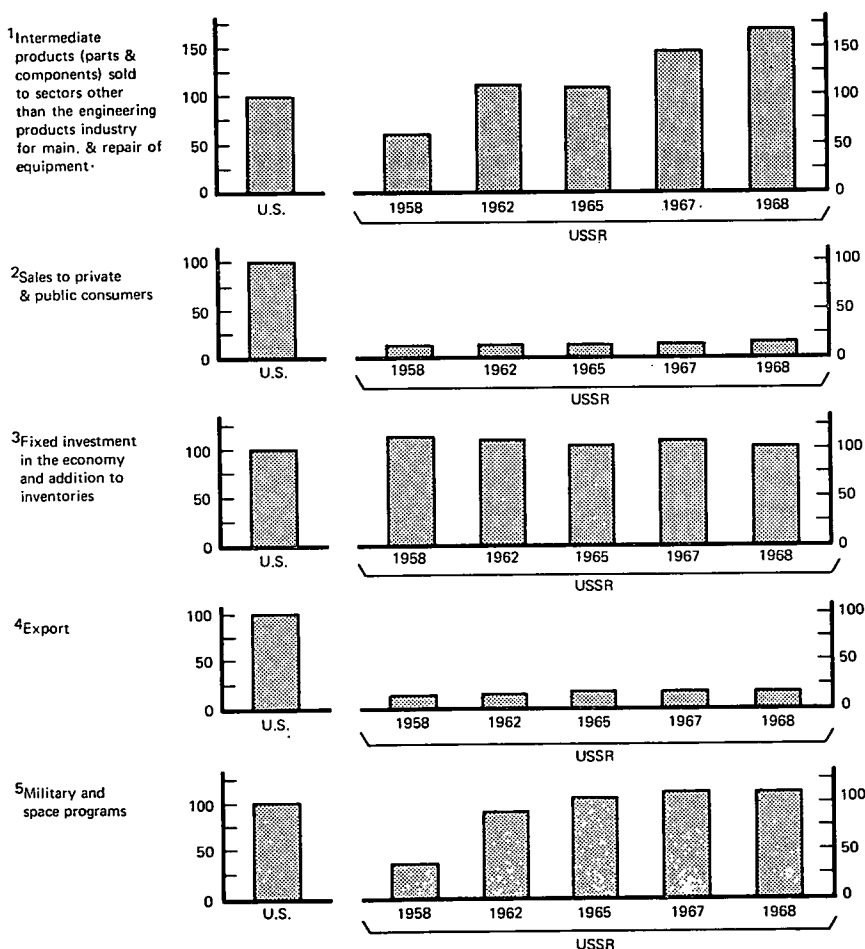
<sup>10</sup> Reader familiar with my 1962 study ("The Soviet Challenge") might recall that in that study I proposed to calculate the residual in question as (Total output net of multiple counting + imports) minus (consumer durables + investment + exports). This proposal assumed that there was little centralized production of replacement parts in the Soviet machine-building industry—in keeping with the Soviet writers' constant complaints about the scarcity of replacement parts and the common practice of the users of machinery and equipment manufacturing their own parts. This assumption proved to be incorrect. The continuing scarcity of replacement parts in the U.S.S.R. is apparently the result of tremendous demand—not a small centralized supply. This problem will be discussed in Section III.



tion is as legitimate a mathematical operation as addition. Moreover, it would be difficult to go wrong when we are working with a fully comprehensive scheme of end-uses, with the kind of control estimates as we have in Table 6, and some other considerations that will soon become apparent.

The results of such approximations in detail for selected years between 1958 and 1968 are presented in Tables 7, 8, and 9, and the highlights are graphically portrayed in Figure 2. The underlying calculations, including an explanation of the estimating procedures and sources of information, will be found in the Appendix.

Figure 2  
APPROXIMATE VALUE OF TOTAL SOVIET OUTPUT OF ENGINEERING PRODUCTS BY END USE RELATIVE TO THE UNITED STATES, 1958-1968



**TABLE 7.—Comparative output and end uses of engineering products (machinery and machinery-like products only): U.S.S.R. versus the United States, selected years 1958-68**

|  | [Producers' prices] |          |          |          |          |
|--|---------------------|----------|----------|----------|----------|
| Item   | 1958                | 1962     | 1965     | 1967     | 1968     |
| <b>A. Soviet output (net of intraindustry sales) and end use valued in constant 1955 prices (millions of rubles):</b>  |                     |          |          |          |          |
| I. Output.....   | 14,749              | 25,332   | 32,321   | 40,492   | 45,102   |
| II. End use:   |                     |          |          |          |          |
| (1) Intermediate products (parts and components) for current and capital repair of equipment and other uses sold to sectors other than the engineering products (machine building) industry..... | 3,943               | 6,693    | 8,494    | 10,326   | 11,336   |
| (2) Final demand products sold to private and public consumers, total...   | 1,451               | 2,143    | 2,878    | 3,901    | 4,574    |
| (2a) Private consumers.....  | 1,102               | 1,493    | 1,866    | 2,767    | 3,279    |
| (2b) Public consumers.....   | 349                 | 650      | 912      | 1,134    | 1,295    |
| (3) Fixed and inventory investment except capital repair of equipment <sup>1</sup> ...   | 7,191               | 10,404   | 13,987   | 16,165   | 17,576   |
| (4) Exports (in domestic prices) <sup>2</sup> .....  | 300                 | 450      | 625      | 782      | 883      |
| (5) Defense and space programs.....  | 1,864               | 5,642    | 6,337    | 9,218    | 10,733   |
| <b>B. Soviet output and end uses valued in 1964 U.S. dollars (millions of U.S. dollars):</b>   |                     |          |          |          |          |
| I. Output <sup>3</sup> .....   | 40,560              | 69,663   | 88,883   | 111,353  | 124,030  |
| II. End use: <sup>4</sup>  |                     |          |          |          |          |
| (1) Intermediate products (parts and components) for current and capital repair of equipment and other uses sold to sectors other than the engineering products industry <sup>5</sup> .....      | 10,843              | 18,406   | 23,359   | 28,397   | 31,174   |
| (2) Final demand products sold to private and public consumers, total...   | 2,032               | 3,000    | 4,029    | 5,462    | 6,403    |
| (2a) Private consumers <sup>6</sup> .....  | 1,543               | 2,090    | 2,752    | 3,874    | 4,590    |
| (2b) Public consumers <sup>7</sup> .....   | 489                 | 910      | 1,277    | 1,588    | 1,813    |
| (3) Fixed and inventory investment except capital repair of equipment <sup>8</sup> .....   | 19,776              | 28,611   | 38,468   | 44,453   | 48,334   |
| (4) Exports <sup>2,3</sup> .....   | 825                 | 1,238    | 1,719    | 2,151    | 2,428    |
| (5) Defense and space programs <sup>9</sup> .....  | 5,872               | 17,772   | 19,962   | 29,352   | 33,809   |
| (5a) Defense and space programs, the most conservative valuation <sup>7</sup> .....  | (5,126)             | (15,516) | (17,427) | (25,625) | (29,516) |
| <b>C. U.S. output (net of intraindustry sales) and end uses in 1964 prices (millions of U.S. dollars):</b>   |                     |          |          |          |          |
| I. Output <sup>8</sup> .....   | 75,175              | 95,425   | 121,383  | 135,815  | 145,423  |
| II. End use:   |                     |          |          |          |          |
| (1) Intermediate products (parts and components) for current and capital repair of equipment and other uses sold to sectors other than the engineering products (machine building) industry..... | 17,366              | 16,262   | 21,318   | 19,381   | 18,311   |
| (2) Final demand products sold to private and public consumers, total...   | 18,215              | 24,937   | 33,398   | 36,606   | 40,266   |
| (2a) Private consumers.....  | 16,517              | 22,675   | 30,695   | 33,368   | 36,933   |
| (2b) Public consumers <sup>9</sup> .....   | 1,698               | 2,262    | 2,703    | 3,138    | 3,333    |
| (3) Fixed and inventory investment except capital repair of equipment <sup>10</sup> .....  | 17,288              | 26,295   | 36,832   | 41,260   | 44,199   |
| (4) Exports <sup>2</sup> .....   | 5,789               | 8,193    | 10,405   | 12,608   | 14,117   |
| (5) Defense and space programs <sup>8</sup> .....  | 16,517              | 19,738   | 19,430   | 26,060   | 28,530   |
| <b>D. U.S.S.R. as percent of the United States (Items in sec. B divided by the corresponding items in sec. C):</b>   |                     |          |          |          |          |
| I. Output.....   | 54                  | 73       | 73       | 83       | 85       |
| II. End use:   |                     |          |          |          |          |
| (1) Intermediate products (parts and components) for current and capital repair of equipment and other uses sold to sectors other than the engineering products (machine building) industry..... | 62                  | 113      | 110      | 147      | 170      |
| (2) Final demand products sold to private and public consumers, total...   | 11                  | 12       | 12       | 15       | 16       |
| (2a) Private consumers.....  | 9                   | 9        | 9        | 12       | 12       |
| (2b) Public consumers.....   | 29                  | 40       | 47       | 51       | 54       |
| (3) Fixed and inventory investment except capital repair of equipment.....   | 114                 | 109      | 104      | 108      | 109      |
| (4) Exports.....   | 14                  | 15       | 17       | 17       | 17       |
| (5) Defense and space programs.....  | 36                  | 90       | 103      | 113      | 113      |
| (5a) Defense and space programs, the most conservative valuation of Soviet procurement.....  | (31)                | (79)     | (90)     | (98)     | (103)    |

See footnotes to table on p. 217.

<sup>1</sup> The investment is estimated to have been composed as follows (millions of rubles):

|                              | 1958  | 1962   | 1965   | 1967   | 1968   |
|------------------------------|-------|--------|--------|--------|--------|
| Fixed investment.....        | 6,921 | 9,891  | 13,491 | 15,390 | 16,739 |
| Increase in inventories..... | 270   | 513    | 496    | 775    | 837    |
| Total.....                   | 7,191 | 10,404 | 13,987 | 16,165 | 17,576 |

<sup>2</sup> Net of values exported as military grants and aid to foreign countries.

<sup>3</sup> Item A/I multiplied by \$2.75, the average conversion factor taken from Table 4.

<sup>4</sup> End use detail in some cases may not add up to output totals because of the variation in dollar/ruble price ratios used to convert the ruble values (Section A) into dollar values (Section B).

<sup>5</sup> Items A/2a and A/2b, respectively, multiplied by \$1.40, the average for automobiles and farm machinery. The appropriateness of this conversion factor for consumer durables is discussed in the text.

<sup>6</sup> Item A/5 multiplied by \$3.15, the conversion factor excluding automobiles and farm machinery in Table 4. The rationale of using this conversion factor for the procurement of military and space "hardware" is discussed in the text.

<sup>7</sup> Item A/5 multiplied by \$2.75, the overall conversion factor for all types of machinery and equipment from Table 4. Inasmuch as it includes low priority items (automobiles and farm machinery), it is thought to yield a most conservative dollar value of the Soviet procurement of military and space "hardware."

<sup>8</sup> Both the total U.S. output and the procurement for defense and space purposes exclude the value of basic and applied research sponsored by the Department of Defense and NASA, but not the value of development, evaluation and testing of new products produced for these agencies. The exclusion, in 1964 prices, amounted to \$888 million in 1958, \$1,190 million in 1962, \$1,427 million in 1965, \$1,499 million in 1967 and \$1,541 million in 1968. The rationale for this exclusion is that in the U.S.S.R. such (basic and applied) research for defense and space purposes is presumed to be performed outside the machine-building industry (in specialized institutes which are not part of the machine-building industry), but the development, evaluation and testing are most probably performed in the machine-building industry.

<sup>9</sup> Procurement by state and local governments and the Federal Government for purposes other than defense and space.

<sup>10</sup> The total investment of engineering products in U.S. economy is estimated to have been composed as follows (millions of dollars in 1964 prices):

|                       | 1958   | 1962   | 1965   | 1967   | 1968   |
|-----------------------|--------|--------|--------|--------|--------|
| Fixed investment..... | 19,218 | 24,368 | 33,832 | 39,297 | 41,755 |
| Inventory.....        | -1,930 | 1,927  | 3,000  | 1,963  | 2,444  |
| Total.....            | 17,288 | 26,295 | 36,832 | 41,260 | 44,199 |

Sources (of all estimates).—See Appendix, Tables A-3 through A-6, and Text Table 4.

TABLE 8.—Comparative growth rates in output and the defined end-use categories of engineering products in the U.S.S.R. and the United States, selected periods in 1958-68

[Average percent growth per year]

| Item  | U.S.S.R. |         |         | United States |         |         |
|---|----------|---------|---------|---------------|---------|---------|
|   | 1958-65  | 1965-68 | 1958-68 | 1958-65       | 1965-68 | 1958-68 |
| I. Output.....  | 11.9     | 11.7    | 11.8    | 7.1           | 6.2     | 6.8     |
| II. End use:  |          |         |         |               |         |         |
| 1. Intermediate products (replacement parts and components for current and capital repair of equipment used in sectors other than the machine-building industry)..... | 11.6     | 10.1    | 11.1    | 3.0           | -4.9    | 0.5     |
| 2. Final demand products sold to private and public consumers (total).....  | 10.3     | 16.7    | 12.2    | 9.0           | 6.4     | 8.3     |
| (2a) Private consumers.....   | 8.6      | 18.6    | 11.5    | 9.3           | 6.4     | 8.4     |
| (2b) Public consumers.....  | 14.7     | 12.4    | 14.0    | 6.9           | 7.2     | 7.0     |
| 3. Investment except capital repair of equipment.....   | 10.0     | 7.9     | 9.3     | 11.4          | 6.3     | 9.8     |
| 4. Exports.....   | 11.1     | 12.2    | 11.4    | 8.7           | 10.7    | 9.3     |
| 5. Defense and space programs.....  | 19.1     | 19.2    | 19.1    | 2.3           | 13.8    | 5.6     |

Source: Calculated from Table 7.

TABLE 9.—Comparative structure of the defined end-use categories of engineering products in 1958, 1962, and 1968: The U.S.S.R. versus the United States

| Item  | [Percent of total output]     |       |       |                            |       |       |               |       |       |
|---|-------------------------------|-------|-------|----------------------------|-------|-------|---------------|-------|-------|
|   | U.S.S.R.                      |       |       |                            |       |       | United States |       |       |
|   | Ruble (domestic)<br>valuation |       |       | Dollar (U.S.)<br>valuation |       |       | Dollar values |       |       |
|   | 1958                          | 1962  | 1968  | 1958                       | 1962  | 1968  | 1958          | 1962  | 1968  |
| I. Output.....  | 100.0                         | 100.0 | 100.0 | 100.0                      | 100.0 | 100.0 | 100.0         | 100.0 | 100.0 |
| II. End use:  |                               |       |       |                            |       |       |               |       |       |
| (1) Intermediate products<br>(replacement parts<br>and components) for<br>current and capital<br>repair of equipment<br>used in sectors other<br>than the machine-<br>building industry.... | 26.7                          | 26.4  | 25.1  | 26.7                       | 26.4  | 25.1  | 23.1          | 17.0  | 12.6  |
| (2) Final demand prod-<br>ucts sold to private<br>and public con-<br>sumers, total.....   | 9.8                           | 8.5   | 10.1  | 5.0                        | 4.3   | 5.2   | 24.2          | 26.1  | 27.7  |
| (2a) Private<br>consumers.....  | 7.5                           | 5.9   | 7.3   | 3.8                        | 3.0   | 3.7   | 22.0          | 23.8  | 25.4  |
| (2b) Public<br>consumers.....   | 2.4                           | 2.6   | 2.9   | 1.2                        | 1.3   | 1.5   | 2.3           | 2.4   | 2.3   |
| (3) Investment except<br>capital repair of<br>equipment.....  | 48.8                          | 41.1  | 39.0  | 48.8                       | 41.1  | 39.0  | 23.0          | 27.6  | 30.4  |
| (4) Exports.....  | 2.0                           | 1.8   | 2.0   | 2.0                        | 1.8   | 2.0   | 7.7           | 8.6   | 9.7   |
| (5) Defense and space<br>programs.....  | 12.6                          | 22.3  | 23.8  | 14.5                       | 25.5  | 27.3  | 21.9          | 20.7  | 19.6  |
| (5a) Defense and<br>space programs,<br>most conserva-<br>tive valuation.....  |                               |       |       | 12.6                       | 22.3  | 23.8  |               |       |       |

NOTE.—Detail may not add to totals because of variation in dollar valuation (middle section) and independent rounding.

Source: Table 7.

Table 7 consists of four parts. Part A gives the estimated values of the total output of Soviet engineering products in 1955 enterprise prices net of intraindustry sales (the same output measure as in Table 2) and of the values of five end-uses: intermediate products (parts and components) sold to sectors other than the engineering products industry; final demand products sold to private and public consumers; fixed and inventory investment; exports; and defense and space programs. Part B converts the Soviet estimates of Part A into the 1964 U.S. dollars using the dollar/ruble conversion factors estimated in Table 4: \$2.75 per ruble for the total output, intermediate products, investment goods and exports; \$1.40 per ruble for private and public consumption; and two for sales to defense and space programs—\$3.15 per ruble for a conservative valuation, and \$2.75 per ruble for the most conservative valuation. The *rationale* for this variation in the use of conversion factors was discussed in the Technical Note of Section I. Part C gives the corresponding dollar values for the United States, and Part D gives the percentage relationship of all the estimated values for the U.S.S.R. in U.S. dollars to those of the United States.

Table 8 gives the comparative growth rates implicit in the estimates of output and the end-uses of Table 7.

Table 9, finally, gives the comparison of the percentage break-down of the two countries' end-uses, with the U.S.S.R.'s derived from ruble values as well as dollar values.

The story conveyed by these three tables and the graph could hardly be more dramatic.

In 1958, merely 12 years ago, the U.S.S.R.'s military was getting only about one-third as much hardware as was the United States' military (Table 7, part D). By 1965, after completion of the seven-year plan period, it was getting, in all probability, as much as the U.S. military. In 1968, about half-way through the next five-year plan, it probably was getting close to 20 percent more; and by the end of the five-year plan (1970), as suggested by the *Gosplan* projection referred to earlier, it might be getting as much as 40 percent more. Throughout the decade between 1958-68 the average annual growth rate of the Soviet build-up of military and space technology would seem to have been in excess of 19 percent, with little variation over time, compared with an average 5.6 percent growth in the United States (Table 8, item 5). Some readers will undoubtedly be surprised that it exceeded the U.S. build-up, and by such a large margin (about one-third), even at the time of the U.S. build-up for Vietnam (1965-1968).

Needless to say, Soviet industry's growth in this area was a major force behind its rapid overall growth as well as its rapid strides in *catching-up* with the United States which we discussed in Section I. However, this build-up of military technology has had its costs, both economic and sociopolitical.

Despite the Soviet industry's tremendous gain in the overall level of output relative to the United States, it did not permit a relatively faster build-up of the modern productive facilities in the economy at large as is evidenced by the almost identical U.S.S.R./U.S. growth and level rates at which the engineering products (machinery and equipment) were being invested in both economies (Tables 7-D and 9, item 5). With the mounting pressures on resources, the only way their planners evidently could cope with the situation was to launch a massive equipment repair program. (The extent of this is indicated by the difference between the 1965 ruble value of investment goods produced by machine-building *and* metalworking as shown in Table 6, item 3, col. 3, and the value of that produced by machine-building alone, as shown in Table 7, item 3. The difference, about 7.8 billion rubles, represents largely the value of capital repair.) While this repair program undoubtedly helped the planners to cope with their pressures, it perpetuated obsolescence, and at a tremendous cost.<sup>11</sup>

Nor did the Soviet growth in the area of military hardware help the Soviet engineering industry make relative inroads into world export markets. Relative to the United States, Soviet exports of machinery and related products was about the same in 1968 as in 1958. And at both times the bulk of the Soviet exports was confined to U.S.S.R.'s satellite countries.

The bulk of the cost, however, was bestowed on the private consumer in the U.S.S.R. Although by 1968 the overall size of their engineering industry reached the level some 85 percent of the U.S. level, this industry was still allowing the private consumer only about one-eighth as many amenities of modern life as the U.S. consumer received—not much better than in 1958 (Table 7-D, item 2a). (Actually the relative position of the Soviet consumer in 1968 might

<sup>11</sup> Cf. My discussion of relative cost of repair of machine tools versus production of new ones in "The Soviet Challenge," pp. 26-27.

have been even worse than indicated in the comparisons because these comparisons do not include purchases of imported consumer durables. The U.S.S.R. imports few consumer durables, but the United States imports a great deal of them. The United States, in 1968, imported about \$8.4 billion worth of engineering products, about half of which were consumer durables).

From all this it should be quite apparent that the U.S.S.R.'s defense burden must be immensely greater than that of the United States. As I stated in Introduction to this paper, there is no way to estimate the two countries' expenditures on defense item by item. The comparative size of manpower in the armed forces presented in Table 1 and the comparative value of hardware the manpower gets, which I estimated, however, are as good indicators of the comparative total defense effort (and comparative total cost) as we might hope to have.

In 1968 the U.S. overall defense budget amounted to \$78 billion or 9.0 percent of GNP, and the aggregate direct cost of active manpower in the armed forces plus the kind of technological input which I considered in this paper represented 62.8 percent of the total budget (manpower, 25.3 percent; technology, 37.5 percent).

For 1968 the Soviet GNP has been estimated by Stanley Cohn at 47.4 percent of the U.S. level if the valuation is in terms of the average of rubles and dollars. If it were valued in dollars only, the relative would be about 64 percent of the U.S. (\$554 billion).

The dollar valuation of Soviet manpower in the armed forces (about 91 percent of the U.S. level, as in Table 1) and the technological input (119 percent of the U.S. level from Table 7-D) implies a total Soviet defense budget of \$84.0 billion or 15.2 percent of GNP, both valued in dollars (the conversion factor of technological input is based on U.S. and Soviet weights, but the difference is negligible). The most conservative valuation of the technology input reduces this percentage to 13.8.

Hence, if both the Soviet defense inputs and GNP are valued in dollars, the Soviet defense *burden* in 1968 might be said to have been about 70 percent larger than the U.S. burden (15.2 percent of GNP to 9.0 percent). If one wishes to be extremely cautious, he might say that this (Soviet burden) was *only* 53 percent greater (13.8 percent of GNP to 9.0 percent, with the former based on the most conservative valuation of the technology input).

The data do not permit to make such calculation in terms of rubles. In line with other analysts I presume that in ruble terms the Soviet burden would appear to be much smaller than in dollars, probably only half as great. However, this "smaller burden" would largely be the result of valuing a soldier's contribution at 3 rubles per month instead of \$130, valuing a month's work of a lathe operator in a missile plant at 150 rubles instead of \$500-\$600, valuing missiles at 100 thousand rubles a piece instead of \$315 thousand or more, etc. The question is, then, in what substantive sense or *whose* burden would be smaller?

### III. THE PROBLEM OF QUALITY AND THE QUEST FOR PROGRESS

#### THE PROBLEM OF QUALITY

In preceding analyses the focus was largely on quantitative comparisons. Differences in the quality of total output and the specific

end-use products were reflected in these analyses only to the extent to which the dollar/ruble conversion factors took them into account. Inasmuch as the price ratios underlying these conversion factors were defined on the basis of products having more or less the same technical characteristics, the conversion of Soviet rubles values into dollars only took account of what Edward Denison calls "economic" quality differences, that is, the cost that would be incurred to make the products comparable. For example, if two machine tools have the same characteristics in regard to dimensions and quality of products they are capable of producing, but one produces products faster than the other because it has automatic control devices and the other does not, the *economic quality difference* between those two machine tools amounts to the cost (price) of the automatic control devices of the faster producing machine tool. Such differences are generally reflected in the comparisons presented in the preceding sections.

In such complicated products as machine tools, aircraft, submarines, missiles and many thousands of other types which comprise the aggregate of the concept of engineering products, however, there is obviously tremendous room for so-called *non-economic* quality differences. For example, two machines identical as to their functional performance and price might greatly differ as to their *frequency of repair* (or *frequency of breakdowns*), *compactness*, *safety in operation*, *consumption of energy*, etc. This type of quality is not reflected in the comparisons set forth in the preceding analyses.

Since in this study the focus has primarily been on the two countries' engineering products industries as a technological base of military power, there is also question of their comparative *scope of the product-mix know-how* (this might differ considerably from the comparative level of aggregate output), and, of course, the question of *comparative efficiency*.

I have, of course, no information on conditions in the establishments of the Soviet "military-industrial complex" *per se*. Whatever judgments are to be made in this area, therefore, must be made by way of qualified generalizations from the overall situation. As with the ruble/dollar price ratios, it might be prudent to assume that conditions in the Soviet "military-industrial complex" relative to the U.S. complex are better than the overall situation. By how much, however, is anyone's guess.

#### EXAMPLES OF DIFFERENCES IN QUALITY

There can be hardly any question that, on the whole, the Soviet engineering industry's products are of substantially lesser quality than the American, although there are undoubtedly some exceptions.

(1) The best, or at least the most dramatic, example of the Soviet products inferiority is a vastly greater *frequency of repair* (breakdowns). The sad state of affairs in this regard is not only alluded daily in the Soviet press, but it is also implicit in the comparative value of the output of replacement parts and components relative to each country's total output of engineering products and, especially, relative to the total stock of machinery and related products in place in each economy.

In 1968, the Soviet engineering products industry's output of parts and components sold to sectors other than itself (for the repair of machinery and equipment) represented about 25 percent of total output, compared with about 13 percent in the United States (Table 9, Section II, item 1), and the actual dollar value of these parts was greater than in the United States by some 70 percent (Table 7-D). Moreover, the production of replacement parts in the Soviet Union is far from fully centralized. A lot are also manufactured in the primitive conditions of repair shops of the users of the equipment. Some of this huge demand for replacement parts is due to the number of years the Soviets keep machinery and equipment in operation, but this factor can hardly be responsible for more than 10 percent of demand for the replacement parts. The bulk is simply caused by frequent breakdowns.

I crudely estimate that U.S.S.R.'s accumulated stock of machinery and all kinds of equipment (in fixed investment, military hardware and household appliances) is probably on the order of some 40 to 45 percent of that in the United States. Relating only the relative value of centralized production of replacement parts (about 170 percent of United States) to this relative stock would imply a breakdown frequency of Soviet-made engineering products 3.5 to 4 times as high as breakdowns of U.S. products.

Although comparable estimates for the United States are not available, the figures for the U.S.S.R. in Table 10 would *not* seem to contradict such a proposition. In line with such a proposition would also seem to be the fact that as of 1965 "the machinery repair and set-up army" of Soviet industry as a whole (manufacturing, mining, and electric utilities), numbered about 3.5 million men, or 16 percent of all workers employed by the industry.<sup>12</sup> This number did not include the repair of agricultural equipment on farms, repair of automobiles, and other types of transportation equipment (railroad equipment, aircraft, ships and boats), communications equipment, nor equipment used by the governments and armed forces. In the aggregate, therefore, the Soviet Union probably employs more people repairing machinery and equipment than it does manufacturing it (about 6.4 million workers in 1968, as shown in Table 4-IV).

TABLE 10.—*Idling of machinery and equipment in the U.S.S.R.*

[In percent]

| Type of machine  | Proportion of a year's time ("nominal time fund") machines are in or waiting for repair | Proportion of scheduled machine-work hours lost due to repair |
|------------------|---|---|
| Excavators.....  | 20  | 30  |
| Bulldozers.....  | 18  | 20  |
| Scrapers.....    | 20-30   | 25-40   |
| Cranes.....      | 12  | 20  |
| Automobiles..... | 20-30   | 20  |
| Tractors.....    | 40-50   | 25  |

Source: B. V. Vlasov *et al.*, *Puti razvitiia mashinostroitel'nykh zavodov* (Trends in the Design of Machine-Building Plants), Moscow, Mashinostroenie, 1969, p. 203 (Estimates of the All-Union Scientific Research Institute of Standardization in Machinery Manufacture—VNIINMASH).

<sup>12</sup> Vlasov, *op. cit.*, p. 140.



(2) The substantially greater consumption of metal per dollar's worth of output in the Soviet engineering products industry compared with the United States (34 percent more in 1967, as shown in Table 5), is also a good indicator that on the whole Soviet-made products are of a lower quality than American. The way I see it, this greater relative consumption is partially due to Soviet industry's relatively greater use of "green-sand-molded" castings for parts, versus weldments and stampings (which makes strictly comparable Soviet machines heavier and bulkier), but in large measure it is also due to a smaller range of products produced for each application. The result of the latter is that although Soviet machines (designed for basically the same application as American) might offer a wider range of application possibilities, they are *less efficient* in any specific application (in terms of energy, fuel, etc., consumption per unit of work to be done) than the more "tailor-made" American machines (for example, a 5-ton truck is to be used for largely 2-ton truck hauls; 100-cubic foot excavator to be used for jobs that largely require 20-cubic foot excavator, etc.).

(3) Although the Soviet engineering products industry has in the last 10 to 15 years produced a number of firsts (e.g., *sputnik*, continuous steel casting machine, electroslag welding machine, atomic ice breaker), the U.S.S.R.'s large imports of chemical-industry machinery, continuous-process mining machinery, petroleum refinery equipment, paper making machinery, gear-making and other special type machine tools (for the Fiat-built automobile plant), etc., indicate unequivocally that its *scope of product-mix know-how* is still substantially less than that of American industry.

(4) At least in terms of labor input per unit (dollar's worth) of output, the Soviet engineering products industry is also still substantially less efficient. As was shown in Table 5, in 1968 it required over 40 percent more man-hours to produce the same output than the American industry.

#### IN QUEST OF PROGRESS

The best indicator of the U.S.S.R.'s quest of progress in the area of engineering products in general, and in area of military hardware in particular, would be the data on their R and D effort in those areas. Unfortunately, though it publishes data that furnish some ideas as to the overall level of R and D activity in the country, the detail by industry or even general orientation of activity has never been revealed. In view of the high priority status of the engineering products industry, however, broad judgments could be made about its quest for progress in these areas on the basis of estimates of the U.S.S.R.'s overall R and D effort relative to that of the United States *and* the role the United States' R and D effort in the engineering product industries in general, and in the military hardware in particular, play in the total U.S. effort. These estimates are provided in Table 11.

TABLE 11.—Estimated employment of qualified scientists and engineers (QSE) in research and development (R. & D.) in U.S.S.R. and the United States, selected years, 1962–68 (full-time equivalent)

|   | 1962 | 1965 | 1966 | 1967 | 1968 |
|---|------|------|------|------|------|
| U.S.S.R.: Total in the economy <sup>1</sup> (thousands).....  | 475  | 594  | 655  | 699  | 745  |
| United States: <sup>2</sup> Total in the economy (thousands).....   | 394  | 454  | 470  | 493  | 511  |
| (1) Employed in "engineering products" industries (thousands).....  | 224  | 250  | 257  | 269  | 284  |
| (1a) Item 1 as percent of the total in the economy.....   | 57   | 55   | 55   | 55   | 56   |
| (2) Employed in "engineering products" industries on projects sponsored by the Federal Government (largely for defense and space purposes) (thousands)..... | 125  | 147  | 149  | 147  | 143  |
| (2a) Item 2 as percent of item 1.....   | 56   | 59   | 58   | 55   | 50   |
| (2b) Item 2 as percent of U.S. total.....   | 32   | 32   | 32   | 30   | 28   |
| U.S.S.R. total as percent of the U.S. total.....  | 121  | 131  | 139  | 142  | 146  |

<sup>1</sup> Estimate for 1962 refers to Dec. 1; for other years to Nov. 15.

<sup>2</sup> U.S. estimates refer to January of the stated years.

#### SOURCES AND EXPLANATIONS

U.S.S.R.—Estimated on the basis of data on the employment of persons with a higher education in scientific research institutions, project-design organizations and other organizations serving science as published by Central Statistical Administration in *Trud v SSSR*, Moscow, 1968; and data on the number of "scientific workers" and other relevant information published *Ibid.*, and regularly updated in *Narodnoe khoziaistvo SSSR* following the procedures and most of the "more generous" assumptions developed by R. W. Davies and M. J. Berry of Birmingham University in connection with their contribution to OECD's *Science Policy in the USSR* (Paris, 1969, Part V) while relying on newer data (*Trud v SSSR* was published after they completed their contribution).

The estimates comprise:

(1) Eighty percent of the persons with higher education working in areas other than social sciences and humanities and employed in establishments of science and scientific research; in project-design institutes except those serving construction; and in other organizations serving science except geological exploration services. The reduction of the total by 20 percent intends to eliminate those who work in these organizations but do not do genuine R. & D. (professionals working in archives, reservations, botanical gardens, museums, libraries, etc.) as defined by Frascati Manual.

(2) Ten percent of the professionals with higher education working in project design organizations serving construction.

(3) Estimated full-time equivalent man-years of research performed by engineers and scientists (other than social scientists) in educational institutions of higher learning.

(4) Estimated full-time equivalent man-years of research in fields other than social sciences and humanities performed by graduate students in educational and research organizations.

(5) Estimated number of "scientific workers" employed in industrial enterprises.

The reason for my following the "more generous" assumptions of Davies and Berry is that the "cautious" ones yield results that are implicit merely in the numbers of "scientific workers":

|   | 1962 | 1965 | 1966 | 1967  | 1968  |
|---|------|------|------|-------|-------|
| Davies and Berry's estimates of Soviet employment of graduates in R. & D., full-time equivalent (thousands):      |      |      |      |       |       |
| "More generous" estimates.....  | 504  | 631  | 670  | ..... | ..... |
| "Cautious" estimates.....   | 363  | 454  | 476  | ..... | ..... |
| Full-time-equivalent employment of Soviet research implicit in the number of "scientific workers" (thousands).... | 331  | 419  | 449  | 479   | 511   |

*Trud v SSSR* (and *Narodnoe khoziaistvo SSSR*), however, seem to imply that "scientific workers" are those who do or might do basic and/or applied research, but no reference is made to development (*razrabotka*). The "scientific workers" include members of all academies of sciences; all persons having earned the degree of doctor of sciences, candidate of sciences or titles: professor, docent, scientist (senior scientific worker), research associate (junior scientific worker), or assistant irrespective of their place and character of work; persons working in scientific research in scientific establishments and institutions of higher learning irrespective of whether they have earned degrees or titles or not; and specialists without earned degrees or titles but doing scientific work in "industrial enterprises and project organizations." (*Cf. Trud v SSSR*, p. 331).

Assuming that "scientific workers" cover the R part of R. & D. (net of students) only, as this definition seems to imply, the D part would be represented by about 30 percent of the totals given in the table and to me this seems to be a fairly plausible proposition.

Source for the United States: National Science Foundation.

With respect to U.S. research and development, it will be noted, first of all, that in the 6-year period covered, the engineering products industry employed about 56 percent of all scientists and engineers working in R. and D. of the U.S. economy as a whole, and of these 50 to 58 percent worked on projects related to defense and space. Although subject to some uncertainty as to the exact amount, which

should be apparent from the explanations to the Table, the overall Soviet employment of scientists and engineers was at least somewhat greater than the U.S. total by 1962, and by 1968, due to faster growth in the Soviet R and D effort, it might have been greater by as much as 40 to 50 percent. There is no valid reason to believe that the concentration of Soviet R and D effort in the engineering products area, and especially in the military hardware area, has been any smaller than those of the United States (although most of it was probably conducted outside the "machine-building" industry as such). On the contrary, the tremendous effort they have exerted to produce more and more machinery, and more and more military and space hardware, give ample reason to believe that as early as 1962 the Soviet relative R and D concentration in those areas must have been substantially greater than in the United States as well as that most of the growth in their total effort since 1962 must have been concentrated in those areas.

Indeed, it appears to me that if the figures on their total employment of scientists and engineers in R and D presented in the table are reasonably near the mark, they could have permitted the party to have twice as many researchers working in the area of engineering products and military and space technology as were working in these areas in the United States. If the party had done so, it would merely have assured itself to have at least the same relative progress in the know-how in these areas as the United States had even if the productivity of Soviet researchers were only half of that of U.S. researchers, as academician Kapitsa has suggested,<sup>13</sup> and still have some R and D activity in other areas.

In conclusion, it perhaps might be also noted that 1968 represented the U.S. peak for the R and D effort in recent years. It was not the peak in the U.S.S.R.

#### APPENDIX TABLES

TABLE A-1.—Percentage distribution of Soviet gross value of output of products of machine building and metalworking, by end use<sup>1</sup>

[Purchasers' prices]

| End use of output   | 1965  | 1970  |
|---|-------|-------|
| Current production (intermediate parts and components sold to all sectors) .. | 37.1  | 37.5  |
| Of that, intrasector use of intermediate products .....                       | 21.4  | 23.4  |
| Capital investment, including capital repair of equipment.....                | 39.4  | 37.6  |
| Consumption.....  | 10.6  | 11.8  |
| Other types of end uses <sup>2</sup> .....                                    | 12.9  | 13.1  |
| Total.....  | 100.0 | 100.0 |

<sup>1</sup> The percentages for 1965 are based on actual input/output relationships in the Soviet economy in that year; and for 1970, on *Gospplan* projections (ex-ante, input/output table).

<sup>2</sup> Since the classification scheme used in this table is all-embracing, "other types of end uses" can only refer to exports and defense and space programs.

Source: B. G. Kolbiagin, V. L. Fomichev, A. A. Shaporov, "Izmeneniia otiraslevoi struktury i mezhotraslevykh svyazi mashinostroeniia" in symposium *Mezhotraslevye svyazi v narodnom khoziaistve SSSR* (Sectoral Interconnections in the U.S.S.R. Economy), Moscow, 1968, pp. 79-92, reproduced in *Referativnyi sbornik: Ekonomika promyshlennosti, svodnyi tom*, No. 1, 1969 pp. 1V181-82.

<sup>13</sup> Peter L. Kapitsa, *Teoriia, eksperiment, praktika* (Theory, Experiment and Practice), Moscow, Znanie, 1966, pp. 13-14.

TABLE A-2.—Percentage distributions of Soviet cost of material inputs in Soviet machine-building and metalworking industries, selected years, 1959-70

[Purchasers' prices]

| Input   | 1959  | 1965  | 1970<br>(ex-ante) |
|---|-------|-------|-------------------|
| Products of metallurgy (ferrous and nonferrous).....  | 39.0  | 29.7  | 27.3              |
| Fuels.....  | 2.7   | 2.7   | 2.4               |
| Electric and thermal energy.....  | 2.7   | 3.4   | 3.2               |
| Products of machine building and metalworking (intra-sectoral<br>use of intermediate products)..... | 29.3  | 40.9  | 44.4              |
| Products of the chemical industry.....  | 7.0   | 7.1   | 7.8               |
| Products of the forestry and woodworking industry.....  | 3.1   | 2.8   | 2.4               |
| Products of construction materials industry.....  | .8    | 1.3   | 1.1               |
| Products of light industry.....   | 2.9   | 2.0   | 1.9               |
| Products of the food industry.....  | 0.2   | 0.1   | 0.1               |
| Products of other branches of industry.....   | 0.9   | 0.9   | 0.7               |
| Transportation and communication.....   | 7.1   | 5.3   | 4.9               |
| Trade and distribution.....   | 2.8   | 3.2   | 3.3               |
| Other inputs.....   | 1.5   | 0.6   | 0.5               |
| Total.....  | 100.0 | 100.0 | 100.0             |

Sources: 1965 to 1970—See sources in Table A-1. 1959—Reconstructed from 1965 on the basis on data on changes in the material coefficients given in Oznobin *et al.*, *op. cit.*, p. 142 and A.M. Vershinin *et al.*, *Ekonomika mashinostroeniia, organizatsiia i planirovanie predpriatii* (Economics of Machine Building and Organization and Planning of Machine-Building Enterprises), Moscow, Mashgiz, 1963, p. 15.

TABLE A-3.—*Estimating the total Soviet output of machine-building products, net of intra-industry sales, and determination of its end uses, selected years 1955-68*

| Item  | 1955   | 1958   | 1959    | 1962   | 1963   | 1965   | 1967   | 1968   |
|---|--------|--------|---------|--------|--------|--------|--------|--------|
| <b>I. Estimating the value of machine-building products net of intraindustry sales:</b>   |        |        |         |        |        |        |        |        |
| A. Gross value of output (GVO) of machine building and metalworking, industry basis (millions of 1955 rubles).....  |        |        | 27,600  |        |        |        |        |        |
| B. Gross value of output (GVO) of machine building and metalworking, commodity basis (primary products only) (millions of 1955 rubles).....                                     |        |        | 25,392  |        |        |        |        |        |
| C. GVO of machine-building products, commodity basis (millions of 1955 rubles).....   | 11,193 | 17,372 | *20,060 | 31,274 | 35,506 | 42,527 | 54,061 | 60,621 |
| D. Percent of "C" used within the machine-building industry (proper) (percent).....   | 12.7   | 15.1   | *16.0   | 19.0   | 20.1   | *24.0  | 25.1   | 25.6   |
| E. Value of the machine-building products (parts and components) used within the industry.....  | 1,422  | 2,623  | 3,210   | 5,942  | 7,137  | 10,206 | 13,569 | 15,519 |
| F. GVO of machine-building products net of intraindustry uses (sales) (millions of 1955 rubles).....  | 9,771  | 14,749 | 16,850  | 25,332 | 28,369 | 32,321 | 40,492 | 45,102 |
| <b>II. Determination of end uses of item "F":</b>   |        |        |         |        |        |        |        |        |
| (1a) Sales of intermediate products (parts and components) to sectors other than the machine-building industry as a percent of GVO including intraindustry sales (percent)..... |        | 22.7   | *22.4   | 21.4   | 21.1   | *20.1  | 19.1   | 18.7   |
| (1) Value of intermediate products (parts and components) sold to sectors other than the machine-building industry (millions of 1955 rubles).....                               |        | 3,943  | 4,493   | 6,693  | 7,492  | 8,494  | 10,326 | 11,336 |
| (2a) Sales of machine-building products to private consumers (millions of 1955 rubles).....   |        | 1,102  | 1,196   | 1,493  | 1,658  | 1,966  | 2,767  | 3,279  |
| (2b) Sales to public consumers (millions of 1955 rubles).....   |        | 349    | 405     | 650    | 733    | 912    | 1,134  | 1,295  |
| (3a) Fixed investment (millions of 1955 rubles).....  |        | 6,921  | 7,292   | 9,891  | 10,991 | 13,491 | 15,390 | 16,739 |
| (3b) Investment in inventories (millions of 1955 rubles).....   |        | 270    | 331     | 513    | 504    | 496    | 775    | 837    |
| (3c) Total investment (3a plus 3b) (millions of 1955 rubles).....   |        | 7,191  | 7,623   | 10,404 | 11,495 | 13,987 | 16,165 | 17,576 |
| (4) Exports (domestic) (millions of 1955 rubles).....   |        | 313    | 452     | 471    | 571    | 654    | 819    | 925    |
| (5) Military and space programs (residual), (millions of 1955 rubles).....  |        | 1,851  | 2,681   | 5,621  | 6,420  | 6,308  | 9,281  | 10,691 |
| III. Imports (millions of 1955 rubles) (domestic).....  |        | 479    | 608     | 1,009  | 1,109  | 1,209  | 1,310  | 1,561  |

SOURCES AND EXPLANATIONS

I. *Estimating the value of machine-building products net of intraindustry sales*

Item A.—There has been a number of figures in circulation regarding the ruble value of the gross value of output (*valovaya produktsiia*) of the machine-building and metalworking industry, all similar but not quite consistent with one another. The value for 1959 given in the table (27,600 million rubles) is derived from a recent study by A. Malorova and A. Tolkahev, "O pokazatele chistoi produktsii" (On Indicators of Net Output), *Voprosy ekonomiki*, no. 10, October 1969, pp. 86-87, which indicates that in 1959 the value of machine-building and metalworking industry constituted 21.0 percent of the gross value of output of the whole industry. In that year the latter amounted to 141.7 billion rubles in 1955 prices (see *Nar. khoz. 1966*, p. 121.). This derivative is consistent with

Khrushchev's statement in 1964 that in 1958 the value was 24 billion rubles and in 1963, 48 billion rubles (see *Promyshlennost' SSSR*, 1964, pp. 14). Khrushchev's figures were authoritatively identified to refer to 1955 prices (see Khel'man, *op. cit.* p. 213).

Item B.—The 25,392 million rubles, 92 percent of item A, represents the gross value of products of the machine-building and metalworking on "commodity basis," that is, wherever produced in the economy (see A. N. Efimov and L. Ia. Berli, (eds.), *Metody planirovaniia mezhotraslevykh proporsii* (Methods of Planning Intra-sectoral Proportions), Moscow, Ekonomika, 1965, p. 81; and Vladimir Tremi, *Commodity and Establishment Accounting in Soviet Statistics* (SIP-30), McLean, Va., Research Analysis Corporation, April 1970, p. 16].

SOURCES AND EXPLANATIONS—Continued

*Item C.*—The value of 20,060 million rubles, marked with an asterisk, represents 79 percent of item B, the ratio of the gross value of the products of machine-building proper to the value of machine-building and metalworking. This ratio is implicit in Vladimir Treml's reconstructed Soviet input/output table for 1959 (*op. cit.*) and is reasonably consistent with earlier extrapolated estimates published in the Soviet press [e.g., V.L. Ganshtak, *Ocherki po ekonomike mashinostroitel' noi promyshlennosti SSSR* (Essays in Economic of Machine-Building Industry of the U.S.S.R.), Moscow, Mashizg, 1957, p. 81]. The estimates for all other years are derived from the benchmark estimate for 1959 and the index of the gross value of output of machine building which is published regularly in *Narodnoe khoziaistvo SSSR* (e.g., *Nar. khoz. 1968*, p. 254).

*Item D.*—The percentages for 1959 and 1965, marked by asterisks, are more or less given.

(1) The 16 percent for 1959 represents 41.7 percent (proportion of sales of intermediate products within the industry) of 38.4 percent (sales of intermediate products to all industries, including the industry manufacturing engineering products). The 41.7 percent figure was specifically stated by A. Efimov in reference to the machine-building industry proper in 1959 (*Cf. A. Efimov, "Razvitiie mezhotraslevykh svyazei promyshlennosti v protsesse perekhoda k kommunizmu"* (Development of Sectoral Interconnections in Industry in the Period of Transition into Communism), *Voprosy ekonomiki*, no. 12, December 1961, p. 28). Similar orders of magnitude were also reported by others and it is implicit in the published portion of the input/output table for that year (this proportion is affected by the withheld information much less than sales of all intermediate products as percent of gross value of output). The 38.4 percent figure, in turn, represents a slight adjustment of a 39.4-percent figure reported by L. Berri and Iu. Shvyrkov ("O strukture proizvodstva SSSR i zarub zhnykh stran" (Industry Structure in the U.S.S.R. and in Foreign Countries), *Voprosy ekonomiki*, no. 1, January 1963, p. 142. Their 39.4-percent figure specifically refers to all sales of intermediate products of machine building as a percent of the total gross value of output in enterprise prices, *net of exports*). The adjustment to include exports reduces the proportion to 38.4 percent). Both the 41.7-percent and 38.4-percent figures are reasonably consistent with other information relevant for the total Soviet machine-building industry which I compiled in the course of this research. They also make sense when compared with such figures for the United States in 1958.

(2) The 24.0 percent figure for 1965 represents an extrapolation from 16.0 percent in 1959 in accordance with the relative growth of intraindustry sales in the machine-building and the metalworking sector implicit in Table A-2 and an assumption that all the relative growth sales was concentrated in the machine-building industry proper rather than in the machine-building and metalworking industry. The *rationale* of this assumption is that the metalworking segment of this larger industry largely represents machinery repair facilities offering few opportunities for growth in specialization which is almost synonymous with growth of intraindustry sales. According to Table A-2 the proportion of intraindustry input or sales of intermediate products in the machine-building and metal working industry increased by about 39 percent. Since this increase is assumed to have been concentrated within machine-building proper, the output of which represents about 80% of both segments combined, the increase in the proportion of sales within machine-building proper is assumed to have been about 50 percent.

(3) The percentages for years from 1965 through 1968 have been extrapolated analogously—assuming the rate of change implicit in the changes between 1965 and the *Gospplan* projection (ex-ante table) for 1970, which are also shown in Table A-2, and the assumption that the changes take place within machine-building proper.

(4) The percentages for the intervening years between 1959 and 1965 and prior years assume that the changes were continuous throughout the period and that they started long before 1959.

All these percentages exert an extremely great influence on the estimated value of the total output of Soviet engineering products net of multiple counting and, hence, on the size of the residual of end uses which I equate with military and space hardware. The estimating assumptions which I have adopted are in line with the best information that is available on the subject matter, but if they contain any built-in bias it is most probably in the direction of an overstatement of these percentages which would be equivalent to an understatement of military and space hardware rather than an understatement. And such a bias, if any, is, as my expressed preference.

*Item E.*—Results of applying the percentages in Item D to the ruble values in Item C.

*Item F.*—Ruble values in item C minus ruble values in item E.

II. *Determination of the end uses of the gross value of machine-building products net of intra-industry sales (Item F)*

*Item (1a).*—The 22.4-percent figure for 1959, marked with an asterisk, simply represents the difference between 38.4 percent—sales of intermediate products as percent of gross value of output including intra-industry sales, and 16 percent—intra-industry sales of intermediate products also expressed as a percent of the total gross value of output (see explanation of item D above). The percentages for other years are consistent with the statement that "In 1965 the proportion (relative importance) of repair in the overall volume of machine-building output declined by almost 9 percent in comparison with 1958. In the current 5-year period, this proportion will decline by 10 percent more. Such an insignificant decrease in the proportion of repair in the total output of machine building indicates that the process of improving machinery repair operations in the country and the process of improving the quality of manufactured machinery and equipment are extremely slow." (See Ozonin, *et al.*, *op. cit.*, page 130.)

For the 1965-70 period, essentially the same information is also implicit in table A-1 (see change in the difference between the proportion in total sales of intermediate products of machine building and metalworking in line 1 and the intrasectoral use of these products in line 2).

*Item (1).*—The estimated ruble values represent results of applying the percentages in Item (1a) to the ruble values in Item (C).

*Item (2a).*—For 1959, 1962 and 1963 the estimated values of sales of engineering products in 1955 enterprise prices to private consumers are based on such data in purchasers' prices are reported in *Narodnoe khoziaistvo SSSR 1964*, pp. 579-583. In these products (consumer durables) the (1955) enterprise prices differ from purchasers' prices by the value of turnover tax, the cost of transportation and communications, and the trade and distribution markups. In reducing the given values in purchasers' prices to enterprise prices, I assumed that the turnover tax on these products represents about 45 percent of the retail price (in line with Philip Hanson's *The Consumer in the Soviet Economy*, London, Macmillan, 1968, pp. 112-113 and 116) and all other "retail price" elements—5.1 to 5.6 percent depending on the year. (As shown in table A-2 these cost elements represented 9.9 percent of the cost of materials in 1959, 8.5 percent in 1965, and should have declined to 8.2 percent by 1970. I estimate that as a percent of the value of sales they amounted to 5.6 percent in 1959 and 5.1 percent in 1963.)

The estimates for other years have been extrapolated from 1959-63 in accordance with data on retail sales of the most important types of consumer durables which are regularly reported in *Narodnoe khoziaistvo SSSR*.

*Item (2b).*—The sources of information and the estimating procedure of "public" consumption are analogous to those used in estimating private consumption (Item 2a) except that these sales are not subject to turnover tax.

*Item (3a).*—The estimates of sales of machinery and equipment for fixed investment in the economy are derived from data for investment in "equipment, instruments, and implements (*inventar*)" net of the value of capital repair of equipment in 1955 prices which is regularly reported in *Narodnoe khoziaistvo SSSR* adjusted for non-machinery type components in this aggregate, the cost of transportation and distribution from producers to users, and the value of imported equipment in domestic prices (rubles). Based on various direct and indirect references regarding the non-machinery type of investment goods in this aggregate (such as furniture, equipment of storage rooms, etc.) it would appear that their value amounts to somewhere between 5 and 10 percent of the total. To be on the safe side (not to underestimate the machinery part since it would exaggerate the residual), I assume that it amounts to 5 percent of the total. Another 5 percent of the reported value is assumed to be the cost of transportation and distribution of investment machinery and equipment from producers to users (cost of installation is not included in the series in question).

The value of imported machinery and equipment is estimated on the basis of import data in "foreign trade rubles" which I have converted into the domestic rubles. The procedure and the underlying reasoning of this conversion is explained in the context of item 4 (Exports). The given data and the process of their adjustment for a few years under consideration is shown below:

|   | 1958   | 1962    | 1967    | 1968    |
|---|--------|---------|---------|---------|
| 1. Capital investment in "equipment, instruments and implements" in the economy as reported in <i>Nar. khoz.</i> (see 1968 edition, p. 520) (millions of 1955 rubles).....  | 8, 200 | 12, 100 | 18, 600 | 20, 300 |
| 2. Ditto, adjusted for nonmachinery type components and the cost of transportation and distribution from producers to users of equipment (90 percent of No. 1) (millions of 1955 rubles).....   | 7, 400 | 10, 900 | 16, 700 | 18, 300 |
| 3. Value of imported machinery and equipment in domestic rubles (for simplicity, all of this is assumed to be fixed investment products; inaccuracy arising from such an assumption is most probably negligible) (millions of 1955 (domestic rubles)..... | 479    | 1, 009  | 1, 310  | 1, 561  |
| 4. Fixed investment of machinery and equipment of domestic origin (No. 2 minus No. 3) (millions of 1955 rubles).....  | 6, 921 | 9, 891  | 15, 390 | 16, 739 |

*Item (3b).*—The estimates of increments in inventories assume that over the years they have grown proportionately to the gross value of output, as in industry as a whole (cf.

the data on the whole industry's output versus the growth of its "working capital" in *Nar. khoz.*, 1968, pp. 183 and 749, respectively). Specifically the given estimates are based on Anchishkin and Iarenenko's figure on the value of working capital of machine-building and metalworking industry in 1960—10 billion rubles, 80 percent of which I assume was in the machine-building industry proper and about 74 percent in the production of engineering products as such (cf. A. I. Anchishkin and Iu. V. Iarenenko, *Tempy i proporsii ekonomicheskogo razvitiia* (The Rates and Proportions of Economic Development), Moscow, Ekonomika, 1967, p. 76), the data on the proportion of all working capital which the enterprises of this industry tend to have in inventories of "material values" and unfinished production (which in recent years has been regularly reported in *Narodnoe khoziaistvo SSSR*) and the index of the gross value of output of machine-building products implicit in Item (C) of this table.

*Item (3c).*—Represents the sum of items (3a) and (3b).

*Item (4).*—The estimates of Soviet exports of machinery and equipment in domestic rubles are based on the value of such exports, including exports of "complete plants", in "foreign trade rubles" regularly reported in *Vneshniaia torgovlia*, assumed proportion of machinery and related products in the value of exported "complete plants", and the estimated relationship of "foreign trade rubles" to domestic rubles. With respect to the proportion of machinery and equipment in the total value of exported "complete plants" we only know, more or less for sure, that machinery represents more than 51% (otherwise this export would not be classified in the machinery group) and that it represents less than 90% of the total (because about 10 percent of the value is said to be value of services). I assumed that the proportion is about 70%, (assumed components to be excluded: 10% services, 10% non-machinery type of equipment, and 10% for value of other materials).

For the conversion of "foreign trade rubles" I know that they essentially represent dollar or equivalent value currencies converted into rubles at the rate of \$1.1 per ruble (the official exchange rate). I also know that the bulk of Soviet export and import transactions in machinery and related products (with satellite countries, Western Europe, Japan and developing countries) involves price levels which are substantially lower than the U.S. domestic price level. On the average this price level is probably about 80% of the U.S. domestic price level. From this it follows that since the *domestic-price ruble* in machinery and related products is worth about \$2.75 of 1964 purchasing power, it also must be worth  $(\$2.75 \times 0.8) + 1.1$ , or roughly 2 foreign trade rubles. (\$2.75 per ruble comes from text table 4.)

In short, the estimates of the Soviet exports of machinery and related products in domestic rubles listed in the table represent the value of these exports in foreign trade rubles adjusted for nonmachinery elements in the export of "complete plants" and divided by 2—the estimated ratio of the value of "foreign trade ruble" to its value in the domestic market (in machinery and related products, of course).

The same procedure was used in the conversion of imports with domestic rubles (Item III) except that there is no problem of adjusting the value for nonmachinery type of components.

*Item (5).*—Represents the residual:

Item F minus sum of items (1, 2a, 2b, 3c, and 4).

TABLE A-4.—U.S. output and end uses of engineering products in 1958 and 1963

| Item  | 1958                                       |                                  |                  | 1963                                       |                                  |                  |
|---|--|----------------------------------|------------------|--|----------------------------------|------------------|
|   | Millions of dollars; current prices (1958) | Millions of dollars; 1964 prices | Percent of total | Millions of dollars; current prices (1963) | Millions of dollars; 1964 prices | Percent of total |
| I. Gross value of output.....   | 101,036                                    |                                  |                  | 141,000                                    |                                  |                  |
| II. Sales of intermediate products within the industries producing engineering products (intra-industry sales)..... | 27,530                                     |                                  |                  | 41,985                                     |                                  |                  |
| III. Gross value of output net of intra-industry sales (I minus II).....  | 73,506                                     | 75,175                           | 100.0            | 99,015                                     | 99,413                           | 100.0            |
| IV. End uses of III:  |  |                                  |                  |  |                                  |                  |
| (1) Intermediate products (parts and components) sold to sectors other than industries manufacturing them.....      | 17,009                                     | 17,366                           | 23.1             | 15,963                                     | 16,005                           | 16.1             |
| (2a) Private consumption.....   | 16,191                                     | 16,517                           | 22.0             | 24,649                                     | 24,754                           | 24.9             |
| (2b) Public consumption <sup>2</sup> .....  | 1,677                                      | 1,698                            | 2.3              | 2,336                                      | 2,386                            | 2.4              |
| (3a) Gross fixed investment.....  | 18,762                                     | 19,218                           | 25.6             | 26,005                                     | 26,146                           | 26.3             |
| (3b) Increase of inventories.....   | -1,866                                     | -1,930                           | -2.6             | 1,929                                      | 1,889                            | 1.9              |
| (4) Export.....   | 5,627                                      | 5,789                            | 7.7              | 8,170                                      | 8,251                            | 8.3              |
| (5) Defense and space programs.....   | 16,102                                     | 16,517                           | 21.9             | 19,963                                     | 19,982                           | 20.1             |

<sup>1</sup> Uniformly deflated with Bureau of Labor Statistics' wholesale price index (WPI) for machinery and motive products (BLS code 11).

<sup>2</sup> Purchases of state and local governments and of the Federal Government for purposes other than defense and space exploration.

Sources: The estimates are based on data developed by the Department of Commerce's Office of Business Economics for its input/output tables of the U.S. economy in 1958 and 1963. To match the Soviet concept of "machine-building" (the manufacture of engineering products) as closely as possible they cover the manufacture of ordnance products (SIC 19, in terms of input/output (I/O) classification—industry 13); non-electrical machinery (SIC 35); electrical machinery and apparatus (SIC 36); transportation equipment (SIC 37); instruments and controls (SIC 38)—in the input/output classification SIC 35 through 38 are grouped in industries 43 through 63; power boilers (SIC 3443); and the industries manufacturing prefabricates and components used exclusively, or almost exclusively, in the manufacture of engineering products, namely ferrous and nonferrous foundries (SIC 332 and SIC 336), the manufacture of stampings for automobiles and appliances (SIC 3461), ferrous and non-ferrous forgings (SIC 3391 and SIC 3392), manufacturers of fasteners and other screw-machine products (SIC 345), manufacturers of steel springs (SIC 3493), and manufacturers of valves other than those used in plumbing (SIC 3494).

As in the case of Soviet estimates, the estimates in this table are based on "primary commodity flows" of relevant industries, which exclude these industries' secondary products and include products produced in other industries which are primary to the relevant industries but secondary to those which actually produce them.

For comparability with Soviet estimates, the totals and the Government purchases of these products for defense and space programs exclude the estimated value of basic and applied research (R part of R. & D.) which these industries performed for the Department of Defense and NASA (\$812,000,000 in 1958 and \$1,337,000,000 in 1963) since in the U.S.S.R. such research is presumed to be performed in research institutes which are not part of the machine-building industry. The value of development, evaluation and testing of new products for these agencies (the D part of R. & D.), however, is included in both places.

TABLE A-5.—Indexes used in estimating U.S. total output and end uses of engineering products from 1963 (table A-4) to other years

| Item  | [1963=100] |       |      |       |       |       |
|---|------------|-------|------|-------|-------|-------|
|   | 1955       | 1962  | 1963 | 1965  | 1967  | 1968  |
| A. Total value added of engineering product industries.....                   | 89.1       | 96.0  | 100  | 122.0 | 136.6 | 146.3 |
| B. Private consumption expenditures for durable goods.....                    |            | 91.6  | 100  | 124.0 | 134.8 | 149.2 |
| C. State and local government expenditures.....                               |            | 94.8  | 100  | 113.3 | 131.5 | 139.7 |
| D. Fixed investment in machinery and equipment.....                           |            | 93.2  | 100  | 129.4 | 150.3 | 159.7 |
| E. Nonfarm inventories.....   |            | 102.0 | 100  | 158.8 | 103.9 | 129.4 |
| F. Exports.....   |            | 98.9  | 100  | 127.6 | 162.3 | 186.9 |
| G. Defense-related shipments.....   |            | 98.8  | 100  | 97.2  | 130.4 | 142.8 |
| H. Sales of parts and components to sectors other than itself (residual)..... |            | 101.6 | 100  | 133.2 | 121.1 | 114.4 |

## SOURCES AND EXPLANATIONS

A. Based on the value-added of all engineering products industries as reported by the U.S. Bureau of the Census (*Census of Manufactures and Annual Survey of Manufactures*) and deflated with the BLS wholesale price index (WPI) for machinery and motive products (code 11). (A) is used for the extrapolation of the total value of output net of intraindustry sales.



## SOURCES AND EXPLANATIONS—Continued

- B. Part of the national income accounts; used in extrapolating sales to private consumers.  
 C. Part of the national income accounts; used in extrapolating sales to "public consumers" (State and local government and to the Federal Government for purposes other than defense and space exploration).  
 D. Part of the national income accounts; used in extrapolating sales for fixed investment.  
 E. Part of the national income accounts; used for estimating changes in inventory investment.  
 F. Based on Bureau of the Census data on exports of machinery and related products deflated with the WPI for machinery and motive products.  
 G. For 1963-68 based on Bureau of the Census' *Current Industrial Reports*, Shipments of Defense-Oriented Industries, Series MA-175, deflated with the WPI for machinery and motive products (code 11). 1962—extrapolated on the basis of monthly shipments of defense products as reported in Series M-3.  
 H. Index derived from residual values assumed to represent the sales of parts and components to sectors other than the industries producing the products.

TABLE A-6.—*Estimating the value of output of engineering products of 4 major West European countries and Japan, selected years, 1955-67*

| Item  | 1955   | 1960   | 1962   | 1967   |
|---|--------|--------|--------|--------|
| A. "Deliveries" net of intraindustry sales valued in domestic currencies converted into dollars by means of official exchange rates current prices (millions of dollars at official exchange rate): |        |        |        |        |
| United Kingdom.....   | 11,337 | 14,684 | 15,657 | 20,456 |
| France.....   | 6,068  | 8,212  | 9,992  | 15,719 |
| West Germany.....   | 7,663  | 13,594 | 16,886 | 22,933 |
| Italy.....  | 2,184  | 3,775  | 4,784  | 7,533  |
| Japan.....  | 2,316  | 8,194  | 12,149 | 23,991 |
| B. "Deliveries" net of intraindustry sales valued in domestic currencies converted into dollars by means of official exchange rates, 1964 prices (millions of dollars at official exchange rate):   |        |        |        |        |
| United Kingdom.....   | 13,228 | 15,344 | 16,291 | 18,479 |
| France.....   | 8,499  | 8,975  | 10,518 | 14,895 |
| West Germany.....   | 9,449  | 15,343 | 17,462 | 21,512 |
| Italy.....  | 2,502  | 4,121  | 5,009  | 7,364  |
| Japan.....  | 2,351  | 8,002  | 11,864 | 23,991 |
| C. "Deliveries" net of intraindustry sales in 1964 prices (item B) adjusted for differences in international price levels (millions of dollars in comparable purchasing power):                     |        |        |        |        |
| United Kingdom.....   | 14,696 | 17,047 | 18,101 | 20,530 |
| France.....   | 9,442  | 9,971  | 11,686 | 16,548 |
| West Germany.....   | 10,498 | 17,046 | 19,424 | 23,902 |
| Italy.....  | 2,780  | 4,578  | 5,566  | 8,181  |
| Japan.....  | 3,135  | 10,669 | 15,818 | 31,988 |

<sup>1</sup> Average for 1966-68.

## SOURCES

European countries—*Section A.*—Data reported in OECD, Special Committee for Machinery, *The Engineering Industries*, Paris, 1961, 1965, and 1969. The data represent official reports of the respective countries. *Sec. B.*—Data in Section A deflated with the individual countries' price indexes for machinery and related products. Some of the indexes were estimated on the basis of indirect data. *Sec. C.*—Estimates in Section B divided by 0.9, the ratio of the assumed overall European price level in machinery and related products to that in the United States. This ratio is consistent with the findings of the recent National Bureau of Economic Research Study of the international price competitiveness of U.S. products.

Japan—1960-67—*Section A.*—Data on gross deliveries of engineering products as reported in OECD's *Engineering Industries*, adjusted for multiple counting in accordance with Japan's input/output tables for 1960, 1963, and 1965 (published in Bank of Japan, *Economic Statistics of Japan 1966*; and *Japan Statistical Yearbook*, 1968). *Section B.*—Estimates in Section A deflated with the wholesale price index for machinery and related products. *Section C.*—Estimates in Section B divided by 0.75, the ratio of Japan's assumed domestic wholesale price level in machinery and related products to that of the United States, partly in line with the NBER study and partly result of consultations with U.S. industry people who have had first-hand experience in the matter of Japanese prices relative to those of the United States in the machinery area. *1965 estimate.* Extrapolated from 1960-67 in accordance with Japanese index of output of machinery and transport equipment.

# INDUSTRIAL LOCATION POLICY IN THE U.S.S.R. DURING THE POSTWAR PERIOD

By I. S. KOROPECKY\*

## CONTENTS

|  | Page |
|--|------|
| I. The reasons for and the development of regionalization.....   | 233  |
| The importance of territorial subdivisions in the U.S.S.R.....   | 233  |
| The underlying principles of Soviet regionalization.....   | 237  |
| Recent developments of Soviet regionalization.....   | 239  |
| The relationship between union republics and economic regions.....                                     | 240  |
| II. Empirical analysis of locational objectives.....   | 244  |
| Statistics.....  | 244  |
| Equalization of industrialization levels.....  | 246  |
| Some implications in regard to population welfare.....   | 248  |
| Growth rates of industry.....  | 250  |
| Growth rates of population.....  | 253  |
| Distribution of investment.....  | 254  |
| Productivity of resources.....   | 257  |
| Defense considerations.....  | 262  |
| III. Geopolitical aspects of location policy.....  | 263  |
| An alternative hypothesis; the colonial exploitation of non-<br>Russian nationalities by Russians..... | 264  |
| The problem of China and the Baltic nations.....   | 267  |
| Eastern regions.....   | 270  |
| Economic advantages of western regions.....  | 277  |
| Particular appeal of metropolitan areas.....   | 280  |
| Conclusions.....   | 283  |

## TEXT TABLES

|  |     |
|--|-----|
| 1. Selected indicators of industrial development of republics and regions<br>in the U.S.S.R. in 1967 (percent).....  | 247 |
| 2. Weighted coefficients of variation of various indicators for republics<br>of the U.S.S.R. and regions of the R.S.F.S.R. for selected years.....                         | 248 |
| 3. Index of industrial gross output per capita and of national income per<br>capita by republics of the U.S.S.R. for selected years.....                                   | 249 |
| 4. Annual growth rates of gross industrial output by republics and regions<br>of the U.S.S.R., 1950-67.....  | 251 |
| 5. Annual growth rates of population by republics and regions of the<br>U.S.S.R., 1950-67.....   | 254 |
| 6. Index of industrial investment per capita by republics of the U.S.S.R.,<br>1951-65.....   | 255 |
| 7. Index of investment per capita in state and cooperative enterprises<br>(excluding kolkhozes) of the U.S.S.R. and regions of the Russian<br>S.F.S.R., 1959-65.....       | 256 |
| 8. Incremental capital-output ratios for total industry and individual<br>branches by selected republics of the U.S.S.R., 1958-65.....                                     | 259 |
| 9. Growth rates of implied productivity of combined labor and capital<br>for total industry and individual branches by selected republics of<br>the U.S.S.R., 1958-65..... | 261 |
| 10. Distribution of industrial gross output by eastern regions of the<br>U.S.S.R. for benchmark years.....   | 272 |

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|   | Page |
|---|------|
| 11. Distribution of industrial gross output by selected western regions of the U.S.S.R. for benchmark years.....  | 277  |
| 12. Distribution of industrial gross output and investment in state and cooperative enterprises (without kolkhoz) by selected western regions of the U.S.S.R., 1958-67..... | 278  |

## APPENDIX TABLES

|   |     |
|---|-----|
| A-1 Area, population, and output of industry, and industrial output per capita by republics and regions of the U.S.S.R. for selected years..                | 286 |
| A-2 Indexes of gross output of industry by republics and regions of the U.S.S.R., 1940-67.....  | 288 |
| A-3 Investment in industry by republics of the U.S.S.R., 1951-65.....   | 289 |
| A-4 Indexes of gross output, employment, fixed capital, and implied productivity of inputs in industry of the U.S.S.R. and selected republics, 1958-65..... | 290 |
| U.S.S.R.....  | 290 |
| R.S.F.S.R.....  | 290 |
| Ukraine.....  | 291 |
| Belorussia.....   | 291 |
| Moldavia.....   | 291 |
| Lithuania.....  | 292 |
| Latvia.....   | 292 |
| Estonia.....  | 292 |
| Georga.....   | 293 |
| Armenia.....  | 293 |
| Kazakhstan.....   | 293 |
| Uzbekistan.....   | 294 |
| Kirghizia.....  | 294 |
| Tadzhikistan.....   | 294 |
| A-5 Distribution of employment and fixed capital for individual industrial branches by republics of the U.S.S.R. in 1965.....                               | 295 |

## I. THE REASONS FOR AND THE DEVELOPMENT OF REGIONALIZATION

The purpose of this paper is to discuss the industrial location policy in the U.S.S.R. after World War II. The paper is divided into three parts. The first part describes the reasons for, underlying principles, and the development of the division of the U.S.S.R. into republics and regions which serve as an institutional framework for investment policy. An empirical analysis in the second part attempts to determine whether the officially proclaimed objectives were indeed decisive for the geographic distribution of investment. In the third part, the objective of strengthening national defense, which appears to be of overriding importance for this policy, is explored in greater detail.

## THE IMPORTANCE OF TERRITORIAL SUBDIVISIONS IN THE U.S.S.R.

The U.S.S.R. is a large country, accounting for about 16 percent of the world's area and 7 percent of the world's population. As such, it contains regions which differ radically in regard to climatic and natural conditions. One need think only of subarctic areas of the north, of the deserts of Central Asia, of the long-inhabited regions in the west of the country, or of the inaccessible empty expanses of Siberia. For this reason alone, it is more urgent for the U.S.S.R. than for any other more homogeneous country to supplement any analysis dealing with the whole country with an analysis of individual regions.

The diversity of the U.S.S.R. is reinforced by the presence of a large number of nationalities, varying extensively in population size, inhabiting their ethnic territories, using various languages, having different history and tradition, and characterized by different levels of cultural, social, and economic achievement. In the spirit of Communist ideology, the Soviet Constitution guarantees all nationalities complete equality and self-government.<sup>1</sup> Depending primarily on the size of population and on geographical location, these nationalities are organized into union republics, autonomous republics, autonomous *oblasts*, or national districts. There are 15 union republics, the larger of which, for administrative convenience, are subdivided into *oblasts*, while the *oblasts*, in turn, are divided into *raions*. The autonomous republics or *oblasts* are included in some union republics, while national districts constitute parts of some *oblasts*.<sup>2</sup> The Soviet authorities often proclaim that the national borders are sacrosanct within the U.S.S.R. This, in practice, should mean that an ethnic territory cannot be divided between two union republics or two autonomous republics.<sup>3</sup>

It should be stated emphatically that the reference to the federal structure of the U.S.S.R., consisting of republics, does not imply a great deal of decentralization of the power structure. The U.S.S.R. is a highly centralized state and decision-making in economics as in all other important affairs is held exclusively in the hands of the Central Committee of the Communist Party in Moscow.<sup>4</sup> Although each republic has an explicit right to approve its own economic plan and its own state budget, and in the capital of each are organized various economic ministries and agencies,<sup>5</sup> in reality all basic decisions are made in Moscow. The republics' ministries and agencies, not having power over the local resources and revenues, are in effect nothing more than the executors of orders issued by their respective superiors in Moscow. Therefore, references to a republic, in discussing a certain problem, should not be interpreted to mean that the nationality which gives the name to this particular republic can decide about the problem under consideration. It simply means that this problem deals with a territorial subdivision of a centrally planned economy on which happens to live an ethnic nationality in a compact mass, although sometimes not even in a majority of the total population.<sup>6</sup> On the other hand, needless to say, economic decisions made in Moscow in regard to any particular republic vitally affect the welfare of its population.

<sup>1</sup> Article 15 of the Soviet Constitution guarantees the sovereignty of union republics in all aspects subject only to the limitations as stated in article 14. Article 14 assures the control of all-union government over the enterprises of nationwide importance. See *Konstitutsiia (osnovnyi zakon) Soiuza Sovetskikh Sotsialisticheskikh Respublik*, Moscow, 1960.

<sup>2</sup> The subsequent discussion will deal with the union republics only; therefore, they will be referred to simply as republics.

<sup>3</sup> Actually there are important discrepancies between political and ethnic boundaries within the U.S.S.R. For instance, substantial parts of Ukrainian and Belorussian ethnic lands are included in the Russian S.F.S.R., and of Armenian lands in the Georgian S.S.R. and the Azerbaidzhan S.S.R.

<sup>4</sup> Leon M. Herman, "The Economic Retardation of the Non-Russian Nationalities in the U.S.S.R.," in U.S. Library of Congress, Legislative Reference Service, *The Soviet Empire a study in discrimination and abuse of power*, Washington, U.S. Government Printing Office, 1965, pp. 91-93 (91-104).

<sup>5</sup> See, for example, *Konstitutsiia (osnovnyi zakon) Ukrain'skoi Radians'koi Sotsialistichnoi Respubliki*, Kiev, 1967, Articles 19, 39-53.

<sup>6</sup> For example, according to the 1959 census, Kazakhs represented 30.0 and Kirghizes 40.5 percent of the total population of the respective republics. See U.S.S.R. Tsentral'noe statisticheskoe upravlenie (TsSU), *Narodnoe khoziaistvo SSSR v 1960 godu*, Moscow, Gosstatizdat, 1961, pp. 18, 20. (In what follows, reference will be made to various Soviet statistical yearbooks. All of them are published by the Central Statistical Administration of the Council of Ministers of the U.S.S.R. (Tsentral'noe statisticheskoe upravlenie pri Sovete Ministrov SSSR) or of one of the fifteen union republics, as the case may be. The source will be cited for the first time in the manner given above. Subsequent references will be in the abbreviated form, e.g. *N. kh. SSSR 1960*, pp. 18, 20.)

While the subdivision of the country into national units even of various sizes may be useful for conventional administrative purposes as well as for the management of the national economy in the sense of carrying out centrally prepared orders, it is inappropriate as a basis for the perspective planning. This is so because of the much too diverse size of the republics. For instance, the Russian S.F.S.R. is almost a hundred times larger than the Estonian S.S.R. in terms of population, and more than 500 times larger than the Moldavian S.S.R. in terms of area. In order to serve as a tool for economic planning, the regions—referred to in the Soviet literature as large economic regions, or, since the elimination of *sovmarkhozy* in 1965, simply as economic regions—should be comparable in size and at the same time large enough in terms of output, and natural and labor resources to facilitate relatively self-sufficient but by no means completely closed economic development.<sup>7</sup> The primary objective of division of the country into regions is to further the development of the entire national economy along the lines chartered by the perspective plans.

The basic prerequisite for achieving the goals of these plans is an effective investment program. Thus, the organization of the country into a meaningful regional system should provide, first of all, a framework for efficient territorial distribution of industrial investment.<sup>8</sup> In the view of Soviet economists, investment distribution in its territorial aspect will be efficient when a number of locational objectives are met.<sup>9</sup> According to their character, these objectives<sup>10</sup> can be classified into three groups: (1) purely economic; (2) combined economic, social, and political; and (3) purely political.

(1) In the first group the following objectives can be included: increase in productivity of resources; rational exploitation of natural resources—depending on their quality and location—and their efficient utilization; providing full employment for labor resources and their rational utilization; elimination of differences between the city and countryside based on differences between industrial and agricultural employment; location of enterprises near sources of raw materials, fuel and energy, industrial materials and semifabricates and, at the same time, near consumption centers, all of which should result in the minimization of transportation costs; specialization of economic regions and administrative subdivisions in production of goods in which these territorial units are most efficient; complex development of all territorial subdivisions; elimination of concentration of economic activity in large cities by location of new enterprises in middle- and small-sized towns possessing the necessary labor, raw materials, water, and other requisite resources; providing favorable living conditions for the population. The implementation of all these objectives or, more realistically, of some of them, as the case may be, would result in the attainment of the basic economic goal: maximization of total output for the entire country essentially over the short run.

<sup>7</sup> Liudmila Nikolaevna Telepko, *Krupnye ekonomicheskie ratony SSSR*, Moscow, Izd.-vo ekon. lit.-ry, 1963, p. 61.

<sup>8</sup> The locational problem can be treated on two levels: in which region to develop an industrial branch, or on which site to construct an individual plant. In this study, only the former aspect is discussed.

<sup>9</sup> For background discussion of this problem and relevant literature, see this writer's "The Development of Soviet Location Theory before the Second World War," *Soviet Studies*, v. 19, nos. 1 and 2, July and October, 1967, pp. 1-28, 232-244.

<sup>10</sup> Cf. A. Ivanchenko, "Problemy ratsional'nogo razmeshchenia proizvoditel'nykh sil i ispol'zovaniia trudovykh resursov," *Plannoe khoziaistvo*, v. 45, no. 3, March 1968, pp. 85-86 (86-90).

(2) The goal of equalization of economic development—meaning primarily industrial development<sup>11</sup> among the regions and republics of the U.S.S.R. comprises social and political elements in addition to the economic ones. The economic function of this goal is as follows: if industry in a backward region grows faster than it does, on the average, for the entire country, this is equivalent to an expansion of the market; and the wider the market, the greater the opportunity for the division of labor, including geographic division of labor.<sup>12</sup> The effect of the increase in the division of labor on the economic growth is obvious.

The equalization of economic development among regions for social purposes is an accepted goal of economic policy in general. However, this goal is of particular importance in the U.S.S.R. which—as an equalitarian society—is obliged to assure equal opportunity for a higher standard of living and for the social advancement to all its members.<sup>13</sup> Such a goal would be most easily realized if the inhabitants of all regions had the same opportunity to be employed in industry, as opposed to agriculture. Moreover, this goal has an additional and even more important meaning in the U.S.S.R. According to the official doctrine, the Socialist (and eventually Communist) society can come into being only in a highly industrialized society. This means, of course, that the U.S.S.R. cannot be considered a Socialist or Communist society until all its territorial subdivisions are developed in this fashion.

Finally, the goal under consideration has an important political implication for the U.S.S.R. as a multinational state. According to the Marxist-Leninist theory, inequality among nations in political, social, or cultural aspects will disappear only when economic inequality among them will be eliminated. It follows that in the U.S.S.R. the inequality inherited from the Czarist regime, in these respects, among various nationalities, cannot be considered eliminated as long as there still exists inequality in the level of economic development.<sup>14</sup> The more reasonable among Soviet economists, while on the one hand, faithfully repeating the official slogans about the urgent need to equalize the levels of economic development among republics and regions, on the other hand warn their readers that these phrases should not be taken literally. They argue that natural conditions and resources, the size and density of population, geographic location, and the availability of transportation will continue for a long time to come to exert a differential effect on the economic growth of these subdivisions.<sup>15</sup> Obviously these economists fail to mention the implication, in Marxist terms, of their conclusions for the problem of political or cultural inequality among the nations of the U.S.S.R.

(3) The purely political objective refers to the defense of the country. It postulates that through the planning of geographic distri-

<sup>11</sup> Recently, however, isolated voices are heard which question the primacy of industry for economic development and also the primacy of heavy industry for the development of industry itself. See P. Voloboi and V. Popovkin, "Pro pokaznyky hospodars'koho rivnia raioniv ta oblastei," *Ekonomika radians'koi Ukrainy*, v. 11, no. 10, Oct. 1968, pp. 56, 59-60 (55-61).

<sup>12</sup> V. Rutgalzer, "Torzhestvo leninskoi natsional'noi politiki v ekonomicheskom stroitel'stve," *Kommunist*, v. 45, no. 18, December 19 pp. 68, 24-25 (24-35).

<sup>13</sup> Kazimierz Dzielowski, "Theoretical Problems in the Development of Economic Regions," in Regional Science Association, *Papers and Proceedings*, v. 8, 1962, p. 45.

<sup>14</sup> For a detailed discussion of this problem, see Vsevolod Holubnychy, "Some Economic Aspects of Relations Among the Soviet Republics," in Erich Goldhagen, ed., *Ethnic Minorities in the Soviet Union*, New York, Praeger, 1968, pp. 50-54.

<sup>15</sup> Cf. Akademiia nauk SSSR, Institut ekonomiki, *Zakonomernosti i faktory razvitiia ekonomicheskikh raionov SSSR* (Iakov Grigor'evich Feigin, ed.), Moscow, Nauka, 1965, p. 36.

bution of industry, great attention can be paid to the needs of national security. Since the time when one of the early Soviet leaders wrote: "In every new undertaking, economic, cultural, and so forth, one must always ask the question: How will the results of this undertaking fit into the defense of the country?"<sup>16</sup> no Soviet economist, while discussing locational policy, failed to emphasize the importance of defense considerations for this policy.

#### THE UNDERLYING PRINCIPLES OF SOVIET REGIONALIZATION

While it is fairly easy to subdivide the Soviet economy according to the nationality principle, its division into economic regions is a difficult task. If in the former case, it is sufficient to depend on the ethnic and historical boundaries, the latter division requires a well-established concept of an economic region. This is, however, a perplexing problem for Soviet economists as it is also for their Western counterparts. According to one American authority in this field, the concept of a region depends on the problem at hand. The region is established in order to validate a certain economic doctrine.<sup>17</sup> According to another source, this concept is used simply to allow a researcher to describe certain characteristics of neighboring geographical areas.<sup>18</sup> In general, the concept of a region implies some kind of homogeneity or cohesion of an area, in some respect, as contrasted with other areas. Traditionally three criteria of homogeneity have been employed in regional studies:<sup>19</sup> (1) homogeneity of physical, economic, or social characteristics or their combinations; (2) nodality or polarization around some central urban place; and (3) unity of administrative entity, primarily in order to facilitate various policy implementations. In practice, some combinations of these criteria have been used, but their choice was most often influenced by the availability of statistical data.

Soviet economists consider pragmatic approach toward the determination of regions in the West as subjective. Following Marxist methodology, they contend that the economic region is an objective and historical category characterized by specific internal economic relations on the one hand and by economic relations with the rest of the national economy on the other. Thus this concept stresses a measure of economic integration of the region and also the fact that that region is part of a larger entity—the entire national economy. Furthermore, this is not a static but a dynamic concept for Soviet economists. They believe that on the basis of historical and empirical studies, general laws of regional economic development may be established. The knowledge of these laws should equip the planners in the socialist economy, they argue, with a effective tool for planning the efficient development of individual regions.<sup>20</sup>

<sup>16</sup> This statement by M. V. Frunze, an early leader of the Red Army, made in 1924, is quoted in Vasilii Danilovich Sokolovskii, ed., *Soviet Military Strategy*; translated and with an analytical introduction, annotations, and supplementary material by Herbert S. Dinerstein and others, New York, Prentice-Hall, 1963, p. 118.

<sup>17</sup> Walter Isard, "Regional Science, the Concept of Region, and Regional Structure," in Regional Science Association, *Papers and Proceedings*, v. 2, 1956, pp. 18-19. However, according to Isard, as these doctrines become more general it is possible, at least in theory, that the concept of a "true" region may eventually emerge. But even this "true" concept would have to be modified with changed conditions.

<sup>18</sup> Harvey S. Perloff, and others, *Regions, Resources, and Economic Growth*, Baltimore, Johns Hopkins Press, 1960, p. 3.

<sup>19</sup> John R. Meyer, "Regional Economics: A Survey," *American Economic Review*, v. 53, no. 1, pt. 1, March 1963, p. 22 (19-54).

<sup>20</sup> Cf. Petr Martynovich Alampiev, *Ekonomicheskoe raionirovanie SSSR*, [v. 1.] Moscow, Izdat. ekonomicheskoi literatury, 1959; v. 2, Moscow, Gosplanizdat, 1963, v. 2, Chapter I; and Akademiia nauk SSSR, *op. cit.*, pp. 9-14.

There is a lack of unanimity in the U.S.S.R. as to which of the various geographic, demographic, and, most of all, economic indicators should actually be used for the identification of a region. The use of one set of indicators instead of another would give entirely different results. At the present time, the opinion seems to prevail that in order for a part of a country to be considered as a region, two basic characteristics must be present.<sup>21</sup> First, because of climate, natural resources, and working habits of the population, each region has an absolute advantage over other regions in production of a certain commodity or group of commodities. Because of these advantages and because of economies of scale, it is most desirable for the entire national economy to promote the specialization of each region in an appropriate direction and thus to expand the territorial division of labor within the entire country. Second, at the same time, in order to utilize all available resources and to keep the demand for transportation services low, the structure of production in each region should be diversified or, as Soviet economists call it, complex.<sup>22</sup> This does not mean that each region should produce everything. Rather, the concept of complex development is interpreted to mean that the output of each region should have a three-layer structure: it should possess branches in which it specializes on a nationwide scale, branches which are suppliers of inputs to specialized branches or consumers of output of the latter, and branches which utilize local resources for production of building materials, food, and other consumer goods for local demand. Soviet economists ascribe to the complex structure one additional important function. They believe that the requirement to develop industry in such a fashion will exert added pressure for even greater growth of the machine-building and chemical industries. In Soviet literature, these are called progressive branches and their development is particularly desired, because technical progress finds its embodiment chiefly in their products.<sup>23</sup>

Finally, the complex development of regions is needed for defense purposes. Such regions reduce the need for the transportation of inputs; therefore, industrial production is easier mobilized and accelerated, and the flow of supplies to the armed forces is assured in the case of war.<sup>24</sup> Furthermore, in the case of atomic war, it is most probable that the communication between the country's capital and various regions would be destroyed. If the regions have succeeded in the complex development of their economies and on this basis a military apparatus has been organized, they would be capable of providing an independent base for military operations.<sup>25</sup>

<sup>21</sup> Alampiev, *op. cit.*, v. 2, Chapters II and III; Akademiia nauk SSSR, *op. cit.*, Chapter III. Alampiev and another economist, S. P. Tokarev, are credited with the preparation of conceptual framework for the present regionalization system in the U.S.S.R. See Telepko, *op. cit.*, p. 61. The other important school follows the general approach of N. N. Kolosovsky. He was in favor of determination of regional structure in which the boundaries would reflect the geographical extent of various production cycles. See for discussion of this problem, Richard E. Lonsdale, "The Soviet Concept of the Territorial-Production Complex," *Slavic Review*, v. 24, no. 3, September 1965, pp. 466-478.

<sup>22</sup> Cf. Vi tor Vasilevich Kistanov, *Kompleksnoe razvitiie i spetsializatsiia ekonomicheskikh raionov SSSR*, Moscow, Nauka, 1968, p. 17. However, some economists argue that complex development is more feasible on the republic's level than within an economic region. While a republic possesses administrative (managing) as well as planning agencies, a region has only a planning commission with only advisory functions which until now has failed to any appreciable degree to influence the complex formation of the economy within a region. See L. M. Korets'kyi and M. M. Palamarchuk, *Heohrafiia promyslovosti Ukraini's'koi RSR*, Kiev, 1967, p. 79.

<sup>23</sup> Telepko, *op. cit.*, p. 124.

<sup>24</sup> Sokolovskii, *op. cit.*, pp. 450-51.

<sup>25</sup> N. Galay, "The Economic and Military Division of the U.S.S.R.," *Bulletin [of the] Institute for the Study of the U.S.S.R.*, v. 9, no. 12, December 1962, p. 31. For this reason, the boundaries of economic regions and military districts in the U.S.S.R. coincide for the most part since 1961. See Appendix to Galay's article.



## RECENT DEVELOPMENTS OF SOVIET REGIONALIZATION

Various regional schemes have been in effect during the history of the U.S.S.R.<sup>26</sup> However, since the planning was highly centralized and based on the primacy-of-branch principle, the existence of regions had no practical significance for planning purposes until the mid-1950's. Only with the territorial decentralization reforms in 1957,<sup>27</sup> did the attention to regional problems increase greatly. As a result of studies conducted by the U.S.S.R., Gosplan at that time, a new system of large economic regions was approved officially in April 1961.<sup>28</sup> It is reported that this system served as a basis for the preparation of the territorial aspects of the long-term plan for 1961-80 and for the current (1966-70) Five-Year Plan.<sup>29</sup>

The functions assigned to the economic regions are quite limited. The regions have no responsibilities for the management of the economy, but are expected to concern themselves primarily with planning. For this purpose there was established in each of them a council for coordination and planning which, in 1963, was replaced by, or more likely renamed, the planning commission. These bodies were expected to coordinate the work of the *sovmarkhozy*, as long as the latter existed, to study the distribution, availability, quality, etc. of economic resources, and to supply recommendations and suggestions to the republics' and all-union Gosplans.<sup>30</sup>

As with anything else in the U.S.S.R., there are wide swings in the degree of attention paid to the problems of regionalization. While regionalization was virtually ignored before 1957, the subsequent period witnessed a veritable flood of different studies, of varying quality and size, and, most welcome of all, an ample supply of statistical data for individual regions. This attention to territorial planning proved to be short lived. The 1965 reform brought with it an evident decline in the interest in this matter.<sup>31</sup> However, according to the chairman of the Uzbek Gosplan, this development is contrary to the spirit of reform, which is supposed to place equal importance on both branch and territorial planning.<sup>32</sup> In any event, since 1965 there have been, unfortunately fewer regional data available.

Despite so much attention to the problems of regional planning between the late 1950's and the mid-1960's, very little has been done toward its implementation. This can be inferred from several complaints which were voiced at the Economic Conference in Moscow in the summer of 1968. Thus, according to the chairman of the Russian Gosplan, all plans for the Russian S.F.S.R. are still prepared by the all-union Gosplan.<sup>33</sup> Furthermore, various all-union and union-

<sup>26</sup> For the history of Soviet regionalization, see Alampiev, *op. cit.*, v. 1.

<sup>27</sup> The essence of this reform was the dissolution of the bulk of industrial ministries in Moscow and of their republican counterparts, and the transfer of their planning and supervisory functions over industrial enterprises to some hundred-odd territorial Councils of National Economy (*sovmarkhoz*) created for these purposes. Later, in February 1963, some of the *sovmarkhozy* were merged and, as a result, their number was reduced to 47. See *Ekonomicheskaya gazeta*, no. 7(80), February 16, 1963, p. 13.

<sup>28</sup> Vasilii Mikhailovich Kostennikov, ed., *Ekonomiko-geograficheskie raiony SSSR*, Moscow, Prosveshchenie, 1965, p. 20.

<sup>29</sup> *Ibid.*

<sup>30</sup> Cf. V. Pavlenko, "Ekonomicheskoe raionirovanie v novykh usloviakh," *Ekonomicheskaya gazeta* no. 42(115), October 19, 1963, pp. 12-13.

<sup>31</sup> *Pravda*, October 3, 1965. This reform actually reversed the system of planning and management of industry to the pre-1957 situation, although it repeatedly affirmed that now the coordination between branch and regional principles will be much closer and better than before. Specifically, the *sovmarkhozy* were dissolved and their functions were transferred to the industrial ministries, which reappeared.

<sup>32</sup> S. Ziladulliev, "Vazhnoe uslovie planovogo rukovodstva," *Ekonomicheskaya gazeta*, no. 23, June 1968, p. 10.

<sup>33</sup> K. M. Gerasimov, "Za dal'neishii pod'em ekonomiki respublik," *ibid.*, no. 22, May 1968, p. 10.

republican economic ministries do not bother to work out the republics' breakdowns of various indicators for labor, profits, cost of production, research and development, introduction of new technology, and many other details for industry and construction.<sup>34</sup> The extent of deficiency of the regional planning was admitted by the chairman of the U.S.S.R. Gosplan in the following terms:<sup>35</sup>

Not infrequently individual measures of ministries are undertaken without agreement with union republics. At the present time, territorial planning, to a large degree, ends in the mechanical throwing together of more important targets for a republic or an economic region, compiled in the process of preparation of plans for ministries and union republics. Their correspondence to the needs and requirements of complex development of large regions is insufficiently analyzed.

These conditions are especially intolerable to the officials responsible for the economic decisions in republics. They believe that without expanded regional planning no progress toward attaining most economic and noneconomic locational objectives can be achieved.<sup>36</sup> Therefore, they argue that the preparation of plans should proceed simultaneously and independently along both branch and regional channels and the final version of plans should be the result of close cooperation of all-union and republics' Gosplans.<sup>37</sup> The proposals for better coordination between branch and territorial planning are not new in the U.S.S.R.; since the inception of central planning they were periodically advanced but never fully implemented. In view of rigidly centralized decision-making, one can be justifiably skeptical as to whether they will be implemented this time.<sup>38</sup>

#### THE RELATIONSHIP BETWEEN UNION REPUBLICS AND ECONOMIC REGIONS

The existing regional system of the U.S.S.R. (see fig. 1) is the result of the 1961 reforms and of the amendments made in 1963.<sup>39</sup> It divides the country into 18 economic regions. The relationship between these regions and republics is as follows: two republics contain more than one region: the Russian S.F.S.R., ten; and the Ukrainian S.S.R., three; two republics, the Belorussian S.S.R. and the Kazakh S.S.R., represent individual regions; the remaining republics are grouped into

<sup>34</sup> Ziladullaev, *op. cit.*, p. 11.

<sup>35</sup> N. Balbakov, "Plan i proizvodstvo v novykh usloviakh," *Pravda*, October 1, 1968, p. 2. This statement implies that the department of regional planning by the U.S.S.R. Gosplan is not yet working effectively. According to Kistanov, *op. cit.*, p. 43, such a department, with six subdivisions, was introduced in September 1965, and was charged with the preparation of republics' and regional plans in cooperation with republics' Gosplans.

<sup>36</sup> A. Belov, and others "Sovershenstvovat' planirovanie i ekonomicheskuiu rabotu," *Kommunist Ukrainy*, v. 43, no. 8, Aug. 1968, pp. 17-18 (14-25).

<sup>37</sup> P. A. Rozenko (chairman of the Ukrainian Gosplan), "Edinyi plan kompleksnogo razvitiia," *Ekonomicheskaya gazeta*, no. 22, May 1968, pp. 11-12. Two other economists, one of them an official of the Ukrainian Gosplan, while also arguing for a greater attention to the territorial planning, believe that it could be effective only on the basis of material balances for republics and regions. However, such balances must be developed first, because few are available as yet. See O. Nevelev and V. Reznikov, "Plan i ekonomichna efektyvnist'," *Radians'ka Ukraina*, no. 182, August 7, 1968, p. 2.

<sup>38</sup> Thus not surprisingly a conference on the geographical distribution of production in Donetsk in April 1969, "especially emphasized that after the reconstruction of administration of industry according to the branch principle nothing was really done in regard to the organization of territorial planning. In this connection proposals for the improvement of territorial planning and for the increase in the role of territorial planning agencies have been advanced." See *Ekonomika radians'koi Ukrainy*, v. 11, no. 8, Aug. 1969, p. 95.

<sup>39</sup> Originally, in 1961, the number of regions amounted to 17. The adjustments of November 1962 and September 1963 upgraded the Belorussian S.S.R. to an economic region, transferred the Kaliningrad *oblast* from the Northwest to the Baltic region, and changed the boundaries of individual regions in the following ways: Bashkirian A.S.S.R. was transferred from the Urals region to the Volga region, Kalmyk A.S.S.R. from the North Caucasus to the Volga region, Iakutian A.S.S.R. from East Siberia to the Far East region, Orel *oblast* from the Central Black Earth to the Central region, and Kirovograd *oblast* from the Southwest to the Donets-Dnieper region. Comparison of 1964 and 1965 statistical yearbooks shows that the Tiumen *oblast* has been transferred from the Urals to the West Siberian region. For the discussion of these changes, see Z. Mieczkowski, "The 1962-1963 Reforms in Soviet Economic Regionalization," *Slavic Review*, v. 24, No. 3, September 1965, pp. 493-404 (479-496), and, by the same author, "The Major Economic Regions of the U.S.S.R. in the Khrushchev Era," *Canadian Geographer*, v. 9, No. 1, 1965, pp. 23-25 (19-30).

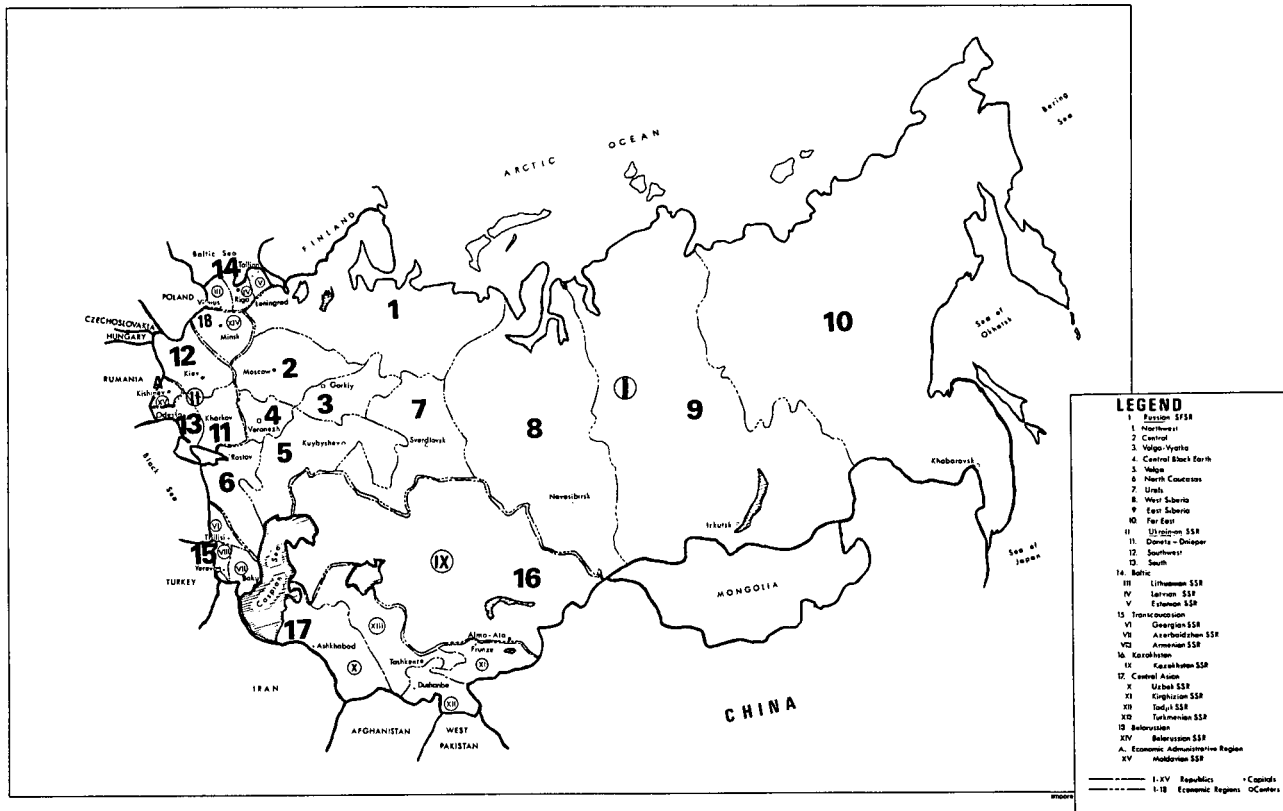
three regions; namely the Baltic (Lithuanian S.S.R., Latvian S.S.R. and Estonian S.S.R. and the Kaliningrad *oblast*, which for planning purposes has been separated from the Russian S.F.S.R.); the Transcaucasian (Georgian S.S.R., Azerbaidzhan S.S.R., and Armenian S.S.R.); and the Central Asian (Uzbek S.S.R., Kirgiz S.S.R., Tadzhik S.S.R., and Turkmen S.S.R.). The Moldavian S.S.R. does not belong any region and, being too small to be a region by itself, is called an economic administrative region.<sup>40</sup>

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<sup>40</sup> Subsequently, the names of republic will be used in the abbreviated form e.g.; R.S.F.S.R., the Ukraine, etc.

Figure 1.

UNION REPUBLICS AND MAJOR ECONOMIC REGIONS OF THE U.S.S.R.: 1968



As can be seen, this regional framework transcends the boundaries of republics, combining some of them into regions and subdividing the two largest republics into a number of regions. This fact has an important political implication. It can be better understood if the relationship between economic regions and political units is stated in Marxist terms. To quote an authority on this subject, there are two basic forms of this relationship:<sup>41</sup>

(1) An economic region develops out of a changing regional structure, and there arises a tendency to adjust administrative structure and divisions to this new but important economic and social fact;

(2) a new administrative division starts to influence the existing regional structure, bringing into being new economic regions, and adjusting the existing economic regions to its boundaries.

Moreover, in planning we sometimes create a third, intermediary situation in the form of an administrative division which is designed to further development of an intended regional structure and system of economic regions. In Marxist terminology, in the first case, productive forces develop their own political superstructure. In the second case, political superstructure harnesses productive forces to its own purposes. In the third, productive forces and political superstructure are welded together for the purpose of economic and social development.

Thus, it seems that Khrushchev's reforms of 1961, being of type (1) and resulting in the present regional system, attempted to lay the economic groundwork for a radical revision of the administrative and political structure of the U.S.S.R. These reforms might have been aimed at the weakening and eventual elimination of union republics, through the gradual transfer of remaining planning and managing functions from some republics to the regions into which they were merged and, for the two largest republics, to the regions into which they were split.

That the above reforms had probably in mind exactly this prospect for the republics becomes apparent when judged against the background of general tendencies in regard to the nationalities problem in 1961, the year of the 22d Party Congress. According to its resolutions, the U.S.S.R. ushered in the period when "the construction of the material and technical base of communism leads to even closer union of Soviet nations."<sup>42</sup> In addition to the greater use of Russian language by all nationalities and greater mobility of populations, primarily of skilled personnel, among the republics, this union will be facilitated by the deemphasis of national boundaries, as reflected in the new regional division. This is because, as this document asserts, "the boundaries of union republics of the U.S.S.R. are increasingly losing their former significance" as the Soviet nations are approaching communism.<sup>43</sup> Consequently, it is clear that regional division, based chiefly on economic considerations, will rise in importance. This process will be consummated in due course when the appropriate administrative organs, replacing union republics, will be created. A first step in this direction can be considered to be the creation of the Bureau for Central Asian Affairs of the C.P.S.U., with the alleged objective of working closer with the four Central Asian republics, which probably meant of supervising them. A similar agency was set up for the three Transcaucasian republics.<sup>44</sup>

<sup>41</sup> Dzielowski, *op. cit.*, p. 52.

<sup>42</sup> XXII s'ezd kommunisticheskoi partii Sovetskogo Soyuza, Moscow, 1962, p. 405.

<sup>43</sup> *Ibid.* For further discussion of this problem, primarily in regard to the Ukrainian S.S.R., see Yaroslav Bilinsky, "Assimilation and Ethnic Assertiveness Among Ukrainians of the Soviet Union" in Goldhagen, *op. cit.*, pp. 153 ff.

<sup>44</sup> Herman, *op. cit.*, p. 103.

There are indications that the representatives of concerned republics showed some resistance to this trend. It is reported that Belorussia refused to be merged with the Baltic republics into one Western region.<sup>45</sup> Similar objections by Transcaucasian economists proved to be unsuccessful. Their argument that the merger of national republics into economic regions is contradictory to the sovereignty principle was rejected by the party-line economists on the grounds that economic regions do not possess any administrative power<sup>46</sup> and, above all that these mergers are economically justified and necessary. It was stated furthermore that for the time being the borders among national units still have been respected.<sup>47</sup> However, should these borders become an obstacle to further economic growth, they undoubtedly will be revised, as was the case a few times during the postwar period.<sup>48</sup>

As mentioned earlier, the fall of Khrushchev in 1964 brought with it the subsiding of interest in regional development and also in the notion that nationalities of the U.S.S.R. should grow closer to each other.<sup>49</sup> This was also evidenced, among other things, by the dissolution of the previously mentioned Bureau for Central Asian Affairs.<sup>50</sup> Presently, the planning and the management of the national economy are again based primarily on the branch principle, with the emphasis on the shifting of decision-making away from Moscow, not to some regional subdivisions, but directly to the enterprises.

## II. EMPIRICAL ANALYSIS OF LOCATIONAL OBJECTIVES

The discussion in the preceding part indicates that the organization of the U.S.S.R. into republics and, even more so, into regions has aimed to equip the planners with a tool for bringing about an efficient territorial distribution of industry. As was indicated there, according to Soviet economists, the distribution will then be efficient only if the industrial output for the entire country is maximized, industry developed equally in all republics and regions, and the country's defense strengthened. An attempt will be made in this part to determine empirically to what extent these objectives were actually achieved. For the purpose of analysis, republics mainly will be used as territorial units and, in cases where the information is available the same will apply to the regions of the Russian and Ukrainian republics.

### STATISTICS

Because of unchanged state boundaries, of the absence of major external and internal disturbances, and of considerable availability of statistical data, the discussion will be limited to the postwar period. Benchmark years, 1950, 1958, 1965 and 1967 were chosen in most cases. It was in 1950 that the completion of reconstruction of the Soviet economy from war damages was officially announced. That year

<sup>45</sup> Alampiev, *op. cit.*, v. 2, p. 213.

<sup>46</sup> This is not true, because, as stated above, the Bureau for Central Asian Affairs had administrative powers.

<sup>47</sup> Alampiev, *op. cit.*, v. 2, pp. 220-21.

<sup>48</sup> Thus, the R.S.F.S.R. turned over to the Ukraine the Crimean peninsula in 1954; Kazakhstan turned over to Uzbekistan the Bostandik district and a part of the Golodnala steppe (also known as Bet-Pak-Dala), while Uzbekistan gave to Tadzhikistan another part of this steppe in 1956; in 1963, Kazakhstan turned over to Uzbekistan the Pakhta-Aral' and Kirov districts and some other territories. See *ibid.*, p. 144.

<sup>49</sup> The present Secretary General of the CPSU, L. I. Brezhnev, in his speech before the 23d Party Congress, limited himself only to calling the participants to work for greater friendship and brotherhood among the nations of the Soviet Union in order that their economic, cultural, and spiritual ties become closer. See *XXIII s'ezd kommunisticheskoi partii Sovetskogo Soiuza*, v. 1, Moscow, 1966, p. 104.

<sup>50</sup> *Pravda*, December 23, 1964.

can thus be considered as the first normal year after the war. In January 1959 the first postwar census of population took place. Its results, combined with other data for 1958, give the first reliable per capita information for relevant geographical subdivisions—a matter of great importance for this kind of study. Finally, 1967 is the most recent year for which some of the necessary data are available. But, as a result of general deemphasis of regional problems during the last three or four years, the most recent data are often available only for 1965. Therefore, in certain cases this year has to serve as the most recent benchmark year.

All statistical data in this study are taken from Soviet sources, mainly from official statistical yearbooks. As such, they suffer from certain deficiencies and biases which have been discussed widely in Western literature and which must be corrected if these data are to be useful for international comparisons. Such adjustments are not undertaken in this study because of its specific purpose, which is not to establish an absolute level of various economic indicators for individual republics and regions, but rather to determine the relative position in a given respect among territorial subdivisions, or between them and the U.S.S.R. as a whole. Obviously, such an approach can be taken only if the following basic assumption is firmly kept in mind: that the deficiencies and biases of official statistics affect all statistical units (republics, regions) to the same degree.

In addition to data on population which are considered to be reliable, data on output, employment, investment, and fixed capital for industry are most often used. In order to facilitate further discussion, it is necessary to make explicit some of the pertinent assumptions. Official data refer to the gross output at 1955 constant prices.<sup>51</sup> The concept of gross output in economic analysis is generally considered inferior to the concept of net value added. While the latter concept shows the actual changes in the total net output of industry, the former can be influenced also by changes in vertical integration and contributions from other economic sectors. Since adjustments will not be undertaken in this study, it is necessary to assume that these changes in vertical integration and contributions from other economic sectors do not affect differentially individual republics and regions.<sup>52</sup>

The employment data refer sometimes only to the main component, workers. Since the latter account for a relatively stable percentage of all employed in recent years,<sup>53</sup> their growth can be considered as representative of the growth of all employed. The data on fixed assets are given gross, including depreciation. Thus, it is necessary to assume that the age, composition, degree of technological obsolescence, and the degree of utilization are the same for all republics.

<sup>51</sup> Sometimes the choice of base-year prices can affect differentially the output indexes of individual regions. This is possible in times of rapid industrialization, accompanied by radical changes in the scarcity relations and in the product mix by industrial regions. While this consideration is relevant for the comparison, for instance, of growth between the U.S.S.R. as a whole and the Ukraine for the period before World War II, it is unimportant for the postwar period. See this writer's "Comparison of Industrial Growth Rates between the Ukraine and the U.S.S.R., 1928-1937 and 1950-1958," *Economics and Business Bulletin* (Bureau of Economic and Business Research, Temple University, Philadelphia.) December 1965, pp. 13-15.

<sup>52</sup> The use of gross output data for the analysis, for example, of investment productivity seems to be satisfactory for Soviet economists. It is reported that the growth rates of productivity obtained on the basis of gross output did not differ to any appreciable degree from the results obtained using the output in physical units weighted with prices, consisting of labor costs and depreciation allowances only. See *Shitakhy pidvyshchennia ekonomichnoi efektyvnosti kapital'nykh vkladov u promyslovosti Ukraini'koi RSR* (O. O. Khrumov, ed.), Kiev, Nauk. dumka, 1967, p. 11.

<sup>53</sup> During the postwar period this percentage fluctuated between 80 and 83 for the entire industry of the U.S.S.R. See *N. kh. S.S.S.R. 1965*, p. 140.

In regard to the quality and reliability of Soviet statistical data, there is general agreement that they have improved over the years. This fact has a direct favorable bearing on this study, which discusses a relatively recent period, but, unfortunately, it is true, by and large, only for the U.S.S.R. In the case of the republics, only the data on output for the entire industry and individual branches and on the industrial investment are available and reported consistently without changes. Data on employment and fixed capital, as will be noted below, are sometimes unavailable for individual republics. More often they appear differently in different Soviet sources so that an arbitrary decision had to be made which set of data to use in this study. However, the differences in individual cases are too small to change the conclusions. In view of these difficulties, it is suggested that the results of this study be considered as tentative at best.

#### EQUALIZATION OF INDUSTRIALIZATION LEVELS

Of the three locational objectives, the equalization of industrialization levels will be analyzed first. In order to determine the level of industrialization of individual regions, various indicators can be used. The most appropriate, of course, would be the total net value added in industry per capita of total population. Since such data are not available for Soviet industry, the closest substitute available, the gross output per capita, must be used. However, since it is a summation of all gross output, not of final output, at the factory level, and thus involves double-counting, such a concept necessarily results in an upward bias in those regions in which the processing industry predominates in the total industry, and in a downward bias in regions specializing in the extractive industries.<sup>54</sup> In addition, the well-known deficiencies of Soviet price structure make the official gross output data hardly an ideal indicator of the level of industrialization.<sup>55</sup> For these reasons, such supplementary indicators as industrial employment per 1,000 population, output of electric power per capita, or the number of urban population per 1,000 of total population are often used.<sup>56</sup>

Table 1 presents these indicators for republics and regions of the Russian and Ukrainian republics in 1967.<sup>57</sup> The data are presented in the form of indexes, with the U.S.S.R. as 100. According to these indicators, the following six regions or republics were relatively well industrialized: the Northwest, the Central, and the Urals regions of Russia, the Donets-Dnieper region of the Ukraine, and two Baltic republics, Latvia and Estonia. Although they accounted for only 14.17 percent of all U.S.S.R. area and for 33.00 percent of all population, their combined gross output was equal to 47.96 percent of the total output in 1967.<sup>58</sup> On the other hand, the least industrialized were

<sup>54</sup> Akademia nauk SSSR, Institut ekonomiki, *Promyshlennost' v khoziaistvennom komplekse ekonomicheskikh raionov S.S.S.R.* (A.M. Korneev, ed.), Moscow, Nauka, 1964, p. 7.

<sup>55</sup> Cf. Rutgaizer, *op. cit.*, pp. 32-33.

<sup>56</sup> In the Soviet context, the development mainly of heavy industry is often identified with the increase in industrialization in general. Therefore, it is suggested that the percentage of heavy industry in the total industry in a given region serves as a good indicator of the degree of industrialization of this region. See Shmul' Leibovich Rozenfel'd, *Opreделение urovnei razvitiia promyshlennosti v raionakh*, Moscow, Izd.-vo ekon. lit.-ry, 1963, pp. 22-23.

<sup>57</sup> The republics in this as well as in all other tables are listed according to their geographic location; western republics are followed by the Baltic republics, then by the three Transcaucasian republics, and finally, by Kazakhstan and the four Central Asian republics. The regions of the Russian and Ukrainian republics are listed in the same order as they are listed in Soviet sources.

<sup>58</sup> Tables A-1 and A-2.



the following regions and republics: the Central Black Earth region in Russia, Moldavia, Azerbaidzhan, and all five Central Asian republics.

In 1967 the interrepublican and interregional differences in the degree of industrial development were quite substantial. According to figures in Table 1 the spread between the highest and lowest subdivision, in terms of output per capita, was 4.0 times; industrial employment, 3.9; urbanization, 2.5; and the output of electric power per capita as high as 9.0 times.<sup>59</sup>

TABLE 1.—Selected indicators of industrial development of Republics and regions in the U.S.S.R. in 1967

[U.S.S.R.=100.0]

| Republics and regions    | Gross industrial output per capita (1) | Industrial employment per 1,000 population (2) | Output of electric power (kw.-hr.) per capita (3) | Percentage of urban population in total population (4) |
|--------------------------|--|--|---|--|
| U.S.S.R. ....            | 100.0                                  | 100.0  | 100.0   | 100.0  |
| R.S.F.S.R. ....          | 113.7                                  | 120.2  | 119.6   | 110.5  |
| Northwest.....           | 149.7                                  | (1)  | 94.7  | 132.4  |
| Central.....             | 152.5                                  | 150.0  | 11.7  | 124.8  |
| Volga-Viatka.....        | 100.2                                  | 123.0  | 67.6  | 91.9   |
| Central Black Earth..... | 51.1                                   | 72.0   | 44.7  | 66.9   |
| Volga.....               | 99.4                                   | 103.0  | 134.1   | 99.8   |
| North Caucasus.....      | 82.4                                   | 79.0   | 63.0  | 89.9   |
| Urals.....               | 134.7                                  | 142.0  | 220.4   | 124.6  |
| West Siberia.....        | 90.9                                   | 107.0  | 131.9   | 108.7  |
| East Siberia.....        | 90.3                                   | 100.0  | 281.8   | 109.9  |
| Far East.....            | 103.2                                  | 109.0  | 72.5  | 132.5  |
| Ukraine.....             | 111.5                                  | 96.3   | 94.4  | 97.3   |
| Donets-Dnieper.....      | 141.3                                  | 125.0  | (1)   | 127.7  |
| Southwest.....           | 91.0                                   | 63.0   | (1)   | 66.2   |
| South.....               | 82.4                                   | 80.0   | (1)   | 101.8  |
| Belorussia.....          | 76.3                                   | 81.0   | 49.7  | 75.6   |
| Moldavia.....            | 61.2                                   | 50.4   | 57.0  | 53.5   |
| Lithuania.....           | 89.3                                   | 95.7   | 61.7  | 84.4   |
| Latvia.....              | 144.3                                  | 131.8  | 45.3  | 134.3  |
| Estonia.....             | 146.5                                  | 134.6  | 266.2   | 115.2  |
| Georgia.....             | 67.6                                   | 62.7   | 58.0  | 86.8   |
| Azerbaidzhan.....        | 51.2                                   | 48.5   | 91.4  | 91.5   |
| Armenia.....             | 80.5                                   | 82.1   | 81.8  | 101.1  |
| Kazakhstan.....          | 55.2                                   | 56.2   | 75.5  | 89.1   |
| Uzbekistan.....          | 41.7                                   | 37.8   | 51.5  | 65.1   |
| Kirghizia.....           | 55.3                                   | 48.9   | 42.2  | 70.3   |
| Tadzhikistan.....        | 43.4                                   | 34.9   | 33.1  | 67.3   |
| Turkmenia.....           | 37.9                                   | 34.2   | 31.2  | 88.6   |

Sources: Col (1): tables A-1 and A-2. Output per capita for the U.S.S.R. was equal to \$1,287. Data on population in this as well as in other columns are estimates as of Jan. 1, 1968. Col (2): Table A-1; *N.kh.SSSR 1967*, p. 208. Industrial employment was equal to 122.5 per 1,000 population for the U.S.S.R. as a whole; for data for Russian and Ukrainian regions for 1965, see A. I. Vedishchev, "Solzmerenie urovnei khoziaistvennogo razvitiia ekonomicheskikh ratonov SSSR" in *Ekonomicheskie problemy razmeshcheniia proizvoditel'nykh sil SSSR* (A.A. Ivanchenko, ed.), Moscow, Nauka, 1969, p. 63. Col (3): table A-1; *N.kh.SSSR 1967*, p. 231; TsSU, *Narodnoe khoziaistvo RSFSR v 1967 godu*, Moscow, Statistika, 1968, p. 72. Output of electric power per capita in the U.S.S.R. was equal to 2,483 kw-hr. Col (4): *N.kh.SSSR 1967*, pp. 13-19. Urban population accounted for 55.3 percent of total population in the U.S.S.R.

<sup>1</sup> Not available.

Of greater interest is the question of whether the situation in 1967 presents an improvement over past years; in other words, whether the differences in the degree of development among republics and regions show a tendency to decline. This problem could be best analyzed with

<sup>59</sup> Therefore, how untrue sound statements, so often repeated in different variants by Soviet officials and economists, such as: "All republics are now on approximately the same level of economic development." See Rutgaizer, *op. cit.*, p. 29.

the help of the coefficient of variation using population distribution as weights.<sup>60</sup> The higher (lower) the coefficient the greater (smaller) is the degree of dispersion of a given variable around the mean for the entire country. Thus, a declining coefficient over a period of time will indicate a trend toward a greater equalization of industrial development among Soviet republics and regions.

Such coefficients for selected years are listed in table 2. In order to show the trend more clearly, this table includes also the last prewar year, 1940. The data for republics and regions of the R.S.F.S.R. are shown separately. Looking first at republics, one can observe that for the first three indicators the coefficients decline between 1940 and through the years 1950 and 1958. The coefficient for the index of urbanization rises slightly. After 1958, the trend is mixed: the coefficient rises for the gross output and industrial employment, continues to decline, but very slightly, for the output of electric power, and remains unchanged for urbanization. Thus, these data seem to justify the conclusion that the trend toward the equalization of industrial development among republics in the U.S.S.R., resulting from the hostilities and the investment policy during the war as well as during the first decade of the postwar period, was stopped or even reversed at the end of the 1950s. Recent years show a slight movement in the opposite direction, toward greater inequality among republics. In the case of Russian regions there is evident a more consistent trend toward greater equality throughout the entire period under discussion.<sup>61</sup>

TABLE 2.—*Weighted coefficients of variation of various indicators for Republics of the U.S.S.R. and regions of the R.S.F.S.R. for selected years*

|   | 1940             | 1950             | 1958  | 1967  |
|---|------------------|------------------|-------|-------|
| <b>Republics:<sup>1</sup></b>                   |                  |                  |       |       |
| Gross output per capita.....                    | 0.246            | 0.227            | 0.221 | 0.253 |
| Industrial employment per 1,000 population..... | .300             | .306             | .276  | .279  |
| Output of electric power per capita.....        | .377             | .354             | .295  | .292  |
| Share of urban in total population.....         | .316             | ( <sup>2</sup> ) | .146  | .146  |
| <b>Regions of the R.S.F.S.R.:<sup>2</sup></b>   |                  |                  |       |       |
| Gross output per capita.....                    | .500             | ( <sup>3</sup> ) | .356  | .274  |
| Output of electric power per capita.....        | .535             | ( <sup>3</sup> ) | .531  | .526  |
| Share of urban in total population.....         | ( <sup>3</sup> ) | ( <sup>3</sup> ) | .206  | .166  |

<sup>1</sup> Variation from the U.S.S.R. mean.

<sup>2</sup> Variation from the R.S.F.S.R. mean.

<sup>3</sup> Not available.

Sources: Population, gross output per capita, urban population: see sources listed in Tables A-1 and A-2. Industrial employment: TsSU, *Trud v SSSR*, Moscow, Statistika, 1968, pp. 24-25, 42-71. Electric power output: *N.kh.SSSR 1967*, p. 231; *N.kh.RSFSR 1967*, p. 72.

#### SOME IMPLICATIONS IN REGARD TO POPULATION WELFARE

The preceding results, indicating the lack of definite trend toward the equalization of industrial development among the republics,

<sup>60</sup> The weighted coefficient of variation ( $V_w$ ) was calculated according to the following formula:

$$V_w = \frac{\sqrt{\sum_i (y_i - \bar{y})^2 s}}{\bar{y}}$$

where  $y_i$  = the given variable for the  $i$  region;

$\bar{y}$  = the given variable for the entire country;

and  $s$  = the region's share in the total population of the country.

<sup>61</sup> The trend toward a greater equality is also evident for the three Ukrainian regions: the spread, in terms of output per capita, between the most and the least developed region narrowed from 2.9 to 1.7 times between 1940 and 1967 (Tables A-1 and A-2).

have an implication in regard to the equalization of standard of living among them. As table 3 shows, the indexes of industrial output per capita are very close to the indexes of national income per capita for republics in the two years for which the data are available. The correlation between these two variables is very high.<sup>62</sup> Since the level of national income determines the level of consumption, an inference is justified that the welfare of population has been becoming more unequal among republics in recent years.<sup>63</sup> This is not true for the regions within the Russian and the Ukrainian republics, where the trend toward the equalization of industrialization levels has been quite pronounced during the postwar period.<sup>64</sup>

TABLE 3.—*Index of industrial gross output per capita and of national income per capita by Republics of the U.S.S.R. for selected years*

[R.S.F.S.R.=100]

|                    | 1961                                      |                                   | 1965                                      |                                   |
|--------------------|---|-----------------------------------|---|-----------------------------------|
|                    | Gross industrial output per capita<br>(1) | National income per capita<br>(2) | Gross industrial output per capita<br>(3) | National income per capita<br>(4) |
| R.S.F.S.R. ....    | 100.0                                     | 100.0                             | 100.0                                     | 100.0                             |
| Ukraine .....      | 96.2                                      | 87.6                              | 99.5                                      | 91.0                              |
| Belorussia .....   | 57.2                                      | 72.5                              | 62.7                                      | 70.9                              |
| Moldavia .....     | 48.6                                      | 69.8                              | 55.0                                      | 77.0                              |
| Lithuania .....    | 64.9                                      | 89.8                              | 75.0                                      | 98.5                              |
| Latvia .....       | 113.7                                     | 123.2                             | 123.7                                     | 128.0                             |
| Estonia .....      | 120.0                                     | 112.7                             | 130.4                                     | 124.6                             |
| Georgia .....      | 62.1                                      | 68.2                              | 60.0                                      | 62.3                              |
| Azerbaidzhan ..... | 57.7                                      | 68.2                              | 48.8                                      | 60.7                              |
| Armenia .....      | 72.1                                      | 76.0                              | 69.2                                      | 67.7                              |
| Kazakhstan .....   | 50.2                                      | 72.4                              | 49.1                                      | 57.5                              |
| Uzbekistan .....   | 43.1                                      | 58.7                              | 38.8                                      | 56.3                              |
| Kirghizia .....    | 45.2                                      | 60.7                              | 45.6                                      | 57.5                              |
| Tadzhikistan ..... | 42.8                                      | 51.5                              | 38.4                                      | 49.6                              |
| Turkmenia .....    | 40.1                                      | 62.9                              | 33.8                                      | 57.5                              |

Sources: Cols. (1) and (3): Output: Tables A-1 and A-2; population: *N.kh.SSSR 1968*, p. 9, *N.kh. SSSR 1965*, p. 9.

Col. (2): Iurii Fedorovich Vorob'ev, *Vyravnivanie urovnei ekonomicheskogo razvitiia soizuznykh respublik*, Moscow, Nauka, 1965, p. 193.

Col. (4): Vedishchev, *op. cit.*, p. 82.

These findings can now be confronted with some recent developments in the theory of economic growth, particularly with the problem of interregional inequality.<sup>65</sup> The essence of the problem was stated by one writer in these words:

Whatever the reason, there can be little doubt that an economy, to lift itself to higher income levels, must and will first develop within itself one or several regional centers of economic strength. This need for the emergence of "growing points" or "growth poles" in the course of the development process means that

<sup>62</sup> The variation in industrial output per capita explains 87.9 percent of the variation in national income per capita in 1961 and 90.4 percent in 1965.

<sup>63</sup> That the differences in the welfare of population were still very large in 1968 can be seen also from the fact that the supply of health care, education, cultural, and municipal services (presumably per capita) by the government varied among economic regions in a greater than 1 to 2 ratio. See Rutgaizer, *op. cit.*, p. 34.

<sup>64</sup> This lack of equalization in the standard of living among the republics in the U.S.S.R. can be also seen from the fact that the variation in national income per capita in 1961, which according to Vorob'ev, *op. cit.* (see sources to table 3), p. 193, remained largely unchanged for the preceding 5 years, accounts for 1.9 percent of the variation in the rates of growth of national income by republics between 1960 and 1967 (*N.kh.SSSR 1967*, p. 672).

<sup>65</sup> Albert O. Hirschman, *The Strategy of Economic Development*, New Haven, Yale University Press 1958, Chapter 10; Gunnar Myrdal, *Economic Theory and Under-Developed Regions*, London, G. Duckworth 1958, Chapters 3-5; Jeffrey G. Williamson, "Regional Inequality and the Process of National Development," *Economic Development and Cultural Change*, vol. 13, No. 4, July 1965.

international and interregional inequality of growth is an inevitable concomitant and condition of growth itself.<sup>66</sup>

The reasons for this increasing inequality can be summarized as follows: migration from underdeveloped to developed regions of skilled, better educated, and more productive labor as well as of capital; overestimation of external economies in developed regions by economic operators; and governmental policies. However, it is believed that as a result of the "spread" or "trickling down" effect, this trend will eventually be reversed. The catching up of underdeveloped with developed regions will result from greater purchases of raw materials or agricultural products from the former by the latter, from increased productivity following migration and, most of all, from government policy. There is hardly a central authority which could withstand over longer periods of time the pressure from underdeveloped regions for growth-promoting assistance. In consequence, changes in the degree of inequality will resemble an inverted U; at the early stages of economic development of a country the inequality among regions will increase, but with the maturing of the economy this inequality will tend to decline. This theoretical consideration has been recently verified statistically with satisfactory results on the basis of cross-section data for twenty-four countries at various levels of economic development and on the basis of time series for some of these countries.<sup>67</sup>

According to the above proposition, the stationary—if not still increasing—inequality of industrial development in the U.S.S.R. on the interrpublican level suggests that the Soviet economy cannot as yet be considered mature. This conclusion is supported by the evidence of existence in the U.S.S.R. of various phenomena touched upon in the preceding paragraph. They are all too familiar to students of the Soviet economy: for example, the brain drain from all over the country to the industrialized regions of Russia proper; the use of *Komsomol* members from other republics in construction projects in these industrial regions; the transfer of investible funds from other regions of the country to a few developing areas; the overestimation of external economies in developed centers evidenced by their overcongestion; the promotion of growth for military reasons in a few centrally located regions of Russia proper.

#### GROWTH RATES OF INDUSTRY

None of the four indicators, given in table 2, show exactly the same trend for the period under discussion. But neither do they drastically contradict each other. For the Russian regions, these coefficients largely coincide. Since the output per capita is the most important among these indicators, it will be the object of subsequent discussion.<sup>68</sup> Of the two determinants of output per capita, growth rates of output will be analyzed first and an analysis of growth rates of population will follow.

As Table 4 shows, there is a significant difference between growth rates of industrial gross output during the period 1950–58 and the

<sup>66</sup> Hirschman, *op. cit.*, pp. 183–84.

<sup>67</sup> Williamson, *op. cit.*

<sup>68</sup> Some Soviet economists advanced a proposal to aggregate such indicators into one synthetic indicator. The difficulty with this proposal is that the weights for the individual indicators have to be assigned arbitrarily. Cf. M. Palamarchuk and S. Bazhan, "Pytannia metodyky doslidzhennia rivniv ekonomichnoho rozvytku raloniv," *Ekonomika radians'koi Ukrainy*, v. 8, no. 1–2 Jan.-Feb. 1965, pp. 81–84; Voloboi and Popovkin, *op. cit.*

succeeding period, covering the Seven-Year Plan. While the former period was characterized by considerable advance in all republics and regions, a noticeable slowdown can be observed in most of them during the more recent period. There is also no evidence of significant improvement in the growth rate during the most recent two years, that is, improvement that might have been expected to result from the well-publicized reforms of 1965. In spite of this fact, the growth rates for the entire period, even if adjusted for the deficiencies of Soviet statistics, are very respectable and compare well with the growth rates of industry in the majority of socialist as well as non-socialist countries of Europe during the same period of time.<sup>69</sup>

TABLE 4.—Annual growth rates of gross industrial output by Republics and regions of the U.S.S.R., 1950-67

|                     | 1950-58 | 1958-65 | 1965-67 | 1950-67 |
|---------------------|---------|---------|---------|---------|
| U.S.S.R.            | 12.05   | 9.12    | 9.18    | 10.50   |
| R.S.F.S.R.          | 11.17   | 8.37    | 8.91    | 9.74    |
| Northwest           | 11.69   | 7.48    | 7.68    | 9.46    |
| Central             | 10.74   | 6.29    | 8.42    | 8.61    |
| Volga-Viatka        | 10.97   | 8.37    | 10.80   | 9.87    |
| Central Black Earth | 15.41   | 10.58   | 8.82    | 12.62   |
| Volga               | 13.22   | 11.01   | 10.62   | 12.00   |
| North Caucasus      | 11.93   | 9.56    | 9.01    | 10.60   |
| Urals               | 10.23   | 8.69    | 9.36    | 9.49    |
| West Siberia        | 11.41   | 8.64    | 9.55    | 10.04   |
| East Siberia        | 11.68   | 10.39   | 9.77    | 10.92   |
| Far East            | 9.28    | 9.54    | 9.03    | 9.36    |
| Ukraine             | 12.81   | 9.20    | 8.77    | 10.83   |
| Donets-Dnieper      | 12.23   | 8.56    | 7.80    | 10.18   |
| Southwest           | 13.73   | 9.92    | 9.89    | 11.70   |
| South               | 14.02   | 10.41   | 10.40   | 12.09   |
| Belorussia          | 14.38   | 10.92   | 13.43   | 12.83   |
| Moldavia            | 19.13   | 11.24   | 9.18    | 14.63   |
| Lithuania           | 19.61   | 12.25   | 12.44   | 15.68   |
| Latvia              | 14.17   | 10.33   | 10.81   | 12.18   |
| Estonia             | 13.29   | 10.29   | 8.68    | 11.50   |
| Georgia             | 10.21   | 7.02    | 9.48    | 8.80    |
| Azerbaijdzhan       | 7.29    | 7.28    | 7.19    | 7.28    |
| Armenia             | 12.31   | 10.11   | 12.58   | 11.43   |
| Kazakhstan          | 11.87   | 11.30   | 10.43   | 11.46   |
| Uzbekistan          | 8.43    | 8.77    | 8.93    | 8.63    |
| Kirghizia           | 11.35   | 10.69   | 15.82   | 11.60   |
| Tadzhikistan        | 11.45   | 9.18    | 11.37   | 10.48   |
| Turkmenia           | 9.69    | 5.97    | 10.97   | 8.29    |

Source: Table A-2.

However, in the present context it is not the absolute but the differential level of industrial growth rates for these subdivisions of the U.S.S.R. that is important. Looking first at the republics, it can be easily seen that non-Russian republics in the European part of the country enjoyed the highest rates of growth during the 1950's. In the case of such republics as the Ukraine, Latvia, or Estonia, this fact reflects a familiar pattern of economic growth: When a developed country is destroyed by war, its postwar reconstruction is accompanied by the simultaneous introduction of new technology which, of course, results in higher growth rates than in the countries not affected by war and not needing the replacement of existing assets. The rapid growth rates of Moldavia and Lithuania, on the other hand, reflect the very low level of industrialization of these two

<sup>69</sup> See James H. Noren, "Soviet Industry Trends in Output, Inputs, and Productivity," in U.S. Congress Joint Economic Committee, *New Directions in the Soviet Economy*, Washington, 1966, p. 289, Table 4; Maurice Ernst, "Postwar Economic Growth in Eastern Europe," *ibid.*, p. 883, Table 7.

republics at the time of their incorporation into the U.S.S.R. In such circumstances, even very slight absolute progress sufficed to cause high growth rates. In regard to Belorussia, both factors—war destruction and low initial level of industrialization—seem to have been responsible for the relatively rapid advance of industry.

During the period after 1958, the situation changed somewhat. Western republics, except the Ukraine, continued to grow at above average rates, although a decline is noticeable for Latvia and Estonia during the two most recent years. The growth of Ukrainian industry slowed down considerably during this period of time and fell below the U.S.S.R. average between 1965 and 1967. The growth rates between 1958 and 1967 were also high in Armenia and Kazakhstan. As the most obvious explanation for the rapid growth of the former, there can be cited the above-average educational attainment and mobility of its population.<sup>70</sup> Of primary significance for the industrial growth of Kazakhstan was an exceptional endowment of this republic in various mineral resources, including the all-important nonferrous metals. However, perhaps of even greater importance for the growth of Kazakhstan was its strategic location *vis-à-vis* China, to be discussed in more detail in Part III. This last factor seems to have been responsible also for the rapid growth of Kirghizia, Tadzhikistan, and Turkmenia during the most recent period of time. The lowest rates of growth during the period 1958 and 1967 were experienced by Georgia, Azerbaidzhan, and Uzbekistan. The slow growth of industry in Georgia is attributed to insufficient investment and to inefficient utilization of labor.<sup>71</sup> In Azerbaidzhan this can be explained by the decline on a nation-wide scale of its main industry, oil extracting and refining, and its still very low productivity in other industrial branches.<sup>72</sup> Similarly, the industry of Uzbekistan grew slowly, because of little attention of planners to the development of its main branch the cotton-cleaning industry.<sup>73</sup>

The Russian republic, as the largest republic in the U.S.S.R., deserves special attention. Its aggregate rate of growth was slightly below the average for the entire country. Among the regions of this republic, the highest rate of growth was shown by the Central Black Earth region, which is also one of the least industrially developed. A high rate of growth can be also observed for the Volga region. This is most likely still the result of very large investment undertaken in this region during the last war.<sup>74</sup> The most industrialized regions, the Northwest and the Central, grew at slightly lower rates than those for the entire republic. The widely publicized development of the Urals and the eastern (West Siberia, East Siberia, and the Far East) regions is not evident in their rates of growth, which, except for the East Siberian region, are very close to the average for the republic.

Was this growth pattern affected by the level of output per capita of territorial subdivisions of the U.S.S.R.? Even a superficial ex-

<sup>70</sup> John A. Armstrong, "The Ethnic Scene in the Soviet Union: The View of Dictatorship," in Goldhagen, *op. cit.*, pp. 11-14.

<sup>71</sup> *Problemy ekonomiki Gruzii*, (B. Melkadze, ed.), v. III, Tbilisi, 1967, pp. 36-38.

<sup>72</sup> *Razsvet ekonomiki Azerbaidzhanskoj SSR*, (A. S. Sumbatzade, and others eds.), Izd.-vo AN AzerSSR, Baku, 1967, pp. 110, 126.

<sup>73</sup> S. K. Ziadullaev, *Promyshlennost' Uzbekistana i osnovnye ekonomicheskie problemy ee razvitiia*, Tashkent, Fan, 1967, pp. 162-63.

<sup>74</sup> Akademiia nauk S.S.S.R., *Zakonomernosti . . .*, p. 37.

amination of statistical data reveals that there is no definite relationship in this regard for republics. A more detailed calculation shows that the variation in output per capita in 1958 (Table A-1) <sup>75</sup> explains less than 1 percent of the variation in growth rates between 1950 and 1967 <sup>76</sup> (Table 4). In other words, there is no evidence that the less developed republics grew faster than the more developed republics.

The situation is different for the Russian regions. There, the coefficient of determination is equal to 68.0 percent, with the coefficient *b* being negative. In this case, the less developed regions grew, in general, faster than the more developed regions. The same trend can also be observed for the Ukrainian regions: the most developed (Donets-Dnieper) region grew significantly slower than the Southwest or South region. Thus the different relationship between these two variables (output per capita and growth rate) for republics and regions—if for a moment the differential growth rates of population can be disregarded—confirms the earlier finding that the levels of industrial development during the postwar period failed to equalize for the former and moved closer for the latter, as was previously shown by the changes, or lack of changes, in coefficients of variation.

#### GROWTH RATES OF POPULATION

The other determinant of the differential changes in the output per capita, the growth rate of population, in most cases reinforced trend of growth rates of output by republics during the postwar period. As can be seen from Table 5, the western republics, which showed the highest rates of output increases (Table 4), experienced the lowest rates of population growth. Moldavia, with high growth rates for both variables, was the only exception. Among the Transcaucasian republics, Georgia showed low growth rates and Armenia high growth rates of both population and output, while in Azerbaidzhan the former grew faster than the latter. In all five Central Asian republics the population grew at a considerably higher rate than in the country as a whole, but only in Kazakhstan and Kirghizia were the growth rates of output also relatively high during the entire period under discussion. In Uzbekistan, Turkmenia, and to a lesser extent Tadzhikistan the low growth rates of output were accompanied by high growth rates of population. In regard to Russian regions during the Seven-Year Plan, one can observe that the below-average growth rates of output in such European regions as Northwest, Central, Volga-Viatka, and Central Black Earth coincided with the growth rates of population which were well below those for the entire country. For the remaining regions there is no clear trend evident in the relationship between these two variables.

<sup>75</sup> To recall, 1958 is the first postwar year for which the output per capita can be calculated for all republics and regions of the U.S.S.R.

<sup>76</sup> The coefficient of determination ( $r^2$ ) and the slope of regression line (*b*) were calculated according to the following formulas:

$$r^2 = \frac{(n\sum XY - (\sum X)(\sum Y))^2}{(n\sum X^2 - (\sum X)^2)(n\sum Y^2 - (\sum Y)^2)}, \text{ and } b = \frac{n\sum XY - (\sum X)(\sum Y)}{n\sum X^2 - (\sum X)^2}$$

where *n* = number of observations;  
*X* = independent variable;  
*Y* = dependent variable.

TABLE 5.—Annual growth rates of population by Republics and regions of the U.S.S.R., 1950-67

|                          | Jan. 1,<br>1951—Jan.<br>15, 1959 | Jan. 15,<br>1959—Jan.<br>1, 1966 | Jan. 1,<br>1966—Jan.<br>1, 1968 | Jan. 1,<br>1951—Jan.<br>1, 1968 <sup>1</sup> |
|--------------------------|----------------------------------|----------------------------------|---------------------------------|--|
| U.S.S.R.....             | 1.76                             | 1.50                             | 1.03                            | 1.57   |
| R.S.F.S.R.....           | 1.67                             | 1.06                             | .53                             | 1.29   |
| Northwest.....           | (2)                              | 1.13                             | .54                             | 1.00   |
| Central.....             | (2)                              | .83                              | .26                             | .70  |
| Volga-Viatka.....        | (2)                              | .005                             | .04                             | .05  |
| Central Black Earth..... | (2)                              | .33                              | -.11                            | .25  |
| Volga.....               | (2)                              | 1.44                             | .94                             | 1.33   |
| North Caucasus.....      | (2)                              | 2.14                             | 1.53                            | 2.00   |
| Urals.....               | (2)                              | 1.01                             | .13                             | .82  |
| West Siberia.....        | (2)                              | 1.10                             | .22                             | .90  |
| East Siberia.....        | (2)                              | 1.64                             | .48                             | 1.38   |
| Far East.....            | (2)                              | 1.96                             | 1.53                            | 1.87   |
| Ukraine.....             | 1.48                             | 1.20                             | .95                             | 1.30   |
| Donets-Dnieper.....      | (2)                              | 1.34                             | 1.06                            | 1.28   |
| Southwest.....           | (2)                              | .83                              | .55                             | .77  |
| South.....               | (2)                              | 2.06                             | 1.93                            | 2.03   |
| Belorussia.....          | .43                              | 1.00                             | 1.08                            | .74  |
| Moldavia.....            | 2.37                             | 2.23                             | 1.71                            | 2.24   |
| Lithuania.....           | .71                              | 1.38                             | 1.30                            | 1.06   |
| Latvia.....              | .86                              | 1.12                             | .79                             | .96  |
| Estonia.....             | 1.01                             | 1.02                             | .74                             | .98  |
| Georgia.....             | 1.61                             | 1.69                             | 1.21                            | 1.60   |
| Azerbaidzhan.....        | 2.94                             | 3.36                             | 2.72                            | 3.09   |
| Armenia.....             | 3.30                             | 3.17                             | 2.52                            | 3.15   |
| Kazakhstan.....          | 3.91                             | 4.10                             | 2.24                            | 3.79   |
| Uzbekistan.....          | 3.01                             | 3.60                             | 3.19                            | 3.28   |
| Kirghizia.....           | 2.00                             | 3.63                             | 3.41                            | 2.83   |
| Tadzhikistan.....        | 3.08                             | 3.84                             | 3.00                            | 3.38   |
| Turkmenia.....           | 2.70                             | 3.39                             | 2.96                            | 3.01   |

<sup>1</sup> For the regions of the R.S.F.S.R. and the Ukraine: Jan. 15, 1959 to Jan. 1, 1968.

<sup>2</sup> Not available.

Source: Table A-1.

#### DISTRIBUTION OF INVESTMENT

The differential growth rates of industry and, consequently, the unequal levels of industrial development of republics and regions are determined primarily by the allocation of investment. Data on geographic distribution of investment in industry per capita in the U.S.S.R. during the postwar period are presented in Table 6. Because of changes in the definition of industrial investment, introduced in 1965,<sup>77</sup> consistent data for all republics for the entire period under discussion were unavailable. Data for the first half of the period, 1951-58, compiled according to the pre-1965 definition, were therefore used. For the period between 1959 and 1965, data compiled according to the new definition were used. Investment per capita for individual republics was calculated by using the total investment and the average population during each period. This information for each republic is presented in the table as an index based on the investment per capita for the U.S.S.R. as a whole.

<sup>77</sup> They differ mainly insofar as according to the old definition, investment in industry does include investment in the construction sector, while according to the new definition, it does not. See U.S. Congress Joint Economic Committee, *Soviet Economic Performance, 1966-67*, Washington, 1968, p. 41.



TABLE 6.—Index of industrial investment per capita by Republics of the U.S.S.R., 1951-65

[U.S.S.R. = 100.0]

|               | 1951-58 | 1959-65 |
|---------------|---------|---------|
|               | (1)     | (2)     |
| U.S.S.R.      | 100.0   | 100.0   |
| R.S.F.S.R.    | 120.4   | 114.5   |
| Ukraine       | 83.5    | 84.3    |
| Belorussia    | 33.3    | 51.7    |
| Moldavia      | 27.3    | 42.5    |
| Lithuania     | 42.6    | 70.6    |
| Latvia        | 47.1    | 86.3    |
| Estonia       | 82.3    | 117.7   |
| Georgia       | 65.5    | 58.2    |
| Azerbaijdzhan | 142.3   | 98.3    |
| Armenia       | 72.7    | 90.4    |
| Kazakhstan    | 101.5   | 113.7   |
| Uzbekistan    | 42.0    | 53.5    |
| Kirghizia     | 68.2    | 156.0   |
| Tadzhikistan  | 62.8    | 58.7    |
| Turkmenia     | 97.9    | 103.3   |

Sources: Investment data: Table A-3. Average population for the period 1951-58 was calculated on the basis of data for Jan. 1, 1951 and Jan. 15, 1959 from TsSU, *S.S.S.R. v tsyfrakh v 1967 godu*, Moscow, Statistika, 1968, p. 7, and for the period 1959-65 on the basis of population estimates for Jan. 1 of each year, given in *N.kh. S.S.S.R. 1959, 1960, 1961, 1962, 1963, 1964, 1965*, pp. 8, 8, 9, 9, 9, 9, 9, respectively.

As can be seen, during the period 1950-58, three republics show an above-average investment per capita: Russia, Azerbaijdzhan, and Kazakhstan. Two factors seem to be responsible for the above-average position of Russia: on the one hand, in this republic are located two traditional industrial concentrations (Moscow, Leningrad) plus two more recent centers (the Urals and Volga); and, on the other hand, the Soviet location policy has consistently favored the development of the Asiatic regions of the country which are largely part of this republic. The case of Azerbaijdzhan can be explained by the presence of an important oil industry center on the Caspian Sea, and the oil industry is, of course, very capital-intensive. By the same token, the above-average investment per capita in Kazakhstan is due to the exploitation of its rich deposits of mineral resources. For the remaining republics the investment per capita is below the U.S.S.R. average and for some of them, for example, Moldavia and Latvia, considerably below. The picture during the subsequent period does not change significantly. The R.S.F.S.R. continues to stay substantially above average for the entire country in this respect. Per capita investment markedly above the average is shown also by Estonia and Kirghizia, while for Turkmenia it is slightly above the average. The indicators for other republics are below the country's average, just as they were during the preceding period, although this time the differences are smaller.

The distribution of industrial investment among the regions of the R.S.F.S.R. is, of course, of major importance. However, such data are not available. Therefore, the data on the distribution of investment in all state and cooperative enterprises (excluding *kolkhozes*) by Russian regions have to be used as a substitute. This procedure can be safely adopted because the share of industrial investment in total investment remains relatively stable for all subdivisions of the U.S.S.R., fluctuating around 40 percent, rarely dropping below 30 or exceeding 50 percent. Furthermore, the data for republics indicate that the degree of correlation between industrial and non-industrial

shares in the total investment is very high.<sup>78</sup> On this basis, it can be safely assumed that the relatively high (low) total investment per capita in a Russian region indicates relatively high (low) industrial investment per capita.

Table 7 presents the indexes of total investment per capita for these regions for the period of the Seven-Year Plan. For comparison with the previous table, the per capita investment in the entire national economy of the U.S.S.R. is used as a base for these indexes.<sup>79</sup> As can be seen, seven out of the 10 regions show investment per capita higher than the average for the entire country. This indicator is particularly high in the two regions located farthest east, East Siberia and the Far East. The three regions with indexes below 100 are located in the European part of the R.S.F.S.R. and are well known for their traditional concentration on agriculture.

TABLE 7.—*Index of investment per capita in State and cooperative enterprises (excluding kolkhozes) of the U.S.S.R. and regions of the Russian S.F.S.R., 1959-65*

[U.S.S.R. = 100.0]

|                     |       |
|---------------------|-------|
| U.S.S.R.            | 100.0 |
| R.S.F.S.R.          | 113.5 |
| Northwest           | 133.8 |
| Central             | 110.9 |
| Volga-Viatka        | 67.8  |
| Central Black Earth | 64.7  |
| Volga               | 112.2 |
| North Caucasus      | 86.5  |
| Urals               | 116.0 |
| West Siberia        | 121.7 |
| East Siberia        | 126.0 |
| Far East            | 187.3 |

Sources: Investment—*N.kh.SSSR 1965*, p. 539. Average population was calculated on the basis of data for January 15, 1959 from *N.kh.RSFSR 1959*, pp. 34-37, and for January 1 of the years 1961-66, for *N.kh.RSFSR 1960, 1961, 1962, 1963, 1964, 1965*, pp. 34-37, 72-74, 12-14, 12-14, 12-14, 12-14, respectively.

The question may be posed at this point as to whether the level of output per capita by republics and regions was of any importance for the geographic distribution of investment; in other words, whether an attempt was being made by the Soviet planners to equalize the industrial development among these subdivisions through the allocation of relatively more investment to the less developed parts of the country. The calculation of the coefficient of determination between output per capita in 1950 and the investment per capita for republics for the period between 1951 and 1958 shows that only 10.3 percent of the variation in the latter can be explained by the variation in the former variable. The corresponding coefficient for the output per capita in 1958 and the investment per capita between 1959 and 1965 is equal to 43.2 percent (Tables 6 and A-1). In both cases slope *b* is positive, indicating that relatively higher investment was directed to the more developed republics. In the case of Russian regions, only

<sup>78</sup> For republics, the variation in industrial investment accounts for example, for 99.7 percent of the variation in non-industrial investment in 1958 and for 99.6 percent in 1960. Investment data from U.S.S.R. TsSU-Otdel statistiki i kapital'nogo stroitel'stva, *Kapital'noe stroitel'stvo v SSSR*, Moscow, Gosstatizdat, 1961, pp. 81-109.

<sup>79</sup> Investment in all state and cooperative enterprises (excluding *kolkhozes*) per capita is as follows for individual republics for 1959-1965 (U.S.S.R. = 100): R.S.F.S.R., 113.9; Ukraine, 79.7; Belorussia, 61.4; Moldavia, 44.9; Lithuania, 77.8; Latvia, 100.4; Estonia, 120.6; Georgia, 62.8; Azerbaïdzhân, 80.1; Armenia, 90.4; Kazakhstan, 148.4; Uzbekistan, 65.3; Kirghizia, 64.3; Tadzhikistan, 69.9; Turkmenia, 102.5. Sources: Investment—*N.kh. U.S.S.R. 1965*, p. 539; population—see sources to Table 6.

7.1 percent of the variation in investment per capita during the Seven-Year Plan can be explained by the variation in the output per capita in 1958 (Tables 7 and A-1). In contrast to the republics,  $b$  is here negative. However, it seems that in all these cases the value of the coefficient of determination is too low to warrant attributing to the relative industrialization level by republics and regions any influence on the geographic distribution of investment.

#### PRODUCTIVITY OF RESOURCES

The previous analysis shows that in the case of republics the investment per capita was not inversely related to the output per capita, as one would expect if the goal of the planners were the elimination of inequality in industrial development. If, instead high investment per capita were directly related to capital productivity, then it would mean that the maximization of output in the entire country is a more important criterion for the geographic distribution of investment than is the equalization of industrialization levels. Such policy would be in accordance with an official document<sup>80</sup> prepared for actual use in economic planning and not for propaganda purposes, as are, for example, resolutions of Party Congresses, which seem to assign equal importance to both objectives. This document recommends unequivocally that only in cases when the productivity of investment is identical or very close in two regions, other social and economic problems, among them the problem of interregional equalization of industrial development, should be taken into account.

In all other cases, in order to achieve the highest level of output, the above document advises allocation of the available investment to the regions in which the profitability of productive capital is the highest<sup>81</sup> or, alternatively in which the increase in net output of a given industrial complex is the highest in terms of investment allocated to all branches constituting this complex.<sup>82</sup> In the latter case, the effectiveness of investment should be evaluated from the point of view of the entire national economy and not narrowly from the point of view of industry alone. This means that, in addition to the investment in fixed and variable capital of the project under consideration, there should also be included investment in related branches, transportation, securing of labor force, nonproductive fixed capital, and compensation of losses to the national economy caused by the construction of this project.<sup>83</sup>

It is necessary here to point out that there is a basic difference between market and socialist economies in regard to the concept of efficiency of investment allocation. For market economies, efficiency means maximization of national income or, as in the present case, of total industrial output. This will be achieved if the investment is allocated to such uses, regardless of economic sector or geographic region, in which the increase in total output will be the highest per unit of investment. Furthermore, in accordance with the principle of optimization, the investment should proceed to these uses until, as a

<sup>80</sup> Akademiia nauk SSSR, Institut ekonomiki, Sektor effektivnosti razmeshcheniia proizvodstva, *Metodika opredeleniia ekonomicheskoi effektivnosti razmeshcheniia promyshlennosti pri planirovanii i proektirovanii novogo stroitel'stva*, Moscow, Ekonomika, 1966, p. 15.

<sup>81</sup> *Ibid.*, p. 11.

<sup>82</sup> *Ibid.*, p. 13.

<sup>83</sup> *Problemy ekonomicheskoi effektivnosti razmeshcheniia sotsialisticheskogo proizvodstva v SSSR*, (Ia. G. Felgin, ed.), Moscow, Nauka, 1968, pp. 28-29.

result of diminishing returns, the marginal products of investment will be equalized among all uses.

In contrast, the goal of investment policy in socialist economies is not to maximize the level of national income or industrial output in general, but to maximize the total output of a definite structure, determined by the central planners.<sup>84</sup> The sequence of investment decisionmaking on a nationwide level in such a case is first to determine the share of total investment which goes to each individual economic sector and industrial branch and then, in order to maximize the output of a given sector or branch per allocated investment, to direct this investment to that region in which its productivity is highest in this use.<sup>85</sup> Therefore, in order to measure the overall efficiency of investment in a region it is necessary to relate the increase in output to investment, but with this qualification: that the aggregate efficiency indicator should be derived through the averaging, with appropriate weights, of efficiency indicators for different branches located in the region under consideration.

Applying this procedure to the present analysis, the next step will be to determine whether the level of investment per capita by republics and regions was indeed related to the productivity of investment. This will be investigated with the help of two analytical tools: the incremental capital-output ratio and the productivity growth of combined labor and capital. The incremental capital-output ratio indicates the relationship between on the one hand, the increase in output and, on the other the investment introduced into operation or the increase in fixed capital. The higher (lower) is this ratio, the lower (higher) is the increase in output per the increase in fixed capital. Thus, given the intent of maximizing production, investment per capita should have been the highest in regions and republics with the lowest capital-output ratio. As was shown above, this indicator for the total industry of a republic or region should be derived through the aggregation of such indicators for individual branches.

Table 8 presents such ratios for individual branches and the total industry for the U.S.S.R. and 13 republics. Because of lack of necessary information, this table contains certain obvious shortcomings: two republics could not be included; the analysis of Russian and Ukrainian regions could not be undertaken; the period prior to 1958 is left out; there are only nine branches listed, which are too aggregative; instead of the index of net value added the index of gross output was used; the distributions of employment and fixed capital are used as weights although the use of output distributions would have been methodologically preferable; and, finally, even for the included republics, a few entries for certain branches and years had to remain blank.

<sup>84</sup> United Nations, Economic Commission for Europe, *Economic Survey of Europe in 1962*, Part 2, Geneva 1965, Chapter IV, p. 36.

<sup>85</sup> Akademiia nauk SSSR, *Metodika* . . . , pp. 5-6.

TABLE 8.—Incremental capital-output ratios for total industry and individual branches<sup>1</sup> by selected Republics of the U.S.S.R., 1958-65<sup>2</sup>

|                              | Total industry                        |  | Electric power   | Fuel             | Ferrous metals   | Chemicals        | Machine building and metal-working | Timber, wood-working, pulp and paper | Building materials | Light | Food  |
|------------------------------|---------------------------------------|--|------------------|------------------|------------------|------------------|------------------------------------|--------------------------------------|--------------------|-------|-------|
|                              | Using employment distribution weights | Using fixed capital distribution weights |                  |                  |                  |                  |                                    |                                      |                    |       |       |
| U.S.S.R. ....                | 1.092                                 | 1.092                                    | 1.030            | 1.038            | 1.185            | 1.294            | 0.857                              | 1.218                                | 1.161              | .397  | 1.196 |
| R.S.F.S.R. <sup>3</sup> ..   | 1.217                                 | 1.191                                    | 1.206            | .947             | 1.212            | 1.488            | .963                               | 1.476                                | 1.302              | 1.650 | 1.169 |
| Ukraine .....                | 1.080                                 | 1.087                                    | 1.078            | 1.130            | 1.155            | .994             | .778                               | 1.213                                | 1.135              | 1.585 | 1.266 |
| Belorussia <sup>4</sup> ..   | .953                                  | 1.043                                    | ( <sup>5</sup> ) | ( <sup>5</sup> ) | ( <sup>5</sup> ) | 1.803            | .892                               | .916                                 | ( <sup>5</sup> )   | .830  | 1.045 |
| Moldavia <sup>4</sup> .....  | 1.114                                 | 1.052                                    | .787             | ( <sup>5</sup> ) | ( <sup>5</sup> ) | 2.278            | .668                               | 1.359                                | 1.396              | 1.267 | 1.082 |
| Lithuania .....              | 1.111                                 | 1.003                                    | .888             | ( <sup>5</sup> ) | ( <sup>5</sup> ) | .668             | 1.164                              | 1.272                                | .905               | 1.306 | .907  |
| Latvia <sup>4</sup> .....    | 1.117                                 | 1.097                                    | .810             | 1.660            | ( <sup>5</sup> ) | ( <sup>5</sup> ) | 1.308                              | .911                                 | 1.468              | .911  | 1.039 |
| Estonia .....                | 1.008                                 | .972                                     | .812             | .876             | ( <sup>5</sup> ) | .900             | .813                               | 1.104                                | 1.203              | 1.063 | 1.173 |
| Georgia <sup>5</sup> .....   | 1.189                                 | 1.084                                    | 1.040            | .710             | 1.124            | ( <sup>5</sup> ) | .661                               | 1.377                                | 1.228              | 1.639 | 1.258 |
| Armenia .....                | 1.156                                 | 1.186                                    | 1.356            | ( <sup>5</sup> ) | ( <sup>5</sup> ) | 1.003            | 1.012                              | 1.194                                | 1.260              | 1.278 | 1.220 |
| Kazakhstan .....             | 1.214                                 | 1.335                                    | 1.537            | 1.173            | 1.521            | 1.330            | .885                               | 1.787                                | 1.165              | 1.230 | 1.333 |
| Uzbekistan .....             | 1.157                                 | 1.101                                    | .990             | .935             | 1.186            | .971             | .742                               | .686                                 | 1.655              | 1.496 | 1.225 |
| Kirghizia <sup>6</sup> ..... | 1.102                                 | 1.106                                    | .373             | 1.963            | ( <sup>5</sup> ) | ( <sup>5</sup> ) | .638                               | 1.445                                | .767               | 1.418 | 1.314 |
| Tadzhikistan <sup>4</sup> .. | 1.087                                 | 1.235                                    | 1.203            | 1.203            | ( <sup>5</sup> ) | ( <sup>5</sup> ) | .729                               | .741                                 | .813               | 1.284 | 1.091 |

<sup>1</sup> Branch ratios are derived by dividing the index of fixed capital by the index of gross output for each branch, and those for total industry by aggregating the branch ratios with the help of employment or fixed capital distribution (tables A-4 and A-5). The percentage share of the listed branches in total industrial employment resp. fixed capital is shown in the last 2 columns of table A-5.

<sup>2</sup> Unless otherwise indicated.

<sup>3</sup> 1959-65.

<sup>4</sup> 1960-65.

<sup>5</sup> Not available.

As can be seen, there are wide variations in the magnitude of incremental capital-output ratio for individual branches as well as for the total industry among the republics. It is beyond the scope of this paper to analyze the reasons for specific cases. This calculation was undertaken in order to determine whether the geographical distribution of investment, on the average for the U.S.S.R. as a whole, was guided by the productivity of capital, as shown by the incremental capital-output ratio; and it indicates that there was no correlation between this ratio and the investment per capita by republics (Table 6). This is true when either employment or fixed capital distribution is used as weights.<sup>86</sup>

Because of various deficiencies in the concept of incremental capital-output ratio,<sup>87</sup> the growth of productivity of combined resources, usually of labor and capital, is considered to be a better indicator for the allocation of investment. In this case, the investment per capita should have been the highest in those republics and regions of the U.S.S.R. in which the growth of productivity has been the highest. As in the previous calculation, the indicator for the total industry should be a weighted average of branch indicators. For the purpose of calculation of growth rates of implied productivity of combined resources, the data on output, employment, and capital are needed, which, to repeat, are frequently incomplete.

On the basis of available information, the growth rates of implied productivity of combined resources for nine branches and the total industry for the U.S.S.R. as a whole and for 13 republics were calculated.<sup>88</sup> They are presented in Table 9. In addition to the shortcomings listed in regard to Table 8, the following approximations had to be taken in this calculation: instead of the index of labor services, the index of employment, and in a few cases the index of workers only, was used; instead of the index of capital contribution—depreciation plus certain return on fixed capital and inventories—the index of fixed capital, including depreciation, was used; the production function for an industrial branch in the U.S.S.R. was assumed to be the same for this branch in all republics.

<sup>86</sup>  $r_2$  is equal to 0.023 using employment distribution weights and to 0.045 using fixed capital distribution weights.

<sup>87</sup> Cf. Gerald M. Meier, *Leading Issues in Development Economics*, New York, Oxford University Press, 1964, pp. 101-104.

<sup>88</sup> The derivation of this indicator is explained in Note to Table A-4.

TABLE 9.—Growth rates of implied productivity of combined labor and capital for total industry and individual branches<sup>1</sup> by selected Republics of the U.S.S.R., 1958-65<sup>2</sup>

|                                 | Total industry                        |  | Electric power   | Fuel             | Ferrous metals   | Chemicals        | Machine building and metal-working | Timber, wood-working, pulp and working | Building materials | Light | Food |
|---------------------------------|---------------------------------------|--|------------------|------------------|------------------|------------------|------------------------------------|--|--------------------|-------|------|
|                                 | Using employment distribution weights | Using fixed capital distribution weights |                  |                  |                  |                  |                                    |  |                    |       |      |
| U.S.S.R.....                    | 3.50                                  | 2.89                                     | 0.23             | 3.98             | 1.99             | 1.30             | 5.54                               | 3.55                                   | 4.98               | 0.53  | 1.85 |
| R.S.F.S.R. <sup>3</sup> .....   | 2.20                                  | 1.64                                     | -2.33            | 5.04             | 1.52             | - .73            | 4.17                               | .91                                    | 2.91               | - .70 | 1.21 |
| Ukraine.....                    | 3.33                                  | 2.81                                     | - .17            | 2.86             | 1.98             | 5.16             | 5.26                               | 2.03                                   | 4.21               | .70   | 1.90 |
| Belorussia <sup>4</sup> .....   | 5.63                                  | 4.01                                     | ( <sup>5</sup> ) | ( <sup>5</sup> ) | ( <sup>5</sup> ) | -3.01            | 4.23                               | 5.48                                   | ( <sup>5</sup> )   | 11.44 | 2.38 |
| Moldavia <sup>4</sup> .....     | 2.66                                  | 3.85                                     | 6.82             | ( <sup>5</sup> ) | ( <sup>5</sup> ) | -7.12            | 6.76                               | - .63                                  | 6.90               | -1.14 | 2.62 |
| Lithuania.....                  | 4.01                                  | 4.25                                     | 3.15             | ( <sup>5</sup> ) | ( <sup>5</sup> ) | 4.85             | 4.56                               | 1.01                                   | 9.24               | 2.08  | 4.38 |
| Latvia <sup>4</sup> .....       | 1.98                                  | 2.58                                     | 5.82             | - .61            | ( <sup>5</sup> ) | ( <sup>5</sup> ) | -3.35                              | 8.75                                   | - .76              | 5.26  | 3.78 |
| Estonia.....                    | 3.09                                  | 4.04                                     | 4.60             | 5.58             | ( <sup>5</sup> ) | 4.87             | 5.52                               | 2.77                                   | 6.26 <sup>4</sup>  | - .22 | 2.55 |
| Georgia <sup>3</sup> .....      | 1.45                                  | .03                                      | -6.17            | 6.93             | .78              | ( <sup>5</sup> ) | 9.07                               | - .23                                  | 1.72               | -4.16 | .70  |
| Armenia.....                    | 2.20                                  | .65                                      | -4.97            | ( <sup>5</sup> ) | ( <sup>5</sup> ) | 5.38             | 3.00                               | 3.64                                   | 5.58               | .48   | .01  |
| Kazakhstan.....                 | 3.00                                  | .96                                      | -4.74            | 1.15             | 1.20             | 2.10             | 6.39                               | 1.71                                   | 5.44               | 1.68  | 2.12 |
| Uzbekistan.....                 | 4.15                                  | 3.66                                     | .60              | 4.92             | 3.40             | 4.76             | 8.97                               | 7.87                                   | 5.02               | .03   | 1.24 |
| Kirghizia <sup>3</sup> .....    | 3.82                                  | 5.45                                     | 17.51            | -2.57            | ( <sup>5</sup> ) | ( <sup>5</sup> ) | 7.65                               | .82                                    | 9.04               | .33   | .51  |
| Tadzhikistan <sup>4</sup> ..... | 2.42                                  | - .26                                    | -8.43            | 1.72             | ( <sup>5</sup> ) | ( <sup>5</sup> ) | 7.10                               | 6.30                                   | 10.63              | - .97 | 2.46 |

<sup>1</sup> Growth rates for individual branches were calculated on the basis of indexes of combined productivity of labor and capital given in Table A-4, and aggregated for the entire industry with the help of employment or fixed capital distribution given in Table A-5. The percentage share of the listed branches in total industrial employment respectively fixed capital is shown in the last 2 columns of table A-5.

<sup>2</sup> Unless otherwise indicated.

<sup>3</sup> 1959-65.

<sup>4</sup> 1960-65.

<sup>5</sup> Not available.

As in the case of incremental capital-output ratios, the differences in the growth rates of productivity among individual branches for the listed republics and the U.S.S.R. are quite substantial. The same is true for productivity growth rates of all industry among the republics, aggregated with the help of either employment or fixed capital distribution. The calculation indicates that the investment per capita between 1959 and 1965 (Table 6) was unaffected by the variation in the growth rates of implied productivity of combined resources.<sup>89</sup> Thus, on the basis of this and preceding calculations, the conclusion can be drawn that the purely economic factor, namely, the maximization of output for the entire country, was not the decisive factor for the geographic distribution of investment in the U.S.S.R. during this period of time.

#### DEFENSE CONSIDERATIONS

Finally, the third objective of Soviet location policy, the defense considerations, will be analyzed. While investigating location practice in the U.S.S.R. before World War II, this writer argued that precisely these considerations, especially from the long-run point of view, were most important for the location decisions of heavy industry branches, the development of which was emphasized at that time.<sup>90</sup> This conclusion was reached on the basis of the analysis of differential development of the Ukrainian industry. It is beyond any doubt that at that time further expansion of the iron and steel industry in the Donbas and of most other heavy industry branches in the European part of the U.S.S.R. would have been more efficient than the opening up for this purpose of backward, very sparsely populated regions of the Eastern Urals and Western Siberia, characterized by a severe climate. The return on direct investment in industry and on additional expenditures in unavoidable social overhead, transportation, and urbanization there was much smaller than the return on corresponding investment in the Ukraine or, in general, in the Western U.S.S.R.

It seems that the advantage of the eastern regions, which apparently outweighed their purely economic disadvantages, was their geographical location. These regions were sufficiently removed from the western boundaries of the U.S.S.R. and, consequently, provided a certain measure of safety from a sudden invasion or from bombardment by aircraft. This was in welcome contrast to the three existing industrial centers in the West—Moscow, Leningrad, and the Donbas—which were particularly vulnerable in this respect. The shift of industry from the west to the east of the country was needed also in view of the potential threat at that time from Japan. Such strategy required the development in the eastern regions of extractive and intermediate branches of heavy industry, to be followed up subsequently by the development of final-products branches. Since the latter part of this program proceeded rather unsuccessfully, because final-products branches, mainly machine building, continued stubbornly to be clustered in a few traditional centers in the west, the U.S.S.R. entered the war in 1941 with an unfinished base in the east.

<sup>89</sup>  $r_2$  is equal to 0.006 and 0.043 using as weights the employment and fixed capital distribution, respectively.

<sup>90</sup> See the previously cited article from *Soviet Studies*, particularly its second part in the October 1967 issue and, for a more extensive discussion, the forthcoming book *Location Problems in Soviet Industry Before World War II: The Case of the Ukraine*, Chapel Hill, the University of North Carolina Press, Chapter 6 and Appendix B.



In retrospect, it is probable that a lesser emphasis on the development of eastern regions and, instead, a continued expansion of western industrial centers would have better prepared the U.S.S.R. for the approaching war, at least in terms of supply of military hardware.<sup>91</sup>

Defense considerations that were applicable 30 years ago are not valid today. In times of orbiting satellites and ICBM's there are no truly safe locations. Still, even now the location policy can play a useful role in assuring the viability of industry, particularly of heavy and defense industry, in the case of war. According to a Soviet authority, although "no geographical distribution of industrial installations will guarantee their protection from missile strikes their survivability must be secured through compulsory dispersion, duplication of production, and antinuclear defense measures. One must especially stress the need for the dispersal of industrial power sources under present conditions."<sup>92</sup>

In the Soviet context, because of the traditional concentration of industry in the European part of the country, the need to disperse industry and to construct duplicate plants is equivalent to the industrialization of the Asiatic parts of the country. Thus this defense requirement coincides with the earlier discussed locational objective, calling for the equalization of industrial development among republics and regions for economic, social, and political reasons. In practice, this objective also means a faster growth of the eastern regions of the Russian S.F.S.R. and of the Asiatic republics than of the European part of the U.S.S.R. Therefore, the results in regard to the equalization, obtained at the beginning of this part, are also indicative of the progress in the industrial dispersal for strategic reasons during the period under discussion. These results, as might be recalled, show that some progress in this respect was evident on the interregional level within the R.S.F.S.R., while no progress can be observed on the interrepublican level. The reason for this is due to the fact that the dispersal is important primarily for the heavy and defense industries. These industries were originally located in the western and central regions of Russia proper and in the Ukraine. Now they are being developed in the eastern parts of Russia and also Kazakhstan. The decreasing coefficient of variation for the Russian regions and the unchanging coefficient for the republics indicate just this trend.

### III. GEOPOLITICAL ASPECTS OF LOCATION POLICY

As the previous discussion has shown, the Soviet location policy was not motivated by the purely economic objective—the maximization of industrial output for the entire country. The implementation of another important objective—the territorial equalization of industrial development—progressed noticeably during the period under discussion, but only in regard to the regions of the R.S.F.S.R., while the differences among the republics remained largely unchanged. Since a wider geographical distribution of industry, even if limited to the R.S.F.S.R. (which after all accounted for nearly two-thirds of the total output in the U.S.S.R.)<sup>93</sup> is presently of great importance for

<sup>91</sup> At the present time, the official line of the U.S.S.R. is to claim that precisely the development of eastern regions, and in particular the construction of the Ural-Kuznetsk Combine, was one of the decisive factors in winning the last war. Cf. Ivan Pavlovich Bardin, *Sotsialisticheskaia industrializatsiia i chernaia metallurgia*, Moscow, Izd.-vo Akademii nauk SSSR, 1950.

<sup>92</sup> Sokolovskii, *op. cit.*, p. 451.

<sup>93</sup> Table A-1.

the national security, the remainder of this paper will be devoted to the further analysis of this aspect of location policy. However, an alternative hypothesis as to which factor dominates this policy needs to be discussed first.

AN ALTERNATIVE HYPOTHESIS: THE COLONIAL EXPLOITATION OF  
NON-RUSSIAN NATIONALITIES BY RUSSIANS

The existing investment policy in the U.S.S.R. is often explained in terms of colonial relationship between Russia proper and the non-Russian nationalities.<sup>94</sup> As was shown in Table 6, investment per capita in the R.S.F.S.R. during the postwar period was constantly above the average for the U.S.S.R. Although the per capita income in this republic—and, consequently, probably also (in per capita terms) the combined direct and indirect taxes, the savings of population, and the profits of its enterprises—was third highest among all the republics,<sup>95</sup> still all these sources were certainly insufficient to entirely finance this high level of investment per capita. Therefore the investible funds accumulated in various non-Russian republics had to be transferred through the mechanism of a centralized union budget to Russia. Obviously, the present discussion refers to the transfers which were in excess of the contributions of individual republics to the union budget for such common expenses as defense, external affairs, and others. It is needless to add that the transfer of funds takes place in the U.S.S.R. without the explicit consent of the republics concerned, and these funds are never returned nor is the interest paid for their use. This situation is particularly well documented for the Ukraine by Soviet as well as Western scholars.<sup>96</sup> Their empirical studies show conclusively that the Ukraine contributed more to the union budget than it received from that budget during various periods of U.S.S.R. history.

The case for the claim that the transfer of funds from non-Russian republics to Russia has been motivated by the colonial relationship between them is strengthened by the fact that the productivity of capital or the productivity of combined resources does not justify such transfer. If the productivity of capital were higher in Russia than in other republics, then at least it could be argued that this investment policy resulted in the maximization of the total output of the U.S.S.R. However, it has been shown that, for example, the incremental capital-output ratio in Ukrainian industry was about one quarter lower on the average than that for the U.S.S.R. during the First and Second Five-Year Plans.<sup>97</sup> (The R.S.F.S.R. and the Ukraine accounted at that time for slightly more than 90 percent of the total output of Soviet industry.) Despite this, the Ukraine received 19 percent of the total U.S.S.R. investment in industry during this period of time.<sup>98</sup> which was equal to its share in the total

<sup>94</sup> For detailed discussion of this problem, see Holubnychy, *op. cit.*, 55-57, 76-86. He cites also extensive literature on this subject.

<sup>95</sup> Table 3.

<sup>96</sup> Calculations about the transfer of funds from the Ukraine to other parts of the U.S.S.R. have been made by: Ukraine, Gosudarstvennaia planovaiia komissia, *Materialy dlia opredeleniia roli Ukrainy v obshegosudarstvennom biudzhete SSSR v 1913, 1922-23, 1923-24, i 1924-25 gg.*, Khar'kov, 1925; V. Dobrogaev, "Problemy finansovogo balansu Ukrainy," *Khvoziaistvo Ukrainy*, v. 4, no. 2, Feb. 1927; and M. Volobuev, "Do problemy ukrains'koi ekonomiky," *Bil'shovyk Ukrainy*, nos. 2 and 3, 1928 (for the mid-1920s); Zinowij Lew Melnyk, *Soviet Capital Formation, Ukraine, 1928/29-1932*, Munich, Ukrainian Free University Press, 1965 (for the First Five-Year Plan); and Akademia nauk Ukrainskoi SSR, Instytut ekonomiky, *Natsional'nyi dokhod Ukrainy'koi RSR v period rozhornutoho budynystva komunizmu* (O. O. Nesterenko, ed.), Kyev, Vid.-vo Akademii nauk Ukr. RSR, 1963, Chapter VII (for the years 1959-1961).

<sup>97</sup> See Chapter 3 of the above mentioned forthcoming book by this author.

<sup>98</sup> U.S.S.R. TsSU, *Kapital'noe stroitel'stvo v SSSR*, pp. 60, 80, 82.

population, while Russia received 69 percent of the total investment, which was about 5 percentage points above the latter's share in the total population.<sup>99</sup> Moreover, as shown by Table 5, the investment per capita in the R.S.F.S.R. was the second highest among all republics during the postwar period, but the incremental capital-output ratio between 1959 and 1965, a period which there is no reason to believe atypical, was 10 percent above the U.S.S.R. average (table 8) and the productivity growth was more than one-third lower than that for the entire country (table 9). Thus, in the light of these facts, the conclusion can be drawn that the above-average industrial investment per capita in Russia cannot be justified by purely economic considerations.

The argument for the existence of Russian colonialism, specifically in regard to the Ukraine, received recently powerful support from a Soviet-Ukrainian writer, Ivan Dziuba.<sup>100</sup> In his book, closely reasoned along Marxist-Leninist lines, Dziuba argues that the transfer of investible funds from the Ukraine to Russia serves precisely as an important vehicle for another aspect of colonial relationship between them, for the Russification of the Ukrainians.<sup>101</sup> Since these funds are not used for providing new jobs in the Ukraine but are used for the financing of new enterprises in underdeveloped regions of Russia, many young Ukrainians who are not able to find employment in their native land are forced to migrate to these developing regions. Since the present Soviet rulers do not permit any schools in the Ukrainian language, nor the publication of any Ukrainian newspapers, nor any cultural activity in the Ukrainian language in the Russian S.F.S.R., these migrants and even more so their children are exposed to rapid denationalization. On the other hand, Soviet planners always find the opportunity to send Russians to the Ukraine, not in order to take some ordinary positions, but mainly in supervisory capacities.<sup>102</sup>

The above facts provide strong support for the claim that the Ukraine contributed to the financing of development in some other regions of the U.S.S.R. Furthermore, on this basis, an inference can be made that this is also true as far as other non-Russian republics are concerned.<sup>103</sup> Yet these facts still do not prove that these transfers were taking place only in order to benefit Russian nationals in Russia at the cost of Ukrainians or other non-Russians. The following factors can be cited in support of the latter contention:

(1) The transfer of funds from a colony to the metropolis, despite the lower productivity of capital in the latter, is more likely to take place when they are geographically removed, i.e., in the case of maritime colonial systems, and thus when the movement of other resources, mainly of labor, is restricted. In this case the funds originating in the colony are used for providing new job opportunities in the metropolis. The U.S.S.R. presents a contiguous land colonial system in which the movement of labor is not only easy but because of ideological considerations even strongly encouraged. Therefore, the funds accumulated in a non-Russian republic can be used for the construction of new enterprises in the same republic, and Russians

<sup>99</sup> *Sotsialisticheskoe stroitel'stvo SSSR*, Moscow, Tsentral'noe upravlenie narodno-khoziaistvennogo ucheta SSSR, 1939, pp. 8-9.

<sup>100</sup> See his book published in English under the title *Internationalism or Russification? A Study in the Soviet Nationalities Problem*, London, Weidenfeld and Nicolson, 1968, pp. 102 ff.

<sup>101</sup> To support his argument, Dziuba uses the findings from *Akademiia nauk Ukrain's' kol SSR*, *op. cit.*

<sup>102</sup> Dziuba, *op. cit.*, pp. 110-11.

<sup>103</sup> See Herman, *op. cit.*, p. 99, for complaints of this type made by the Kazakhs.

might migrate to find employment there. In this case, Russians would benefit even more, because they would be working often in more efficient factories.

(2) Regardless of the type of the colonial system, transfer of funds would take place if the domination of the metropolis over its colonies were uncertain. Unfortunately for non-Russian nationalities, with the fresh memory of Czechoslovakia of August 1968, there are no indications of even loosening of Moscow's grip over the non-Russian republics in the foreseeable future.

(3) As Table 6 shows, investment in industry per capita was above the U.S.S.R. average not only in the R.S.F.S.R., but also, during various periods of time, in Azerbaidzhan, Estonia, and Kirghizia. It was about equal to the average in Kazakhstan and Turkmenia. It is true that this investment, for example, in the Central Asian republics benefited first of all the newly arrived Russians and also the Ukrainians and Belorussians who take over many of the new jobs.<sup>104</sup> This can be also inferred from the fact that the share of the indigenous population in growing urban centers, where the bulk of industry is located, is much below its share in the total population in these republics.<sup>105</sup> But there is also no question that this investment did provide some jobs for the native population as well and, moreover, is the source of important external economies for the whole economy of these republics.

(4) As Table 7 indicates, the investment per capita (although in this case, the investment in total economy, not investment in industry alone as in the preceding paragraph) was not above the U.S.S.R. average in all Russian regions. For example, in such historical regions of Russia proper as Volga-Viatka or Central Black Earth, which accounted for 12.7 percent of the total population in the Russian S.F.S.R., in 1967 the investment per capita during the Seven-Year Plan was about two-thirds of the U.S.S.R. average. If there were only the problem of nationality one may ask why Russians and also some non-Russian migrants from the Western U.S.S.R. in East Siberia or the Far East regions (where, as might be recalled, average investment per capita was considerably above the U.S.S.R. average) were receiving preferential treatment in relation to Russians in the Volga-Viatka or the Central Black Earth regions.

(5) Finally, the present discussion deals with investment decisions concerning the development of industrial branches and considerably affecting the entire economy of individual regions and not with investment decisions for a single plant of a local character. In the bureaucratic and centralized system of the U.S.S.R. such investment projects have to be discussed, reviewed time and again, and finally approved

<sup>104</sup> For example, in its criticism of the work of the Tadzhik Communist Party, the Central Committee of the C.P.S.U. admitted that, allegedly: "Insufficient attention is paid to training workers from among the indigenous population; there are especially few Tadzhiks among the industrial production personnel at enterprises in the chemical industry, machine building and metal processing." See "O rabote CK Kompartii Tadzhikistana po vypolneniiu reshenii XXIII S"ezda KPSS, *Partiinaiia zhizn'*, No. 1, January 1969, pp. 3-8, as translated in *The Current Digest of the Soviet Press*, v. 21, No. 3, February 5, 1969, p. 13. That this refers to a not insignificant fraction of all industrial workers can be seen from the fact that the employed in the machine building and metal processing accounted for 10.6 and 16.4 percent of all the employed in Tadzhik industry in 1960 and 1965, respectively. See U.S.S.R. TsSU, *Trud v SSSR*, Moscow, Statistika, 1968, pp. 112-113. (The figures on employment in chemical industry are unavailable.) Or, the proportion of indigenous population in the total employment in such important industries as coal and various nonferrous mining and woodworking in the Iakut A.S.S.R. was as low as 2.6 percent in 1957 and 4 percent in 1958. This situation remained basically unchanged in more recent years. See Murray Feshbach, "Manpower in the U.S.S.R.: A Survey of Recent Trends and Prospects," in U.S. Congress, Joint Economic Committee, *New Directions* . . . . pp. 731-732.

<sup>105</sup> Cf. James W. Brackett and John W. De Pauw, "Population Policy and Demographic Trends in the Soviet Union," *ibid.*, p. 634.

by a large number of various offices,<sup>106</sup> most of them located in Moscow. In spite of the fact that the officials are most likely to be Russians, it is very doubtful that in a society dedicated to internationalism, even if *pro forma*, the argument of benefit to Russians at the cost of non-Russians can be brought up openly in the discussion of merits or demerits of the location of a particular investment project. However, it is very possible that if a Russian national has to make a decision he might be motivated by this argument, while a non-Russian in the same position would probably not act favorably to his native land, out of fear of being accused of bourgeois nationalism.

The following conclusion can be drawn on the basis of the preceding arguments: The interrepublican transfers of investible funds, which have been taking place in the U.S.S.R., cannot be explained by the tendency on the part of the largest republic, the Russian S.F.S.R., to exploit other republics, as it is sometimes argued. Instead, this investment policy was in accordance with the requirements of the entire state, as seen by the leadership in Moscow. In order to attain certain economic or political goals of nationwide importance, such transfers of funds were effected among republics without regard to what nationality inhabits the republics in question. However, since the regime is dominated by Russian nationals, one can argue that any investment policy designed to strengthen the regime benefits indirectly the Russian people.

#### THE PROBLEM OF CHINA AND THE BALTIC NATIONS

Coming back now to the analysis of the influence of defense considerations on the location policy in the U.S.S.R., it is necessary to point to the following fact: As was shown in chapter II, the dispersal of industry, which was implemented through the geographical distribution of investment, was not taking place proportionally throughout the country but was directed to a few specific regions. Therefore, its purpose was not so much to avoid presenting to the enemy a concentrated target but to build up these few regions in terms of human and economic potential and thus to strengthen the defense posture of the country versus other, primarily neighboring, countries. For this reason it is preferable to call such location measures geopolitical<sup>107</sup> and not, as is conventionally done, defense measures. It is suggested that the emphasis on the development of the regions neighboring China, the Baltic republics, and the eastern regions of the R.S.F.S.R. should be viewed in this light. These problems will now be discussed.

As Table 7 shows, the investment per capita in the late 1950's and in the first half of the 1960's was the highest in the easternmost region of the Russian S.F.S.R., the Far East. The investment was also considerably above the average for the entire country in the neighboring region, East Siberia. Outside Russia, in the Asiatic parts of the U.S.S.R., the industrial investment per capita was relatively high in Kirghizia, Turkmenia, and Kazakhstan (Table 6). All these regions are very rich in natural resources, and, no doubt, this factor could have

<sup>106</sup> Cf. Iakov Grigor'evich Feigin, *Razmeshchenie proizvodstva pri kapitalizme i sotsializme*, 2d ed., Moscow, Gospolitizdat, 1953, p. 204.

<sup>107</sup> According to Webster's *New Collegiate Dictionary*, geopolitics is a systematic study of internal and continental geographic features, physical, economic, and anthropographic, as essential factors in shaping governmental policies, especially foreign policy, for achieving national security.

been of considerable importance for decisions concerning investment distribution, despite the fact that some of these regions such as Siberia and the Far East have consistently suffered from a shortage of labor resulting from the relatively low density of population.<sup>108</sup> Furthermore, of certain importance for the investment decisions, primarily in the case of Central Asian republics, might have been their very low level of industrialization. However, the fact that all these areas are bordering on China seems to be of overriding importance for the emphasis on their rapid economic development.

It is well known that relations between the U.S.S.R. and China since the late 1950's have worsened considerably on ideological as well as on practical grounds. These relations have become particularly strained in most recent times, even leading to armed border clashes.<sup>109</sup> In addition, Peking's claims to the Far Eastern and Central Asian regions of the U.S.S.R., which in the past had belonged to China, tend to exacerbate this hostility.<sup>110</sup> Furthermore, secret ambitions in regard to sparsely populated expanses of Siberia that are rich in natural resources have long been ascribed as the goals of overpopulated China.<sup>111</sup> All this, no doubt, compels the U.S.S.R. to populate these regions and to build them up economically in order to withstand this potential pressure from China. This consideration even led the U.S.S.R. to seek the cooperation of Japan in providing the necessary capital for the development of these regions in return for imports of timber and other natural resources from the U.S.S.R.<sup>112</sup>

Looking now at the opposite end of the U.S.S.R., it is obvious that the geographic location of the three Baltic republics is also of extreme strategic importance to the Soviet regime.<sup>113</sup> Therefore, in order to secure its northwest flank, the regime, hoping to gain the sympathy of the population, was compelled to make certain concessions to local nationalism. For example, it allowed only these three republics to expand elementary and high school education to 11 years, in contrast to 10 years in the rest of the U.S.S.R., so that opportunity can be provided for the students to learn the native languages more thoroughly.<sup>114</sup> Another, more tangible, means used by the regime to placate the potential irredenta in this region was the highest income per capita among all republics in Estonia and Latvia and relatively high in Lithuania and thus probably the highest standard of living in the U.S.S.R.<sup>115</sup> This was obviously made possible through relatively high investment per capita in the overall economy<sup>116</sup> as well as in industry (Table 6). It looks as if Lithuania benefited least among these three republics from this preferential treatment. However, its level of industrialization is still relatively high as compared with that of other non-Russian republics (Table 1). On the other hand, Estonia was particularly favored. Having a related language and traditional

<sup>108</sup> For example, in 1965, the population per 1 km<sup>2</sup> was 10.35 for the U.S.S.R. as a whole, but only 1.76 for East Siberia and 0.89 for the Far East. For the four Central Asian republics it was equal to 13.86 and for Kazakhstan to 4.47. See N. kh. SSSR 1965, pp. 12-13.

<sup>109</sup> For a report on a recent clash on the Ussuri River, the boundary river between the U.S.S.R. and China, see *The New York Times*, March 3, 1969, p. 1.

<sup>110</sup> For example, China published maps showing 500,000 square miles of the U.S.S.R. as Chinese territory. See H. Schwartz, "Most sweeping charge," *The New York Times*, September 2, 1964, p. 12. Chinese leaders claim that these areas have been annexed by Russia as a result of nine "unequal" and "temporary" treaties imposed on China in the 19th century. See H. E. Salisbury, "Russians going to area China claims," *The New York Times*, March 22, 1963, p. 8. For a short discussion of these treaties and the map showing the disputed territories (the Far East and the Central Asian republics), see Theodore Shabad, "Russian-Chinese clashes in border area began in 17th century," *The New York Times*, March 12, 1969, p. 16.

<sup>111</sup> For a succinct analysis of the Soviet-Chinese conflict by Mlovan Djilas, see his interview in *The New York Times*, November 27, 1968, p. 10.

<sup>112</sup> Philip Shabecoff, "Soviet and Japan sign Siberia pact," *The New York Times*, August 18, 1968, p. 10.

cultural ties with Finland, this republic was not only allowed but even encouraged to maintain close mutual contracts with friendly but, after all, capitalist Finland.<sup>117</sup> This is, of course, unheard of in the case of any other Soviet republic. It seems that Estonia has been assigned the role of a showcase of the U.S.S.R. in the region of the Baltic Sea and this, perhaps, explains the privileged position of this republic. Attention should also be drawn to the fact that the incremental capital-output ratio in Baltic republics has been about equal to the average for the U.S.S.R. (Table 8) and the growth of productivity has been relatively high as compared with that in other republics. (Table 9). This factor has been perhaps an additional argument for the allocation of relatively high investment per capita in this region.

If the main objective, or even one of a few important objectives, of the Soviet regime were the economic bolstering of all regions bordering on other countries, then all non-Russian republics would fare very well in regard to the allocation of investment, because one of the conditions for a non-Russian nationality to be elevated to the status of a union republic is to have such a border. However, the data in table 6 show that this has not been true in the case of the remaining non-Russian republics in Western U.S.S.R. (the Ukraine, Belorussia, Moldavia), two Transcaucasian republics (Georgia, Armenia) and two Central Asian republics (Uzbekistan, Tadzhikistan). The investment per capita during the postwar years was for all of them below the average for the U.S.S.R., and for some of them quite considerably so.

Despite the fact that productivity growth was relatively high in some of these republics it seems that strategic considerations were of even greater importance for the lack of attention shown to the development of all republics enumerated in the preceding paragraph. A greater buildup of the economic potential of the Ukraine, Belorussia, and Moldavia was not particularly desired for defense reasons, because after World War II they lost their western most position and became practically a hinterland in the Soviet commonwealth of nations. Through the imposition of socialist regimes in East-Central European countries and by maintaining there its political influence and military presence, the U.S.S.R. was able to build for itself a *cordon sanitaire* which separates it from the capitalist West and which in the case of conventional warfare could absorb the main shock. The location of the Transcaucasian republics also does not require their economic buildup for strategic reasons.<sup>118</sup> Because of mountainous terrain and because of the weakness of neighboring countries, this region has never in the past been an invasion route into Russia. Finally, in regard to the two above-mentioned Central Asian republics, in view of the existing Soviet-Chinese relations it might not come as a surprise if the planners soon begin to emphasize also the growth of these republics.

<sup>117</sup> Armstrong, *op. cit.*, p. 22.

<sup>118</sup> The favorable treatment of the Baltic republics becomes even more striking in view of the fact that the opposition to the notorious education laws of the late 1950s, aiming at a more intensive Russification of other nationalities, was also very strong but without success in all three Transcaucasian republics. See Yaroslav Bilinsky, "The Soviet Education Laws of 1958-9 and Soviet Nationality Policy," *Soviet Studies*, v. 14, No. 2, October 1962, p. 140 (138-157).

<sup>119</sup> Table 3.

<sup>120</sup> See footnote 79, above.

<sup>121</sup> Jaan Peniar, "Nationalism in the Soviet Baltics" in Goldhagen, *op. cit.*, p. 215 (198-218).

<sup>122</sup> The privileged position of the remaining Transcaucasian republic, Azerbaijan, in regard to investment per capita, primarily during the 1950s, can be explained by the nation-wide importance of this republic's oil industry.

## EASTERN REGIONS

Another factor which dominates Soviet locational thinking is the problem of the eastern regions. There is practically no official document<sup>119</sup> or piece of pertinent economic literature in the U.S.S.R. which does not stress emphatically the need to develop, meaning the need to industrialize, these regions speedily. Officially, the following regions are included in this definition: the Urals, West Siberia, East Siberia, the Far East, Kazakhstan, the four Central Asian republics, and the Bashkir A.S.S.R. of the Volga region.<sup>120</sup> In 1967 these regions (without Bashkiria) represented 77.85 percent of the total area of the U.S.S.R. and 30.44 percent of its total population.<sup>121</sup> In a narrower sense, the Ural region is excluded from eastern regions.<sup>122</sup> In addition, the four Central Asian republics might also be excluded, because they belong to the eastern regions only geographically and not conceptually, in the sense that the development of these republics was never particularly emphasized, except, as was shown earlier, in very recent times because of the problems with China. Thus, the hard core eastern regions are actually West and East Siberia, and the Far East of the Russian S.F.S.R., and Kazakhstan. Even so, they still represented 69.09 percent of the total area, but only 16.01 percent of the total population of the U.S.S.R. in 1968.<sup>123</sup>

The preoccupation of Soviet leaders with the need to develop the eastern regions is not exactly of the most recent origin.<sup>124</sup> Interest in their development was particularly strong in the 1930's, and has been intensified again since the 20th Party Congress in 1956.<sup>125</sup> It seems that this interest will continue also in the future because, according to the current Five-Year Plan, the industrial growth in these regions is geared to be very high.<sup>126</sup> The obvious reason for the attractiveness of the eastern regions to Soviet planners is their vast but sparsely settled areas, which could relieve the overpopulation in some parts of European U.S.S.R. But the availability of rich natural and mineral resources, which offers an exceptional opportunity for the development of all kinds of economic activity, is of even greater appeal to the Soviet leadership. According to N. Baibakov, chairman of the U.S.S.R. Gosplan, in these regions are concentrated about 90 percent of the country's fuel resources, large reserves of lumber, ores of ferrous and nonferrous metals, and enormous hydraulic resources.<sup>127</sup> These resources are getting at the present time even more inviting, because of the availability of new technology appropriate to local conditions, and of large investments, which could be allocated at once and thus become more effective than if allocated piecemeal.<sup>128</sup>

<sup>119</sup> For example, among the goals for the current 5-year plan, the rapid development of the eastern regions occupies a very prominent place. See *XXVII s'ezd*, v. II, pp. 18-19, 21-22.

<sup>120</sup> *N. kh. SSSR 1965*, p. 161.

<sup>121</sup> Table A-1.

<sup>122</sup> For example, in the documents of the 23d Party Congress, the Ural region is consistently included in the west of the U.S.S.R.

<sup>123</sup> Table A-1.

<sup>124</sup> Cf. Franklyn D. Holzman, "The Soviet Ural-Kuznetsk Combine: A Study in Investment Criteria and Industrialization Policies," *Quarterly Journal of Economics*, v. 71, no. 3 (no. 284), August 1957, pp. 368-405.

<sup>125</sup> Kistanov, *op. cit.*, p. 42.

<sup>126</sup> For example, according to *XXIII s'ezd*, v. II, "A very important economic goal of the new 5-year plan is the rapid development of productive forces in the regions of Siberia and the Far East," (p. 366) or "rapidly to intensify the economic potential of the Far East" (p. 366).

<sup>127</sup> N. Baibakov, "Progress sovetskoi ekonomiki," *Pravda*, no. 224, August 12, 1967, p. 2.

<sup>128</sup> *A kademila nauk SSSR, Zakonomernosti . . .*, p. 37.



In fact, the industrialization of the eastern regions is often represented as the solution of all locational problems in the U.S.S.R.<sup>129</sup> However, in their praise, Soviet economists sometimes fail to mention one unpleasant fact about the east, namely that the climate in these parts of the country is often inhospitable to efficient economic activities and, indeed, to human habitation in general.<sup>130</sup> Most of the Asiatic regions of Russia have very long and severe winters, while Kazakhstan and the other Central Asian republics suffer often from long dry spells.

In order to bring these rich natural resources into exploitation, the Soviet leadership directed large investments into the eastern regions. According to Baibakov, they (inclusive of the Urals) received 35 percent of all state investment throughout the period of the Soviet rule.<sup>131</sup> In more recent times (1958-1967), the eastern regions in a broader sense, but without Bashkiria, received 36.5 percent of all investments in state and cooperative enterprises (excluding kolkhozes). West and East Siberia and the Far East alone received during this period of time 16.2 and 26.2 percent of all investments in the U.S.S.R. and R.S.F.S.R., respectively.<sup>132</sup> The other component of the eastern regions, Kazakhstan, the development of which was also particularly stressed, received 5.3 percent of all U.S.S.R. investment in state and cooperative enterprises between 1951 and 1957 and 7.3 percent during the period 1958 and 1967.<sup>133</sup>

As a result of this substantial investment, a shift in the share of eastern regions in the total industrial output of the U.S.S.R., amounting to 7.5 percentage points, took place between 1940 and 1967 (table 10). As can be seen from this table, this shift was actually limited to the period between 1940 and 1950, and thus had resulted primarily from the war pressures. Having completed the reconstruction by 1950, the west started to regain its prewar position and by 1958 was able to recover two percentage points of the total industrial output. The shift in industry from west to east was accompanied by the shift in the population, which, however, was more consistent. As table 1-A shows, the share of eastern regions in the total population increased between 1940 and January 15, 1959, from 23.10 to 28.61 percent, and on January 1, 1968 to 30.44 percent. This increase was mainly due to the above-average growth of population in Central Asian republics<sup>134</sup> though there was also some increase in the population share of the eastern regions of Russia as well.

<sup>129</sup> Cf. Feigin, *op. cit.*, p. 247.

<sup>130</sup> Cf. Holland Hunter, *Soviet Transport Experience: Its Lessons for Other Countries*, Washington, The Brookings Institution, 1968, pp. 10-11.

<sup>131</sup> Baibakov, *loc. cit.*

<sup>132</sup> *N.kh.SSSR 1965*, p. 539; *N.kh.SSSR 1967*, p. 607.

<sup>133</sup> U.S.S.R. TsSU, *Kapital 'noe stroitel'stvo v SSSR*, p. 75; *N.kh.SSSR 1965*, p. 539; *N.kh.SSSR 1967*, p. 607.

<sup>134</sup> This fact led some observers to believe that the population census scheduled for 1970 will for the first time show that Russians will constitute less than one-half of the total population of the U.S.S.R. See Farnsworth Fowle, "Russians becoming a Soviet minority," *The New York Times*, Apr. 27, 1969, p. 16.

TABLE 10.—*Distribution of industrial gross output by eastern regions of the U.S.S.R. for benchmark years*

|   | [In percent of U.S.S.R.] |        |        |        |
|---|--------------------------|--------|--------|--------|
|   | 1940                     | 1950   | 1958   | 1967   |
| U.S.S.R. ....                                       | 100.00                   | 100.00 | 100.00 | 100.00 |
| Western regions.....                                | 82.45                    | 73.92  | 75.96  | 74.91  |
| Eastern regions.....                                | 17.55                    | 26.08  | 24.04  | 25.09  |
| Urals.....  | 5.35                     | 9.63   | 8.69   | 8.69   |
| West Siberia, East Siberia, Far East.....           | 7.01                     | 10.07  | 9.54   | 9.97   |
| Kazakhstan.....                                     | 1.65                     | 2.42   | 2.45   | 2.95   |
| Uzbekistan, Kirghizia, Tadzhikistan, Turkmenia..... | 3.54                     | 3.96   | 3.36   | 3.48   |

Sources: Tables A-1 and A-2.

The question can now be posed whether this shift of industrial output and population from west to east facilitated the attainment of two main locational objectives—the maximization of output and the equalization of industrial development among republics and regions. The effect of this policy on the former objective will be analyzed first. To repeat, the maximization of output will take place if investment is allocated to regions in which its productivity is highest. The scarcity of data for the eastern regions does not allow the calculation of resource productivity. Nevertheless, the available fragmentary information gives quite an unfavorable picture. For example, the conference on the development of Siberia, held by the Economic Institute of the Siberian Branch of the U.S.S.R. Academy of Sciences, revealed that, although the recipient of 12 percent of total investment in the U.S.S.R., this region produced only 7 to 8 percent of all industrial and agricultural output.<sup>135</sup> Furthermore, a comparison of the share of the three Russian eastern regions (West Siberia, East Siberia, and the Far East) in total U.S.S.R. output with their share in total U.S.S.R. investment during the period between 1958 and 1967, shows that the latter was considerably higher than the former: 9.80 and 16.20 percent respectively.<sup>136</sup> The below-average productivity of investment in these regions can be further supported by the following evidence: After qualifying his results because of the well-known deficiencies of official price structure but believing that they nevertheless average themselves out for republics and regions and thus, after all, indicate the trend, one Soviet author calculated a regional index of cost per one ruble of marketable (*tovarnaia*) output in the year 1963.<sup>137</sup> Taking the U.S.S.R. as 1, he obtained the following results for the regions in question: West Siberia—1.039; East Siberia—1.052; and the Far East—1.121. As can be seen, the cost of production was between 4 and 12 percent higher in these regions than on the average in the U.S.S.R.

Available indicators show a similarly unfavorable relationship between investment and output for industry in another important part of the eastern regions, Kazakhstan. Thus, during the periods

<sup>135</sup> F. Baturin and B. Orlov, "Ekonomika Sibiri: otsenki i rekomendatsii," *Voprosy ekonomiki*, No. 5, May 1968, p. 146 (146-148). The authors do not specify to what period these figures refer, but from the context it may be inferred that they have in mind recent years.

<sup>136</sup> Investment *N.kh. SSSR 1965*, p. 539, *N.kh. SSSR 1967*, p. 607; output Tables A-1 and A-2. Investment data refer to total investment (excluding *kolkhozes*) in the national economy.

<sup>137</sup> Kistanov, *op. cit.*, p. 121. There is no reason to believe that the year was exceptional in any respect and that these results are abnormal. It might be assumed that the results for other postwar years would not be much different.

1951-58 and 1959-65, the shares of this republic in the country's investment were 4.13 and 5.61 percent while in the output they were only 2.38 and 2.76 percent (Tables A-1, A-2, and A-3). The capital-output ratio, whether aggregated with employment or fixed capital weights, was significantly above and the rate of productivity growth of resources below the average for the U.S.S.R. (Tables 8 and 9). Equally unfavorable for Kazakhstan was the above-mentioned index of production cost, being equal to 1.043.<sup>138</sup> In regard to the remaining component of the eastern regions, the four Central Asian republics, the picture is less clear. During the period between 1951 and 1958 the combined shares of these republics in total investment and total output were almost the same, 3.52 and 3.64 percent respectively. During the following period, 1959-65, the investment share rose to 5.32 percent while the output share declined to 2.70 percent (Tables A-1, A-2, and A-3). The capital-output ratios were slightly above average for the three republics for which data are available (Uzbekistan, Kirghizia, and Tadzhikistan). The productivity growth rates, on the other hand, were also higher than for the U.S.S.R., but only for the first two of these republics while for Tadzhikistan they were lower and, using fixed capital weights, even negative. Finally, the relative cost-of-production index for all four republics combined was 1.030.<sup>139</sup>

In the light of the above facts, the following conclusion can be drawn in regard to the investment productivity in eastern regions: There is little doubt that the emphasis on the development of West Siberia, East Siberia, and the Far East as well as of Kazakhstan could not have resulted in the maximization of total output of the entire country; on the other hand, the evidence is not conclusive in regard to the remaining Central Asian republics.

According to the above-mentioned conference report,<sup>140</sup> the following reasons are responsible for this low return on investment in Siberia: the climatic and natural conditions; the emphasis on the development of the capital-intensive structure of industry; and the large investment requirements in nonproductive assets.<sup>141</sup> But most of all, the main culprit in this situation is the chronic shortage and fluctuation of labor.<sup>142</sup> In addition to being very sparsely settled, West Siberia showed in recent years a lower rate of population growth than the U.S.S.R. as a whole, while East Siberia showed only a slightly higher rate.<sup>143</sup> In fact, in both parts of Siberia the overall growth rate of the population was lower than the natural growth rate. This indicates that the number of people who left Siberia was higher than the number of those who arrived, though the latter, according to official reports, was quite substantial.<sup>144</sup> There are indications that the

<sup>138</sup> *Ibid.*

<sup>139</sup> *Ibid.*

<sup>140</sup> Baturin and Orlov, *op. cit.*, p. 146.

<sup>141</sup> According to one estimate, the cost of construction of housing and communal institutions per capita in developing regions in the east amounts to 2.6 thousand rubles, while per worker it is equal to 9.1 thousands. Obviously, the less developed the regions and the harsher the climate, the higher are these expenditures. See *Ekonomicheski problemi* . . . (Ivanchenko, ed.) p. 85.

<sup>142</sup> For an extensive discussion of this problem, see S. G. Prociuk, "The Manpower Problem in Siberia." *Soviet Studies*, v. 19, no. 2, October 1967, pp. 190-210.

<sup>143</sup> See Table 5.

<sup>144</sup> For example, between 1956 and 1960 more than 700,000 people migrated in organized fashion from other parts of the U.S.S.R. to Siberia and even a greater number migrated on their own. See E. Manevich, "Vseobshchnost' truda i problemy ratsional'nogo ispol'zovaniia rabochei sily v SSSR," *Voprosy ekonomiki*, no. 6, June 1965, p. 25 (23-30). Still, the population movement in the opposite direction must have been even greater, because it is estimated that only one region—West Siberia—registered between 1959 and 1963 a net outflow equal to 250,000. See Viktor Ivanovich Perevedentsev, *Sovremennaiia migratsiia naseleniia Zapadnoi Sibiri*, Novosibirsk, Zapadno-sibirskoe knizhnoe izd-vo, 1965, p. 11.

workers represent a particularly large share of those who are leaving Siberia.<sup>145</sup> The irony of it is that these workers settle in the regions of European U.S.S.R. in which there is no labor shortage from the planners' point of view. Soviet economists never fail to point out the reasons for fluidity of labor in Siberia, e.g., harsh climate, high prices, primitive living conditions, which are not compensated by sufficiently high wages.<sup>146</sup> Despite their general awareness of this problem, the Soviet leaders will not or cannot do much to alleviate these conditions.<sup>147</sup> In the meantime, the economy suffers from the resulting low productivity of resources. Moreover, the losses to the national economy are compounded by the high cost of continuous recruiting and settling of new workers in the eastern regions.<sup>148</sup>

The development of the eastern regions was characterized by another important economic inefficiency, namely, the lopsided structure of industry. In view of the availability of rich natural resources, the expansion of extractive and primary-processing branches was exceptionally appealing there. This tendency was reinforced by the all-too-obvious advantages of large-scale production. On the other hand, such factors as the lack of skilled labor, the absence of established cooperation among related enterprises and the high initial costs in general on the supply side and the low population density on the demand side, have discouraged the concomitant growth of final-goods industries. Thus, one finds in the industrial structure of the eastern regions, as compared with the U.S.S.R. as a whole, a high share of fuel, electric power, timber, and wood processing branches, but a relatively low share of machine building and metalworking, consumer goods, and other processing branches.<sup>149</sup> The case of the chemical industry can be particularly instructive in this respect.<sup>150</sup> Despite great availability of cheap raw materials and electric power, so important in its cost structure, the share of the chemical industry in the total industry of the eastern regions not only failed to rise but even declined in recent years. Moreover, the plans do not foresee any changes in this direction in the near future.<sup>151</sup> As a result, much of the output of extractive and primary goods branches had to be transported to the western industrial centers and from there, in turn, various final goods had to be delivered to the consumers in the east. Often the resulting transportation costs outweighed the advantages of low production cost in the east as compared with the production of the same goods in the west. In any case, the demand for transportation, resulting from this split between west and east, was higher

<sup>145</sup> For example, between 1959 and 1965, about 350,000 workers left Siberia for other parts of the U.S.S.R. See Baturin and Orlov, *op. cit.*, p. 146.

<sup>146</sup> For example, the wages in eastern and northern regions are much higher than on the average for the Russian S. F. S. R. and more than double the wages paid in the Central region. However, at the same time, the living costs there are proportionally even higher than in the European part of the U. S. S. R. Particularly high are the costs of communal services, when they are available; 2 to 2½ times higher in the north and the east than in the west. See Feshbach, *op. cit.*, pp. 730-731.

<sup>147</sup> The call to increase wages for workers in the east and also in the north was heard again by the most recent Party Congress. See *XXIII s'ezd*, v. II, p. 365.

<sup>148</sup> According to Manevich, *op. cit.*, p. 27, it costs approximately 500 rubles to recruit a worker for Siberia and to settle him there. The resettlement of a worker from one to another place causes him to lose thirty working days.

<sup>149</sup> For industrial structure of individual regions in 1960, see Akademiia nauk SSSR, *Promyshlennost' . . .*, p. 11, Table 3; and in 1962, *Zakonomernosti . . .*, p. 72, Table 2; and for the regional shares in the U. S. S. R. total for individual industrial branches in 1960, Telepko, *op. cit.*, p. 96 and in 1965, Kistanov, *op. cit.*, p. 94, Table 6.

<sup>150</sup> The share of the chemical industry in total industry is not listed in the sources cited in the preceding footnote.

<sup>151</sup> M. Pervukhin, "Kriterii razmeshcheniia promyshlennosti," *Ekonomicheskaiia gazeta*, no. 45, November 1967, p. 16.

and the cost to the national economy greater than if there had been a more balanced growth in individual regions.<sup>152</sup>

The low productivity of investment in other components of the eastern regions, Kazakhstan, the development of which was also greatly stressed, can be accounted for mainly by the following two factors: first, despite the fact that fixed capital and electric power output per worker as well as the qualification of workers there were above the U.S.S.R. average, the productivity of labor was below average.<sup>153</sup> This was mainly the result of a great turnover of workers.<sup>154</sup> The reasons for this labor fluidity in Kazakhstan are similar to those in the Russian eastern regions. Since the supply of local labor, primarily skilled labor, was insufficient in Kazakhstan to fulfill the ambitious plans, it was necessary to recruit workers from Western U.S.S.R.<sup>155</sup> However, because of the harsh climate, poor housing conditions, high cost of living, etc., only a minority of migrants settled permanently.<sup>156</sup> Second, because of large investment outlays, many new enterprises have been introduced into operation in Kazakhstan during and since the last war.<sup>157</sup> According to a Soviet source, the planners and managers were unable to cope with these rapidly rising capacities;<sup>158</sup> in other words, the economy was unable to absorb the rapid increases of productive facilities and to use them efficiently.

The preceding discussion dealt with the productivity of industrial capital in eastern regions, i.e., with how much industrial investment was required in order to increase the total output of industry by one ruble. As shown, capital requirement was higher in eastern regions than on the average in the U.S.S.R. But from the point of view of the total national economy it is no less important to compare total investment, not only its industrial component, for the planned increase in output between the east and the rest of the country. The total investment, in addition to that part going to industry, obviously includes investment in transportation, urbanization, agriculture, etc.<sup>159</sup> It is superfluous to elaborate that such additional investment is much higher in undeveloped regions with a severe climate than in developed regions with a relatively milder climate, as is the case with the eastern regions versus western regions of the U.S.S.R. Thus, in order to increase the total industrial output by the same amount, more investment was required in the east than in the west, because of differential productivity of capital and investment requirements in other economic sectors.

While considering the effect of industrialization of the east on the equalization of economic development among Soviet regions, one

<sup>152</sup> According to Hunter, *op. cit.*, p. 36, Table 4 and p. 42, this dispersion of economic activity was one of the reasons why freight traffic grew at a faster rate than the real GNP from the late 1920's until the present time.

<sup>153</sup> T. V. Checheleva, "K probleme povysheniia ekonomicheskoi effektivnosti obshchestvennogo proizvodstva" in *Problemy sovremennoi ekonomiki Kazakhstana* (S. B. Baishev, ed.), Alma-Ata, Nauka, 1966, p. 47.

<sup>154</sup> *Ibid.*, p. 48.

<sup>155</sup> One should not forget the impact on the demand for labor also of the opening of the virgin lands.

<sup>156</sup> According to E. N. Gladysheva, "Vazhnyi rezerv ekonomii obshchestvennogo truda," *ibid.*, pp. 248, 250, the net gain of migration to Kazakhstan between 1960 and 1964 was equal to over one-half million people. However, this number represented only about one-eighth of the total migration flow. As can be seen, Kazakhstan's record in this respect was better than that of Siberia, which, as was shown, experienced a net outflow of population.

<sup>157</sup> For an impressive list of new industrial enterprises in Kazakhstan, see *Razvitie narodnogo khoziaistva Kazakhstana za 50 let sovetskoi vlasti* (S. B. Baishev and G. Ch. Chulanov, eds.), Alma-Ata, Nauka, 1967, pp. 61, 68.

<sup>158</sup> Checheleva, *op. cit.*, p. 48.

<sup>159</sup> Soviet economists are aware of this problem and recommend inclusion of this additional investment in calculation of differential investment productivity by regions. Cf. *Akademiiia nauk SSSR., Metodika . . . , Parts II and III.*

should be clear as to the definition; namely, is the objective of such an investment policy to advance the equalization of output per area or the equalization of output per capita? If the objective is the equalization of output per area, then a certain success has been achieved by industrialization of that part of the eastern regions which belongs to the R.S.F.S.R. and of Kazakhstan during the postwar period, as reflected in their rising shares in the total output of the U.S.S.R. (Table 10.) Since this industrial growth could not have taken place without the concomitant population migration from the European U.S.S.R., there was, however, little relative improvement in these areas in terms of output per capita (Tables 1 and A-1.) On the other hand, the industrial investment in the remaining part of the eastern regions, Central Asian republics, was not large enough to improve their position either in terms of shares in the total U.S.S.R. output or of output per capita. Moreover, although output per capita in these republics was the lowest in the U.S.S.R. to begin with, it even worsened relatively during the period under discussion. This situation existed despite the availability of all conditions needed for efficient industrialization, such as rich mineral resources, tolerable climatic and natural conditions, and mostly large resources of underemployed labor.<sup>160</sup>

As can be seen, the high investment in the eastern regions was not justified in terms of maximization of output of the entire country during the period under discussion and also, most probably, in the foreseeable future. On the other hand, this locational policy corrected only slightly, and only for the regions of the R.S.F.S.R. and not for the republics, the territorial imbalance in regard to shares in total industrial output and output per capita. But was this insignificant success worth its economic cost? Indeed, if the problem of industrialization of the eastern regions were limited to these objectives, one is forced to fall again on the premise that "to 'fill up white spots on the map' has either a noneconomic rationale or none."<sup>161</sup>

Thus, it seems that this extraordinary attention of Soviet leaders to the development of the eastern regions is explained better by geopolitical considerations. Having conquered these territories militarily in the 18th and 19th centuries, the Czarist empire and its Soviet successor were naturally obliged to consolidate there the power versus the indigenous population as well as versus neighboring countries. Industrialization provides the best answer to this problem. Since the native population cannot initially supply skilled labor to the developing industry, the necessary specialists are brought from Russia proper or other western regions. Settling in towns, occupying responsible positions and being more loyal to the regime than the native population, these Russian "colons" are the mainstay of Soviet power in these regions. Furthermore, industrialization facilitates the settlement of previously sparsely populated areas and, in general, builds them up economically. As a result, these areas are becoming stronger *vis-a-vis* neighboring countries. This point, as was discussed earlier, is at the present particularly important in view of the strained relations between the U.S.S.R. and China. Finally, the opening up of Asiatic regions is the only way to secure the permanent link between the

<sup>160</sup> About favorable conditions, for example, in Tadzhikistan, see *Problemy razvitiia i razmeshchientia proizvoditel'nykh sil Tadzhikskoi SSR* (I. K. Narzikulov, ed.), Dushanbe, Donish 1967, pp. 11, 18-19; in Uzbekistan, see Ziliadullaev, *Promyshlennost'* . . . , Chapter VII and pp. 208, 212.

<sup>161</sup> Peter John de la Fosse Wiles, *The Political Economy of Communism*, Cambridge, Harvard University Press, 1962, p. 153.

European heartland of the U.S.S.R. and its access to the Pacific Ocean. In this respect, the U.S.S.R. faces a similar problem to that which the United States faced in the 19th century when it had to settle the vast areas between the east and west coasts.<sup>162</sup>

#### ECONOMIC ADVANTAGES OF WESTERN REGIONS

Logically, an emphasis on the development of the east implies a deemphasis on the further development of the west. This was indeed an explicit goal of Soviet leaders from the very beginnings of the U.S.S.R.<sup>163</sup> If by the west is understood the entire European part of the country, then on balance there was progress made in this direction between 1940 and 1967. As Table 11 indicates, the importance of the west in the total industrial output declined by 7½ percentage points. Virtually all this decline took place between 1940 and 1950, and thus it was more the result of war impact than of planning. After 1950, the importance of the west rises again, although a slight reversal in trend is noticeable in recent years.

For Soviet economists, the concept of the industrialized west is associated chiefly with three traditional centers, Moscow, Leningrad, and the Donbas, around which are presently organized the Central, Northwestern, and Donets-Dnieper regions respectively. As can be seen in Table 11, the shares of these regions in the total industrial output decreased between 1940 and 1967, and like those for the entire west, they decreased mainly during the war years. There was little change in the Northwest and Donets-Dnieper shares during the postwar period, while the shares of the Central region continued to decline. The main beneficiary of this trend was the Volga region which during the war became a very important producer of armaments and of machine building in general.<sup>164</sup> The momentum gained by this region at that time persists up to the present. The increases were registered also by the Baltic republics. The shares of other European regions rose individually only slightly, although in sum these increases amounted to three and one-half percentage points during the postwar years.

TABLE 11.—*Distribution of industrial gross output by selected western regions of the U.S.S.R. for benchmark years*

|                            | [In percent of U.S.S.R.] |        |        |        |
|----------------------------|--------------------------|--------|--------|--------|
|                            | 1940                     | 1950   | 1958   | 1967   |
| U.S.S.R. ....              | 100.00                   | 100.00 | 100.00 | 100.00 |
| Eastern regions.....       | 17.55                    | 26.08  | 24.04  | 25.09  |
| Western regions.....       | 82.45                    | 73.92  | 75.96  | 74.91  |
| Northwest.....             | 10.55                    | 8.83   | 8.85   | 7.93   |
| Central.....               | 23.10                    | 21.92  | 20.50  | 17.24  |
| Volga.....                 | 3.49                     | 5.71   | 6.37   | 7.56   |
| Donets-Dnieper.....        | 17.04                    | 11.85  | 12.33  | 11.89  |
| Baltic republics.....      | 1.26                     | 2.19   | 2.84   | 3.37   |
| Other western regions..... | 27.01                    | 23.42  | 25.07  | 26.92  |

Sources. Tables A-1 and A-2.

<sup>162</sup> "From the high rostrum of the congress we address ourselves with the fervent appeal to our youth, to *Komsomol* members, whose hearts are full of patriotic feelings and creative daring: Come with us to the Far East, to our beautiful native Primor'e, in order to work together for the benefit of our nation, for the benefit of communism!" See *XXIII s'ezd*, v. 1, p. 252. Does not this emotional appeal of the then Party Secretary of the Primor'e krai, V. E. Chernyshev, remind one of "Go West, young man.?"

<sup>163</sup> Hunter, *op. cit.*, pp. 5-7.

<sup>164</sup> This increase was due mainly to the fact that about 200 enterprises were evacuated from the western part of the country to this region in 1941. As a result, the output, for example, of the metalworking industry, mainly of armaments, increased from 1.2 billion to 10.5 billion rubles between 1940 and 1943 alone. See Nikolai Alekssevich Voznesenskii, *The Economy of the USSR During World War II*, Washington, Public Affairs Press, 1948, p. 28.

It is clear that the west succeeded in maintaining its importance in the territorial distribution of U.S.S.R. industry despite the official determination to shift the gravity point of industry eastwards. What factors accounted for this phenomenon? There were basically two of them. First, the investment in industry was more productive in these regions than on the average for the entire country. This statement, unfortunately, as in the case of the eastern regions, must be made on the basis of investment in all state and cooperative enterprises (without *kolkhozes*), because of lack of regional data on investment in industry alone. The shares of selected western regions in the total investment and industrial output for the period 1958–1967 are given in Table 12. As can be seen, with the exception of Volga region, the output shares are uniformly higher than the investment shares. The cost of industrial production is also lower for these regions than on the average for the entire country. According to the already mentioned calculation of the regional cost production in 1963, the index for the Northwest was 0.985; Central—0.992; Volga—0.978; and Baltic—0.990.<sup>165</sup>

TABLE 12.—*Distribution of industrial gross output and investment in state and cooperative enterprises (without kolkhoz) by selected western regions of the U.S.S.R., 1958–67*

[In percent of U.S.S.R.]

| U.S.S.R. ....               | Output<br>100.00 | Investment<br>100.00 |
|-----------------------------|------------------|----------------------|
| Eastern regions .....       | 24.63            | 36.52                |
| Western regions .....       | 75.37            | 63.48                |
| Northwest .....             | 8.35             | 6.80                 |
| Central .....               | 18.45            | 12.83                |
| Volga .....                 | 7.20             | 8.68                 |
| Donets-Dnieper .....        | 12.17            | 8.80                 |
| Baltic republics .....      | 3.13             | 2.69                 |
| Other western regions ..... | 26.07            | 23.68                |

Sources: Output—Tables A-1 and A-2; Investment—*N.kh.SSSR 1965*, p. 539; *N.kh.SSSR 1967*, p. 607.

Second, the western regions account for a large share of the total output of processing industries. For example, the shares of some of them in the total U.S.S.R. output of such all-important industrial branches as machine building and metalworking were as follows in 1965 (in percent): Northwest, 8.4; Central, 19.6; Donets-Dnieper, 9.9; and Volga, 8.7. In the case of another important final goods industry, the light industry, the respective shares were: 6.6; 35.7; 4.4; and 5.3.<sup>166</sup> Thus almost one-half and over one-half, respectively, of the total output of these two branches was produced in the four regions in question. The productivity of processing industries depends to a large extent on such factors as the availability of fixed capital per worker, skilled labor force, social overhead, an easy access to research and educational institutions, and the established cooperation among enterprises (e.g., subcontracting), just to mention the most important ones. In the underdeveloped regions it not only takes more time to construct a new plant than to expand an existing one in the developed regions, but it also takes an even longer time to bring about all these conditions. Moreover, an additional time will pass before the new plant and all these factors start working together effectively. Therefore

<sup>165</sup> Kistanov, *op. cit.*, p. 121. No index was given for the Donets-Dnieper region.

<sup>166</sup> *Ibid.*, p. 94.



the output can be expanded quicker, and for a considerable time also cheaper, in the developed than in the underdeveloped regions. Since it is repeatedly stated in the U.S.S.R. that the time factor is of extreme importance,<sup>167</sup> pressure is thus exerted on the expansion of processing industries in the west, mainly through the reconstruction and widening of existing capacities.<sup>168</sup>

Of no less importance for the development of the western regions, despite the planners' preference for the development of the east, might have been the interests of individual economic ministries and local administrations, at various levels. These influences might be of two kind. The ministers and local administrators might try to advance their own vested interest—in Soviet parlance, *vedomstvennost'* and *mestnichestvo* respectively.<sup>169</sup> But more likely other considerations were of greater importance. Since ministers or their subordinates and local administrators are evaluated on the basis of their performance, they are interested in the efficient working of enterprises under their jurisdiction. Being more familiar with the conditions affecting the work of these enterprises than the central planners, they try to base the investment decisions on genuine economic criteria.<sup>170</sup> Doubtless, these criteria often favored further development of the west. The continued growth of the western developed regions is a good example of the fact that under the conditions of central planning it is still possible for economic considerations to assert themselves even if they are in conflict with the official locational objective.

However, even in this case the noneconomic considerations, chiefly the defense needs, cannot be dismissed altogether. Armaments, including the equipment for such related programs as foreign aid or space exploration, represent a considerable share in the total output of final goods industries, such as the machine building industry. Therefore, in order to be able to achieve these objectives, the government exerts strong pressure on the development of pertinent industries. Since they are for the most part located in the west and since their output can also be most quickly expanded there, it is obvious that this factor reinforces purely economic considerations favoring the further growth of western developed regions.<sup>171</sup> The need to be pro-

<sup>167</sup> Cf. Akademiia nauk SSSR, *Zakonomernosti* . . . , pp. 51-52; Anatolii Ivanovich Zubkov, *Osobennosti razmeshcheniia promyshlennosti RSFSR v period postroeniia kommunizma*, Moscow, Sovetskaiia Rossiia, 1964 p. 8; or as Khrushchev once said, "in the economic competition with capitalism an extremely important vital problem is the problem of winning time, the problem of determining the time targets for economic tasks." See "Tipovaia metodika opredeleniia ekonomicheskoi effektivnosti kapital'nykh vlozhenii i novoi tekhniki v narodnom khoziaistve SSSR." *Plannoe khoziaistvo*, v. 37, no. 3, March 1960, p. 56 (56-62).

<sup>168</sup> *XVII s'ezd*, v. II, p. 362. During the Seven-Year Plan, the planners earmarked 93 percent of all industrial investment in the city of Moscow for reconstruction purposes and only 7 percent for new construction. See Moskovskoe gorodskoe soveshchanie agitatorov i propagandistov, 1958, *O perspektivakh razvitiia promyshlennosti, stroitel'stva i gorodskogo khoziaistva Moskvy v 1959-1965 gg.*, Moscow, Moskovskii rabochii, 1959, p. 31. According to G. I. Granik ("Ekonomicheskie osobennosti razvitiia i razmeshcheniia proizvoditel'nykh sil staropromyshlennykh raionov," in *Ekonomicheskie problemy* . . . (Ivanenko, ed.), p. 172), 90 percent of the planned increase in industrial output of the Northwest region during the current Five-Year Plan can be obtained by expanding the existing facilities and only for 10 percent of the increase new facilities are needed. This is because the return on investment is much higher when used for reconstruction than when used for new construction; for one ruble of investment, the return is on the average 1.5 rubles, 1.7 rubles in the case of reconstruction, and 1.1 rubles in the case of new construction.

<sup>169</sup> That these factors are important in Soviet practice might be inferred from the attention paid to them by the recent Party Congress, which calls for "the elimination of all manifestations of *redomstvennost'* and *mestnichestvo* in the solution of these [location] problems." See *XVIII s'ezd*, v. II, p. 363.

<sup>170</sup> One such local administrator in the Western U.S.S.R. (the head of the Vinnitsia oblast planning commission) has the following to say about this problem: "Local *soviets* and their planning commissions are closer to the production, realize clearer the possibilities of correct location of productive forces and their specialization for the economic development of an *oblast* or a *raion*, can more fully utilize additional reserves for the increase of output and the effectiveness of investment and labor resources." See P. Soleiko "Sheche do pytannia pro vdoskonalennia terytorial'noho planuvannia," *Ekonomika radians'koi Ukrainy*, no. 11, Nov. 1968, pp. 7-8.

<sup>171</sup> This is particularly applicable to the Baltic republics, which are specialized in electrical engineering, radio engineering, and instruments production. See Rutgaizer, *op. cit.*, p. 31.

vided with armaments quickly goes counter to the other important defense requirement, the need to disperse industry. Thus, Soviet leaders are facing the dilemma between defense supplies right now, but in more vulnerable locations, and defense supplies a little later, but in less vulnerable locations.

#### PARTICULAR APPEAL OF METROPOLITAN AREAS

The pull of industry toward the well-developed areas is even more evident when one looks at its geographical distribution within the most important western regions, the Northwest and the Central. For example, the level of industrialization varies widely among the oblasts of the Northwest region. Although its area is very large (7.4 percent of the U.S.S.R.), only a few *oblasts*, such as Leningrad, Pskov, or Novgorod (11.8 percent of the region's area) are relatively well settled and urbanized.<sup>172</sup> The Leningrad *oblast*, inclusive of the city of Leningrad, alone accounted for 42.9 percent of that region's population, but for only 5.2 percent of its area.<sup>173</sup> The rest of the region is economically still very backward. This and the harsh climate make these areas closely resemble the eastern regions of the U.S.S.R. Industry is, of course, drawn toward the populated centers. This is particularly true for such processing branches as machine building or light industries. Thus in 1965 the *oblast* and city of Leningrad produced 63 percent of the region's total industrial output, 80.3 percent of the total machine building output, and 78.2 percent of the total light industry output.<sup>174</sup> There are a number of products, such as certain electric equipment, precision instruments, transportation equipment, and others, of which this *oblast* is the sole producer in the nation.<sup>175</sup> A similar situation existed in the Central region. This region is also a very important producer of final industrial goods.<sup>176</sup> However, the bulk of this output was produced in a few *oblast* centers and in their vicinity,<sup>177</sup> while their hinterland was still predominantly agricultural. Finally, to cite one more example, in such a well-developed republic as Latvia, two-thirds of the industry is concentrated in the capital city, Riga.<sup>178</sup>

The concentration of industry in a few well-developed *oblasts* in the Western U.S.S.R. took place despite the fact that they often lack even the basic inputs. Thus, the industry in Leningrad *oblast* operates almost completely on the basis of raw materials and fuel shipped in from other areas. The shipments of the latter have been growing especially in recent times.<sup>179</sup> The main supplier of iron and steel for the Northwest region, the Cherepovets metallurgical center, also depends on the supply of basic resources from other regions: coal and gas from the Saratov area and iron ore from the Kola Peninsula.<sup>180</sup> In addition, industry in the developed oblasts of the Northwest region, with its very harsh climate, is plagued by shortage of labor,

<sup>172</sup> *N.kh. SSSR 1965*, p. 12. Toremind, the Kaliningrad *oblast* is not included.

<sup>173</sup> *Ibid.*, p. 16.

<sup>174</sup> *Severo-zapadnyi ekonomicheskii raion* (Grigorii Il'ich, Granik, ed.), Moscow, Nauka, 1966, p. 16. Strangely G. I. Granik a few years later gives the percentage of Leningrad *oblast* in the total industrial output of the Northwest region for the same year as 81.5 percent. See Granik, "Ekonomicheskie . . .", p. 170.

<sup>175</sup> *Severo-zapadnyi . . .*, p. 37.

<sup>176</sup> Kistanov, *op. cit.*, p. 94, Table 6. The Central region is particularly important in the production of textiles in the U.S.S.R. In 1965, its share in the country's output of cotton fabrics was 78.2 percent; woolens, 54.3 percent; linens, 63.7 percent; and silks, 66.8 percent. See *N.kh. SSSR 1965*, pp. 225-28.

<sup>177</sup> Zubkov, *op. cit.*, p. 121; Kostennikov, *op. cit.*, p. 84.

<sup>178</sup> See V. Parfenov and O. Ivanov, "Vertikal' i gorizonta!"; 1. Gdestoiat' zavodu," *Pravda*, no. 57, February 26, 1969, p. 2.

<sup>179</sup> The imports of composite fuel to this oblast grew from 17.4 to 26 million tons between 1960 and 1965. See *Severo-zapadnyi . . .*, p. 21.

<sup>180</sup> Kostennikov, *op. cit.*, p. 67.

by an insufficient agricultural base as well as, in some areas, by the shortage of water and by poorly developed transportation.<sup>181</sup> The industrial centers of the Central region are definitely better off in respect to climate and supply of labor and agricultural raw materials and consumer products than those in the Northwest region; still, the most important inputs for the region's main industries have to be brought in from other regions; machine building is working on steel from the Urals and the Donbas,<sup>182</sup> while the textile industry works on Central Asian cotton. On the other hand, the final goods produced in these few centers have to be distributed throughout the entire country.<sup>183</sup> The crossflows of inputs and outputs place an obviously heavy burden on the Soviet transportation system.

In addition to the overburdening of transportation, the concentration of industry in a few large cities and, at the same time, the notorious neglect of housing have caused serious problems for Soviet leaders. Overcrowding, poor hygienic conditions, juvenile delinquency, insufficient supply of communal services, air and water pollution are the most important among them. Aware of these problems, Soviet planners have for a long time been determined to retard the growth of large western cities.<sup>184</sup> Instead, their hope was to direct industrial expansion to the eastern regions. In order to achieve this goal, a Party resolution as early as in 1931, prohibited any new industrial construction in half a dozen cities in the European U.S.S.R.<sup>185</sup> This problem was stressed again by the 18th Party Congress in 1939.<sup>186</sup> It is also being repeated now.<sup>187</sup> However, at the present time Soviet planners show a greater understanding of locational problems than in the past. They seem to be reconciled to the fact that all plants cannot indiscriminately be located in the east. There are some industries for which the locating of enterprises in geographic clusters offers definite economic advantages. Thus the new plants in these industries are drawn toward the existing centers. Since such centers exist mostly in western developed regions, the planners are forced to yield to this economic fact of life. They go along with the construction of new plants in the west, but with this modification: they urge selection of the location sites not in large cities but in middle- and small-sized towns. By doing so, they hope to realize important gains. Locating a plant in such towns often does not require additional investment in social overhead and urbanization. Indeed, chances are that the existing facilities had as yet not been fully utilized. Moreover, the pressure to eliminate increasing unemployment in certain areas of the European U.S.S.R. acts in the same direction.<sup>188</sup>

<sup>181</sup> *Severo-zapadnyi . . .*, p. 21.

<sup>182</sup> Kostennikov, *op. cit.*, p. 82.

<sup>183</sup> For example, about 75 percent of all output of textiles in the Central region is exported to other regions of the U.S.S.R. See *ibid.* p. 84. A similar situation exists in the Northwest region. According to *Severo-zapadnyi . . .*, p. 45, "A predominant part of the machine building output (80 to 100 percent) is exported outside the borders of the region."

<sup>184</sup> For example, in regard to Riga, "further growth of its population is undesirable because it leads to price rises of communal services and the worsening of life conditions of the population. Therefore, an important problem of the current period is to decrease the growth rate of Riga and to increase the development of industry in other cities of the republic." See Pēteris Gulāns (Petr Vatslavovich Gulian), *Latvija v sistēme narodnogo khoziastva SSSR*, Riga, Zinatne, 1967, p. 280.

<sup>185</sup> *Kommunisticheskaia partiia Sovetskogo Soiuza (KPSS), Kommunisticheskaia partiia Sovetskogo Soiuza v rezolutsiakh i resheniakh s'ezdov, konferentsii i plenumov TsK*, Moscow, Gos.izdat. polit. lit.-ry, 1954, v. III, p. 128.

<sup>186</sup> KPSS, 18. s'ezd, *The Land of Socialism Today and Tomorrow: Reports and Speeches at the Eighteenth Congress of the Communist Party of the Soviet Union (Bolsheviks)*, Moscow, Foreign Languages Publishing House, 1939, p. 440.

<sup>187</sup> *XXIII s'ezd*, v. II, pp. 362-63.

<sup>188</sup> See Prime Minister Kosygin's admission of substantial unemployment in Western Ukraine, Western Belorussia, and parts of Transcaucasus in *Pravda*, no. 271, September 28, 1965, p. 2.

Obviously, this official attitude had a certain effect on the industrial growth of large metropolitan centers. For example, the two largest Moscow and Leningrad, and the oblasts bearing their names, grew at a slower rate during the 7-year Plan than did the regions to which they belong.<sup>189</sup> But even so, the growth rates of these metropolises were above those of the least developed *oblasts* in these regions, not to mention several other underdeveloped *oblasts* and regions throughout the country.<sup>190</sup> The continuous economic growth of metropolises can also be judged on the basis of growth of their population. During the last 9 years, this growth on absolute terms was largest in the country's largest cities, Moscow, Leningrad, Kiev, Tashkent, in that order. In Moscow alone the increase amounted to one-half million people between the beginning of 1959 and the beginning of 1968. The rapid growth of large cities was accompanied by a similar growth of their suburbs, thus making the growth of urban population concentrations even larger than reflected in the statistics on cities alone. It is significant that this process was taking place despite the fact that the planners consider cities with populations between 50 and 200 thousand as optimal, and up to 400 thousand as permissible.<sup>191</sup>

The continued importance of large cities in the total industrial output was mainly the result of the following factors:

(1) With the growth of the Soviet economy, the structure of industry underwent important changes; the share of processing branches rose in relation to the share of extractive branches. Since the processing industry is not as location-bound as is the extractive industry, the manufacturing plants gravitate to the locations in which labor and capital are most productive, and such conditions exist usually in large cities. For example, according to the Soviet population expert Perevedentsev, the productivity of labor in cities with a population over 1 million is 38 percent higher than in cities with populations between 100,000 and 200,000, and the return on invested capital twice as high. The advantage of metropolitan cities over smaller cities is even greater.<sup>192</sup> This pull of processing industries toward high productivity locations in large cities is recently particularly reinforced because of the economic reforms of 1965 which place much greater emphasis on the profitability of enterprises than has been the case heretofore.

(2) There is no doubt that technological progress takes place usually in large urban concentrations with easy access to educational institutions and under conditions of a sophisticated cultural environment.<sup>193</sup> The introduction of new products is also much easier in these centers than in outlying regions.<sup>194</sup> Since both technical progress and new products are to such a degree responsible for economic growth and the defense of the country, the central planners, by tolerating

<sup>189</sup> *N.kh.SSSR 1965*, p. 50.

<sup>190</sup> *Severo-zapadnyi* . . . p. 16.

<sup>191</sup> For a discussion of this problem, see V. Perevedentsev, "Goroda i gody," *Literaturnaia gazeta*, no. 9 (4191), February 26, 1969, p. 12, as translated in *The Current Digest of the Soviet Press*, v. 21, no. 9, March 19, 1969, p. 8.

<sup>192</sup> *Ibid.*

<sup>193</sup> For example, of the 1250 research and scientific institutions in the country, 135 are located in Leningrad; 10 percent of the country's scientific workers with academic degrees are working there. See Granik, *op. cit.*, p. 171. Or, in 1964, of all personnel employed in Estonia's machine-building and metalworking 61.2 percent were concentrated in its two largest cities, Tallin and Tartu. See Arnold T. Veimer, *Razvitie promyshlennosti Estonskoi SSR za semiletie, 1959-1965 gg.*, Moscow, Nauka, 1967, p. 208. These two cities are also the seats of the world famous technical school and university.

<sup>194</sup> It is reported that in 1964 a library was organized in Leningrad which contains microphotocopies of about three million foreign patents. These patents should help local enterprises in maintaining high standards and in introduction of new products. See *Leningradskaia promyshlennost' za 50 let* (P. P. Anisimov, ed.), Leningrad, Lenizdat, 1967, p. 37.

further growth of large cities, had to compromise with their basic locational objective—the shift of industry eastwards.

(3) As was discussed in Part I of this paper, coordination between branch and regional planning is still very deficient in the U.S.S.R. By formulating their plans, the branch ministries usually pursue their own interests and do not pay much attention to regional needs. Thus, even though the official attitude is against any further new construction in large European cities, the branch ministries are nevertheless attempting to locate their plants there because of obvious advantages, as was mentioned above. That these attempts are not trivial can be seen, for example, from plans prepared on a decentralized basis for the city of Moscow. They foresee such growth of Moscow's economy that, in order to support it in 1980, the city's population must grow 1.7 times by that year.<sup>195</sup> Or, despite the general overcrowding in Leningrad, the plans provide for the construction of 10 new plants in this city during the current Five-Year Plan.<sup>196</sup> These factors show that, just as in the case of western regions in general, the growth of a few metropolitan areas illustrates the fact that economic considerations frequently prove to be very strong, even if they conflict with official locational objectives.<sup>197</sup>

(4) Finally, there is one more factor, this time noneconomic, which seems to be also responsible for the industrial growth of metropolitan cities—the influence of local officials. It goes without saying that the status of any local official is enhanced if the administrative unit under his jurisdiction is economically strong. Traditionally, the party and government leaders in such centers as Moscow, Leningrad, and a few other cities carry a significant nationwide weight.<sup>198</sup> Their relations with the officials of all-union agencies are much closer and their influence on the latter much stronger than those of officials, even with the same nominal rank in some outlying city or *oblast*. It would therefore not be surprising if the large cities and developed *oblasts* in the west had received a preferential treatment by central agencies when it came to the territorial distribution of investment.<sup>199</sup>

#### CONCLUSIONS

Various factors affecting Soviet location policy have been discussed in this part. The investigation has shown that their effect on this policy is best understood if they are placed in the context of the nature of the Soviet regime. In the U.S.S.R., as in any other totalitarian state, national goals are not a compromise resulting from the interplay of interests of various population groups, but they are the goals of a ruling group—the Central Committee of the Communist Party or its Politbureau. Nevertheless, by formulating these goals, the leaders doubtless take into account, at least to some degree, the interests of other groups of the population also. However, logic itself dictates that the ultimate goal for the leaders must be to retain power in their hands and, if possible, to expand it. All aspects of national life are subordi-

<sup>195</sup> See K. M. Gerasimov "Za dal'neishii pod'em ekonomiki respublikii," *Ekonomicheskaya gazeta*, no. 22, May 1968, p. 10.

<sup>196</sup> *Severo-zapadnyi . . .*, p. 46.

<sup>197</sup> According to the Pervedentsev article (see footnote 191), additional factors responsible for the growth of large cities are: the growth of service sectors and scientific institutions (both are located primarily in large cities) and more attractive opportunities for spending leisure time.

<sup>198</sup> The leaders of Moscow and Leningrad party organizations are usually members of the Politbureau of the C.P.S.U.

<sup>199</sup> Wiles, *op. cit.*, p. 152.

nated to this objective.<sup>200</sup> Among factors which can further its attainment, economics is one of the most important.<sup>201</sup> Within the broad area of economics, the problem of industrial location deserves the important attention of Soviet leaders. If a particular location decision coincides with their political objectives in the above sense and is at the same time economic, in terms of maximization of output, there is no problem. However, should the two considerations conflict, politics takes precedence over economics.<sup>202</sup>

Inasmuch as the internal and external conditions, which either endanger the power of the ruling group or impede the expansion of its influences, are constantly changing, the policies of leadership have to change accordingly. This obviously applies also to industrial location policy. A quick glance over the history of the U.S.S.R. illustrates this point. The policy during the 1930's was dominated by the anticipation of war with Germany and Japan. It found its expression in an intensive industrialization of the Eastern Urals and Western Siberia, regions more removed from the former country but closer to the latter than traditional centers in Western U.S.S.R. During World War II it was obviously necessary to locate industry in the hinterland of the country, but not too far from the battlefield; therefore, the growth of the Volga and Ural regions. After the war, until the second half of the 1950's, the objective of the leadership was to overcome the effects of hostilities in the shortest possible time, to create an industrial basis for competition with capitalist countries, and to improve the standard of living of the population. As a result, there was emphasis on the growth of the western regions of the country where the achievement of these objectives was most feasible. Then again, the looming danger from China led to a renewed interest in the eastern regions, but this time in those adjacent to China, such as East Siberia, the Far East, and Kazakhstan. At the same time, the status of a major world power requires the U.S.S.R. to assure the continuous and rapid advance of technology and, based on it, the growth of output of sophisticated machinery, instruments, etc. This could clearly take place only or mainly in well-developed and urbanized parts of the U.S.S.R. Hence the growth of metropolitan centers and their neighboring regions in European Russia, the Ukraine, and the Baltic republics.

However, Soviet location policy at any point of time is not represented by a single dominant trend, notwithstanding how important it might be. There are many other tendencies simultaneously at work, mainly those which were dominant in the past and which continue, although

<sup>200</sup> The following quotation describes well the influence of the Party over one sphere of human endeavor—culture. "Discredited as Stalinism and 'the cult' may be, the party of Lenin is a powerful and ubiquitous force—not only in its control of the levers of power, the publishing houses and journals, the courts and the newspapers, the *druzhinniki* and the KGB, but in its control over the prestige machinery, the distribution of public accolades and material rewards, as well. Every schoolbook, every park of culture and rest, every recreation club, indeed almost every word in the dictionary, is impregnated with the influence of the party; every monument on every public boulevard, even the Tolstoy home at Yasnaia Poliana, is inscribed with a quotation from Lenin." See Sidney Monas, "Engineers or Martyrs: Dissent and the Intelligentsia," *Problems of Communism*, no. 5, Sep.—Oct. 1968, p. 13 (2-17).

<sup>201</sup> This is spelled out by the recent Party Congress in the following way: "The 23rd Congress of the CPSU considers that the new Five-Year Plan (1966-1970) is called to secure considerable progress of our society on its way to the construction of communism, further development of material and technical base, the strengthening of the economic and defense capacity of the country." *XXIII s'ezd*, v. II, p. 325.

<sup>202</sup> A recent article reaffirms the principle of priority of politics over economics in a socialist state, as formulated by Lenin, in order to consolidate the power of the working class. See G. Gleserman in *Pravda*, January 29, 1969. Obviously, the power of the working class in practice means the power of the ruling group, the Central Committee, or the Politbureau of the C.P.S.U. This justification will be valid as long as there are any non-socialist countries left; should all the world become socialist, this form of rule might still be justified by the survival of elements, real or imaginary, hostile to socialism.

to a decreasing rate, to influence current investment distribution. Furthermore, along with central planning, including often objectives other than economic, there is always felt in the economic life the influence of purely economic considerations not specified by the planners but reflected in decisions of managers and administrators on lower levels. These latter considerations are frequently in conflict with the noneconomic considerations. Finally the, influence of branch and local interests cannot be ignored either. It follows that the Soviet location policy during any period of time is a mixture of all these various factors. Yet, in view of the totalitarian framework, one objective, that which reflects the current concern of the ruling group and is being constantly articulated by the entire state apparatus, regardless of the euphemism, stands out among all others.

## APPENDIX

TABLE A-1.—Area, population, and output of industry, and industrial output per capita by Republics and regions of the U.S.S.R. for selected years

[As percent of U.S.S.R.]

|                     | Area         |              | Population   |               |              |              | Output of industry | Industrial output per capita |       |       |       |
|---------------------|--------------|--------------|--------------|---------------|--------------|--------------|--------------------|------------------------------|-------|-------|-------|
|                     | Jan. 1, 1968 | Jan. 1, 1940 | Jan. 1, 1950 | Jan. 15, 1959 | Jan. 1, 1966 | Jan. 1, 1968 | 1960               | 1940                         | 1950  | 1958  | 1965  |
|                     | (1)          | (2)          | (3)          | (4)           | (5)          | (6)          | (7)                | (8)                          | (9)   | (10)  | (11)  |
| U.S.S.R.....        | 100.00       | 100.00       | 100.00       | 100.00        | 100.00       | 100.00       | 100.00             | 100.0                        | 100.0 | 100.0 | 100.0 |
| R.S.F.S.R.....      | 76.22        | 56.73        | 56.68        | 56.28         | 54.59        | 54.04        | 63.30              | 105.6                        | 115.8 | 112.9 | 112.9 |
| Northwest.....      | 7.49         | 5.77         | (1)          | 5.49          | 5.35         | 5.30         | 8.78               | 182.8                        | (1)   | 161.0 | 152.6 |
| Central.....        | 2.17         | 13.93        | (1)          | 12.31         | 11.49        | 11.31        | 19.81              | 165.7                        | (1)   | 166.4 | 152.5 |
| Volga-Vjatka.....   | 1.17         | 4.56         | (1)          | 3.95          | 3.57         | 3.50         | 3.49               | 57.3                         | (1)   | 88.1  | 95.6  |
| Central Black       |              |              |              |               |              |              |                    |                              |       |       |       |
| Earth.....          | .75          | 4.69         | (1)          | 3.72          | 3.44         | 3.36         | 1.57               | 35.6                         | (1)   | 41.3  | 50.4  |
| Voiga.....          | 3.04         | 8.06         | (1)          | 7.65          | 7.62         | 7.61         | 6.80               | 43.2                         | (1)   | 83.2  | 96.9  |
| North Caucasus..... | 1.59         | 5.41         | (1)          | 5.56          | 5.80         | 5.86         | 4.67               | 113.8                        | (1)   | 82.7  | 83.5  |
| Urals.....          | 3.04         | 5.42         | (1)          | 6.79          | 6.56         | 6.45         | 8.69               | 98.7                         | (1)   | 127.9 | 132.1 |
| West Siberia.....   | 10.83        | 4.73         | (1)          | 5.39          | 5.24         | 5.15         | 4.61               | 49.2                         | (1)   | 86.9  | 89.1  |
| East Siberia.....   | 18.40        | 2.53         | (1)          | 3.10          | 3.13         | 3.09         | 2.55               | 79.1                         | (1)   | 80.3  | 88.6  |
| Far East.....       | 27.74        | 1.63         | (1)          | 2.32          | 2.39         | 2.41         | 2.33               | 165.2                        | (1)   | 102.3 | 104.7 |
| Ukraine.....        | 2.68         | 21.30        | 20.49        | 20.65         | 19.63        | 19.59        | 21.39              | 125.2                        | 95.9  | 106.5 | 112.3 |
| Donets-Dnieper..... | .99          | 8.44         | (1)          | 8.51          | 8.41         | 8.42         | 12.24              | 201.8                        | (1)   | 145.0 | 145.3 |
| Southwest.....      | 1.20         | 10.30        | (1)          | 9.11          | 8.70         | 8.61         | 7.23               | 70.2                         | (1)   | 78.6  | 89.2  |
| South.....          | .49          | 2.56         | (1)          | 2.43          | 2.52         | 2.56         | 1.92               | 93.5                         | (1)   | 76.5  | 82.1  |
| Belorussia.....     | .93          | 4.66         | 4.28         | 3.86          | 3.72         | 3.73         | 2.38               | 55.6                         | 44.3  | 59.4  | 70.8  |
| Moldavia.....       | .15          | 1.27         | 1.32         | 1.38          | 1.45         | 1.47         | .76                | 30.6                         | 34.7  | 55.6  | 62.1  |
| Lithuania.....      | .29          | 1.51         | 1.41         | 1.30          | 1.29         | 1.29         | .93                | 27.8                         | 35.7  | 67.2  | 84.7  |
| Latvia.....         | .28          | .97          | 1.08         | 1.00          | .98          | .97          | 1.28               | 55.3                         | 95.9  | 122.5 | 139.7 |
| Estonia.....        | .20          | .54          | .61          | .57           | .55          | .55          | .76                | 56.1                         | 107.9 | 128.5 | 147.2 |
| Georgia.....        | .31          | 1.86         | 1.96         | 1.77          | 1.96         | 1.97         | 1.40               | 89.4                         | 83.8  | 76.3  | 67.7  |
| Azerbaijan.....     | .39          | 1.69         | 1.62         | 1.77          | 2.01         | 2.08         | 1.16               | 112.5                        | 103.4 | 68.5  | 55.1  |
| Armenia.....        | .13          | .68          | .75          | .84           | .95          | .97          | .70                | 60.2                         | 86.3  | 79.9  | 78.1  |
| Kazakhstan.....     | 12.12        | 3.12         | 3.71         | 4.38          | 5.23         | 5.36         | 2.62               | 52.8                         | 65.3  | 56.0  | 55.4  |
| Uzbekistan.....     | 2.01         | 3.42         | 3.59         | 3.96          | 4.50         | 4.76         | 1.98               | 63.5                         | 70.4  | 50.4  | 43.8  |
| Kirghizia.....      | .89          | .79          | .97          | .99           | 1.14         | 1.20         | .52                | 49.3                         | 54.6  | 52.4  | 51.5  |
| Tadzhikistan.....   | .64          | .79          | .86          | .95           | 1.11         | 1.16         | .47                | 63.8                         | 56.0  | 49.4  | 43.4  |
| Turkmenia.....      | 2.18         | .67          | .67          | .73           | .83          | .86          | .35                | 71.7                         | 64.6  | 51.9  | 38.2  |



<sup>1</sup> Not available.

#### Sources

Col. (1): *N.kh.SSSR 1967*, p. 12. Total area of the U.S.S.R. is equal to 22,402,200 square kilometers.

Cols. (2), (4), (5): *N.kh. SSSR 1965*, pp. 12-13. Total population was 194,077,000; 208,827,000; and 231,868,000 respectively.

Col. (3): *SSSR o tsifrah-1967*, p. 7. Total population was 181,603,000.

Col. (6): *N.kh.SSSR 1967*, p. 12. Total population was 236,689,000.

Col. (7): Paul K. Cook, "The Administration and Distribution of Soviet Industry" in U.S. Congress, Joint Economic Committee, *Dimensions of Soviet Economic Power*, Washington, 1962, pp. 704-732. According to this estimate, the value of industrial output in the U.S.S.R. in 1960 was equal to \$172,000,000,000. Cook's estimates were prepared for regions in their 1961 boundaries. In view of the changes of boundaries in 1963 and 1965 (cf. footnote 39), the original estimates were here adjusted according to the distribution of urban population in 1960 (*N.kh.SSSR 1960*, pp. 44-47) because no better method was readily available. For example, Yakutian A.S.S.R. was transferred from the East Siberian to the Far East region. Thus, the output of the East Siberian region in 1960 was decreased by 6.05 percent, the share of Yakutia in the total urban population of this region in this year, and this amount has been added to the total industrial output of the Far East region. A similar method was applied to all other changes in boundaries. Despite the fact that the Kalliningrad *oblast* has belonged since 1963 to the Baltic region and no longer to the Northwest region, although administratively this *oblast* is still a part of the

R.S.F.S.R., it seemed appropriate in this study to retain this *oblast* consistently in the Northwest region.

Cols. (8), (9), (10), (11): Derived on the basis of population data from sources listed for Cols. (2) to (6) and of indexes from table A-2. The output per capita was as follows for the benchmark years: 1940—\$192, 1950—\$323, 1958—\$681, 1965—\$1,100. By calculating the value of output for years other than 1960, the figure obtained directly for the U.S.S.R. (R.S.F.S.R., Ukraine), differs from the figure obtained by adding the data for individual republics (Russian or Ukrainian regions), obtained on the basis of their indexes. Throughout this study the data for the U.S.S.R. (R.S.F.S.R., Ukraine) were calculated by using the latter method, i.e., by adding the component parts in order to get the total. Soviet data on gross industrial output per capita by territorial subdivisions seem to be available only for the year 1965 and only for economic regions, see Vedishchev, *op. cit.*, p. 63. Moreover, they are given indirectly. These data can be used for comparison with data in Col. (11). Following is the list of regions giving their rank according to the calculation in this table followed (in parenthesis) by that according to Vedishchev's calculation: Central 1 (1), Volga-Viatka 7 (5); Central Black Earth 17 (12); Volga 6 (6); North Caucasus 11 (11); Ural 3 (3); West Siberia 9 (9); East Siberia 10 (10); Far East 5 (7); Donets-Dnieper 2 (4); Southwest 8 (16); South 12 (8); Belorussia 13 (13); Moldavia 15 (15); Baltic 4 (2); Transcaucasus 14 (14); Kazakhstan 16 (17); Central Asia 18 (18). The data for the Northwest region exclude the city of Leningrad and thus are not meaningful. The two sets of data differ in regard to the absolute level of indexes but, as can be seen, they are very close in terms of ranking.

TABLE A-2.—Indexes of gross output of industry by Republics and regions of the U.S.S.R., 1940-67

|                          | 1940 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 |
|--------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| U.S.S.R. ....            | 19.0 | 33.0 | 38.5 | 42.9 | 48.1 | 54.4 | 61.1 | 67.6 | 74.4 | 82.0 | 91.0 | 100  | 109  | 120  | 129  | 139  | 151  | 164  | 180  |
| R.S.F.S.R. ....          | 21.6 | 35.4 | 40.9 | 45.3 | 50.4 | 56.9 | 63.6 | 69.6 | 75.9 | 82.6 | 97.7 | 100  | 108  | 118  | 127  | 135  | 145  | 157  | 172  |
| Northwest.....           | 26.0 | 34.4 | (1)  | (1)  | (1)  | (1)  | 63.4 | (1)  | (1)  | 83.3 | 91.7 | 100  | 105  | 113  | 123  | 131  | 138  | 147  | 160  |
| Central.....             | 25.2 | 37.8 | (1)  | (1)  | (1)  | (1)  | 67.3 | (1)  | (1)  | 85.5 | 94.0 | 100  | 105  | 112  | 118  | 125  | 131  | 141  | 154  |
| Volga-Vlatka.....        | 16.2 | 35.9 | (1)  | (1)  | (1)  | (1)  | 64.4 | (1)  | (1)  | 82.6 | 91.7 | 100  | 107  | 117  | 127  | 135  | 145  | 160  | 178  |
| Central Black Earth..... | 22.9 | 25.6 | (1)  | (1)  | (1)  | (1)  | 54.5 | (1)  | (1)  | 80.6 | 91.9 | 100  | 113  | 128  | 137  | 145  | 163  | 175  | 193  |
| Volga.....               | 11.1 | 28.7 | (1)  | (1)  | (1)  | (1)  | 57.8 | (1)  | (1)  | 77.5 | 89.1 | 100  | 113  | 126  | 139  | 147  | 161  | 178  | 197  |
| North Caucasus.....      | 28.5 | 33.0 | (1)  | (1)  | (1)  | (1)  | 60.7 | (1)  | (1)  | 81.3 | 92.7 | 100  | 111  | 122  | 131  | 138  | 154  | 167  | 183  |
| Urals.....               | 13.3 | 37.8 | (1)  | (1)  | (1)  | (1)  | 65.5 | (1)  | (1)  | 82.6 | 90.9 | 100  | 109  | 119  | 129  | 137  | 148  | 161  | 177  |
| West Siberia.....        | 10.9 | 35.3 | (1)  | (1)  | (1)  | (1)  | 63.3 | (1)  | (1)  | 84.0 | 91.6 | 100  | 109  | 121  | 132  | 138  | 150  | 161  | 180  |
| East Siberia.....        | 17.0 | 33.3 | (1)  | (1)  | (1)  | (1)  | 57.7 | (1)  | (1)  | 80.6 | 90.3 | 100  | 111  | 124  | 136  | 149  | 161  | 175  | 194  |
| Far East.....            | 24.9 | 41.3 | (1)  | (1)  | (1)  | (1)  | 63.7 | (1)  | (1)  | 84.0 | 90.8 | 100  | 111  | 124  | 138  | 151  | 159  | 171  | 189  |
| Ukraine.....             | 27.4 | 31.5 | 36.7 | 41.9 | 47.4 | 53.7 | 60.3 | 67.7 | 74.5 | 82.6 | 91.7 | 100  | 110  | 121  | 129  | 138  | 153  | 165  | 181  |
| Donets-Dnieper.....      | 30.1 | 33.1 | (1)  | (1)  | (1)  | (1)  | (1)  | (1)  | (1)  | 83.3 | 91.7 | 100  | 109  | 119  | 127  | 136  | 148  | 159  | 172  |
| Southwest.....           | 21.6 | 29.3 | (1)  | (1)  | (1)  | (1)  | (1)  | (1)  | (1)  | 82.0 | 92.6 | 100  | 113  | 122  | 130  | 141  | 159  | 173  | 192  |
| South.....               | 27.0 | 28.0 | (1)  | (1)  | (1)  | (1)  | (1)  | (1)  | (1)  | 80.0 | 89.6 | 100  | 111  | 123  | 134  | 144  | 160  | 174  | 195  |
| Belorussia.....          | 23.5 | 27.1 | 31.7 | 36.6 | 42.0 | 49.3 | 55.8 | 62.9 | 71.0 | 79.4 | 89.7 | 100  | 112  | 124  | 135  | 149  | 164  | 187  | 211  |
| Moldavia.....            | 11.1 | 20.7 | 29.4 | 31.5 | 42.0 | 43.9 | 53.6 | 62.7 | 74.5 | 84.0 | 91.6 | 100  | 111  | 127  | 139  | 152  | 177  | 189  | 211  |
| Lithuania.....           | 9.7  | 18.5 | 22.9 | 27.2 | 33.7 | 40.9 | 48.0 | 55.6 | 68.3 | 77.5 | 88.4 | 100  | 111  | 122  | 136  | 154  | 174  | 195  | 220  |
| Latvia.....              | 9.1  | 27.5 | 32.7 | 36.9 | 41.3 | 47.9 | 53.2 | 60.9 | 70.2 | 79.4 | 88.1 | 100  | 108  | 118  | 129  | 142  | 158  | 175  | 194  |
| Estonia.....             | 8.7  | 29.7 | 35.9 | 41.1 | 45.8 | 52.1 | 58.3 | 65.3 | 73.4 | 80.6 | 90.3 | 100  | 110  | 122  | 135  | 147  | 160  | 173  | 189  |
| Georgia.....             | 25.8 | 40.3 | 45.5 | 49.4 | 55.6 | 62.8 | 68.5 | 73.9 | 78.8 | 87.7 | 94.7 | 100  | 106  | 117  | 123  | 128  | 141  | 157  | 169  |
| Azerbaijan.....          | 35.3 | 49.1 | 54.4 | 57.9 | 62.9 | 66.8 | 71.4 | 76.0 | 80.2 | 86.2 | 91.4 | 100  | 112  | 119  | 126  | 132  | 141  | 151  | 162  |
| Armenia.....             | 12.7 | 31.6 | 38.2 | 40.4 | 47.0 | 54.4 | 60.5 | 65.8 | 72.0 | 80.0 | 89.6 | 100  | 111  | 119  | 131  | 140  | 157  | 175  | 199  |
| Kazakhstan.....          | 13.6 | 31.6 | 36.0 | 39.5 | 44.2 | 49.3 | 57.4 | 62.6 | 69.4 | 77.5 | 88.4 | 100  | 113  | 126  | 138  | 147  | 164  | 177  | 200  |
| Uzbekistan.....          | 23.8 | 43.6 | 53.3 | 56.4 | 59.8 | 64.3 | 70.2 | 71.7 | 79.0 | 83.3 | 90.8 | 100  | 107  | 114  | 121  | 138  | 150  | 163  | 178  |
| Kirghizia.....           | 16.1 | 34.7 | 40.9 | 43.7 | 49.8 | 56.6 | 61.5 | 68.4 | 75.2 | 82.0 | 91.0 | 100  | 109  | 121  | 133  | 146  | 167  | 191  | 224  |
| Tadzhikistan.....        | 23.3 | 35.1 | 42.1 | 45.1 | 51.6 | 58.6 | 64.4 | 70.9 | 77.7 | 83.3 | 94.2 | 100  | 110  | 123  | 129  | 145  | 154  | 170  | 191  |
| Turkmenia.....           | 29.8 | 42.6 | 52.4 | 57.5 | 61.9 | 66.5 | 76.5 | 77.1 | 83.0 | 89.3 | 93.8 | 100  | 106  | 110  | 116  | 128  | 134  | 147  | 166  |

Sources: TsSU, *Promyshlennost' SSSR*, Moscow, 1957, p. 18; *Promyshlennost' 1964*, pp. 50-52; *N.kh. SSSR 1958*, p. 141; *N.kh. SSSR 1966*, pp. 127-28; *N.kh. SSSR 1967*, p. 191; *N.kh. RSFSR 1961*, p. 102; *N.kh. RSFSR 1963*, pp. 80-81; *N.kh. RSFSR 1965*, pp. 48-49; TsSU, *Narodnoe hospodarstvo Ukrainy v 1964 rotsi*, Kiev, 1965, p. 63; *N.kh. RSFSR 1967*, pp. 44-45. For 1955 and 1962-1967 the Kaliningrad oblast had to be included in the

Northwest region with the help of urban population distribution in the respective years. For 1955 the distribution of 1959 was used.

<sup>1</sup> Not available.

TABLE A-3.—Investment in industry by Republics of the U.S.S.R., 1951-65

[Million rubles]

|                     | 1951-58 | 1959-65 |
|---------------------|---------|---------|
| U.S.S.R. ....       | 64,940  | 100,523 |
| R. S. F. S. R. .... | 44,016  | 63,864  |
| Ukraine .....       | 11,000  | 16,785  |
| Belorussia .....    | 876     | 1,962   |
| Moldavia .....      | 240     | 607     |
| Lithuania .....     | 375     | 918     |
| Latvia .....        | 318     | 855     |
| Estonia .....       | 315     | 664     |
| Georgia .....       | 830     | 1,140   |
| Azerbaijdzhan ..... | 1,573   | 1,867   |
| Armenia .....       | 378     | 814     |
| Kazakhstan .....    | 2,664   | 5,643   |
| Uzbekistan .....    | 1,038   | 2,258   |
| Kirghizia .....     | 435     | 1,671   |
| Tadzhikistan .....  | 370     | 600     |
| Turkmenia .....     | 446     | 806     |

Note: For the period 1951-58 the data on investment in industry according to the pre-1965 definition are used; for the period 1959-65 the data according to the post-1965 definition are used.

Sources: 1951-58: For all republics, TsSU, *Kapital'noe stroitel'stvo v SSSR*, pp. 61, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99, 101, 103, 105, 107, 109 (data rounded).

1959-65: U.S.S.R.: *N. kh. SSSR 1966*, p. 533.

R. S. F. S. R.: *N. kh. RSFSR 1966*, p. 373.

Ukraine: *N. hosp. Ukr. RSR 1966*, p. 419.

Belorussia: United Nations Secretariat sources.

Moldavia: Moldavian S.S.R. TsSU, *Sovetskaya Moldavia k 50-letiu Velikogo Oktabria*, Kishinev, Statistika, 1967, p. 147.

Lithuania: *Narodnoe khoziaistvo Litovskoi SSR v 1965 godu*, Vil'nius, Statistika (Litov. otдел.) 1966, p. 166; Lithuanian S.S.R. Centre statistikos valdyba, *Ekonomika i kul'tura Litovskoi SSR*, Vil'nius, Statistika, 1966, p. 203.

Latvia: Latvian S.S.R. Centrala statistikas parvalde, *Ekonomika i kul'tura sovetskoj Latvii*, Riga, 1966, p. 271.

Estonia: Veimer, *op. cit.*, p. 19.

Georgia: Georgia, Statisticheskoe upravlenie, *Sovetskaya Gruzia k 50-letiu Velikoi Oktibr'skoi sotstatisticheskoi revoliutsii*, Tbilisi, Statistika, 1968, p. 178.

Azerbaijdzhan: *Narodnoe khoziaistvo Azerbaidzhanskoi SSR v 1965 godu*, Baku, Statistika (Azerb. otдел.), 1965, p. 165.

Armenia: *Narodnoe khoziaistvo Armianskoi SSR v 1965 godu*, Erevan, Statistika, 1966, p. 164.

Kazakhstan: *Narodnoe khoziaistvo Kazakhstana*, Alma-Ata, Statistika, 1968, p. 231.

Uzbekistan: *Narodnoe khoziaistvo Uzbekskoi SSR v 1965 godu*, Tashkent, Uzbekistan, 1966, p. 241.

Kirghizia: *Narodnoe khoziaistvo Kirgizskoi SSR v 1965 godu*, Frunze, Statistika (Kirg. otдел.), 1966, p. 80.

Tadzhikistan: *Narodnoe khoziaistvo Tadzhikskoi SSR v 1965 godu*, Dushanbe, Statistika, 1966, p. 149.

Turkmenia: Turkmen S.S.R. TsSU, *Turkmenistan za gody Sovetskoj vlasti*, Ashkhabad, Turkmenistan, 1967, p. 71.

TABLE A-4.—Indexes of gross output, employment, fixed capital, and implied productivity of inputs in industry of the U.S.S.R. and selected republics, 1958-65

U.S.S.R., 1965 (1958=100)

|  | Output | Employment | Fixed capital | Combined inputs | Implied productivity of inputs |
|--|--------|------------|---------------|-----------------|--------------------------------|
|  | (1)    | (2)        | (3)           | (4)             | (5)                            |
| Total.....                                   | 184    | 130.0      | 210           | -----           | -----                          |
| Electric power.....                          | 230    | 174.2      | 237           | 226.3           | 101.6                          |
| Fuel.....                                    | 159    | 98.4       | 165           | 121.0           | 131.4                          |
| Ferrous metals.....                          | 178    | 128.3      | 211           | 155.0           | 114.8                          |
| Chemicals.....                               | 245    | 185.5      | 317           | 223.8           | 109.5                          |
| Machine building and metalworking.....       | 237    | 154.3      | 203           | 162.6           | 145.8                          |
| Timber, woodworking, and pulp and paper..... | 147    | 103.1      | 179           | 115.1           | 127.7                          |
| Building materials.....                      | 217    | 130.1      | 252           | 154.5           | 140.5                          |
| Light.....                                   | 131    | 120.5      | 183           | 126.2           | 103.8                          |
| Food.....                                    | 163    | 123.9      | 195           | 143.3           | 113.7                          |

NOTE.—Data on fixed capital for the U.S.S.R. as well as subsequently for most of the republics refer to the value of capital at the end of the year. The indexes of implied productivity for individual branches (col. 5) were derived by dividing the official indexes of gross output for these branches (col. 1) by the respective indexes of combined employment and capital (col. 4). The latter were constructed by using a Cobb-Douglas-type production function. Specifically the following formula was used:

$$P = \frac{O}{L \cdot K^b}$$

where

$P$  = index of implied productivity of combined resources;

$O$  = index of gross output;

$L$  = index of all the employed or of workers only;

$K$  = index of fixed capital gross of depreciation;

$a$  and  $b$  = labor and capital coefficients ( $a+b=1$ ).

Labor and capital coefficients are taken from Noren, *op. cit.*, table 6, pp. 304-305. They were calculated for the U.S.S.R. with 1960 as the base year, using 8 percent return on fixed capital. The coefficient for fuel industry was derived by aggregation of Noren's coefficients for coal and petroleum products and natural gas industries. The coefficient for electric power industry was assumed to be the same as that of Czechoslovakia in 1960 with 8 percent return on capital, according to the study on the growth of GNP in CSSR by Project on National Income in East Central Europe, Columbia University.

The coefficients for individual branches were as follows (for labor and capital respectively): electric power, 0.15, 0.85; fuel, 0.60, 0.40; ferrous metals, 0.62, 0.38; chemicals, 0.65, 0.35; machine building and metalworking, 0.81, 0.19; timber, woodworking, pulp and paper, 0.80, 0.20; building materials, 0.74, 0.26; light, 0.89, 0.11; food, 0.68, 0.32.

Sources: Output: *N.kh.SSSR 1965*, p. 125.

Employment: Index for 1960 and 1965 based on data from *Trud v SSSR*, pp. 87, 89, connected with the index for 1958 and 1960 based on data for workers only from *N.kh.SSSR 1965*, p. 140; chemical industry for the whole period based on workers only, *ibid.*; index for fuel industry between 1958 and 1960 based on coal and oil workers' data from Noren, *op. cit.*, table 7.

Fixed capital: *N.kh.SSSR 1965*, p. 149.

R.S.F.S.R. 1965 (1959=100)

|  | Output | Employment | Fixed capital | Combined inputs | Implied productivity of inputs |
|--|--------|------------|---------------|-----------------|--------------------------------|
|  | (1)    | (2)        | (3)           | (4)             | (5)                            |
| Total.....                                   | 157.7  | 125.1      | 190.2         | -----           | -----                          |
| Electric power.....                          | 186.0  | 161.6      | 224.3         | 213.5           | 87.1                           |
| Fuel.....                                    | 153.2  | 97.2       | 145.1         | 114.1           | 134.3                          |
| Ferrous metals.....                          | 164.5  | 126.2      | 199.4         | 150.2           | 109.5                          |
| Chemicals.....                               | 210.0  | 181.5      | 312.4         | 219.5           | 95.7                           |
| Machine building and metalworking.....       | 194.8  | 145.2      | 187.5         | 152.4           | 127.8                          |
| Timber, woodworking, and pulp and paper..... | 117.7  | 99.8       | 173.7         | 111.5           | 105.6                          |
| Building materials.....                      | 171.4  | 123.8      | 223.1         | 144.3           | 118.8                          |
| Light.....                                   | 114.8  | 113.1      | 189.4         | 119.7           | 95.9                           |
| Food.....                                    | 145.0  | 121.2      | 169.5         | 134.9           | 107.6                          |

Sources: Output: *N.kh.RSFSR 1965*, pp. 47, 81, 83, 87, 91, 98, 105, 122, 131, 155.

Employment: 1959-1960, indexes for workers only, calculated on the basis of productivity indexes, *N.kh.RSFSR 1965*, pp. 88, 94, 101, 106, 123, 132, 156; index for fuel industry, *N.kh.RSFSR 1961*, p. 94; index for electric power extrapolated from 1960 to 1959 on the basis of growth rate between 1960 and 1965; 1960-65, *Trud v SSSR*, pp. 90-91; index for chemical industry for workers only, *N.kh.RSFSR 1965*, p. 68.

Fixed capital: Index for the total 1959-60, *N.kh.RSFSR 1962*, p. 36; 1960-65 (including variable capital), *N.kh.RSFSR 1965*, p. 38; distribution for 1959, *N.kh.RSFSR 1960*, p. 20, and for 1965, *N.kh.SSSR 1965*, pp. 150-151.

TABLE A-4.—Indexes of gross output, employment, fixed capital, and implied productivity of inputs in industry of the U.S.S.R. and selected republics, 1958-65—Continued

## UKRAINE 1965 (1958=100)

|   | Output<br>(1) | Employment<br>(2) | Fixed capital<br>(3) | Combined inputs<br>(4) | Implied productivity of inputs<br>(5) |
|---|---------------|-------------------|----------------------|------------------------|---------------------------------------|
| Total.....  | 184.1         | 144.5             | 201                  | -----                  | -----                                 |
| Electric power.....   | 226.4         | 160.5             | 244                  | 229.1                  | 98.8                                  |
| Fuel.....   | 143.3         | 95.1              | 162                  | 117.7                  | 121.8                                 |
| Ferrous metals.....   | 170.5         | 125.2             | 197                  | 148.7                  | 114.7                                 |
| Chemicals.....  | 293.8         | 171.5             | 292                  | 206.6                  | 142.2                                 |
| Machine building and metalworking.<br>Timber, woodworking, and pulp<br>and paper..... | 249.5         | 169.9             | 194                  | 174.2                  | 143.2                                 |
| Building materials.....   | 143.5         | 114.7             | 174                  | 124.7                  | 115.1                                 |
| Light.....  | 203.5         | 131.7             | 231                  | 152.4                  | 133.5                                 |
| Food.....   | 145.1         | 129.8             | 230                  | 138.2                  | 105.0                                 |
|   | 165.1         | 121.7             | 209                  | 144.7                  | 114.1                                 |

Sources: Output: *N. hosp. Ukr. RSR 1965*, p. 59; *N. hosp. Ukr. RSR 1966*, pp. 79, 81.  
 Employment: *N. hosp. Ukr. RSR 1966*, p. 89; *Trud v SSSR*, pp. 92-93; electric power for the period calculated on the basis of productivity indexes from *N. hosp. Ukr. RSR 1964*, p. 66; *N. hosp. Ukr. RSR 1966*, p. 90.  
 Fixed capital: *N. hosp. Ukr. RSR 1965*, p. 93.

## BELORUSSIA 1965 (1960=100)

|   | Output<br>(1) | Employment<br>(2) | Fixed capital<br>(3) | Combined inputs<br>(4) | Implied productivity of inputs<br>(5) |
|---|---------------|-------------------|----------------------|------------------------|---------------------------------------|
| Total.....  | 164.0         | 137.4             | -----                | -----                  | -----                                 |
| Chemicals.....  | 306.5         | 280.2             | 552.6                | 355.4                  | 86.2                                  |
| Machine building and metalworking.<br>Timber, woodworking, and pulp<br>and paper..... | 214.8         | 170.9             | 191.7                | 174.7                  | 123.0                                 |
| Light.....  | 144.6         | 105.8             | 132.5                | 110.7                  | 130.6                                 |
| Food.....   | 242.5         | 135.0             | 201.2                | 141.1                  | 171.9                                 |
|   | 151.8         | 125.0             | 158.6                | 134.9                  | 112.5                                 |

Sources: Output: *N. kh. SSSR 1965*, p. 129; Belorussia, TsSU, *Promyshlennost' Belorusskoi SSR*, Minsk, Statistika, 1965, p. 25, *Osnovnye fondy i kapital'nye vlozhenia v promyshlennost'* (O. S. Sitnikov and V. A. Mukhina, eds.), Minsk, Nauka i tekhnika, 1968, pp. 19, 160, 195, 330; for light industry calculated on the basis of number of the employed from *Trud v SSSR*, pp. 94-95, and output per employee from *Osnovnye fondy* . . . , p. 210.

Employment: *Trud v SSSR*, pp. 94-95; for chemical industry calculated on the basis of indexes of fixed capital and fixed capital per employee, *Osnovnye fondy* . . . , p. 210.

Fixed capital: *Ibid.*, pp. 19, 111, 160, 195, 205, 316; the index for machine building (unavailable for combined machine building and metalworking) given for the period 1958-65, adjusted to 1960-65 by using the growth rate between 1959 and 1963 of 12.6 percent, see *ibid.*, p. 21.

## MOLDAVIA 1965 (1960=100)

|   | Output<br>(1) | Employment<br>(2) | Fixed capital<br>(3) | Combined inputs<br>(4) | Implied productivity of inputs<br>(5) |
|---|---------------|-------------------|----------------------|------------------------|---------------------------------------|
| Total.....  | 177           | 148.5             | 213.0                | -----                  | -----                                 |
| Electric power.....   | 477           | 206.0             | 375.2                | 342.9                  | 139.1                                 |
| Chemicals.....  | 187           | 203.6             | 426.0                | 263.6                  | 70.9                                  |
| Machine building and metalworking.<br>Timber, woodworking, and pulp<br>and paper..... | 341           | 250.3             | 227.7                | 245.8                  | 138.7                                 |
| Building materials.....   | 140           | 134.9             | 190.2                | 144.5                  | 96.9                                  |
| Light.....  | 199           | 112.8             | 277.9                | 142.6                  | 139.6                                 |
| Food.....   | 133           | 137.6             | 168.5                | 140.7                  | 94.5                                  |
|   | 173           | 137.8             | 187.1                | 152.0                  | 113.8                                 |

Sources: Output: Moldavian S.S.R. TsSU, *op. cit.*, p. 39.

Employment: *Ibid.*, p. 49, for workers only.

Fixed capital: Index for the total, *ibid.*, p. 23; distribution for 1960, *Narodnoe khoziaistvo Moldavskoi SSR v 1962 godu*, Kishinev, Gosstatizdat, 1963, p. 23; the share of chemical industry is assumed to be the same as in 1961, *N. kh. SSSR 1961*, p. 187; and for 1965, *N. kh. SSSR 1965*, pp. 150-151.

TABLE A-4.—Indexes of gross output, employment, fixed capital, and implied productivity of inputs in industry of the U.S.S.R. and selected republics, 1958-65—Continued

## LITHUANIA 1965 (1958=100)

|  | Output | Employment | Fixed capital | Combined inputs | Implied <sup>d</sup> productivity of inputs |
|--|--------|------------|---------------|-----------------|---|
|  | (1)    | (2)        | (3)           | (4)             | (5)   |
| Total.....                                   | 224    | 167.6      | 291.0         | -----           | -----                                       |
| Electric power.....                          | 537    | 248.0      | 477.0         | 432.4           | 124.2                                       |
| Chemicals.....                               | 914    | 682.1      | 610.7         | 656.2           | 139.2                                       |
| Machine building and metalworking.....       | 365    | 239.6      | 425.0         | 267.2           | 136.2                                       |
| Timber, woodworking, and pulp and paper..... | 195    | 168.2      | 248.0         | 181.8           | 107.3                                       |
| Building materials.....                      | 325    | 146.0      | 294.0         | 175.1           | 185.6                                       |
| Light.....                                   | 170    | 139.9      | 222.0         | 147.2           | 115.5                                       |
| Food.....                                    | 193    | 130.0      | 175.0         | 143.0           | 135.0                                       |

Sources: Output: *N.kh.Lit.SSR 1965*, pp. 48-49.

Employment: *Ibid.*, p. 70; for chemical industry calculated from productivity indexes, *ibid.*, p. 76.

Fixed capital: *Ibid.*, p. 60; for chemical industry from *Ekonomika i kul'tura Litovskoi SSR*, p. 116.

## LATVIA 1965 (1960=100)

|  | Output | Employment | Fixed capital | Combined inputs | Implied <sup>d</sup> productivity of inputs |
|--|--------|------------|---------------|-----------------|---|
|  | (1)    | (2)        | (3)           | (4)             | (5)   |
| Total.....                                   | 109    | 124.4      | 177.0         | -----           | -----                                       |
| Electric power.....                          | 230    | 114.9      | 186.3         | 173.3           | 132.7                                       |
| Fuel.....                                    | 101    | 75.8       | 167.7         | 104.1           | 97.0  |
| Machine building and metalworking.....       | 132    | 151.8      | 172.7         | 155.6           | 84.8  |
| Timber, woodworking, and pulp and paper..... | 165    | 100.0      | 150.3         | 108.5           | 152.1                                       |
| Building materials.....                      | 119    | 109.4      | 174.7         | 123.6           | 96.3  |
| Light.....                                   | 150    | 113.8      | 136.7         | 116.1           | 129.2                                       |
| Food.....                                    | 158    | 118.1      | 164.1         | 131.2           | 120.4                                       |

Sources: Output: Latvian S.S.R. Centrala statistikas parvalde, *Latvija za gody sovetskoi vlasti*, Riga, Statistika (Latv. otдел.) 1967, p. 83.

Employment: *Ibid.*, pp. 8, 91, for workers only.

Fixed capital: Index for the total, *ibid.*, p. 61; distribution for 1960 is assumed to be the same as in 1961, *N.kh.SSSR 1961*, p. 187, and for 1965, *N.kh.SSSR 1965*, pp. 150-151.

## ESTONIA 1965 (1958=100)

|  | Output | Employment | Fixed capital | Combined inputs | Implied <sup>d</sup> productivity of inputs |
|--|--------|------------|---------------|-----------------|---|
|  | (1)    | (2)        | (3)           | (4)             | (5)   |
| Total.....                                   | 198.4  | 141.6      | 236           | -----           | -----                                       |
| Electric power.....                          | 648.0  | 259.1      | 526           | 473.0           | 137.0                                       |
| Fuel.....                                    | 182.6  | 105.9      | 160           | 124.9           | 146.2                                       |
| Chemicals.....                               | 222.3  | 141.0      | 200           | 159.3           | 139.5                                       |
| Machine building and metalworking.....       | 298.9  | 197.4      | 243           | 205.3           | 145.6                                       |
| Timber, woodworking, and pulp and paper..... | 145.8  | 112.0      | 161           | 120.4           | 121.1                                       |
| Building materials.....                      | 270.1  | 142.4      | 325           | 176.5           | 153.0                                       |
| Light.....                                   | 139.2  | 140.5      | 148           | 141.3           | 98.5  |
| Food.....                                    | 199.5  | 142.7      | 234           | 167.2           | 119.3                                       |

Sources: Output: Estonian S.S.R. Statistika Keskvaitisus, *Sovetskaya Estoniya za 25 let*, Tallin, Eesti Raamat, 1965, pp. 38-39; *idem*, *Razvitie narodnogo khoziaistva Estonskoi SSR*, Tallin, Eesti Raamat, 1967, pp. 24-25.

Employment: Veimer, *op cit.*, p. 40; chemical industry (workers only) *Sovetskaya Estoniya za 25 let*, p. 39; *Razvitie narodnogo khoziaistva Estonskoi SSR*, pp. 24-25.

Fixed capital: *Ibid.*, p. 32.

TABLE A-4.—Indexes of gross output, employment, fixed capital, and implied productivity of inputs in industry of the U.S.S.R. and selected republics, 1958-65—Continued

## GEORGIA 1965 (1959=100)

|  | Output<br>(1) | Employment<br>(2) | Fixed capital<br>(3) | Combined inputs<br>(4) | Implied productivity of inputs<br>(5) |
|--|---------------|-------------------|----------------------|------------------------|---------------------------------------|
| Total.....                                   | 148.7         | 134.1             | 175.0                | -----                  | -----                                 |
| Electric power.....                          | 190.6         | 359.8             | 198.3                | 216.8                  | 87.9                                  |
| Fuel.....                                    | 131.1         | 84.3              | 93.1                 | 87.7                   | 149.5                                 |
| Ferrous metals.....                          | 135.6         | 117.0             | 152.4                | 129.4                  | 104.8                                 |
| Machine building and metalworking.....       | 260.5         | 150.8             | 172.3                | 154.7                  | 168.4                                 |
| Timber, woodworking, and pulp and paper..... | 116.8         | 109.8             | 160.8                | 118.5                  | 98.6                                  |
| Building materials.....                      | 167.7         | 135.9             | 206.0                | 151.4                  | 110.8                                 |
| Light.....                                   | 111.2         | 137.8             | 182.3                | 142.1                  | 78.3                                  |
| Food.....                                    | 139.5         | 117.8             | 175.5                | 133.8                  | 104.3                                 |

Sources: Output: *Narodnoe khoziaistvo Gruzinskoi SSR v 1964 godu*, Tbilisi, Statistika (Gruz. otdel.) 1965, pp. 27-28; Georgia, SU, *op. cit.*, pp. 54-56.

Employment: *N.kh.Gruz. SSR 1961*, pp. 58-59; Georgia, SU, *op. cit.*, pp. 59-60.

Fixed capital: Index for the total, Georgia, SU, *op. cit.*, p. 26; distribution for 1959, *N.kh.Gruz. SSR 1962*, pp. 58-59, and for 1965, *N.kh.SSSR 1965*, pp. 150-151.

## ARMENIA 1965 (1958=100)

|  | Output<br>(1) | Employment<br>(2) | Fixed capital<br>(3) | Combined inputs<br>(4) | Implied productivity of inputs<br>(5) |
|--|---------------|-------------------|----------------------|------------------------|---------------------------------------|
| Total.....                                   | 196           | 157.7             | 230                  | -----                  | -----                                 |
| Electric power.....                          | 135           | 232.3             | 183                  | 189.7                  | 71.2                                  |
| Chemicals.....                               | 308           | 175.0             | 309                  | 213.5                  | 144.3                                 |
| Machine building and metalworking.....       | 341           | 263.4             | 345                  | 277.2                  | 123.0                                 |
| Timber, woodworking, and pulp and paper..... | 134           | 93.8              | 160                  | 104.4                  | 128.4                                 |
| Building materials.....                      | 242           | 133.5             | 305                  | 165.5                  | 146.2                                 |
| Light.....                                   | 133           | 124.2             | 170                  | 128.6                  | 103.4                                 |
| Food.....                                    | 150           | 136.3             | 183                  | 149.8                  | 100.1                                 |

Sources: Output: *N.kh.Arm.SSR 1965*, p. 33.

Employment: 1958-1960, indexes for workers only, *N.kh.Arm.SSR 1965*, pp. 46-47; 1960-65, *Trud v SSSR*, pp. 114-115; for chemical industry for the entire period, calculated on the basis of productivity index, *N.kh.Arm.SSR 1965*, p. 56.

Fixed capital: *Ibid.*, p. 48.

## KAZAKHSTAN 1965 (1958=100)

|  | Output<br>(1) | Employment<br>(2) | Fixed capital<br>(3) | Combined inputs<br>(4) | Implied productivity of inputs<br>(5) |
|--|---------------|-------------------|----------------------|------------------------|---------------------------------------|
| Total.....                                   | 235           | 170.3             | 275                  | -----                  | -----                                 |
| Electric power.....                          | 268           | 203.0             | 412                  | 378.1                  | 70.9                                  |
| Fuel.....                                    | 156           | 122.8             | 183                  | 144.0                  | 108.3                                 |
| Ferrous metals.....                          | 457           | 308.8             | 695                  | 450.4                  | 101.5                                 |
| Chemicals.....                               | 209           | 143.2             | 278                  | 180.6                  | 115.7                                 |
| Machine building and metalworking.....       | 349           | 210.2             | 309                  | 249.9                  | 139.7                                 |
| Timber, woodworking, and pulp and paper..... | 164           | 122.4             | 293                  | 140.4                  | 116.8                                 |
| Building materials.....                      | 279           | 160.3             | 325                  | 226.7                  | 123.1                                 |
| Light.....                                   | 196           | 167.5             | 241                  | 167.4                  | 117.1                                 |
| Food.....                                    | 198           | 139.4             | 204                  | 167.3                  | 118.4                                 |

Sources: Output: *Effektivnost' kapital'nykh vlozhenii v promyshlennosti Kazakhstana* (U. B. Baimuratov, ed.), Alma-Ata, 1969, Nauka, pp. 45-56.

Employment: On the basis of productivity indexes for workers, *N.kh.Kazakhstana 1968*, pp. 45-46.

Fixed capital: *Effektivnost'* . . . pp. 45-46.

TABLE A-4.—*Indexes of gross output, employment, fixed capital, and implied productivity of inputs in industry of the U.S.S.R. and selected republics, 1958-65—Continued*

UZBEKISTAN 1965 (1958=100)

|  | Output | Employment | Fixed capital | Combined inputs | Implied productivity of inputs |
|--|--------|------------|---------------|-----------------|--------------------------------|
|  | (1)    | (2)        | (3)           | (4)             | (5)                            |
| Total.....                                   | 180    | 144.4      | 249.0         | -----           | 104.3                          |
| Electric power.....                          | 254    | 202.7      | 251.5         | 243.5           | 140.0                          |
| Fuel.....                                    | 288    | 171.9      | 269.4         | 205.7           | 126.4                          |
| Ferrous metals.....                          | 163    | 100.7      | 193.3         | 129.0           | 138.5                          |
| Chemicals.....                               | 271    | 166.8      | 263.2         | 195.7           | 182.5                          |
| Machine building and metalworking.....       | 307    | 156.7      | 227.7         | 168.2           | 169.9                          |
| Timber, woodworking, and pulp and paper..... | 222    | 125.8      | 152.3         | 130.7           | 140.9                          |
| Building materials.....                      | 333    | 175.6      | 551.1         | 236.4           | 100.2                          |
| Light.....                                   | 132    | 125.4      | 197.5         | 131.8           | 109.0                          |
| Food.....                                    | 157    | 125.6      | 192.4         | 144.0           |                                |

Sources: Output: *N.kh.Uzb.SSR 1965*, p. 39.

Employment: 1965, *ibid.*, p. 46; 1958 calculated on the basis of total for this year, *ibid.*, and the distribution of workers, *N.kh.Uzb.SSR 1958*, p. 32.

Fixed capital: Index for the total, Ziaadullaev, *Promyshlennost' Uzbekistana* . . . p. 109; distribution for 1958, Uzbek S.S.R. TsSU, *Sovetskii Uzbekistan za 40 let*, Tashkent, Uzbekistan, 1964, p. 54 and for 1965, *N.kh.SSSR 1965*, pp. 150-151.

KIRGHIZIA 1965 (1959=100)

|   | Output | Employment | Fixed capital | Combined inputs | Implied productivity of inputs |
|---|--------|------------|---------------|-----------------|--------------------------------|
|   | (1)    | (2)        | (3)           | (4)             | (5)                            |
| Total.....                                | 183.4  | 147.0      | 209.0         | -----           | 263.3                          |
| Electric power.....                       | 524.8  | 222.2      | 195.5         | 199.3           | 85.9                           |
| Fuel.....                                 | 108.1  | 88.9       | 212.2         | 125.9           |                                |
| Machine building and metalworking.....    | 331.8  | 213.5      | 211.8         | 213.2           | 155.6                          |
| Timber, woodworking, and pulp, paper..... | 153.6  | 131.8      | 221.9         | 146.3           | 105.0                          |
| Building materials.....                   | 278.0  | 151.3      | 213.3         | 165.4           | 168.1                          |
| Light.....                                | 150.4  | 140.8      | 213.2         | 147.4           | 102.0                          |
| Food.....                                 | 161.3  | 135.6      | 211.9         | 156.4           | 103.1                          |

Sources: Output: *N.kh.Kirg. SSR 1965*, pp. 26-28; *N.kh.Kirg. SSR 1965*, p. 35; Kirghiz S.S.R. TsSU, *Kirgizstan za 50 let Sovetskoi vlasti*, Frunze, Kirgizstan, 1967, p. 46; indexes for coal and oil industries combined into the index for the fuel industry, using employment in 1965 as weights, *N.kh.Kirg. SSR 1965*, p. 40.

Employment: *N.kh.Kirg. SSR 1965*, p. 33; *N.kh.Kirg. SSR 1965*, p. 40.

Fixed capital: Index for the total, *Kirgizstan za 50 let Sovetskoi vlasti*, p. 24; distribution for 1959, *N.kh.Kirg. SSR 1965*, p. 44, and for 1965, *N.kh.SSR 1965*, pp. 150-151.

TADZHIKISTAN 1965 (1960=100)

|  | Output | Employment | Fixed capital | Combined inputs | Implied productivity of inputs |
|--|--------|------------|---------------|-----------------|--------------------------------|
|  | (1)    | (2)        | (3)           | (4)             | (5)                            |
| Total.....                                   | 154    | 139.1      | 193.0         | -----           | 66.7                           |
| Electric power.....                          | 150    | 145.0      | 243.2         | 225.0           | 108.9                          |
| Fuel.....                                    | 117    | 89.7       | 140.7         | 107.4           |                                |
| Machine building and metalworking.....       | 305    | 215.2      | 222.3         | 216.5           | 140.9                          |
| Timber, woodworking, and pulp and paper..... | 152    | 111.9      | 112.6         | 112.0           | 135.7                          |
| Building materials.....                      | 252    | 137.0      | 204.9         | 152.1           | 165.7                          |
| Light.....                                   | 135    | 138.1      | 173.3         | 141.6           | 95.3                           |
| Food.....                                    | 160    | 126.5      | 174.6         | 140.2           | 114.1                          |

Sources: Output: *N.kh.Tadzh. SSR 1965*, p. 44.

Employment: *Trud v SSSR*, pp. 112-113.

Fixed capital: Index for the total, *N.kh.Tadzh. SSR 1965*, p. 28, distribution for 1960 is assumed to be the same as in 1961, *N.kh.SSSR 1961*, p. 187, and for 1965, *N.kh.SSSR 1965*, pp. 150-151.



TABLE A-5.—Distribution of employment and fixed capital for individual industrial branches by Republics of the U.S.S.R. in 1965

[In percent]

| Republic           | Total Employment    |         | Total fixed capital | Electric power |               | Fuel       |               | Ferrous metals |               | Chemicals  |               | Machine-building and metal-working |               | Timber, wood-working, pulp and paper |               | Building materials |               | Light      |               | Food       |               | Not available |               | Total share of branches included in tables 8 and 9 <sup>2</sup> |               |            |
|--------------------|---------------------|---------|---------------------|----------------|---------------|------------|---------------|----------------|---------------|------------|---------------|------------------------------------|---------------|--------------------------------------|---------------|--------------------|---------------|------------|---------------|------------|---------------|---------------|---------------|---|---------------|------------|
|                    | Number <sup>1</sup> | Percent | Percent             | Employment     | Fixed capital | Employment | Fixed capital | Employment     | Fixed capital | Employment | Fixed capital | Employment                         | Fixed capital | Employment                           | Fixed capital | Employment         | Fixed capital | Employment | Fixed capital | Employment | Fixed capital | Employment    | Fixed capital | Employment  | Fixed capital |            |
|                    |                     |         |                     |                |               |            |               |                |               |            |               |                                    |               |                                      |               |                    |               |            |               |            |               |               |               |   |               | Employment |
| U.S.S.R.....       | 27,056,100          | 100     | 100                 | 1.8            | 14.9          | 5.8        | 13.9          | 4.6            | 10.6          | 4.2        | 8.3           | 35.7                               | 19.0          | 10.0                                 | 5.6           | 6.0                | 6.4           | 16.0       | 4.4           | 9.5        | 9.2           | 6.4           | 7.7           | 93.6  | 92.3          |            |
| R.S.F.S.R.....     | 17,845,700          | 100     | 100                 | 1.7            | 15.1          | 4.4        | 11.9          | 3.9            | 8.6           | 4.7        | 9.2           | 38.4                               | 21.4          | 11.8                                 | 7.4           | 5.2                | 6.1           | 15.2       | 4.4           | 8.3        | 8.2           | 6.4           | 7.7           | 93.6  | 92.3          |            |
| Ukraine.....       | 5,015,600           | 100     | 100                 | 1.6            | 10.6          | 12.0       | 18.6          | 9.0            | 22.4          | 3.4        | 6.8           | 33.9                               | 16.9          | 15.7                                 | 1.9           | 7.0                | 5.7           | 12.1       | 2.5           | 10.8       | 10.2          | 4.5           | 4.4           | 95.5  | 95.6          |            |
| Belorussia.....    | 760,100             | 100     | 100                 | 1.9            | 19.0          | 2.1        | 7.6           | .3             | .3            | 5.0        | 8.8           | 33.9                               | 26.7          | 13.0                                 | 6.1           | 6.9                | 8.1           | 22.3       | 8.8           | 11.4       | 11.5          | 3.2           | 3.1           | 85.6  | 61.9          |            |
| Moldavia.....      | 184,000             | 100     | 100                 | 2.1            | 19.2          | (3)        | (9)           | (3)            | (9)           | 1.4        | 1.0           | 20.6                               | 9.3           | 7.4                                  | 2.5           | 11.3               | 10.7          | 26.8       | 7.2           | 26.0       | 47.6          | 4.4           | 2.5           | 95.6  | 97.5          |            |
| Lithuania.....     | 309,300             | 100     | 100                 | 2.0            | 20.4          | 1.6        | 2.8           | (3)            | .2            | 2.6        | 5.1           | 29.9                               | 17.9          | 12.0                                 | 6.9           | 7.6                | 10.4          | 13.6       | 8.5           | 14.7       | 23.1          | 16.0          | 4.7           | 82.4  | 92.3          |            |
| Latvia.....        | 342,600             | 100     | 100                 | 1.2            | 16.1          | 1.2        | 3.6           | (3)            | 2.0           | (3)        | 7.2           | 32.8                               | 20.0          | 13.5                                 | 9.0           | 5.0                | 7.7           | 21.9       | 7.8           | 13.1       | 22.9          | 11.3          | 3.7           | 88.7  | 87.1          |            |
| Estonia.....       | 204,000             | 100     | 100                 | 2.8            | 27.0          | 8.8        | 13.9          | (3)            | (9)           | 1.2        | 2.4           | 22.0                               | 11.3          | 11.4                                 | 6.4           | 5.9                | 8.4           | 26.9       | 8.3           | 14.8       | 20.2          | 6.2           | 2.1           | 93.8  | 97.9          |            |
| Georgia.....       | 328,700             | 100     | 100                 | 2.3            | 24.3          | 3.0        | 6.0           | 7.3            | 14.9          | (3)        | 7.8           | 21.2                               | 11.3          | 6.1                                  | 2.8           | 8.5                | 6.7           | 24.3       | 5.8           | 15.6       | 14.4          | 11.7          | 6.0           | 88.3  | 86.2          |            |
| Azerbaijdzhan..... | 279,600             | 100     | 100                 | 2.8            | 12.6          | (3)        | 53.3          | 3.7            | 4.0           | (3)        | 6.2           | 23.0                               | 6.1           | 3.5                                  | .7            | 6.0                | 3.3           | 24.1       | 3.4           | 10.2       | 3.7           | 26.7          | 6.7           | -----   | -----         |            |
| Armenia.....       | 197,500             | 100     | 100                 | 2.2            | 25.9          | (3)        | (3)           | (3)            | 4.4           | 7.8        | 15.5          | 30.2                               | 17.6          | 3.2                                  | 1.5           | 9.3                | 6.9           | 27.3       | 7.1           | 10.1       | 9.4           | 9.9           | 15.7          | 90.1  | 83.9          |            |
| Kazakhstan.....    | 773,100             | 100     | 100                 | 4.3            | 18.0          | 7.7        | 10.1          | 4.7            | 13.0          | 2.2        | 4.4           | 20.4                               | 7.3           | 4.7                                  | 1.7           | 11.1               | 9.3           | 16.0       | 2.9           | 12.9       | 6.9           | 16.0          | 26.4          | 84.0  | 73.6          |            |
| Uzbekistan.....    | 485,200             | 100     | 100                 | 3.1            | 20.4          | 2.2        | 11.9          | .6             | 7             | 3.2        | 9.3           | 29.1                               | 13.9          | 4.0                                  | 1.9           | 9.4                | 10.4          | 29.9       | 11.5          | 11.2       | 6.8           | 7.2           | 13.2          | 92.8  | 86.8          |            |
| Kirghizia.....     | 147,700             | 100     | 100                 | 2.7            | 18.8          | 7.0        | 20.2          | (3)            | (3)           | (3)        | 1.1           | 29.9                               | 15.0          | 3.9                                  | 1.7           | 8.2                | 9.9           | 26.4       | 10.0          | 13.7       | 14.9          | 8.2           | 9.3           | 91.8  | 90.6          |            |
| Tadzhikistan.....  | 103,600             | 100     | 100                 | 2.8            | 31.0          | 2.5        | 4.3           | (3)            | (3)           | (3)        | 1.1           | 16.4                               | 9.1           | 4.5                                  | 1.4           | 9.7                | 13.8          | 42.0       | 18.5          | 13.8       | 11.4          | 8.4           | 8.3           | 9.4   | 91.7          | 89.5       |
| Turkmenia.....     | 79,400              | 100     | 100                 | 5.9            | 15.0          | (9)        | 44.6          | (3)            | (3)           | (3)        | 8.3           | 16.6                               | 4.4           | 5.2                                  | .8            | 11.0               | 9.2           | 31.6       | 6.0           | 12.7       | 6.5           | 17.0          | 5.2           | -----   | -----         |            |

<sup>1</sup> Rounded to the nearest hundred.

<sup>2</sup> Data in this column are sums of percentage shares of only those branches and/or republics that appear in Tables 8 and 9. Consequently, they may not be identical with the horizontal sums of data in this table alone, or—added to those in the "Not available" column—may not equal 100.0.

<sup>3</sup> Not available.

 Sources: Employment: *Trud v SSSR*, pp. 87-119. Chemicals: USSR—*N.kh. SSSR 1965*, p. 140, workers only; RSFSR—*N.kh. RSFSR 1965*, p. 68, workers only; Belorussia—*Osnovnye fondy* \* \* \*, p. 96; Moldavia—*Sovetskaja Moldavia k 50-letiju* . . . , p. 49, workers

 only; Uzbekistan—*N.kh. Uzb. SSR 1965*, p. 46. The share of the employed in the chemical industry in total industrial employment was slightly above one-half of the share of fixed capital in this industry in total fixed capital in the U.S.S.R. and R.S.F.S.R. in 1965. Since employment data for this industry are unavailable for the Ukraine, Lithuania, Estonia, Armenia, and Kazakhstan, it was necessary to assume that the employment share for these republics is also equal to one-half of the fixed-capital share. Electric power: Latvia—*Latvija za gody soetskoi vlasti*, p. 91, workers only; Kirghizia—*Kirgizstan za 50 let soetskoi vlasti*, p. 55. Ferrous metals: Belorussia—*Ekonomika soetskoi Belorussi, 1917-1967* (F.S. Martinkevich, ed.) Minsk, Nauka i tekhnika, 1967, p. 443. Fixed capital: *N.kh. SSSR 1965*, pp. 150-151; data are as of January 1, 1966.