THE INCREMENTAL CAPITAL/OUTPUT RATIO IN A MATURING ECONOMY: THE SOVIET EXPERIENCE, 1958-1964

by

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INTRODUCTION

The subject of this thesis is to inquire, in terms of investment coefficient and marginal capital/output ratio, into the relationship between investment and growth in the U.S.S.R.'s economy, and to attempt to determine the causes of the decline in the rate of Soviet economic growth in 1958-1964.

The high rate of investment and low capital/output ratio were among the main reasons why the Soviet economy has until recently been able to grow at a rapid rate. The changes in these two variables, therefore, will be essential in any attempt to explain the decline of Soviet growth in the past few years. Moreover, since the economic system concerned is one which makes it possible for the planners to determine the volume of investment and to allocate available investment funds among the various sectors of the economy in accordance with their policy goals, the changes in the two magnitudes may help throw some light on the trends now prevailing in the Soviet economic policy.

A great deal of attention is being paid by Soviet writers to the problem of productivity of investment at present time, as the numerous articles and essays in the current Soviet economic literature may indicate. However, Soviet economists seem to be interested in solving the specific problems of investment planning

and management rather than making attempts to revise the growth-theoretical framework of the Marxist concept of extended reproduction. In the West, no systematic study of Soviet economic growth in terms of investment coefficient and marginal capital/output ratio has so far been made. This study is consequently the first attempt of this kind.

Chapter I deals with the basic concepts, i.e., investment coefficient and the rate of investment productivity, and methodology upon which the examination of pertaining Soviet statistical data will be based.

Chapter II is a statistical survey and analysis of the changes in Soviet investment rate, in the structure of Soviet capital stock and investment distribution, and in the incremental capital/output ratio and growth.

Chapters III and IV attempt to determine the causes of the decline in the rate of Soviet growth and investment productivity in the years from 1958 to 1964. Factors, accounting for this decline, originating from the built-in doctrinal and institutional weaknesses of the system are examined in Chapter III. Long-run tendencies which accompany the process of maturing of the Soviet economy, i.e. decreasing productivity of capital as a result of the conditions of diminishing returns in primary industries and the

change in relative scarcity of labor and capital, are investigated in Chapter IV.

CHAPTER I

METHODOLOGY AND CONCEPTS

The level of national income (output) and its growth are determined by the quantity of labor employed and its productivity which is closely tied to the quantity of capital available per worker, and to the quality and level of utilization of both. Therefore, in explaining levels of economic achievements, we concentrate primarily on labor and capital, the two main factors of production, their inter-relationship and structure, and inter-dependence of their respective productivities.

In the long run, any economic system becomes more productive as time passes because of the accumulation of capital, improved utilization of resources, discovery of new resources, and progress in the techniques of production. Improvements in productivity over time present the dynamic aspect of economic performance of an economic system. The static aspect of its performance concerns the effectiveness with which given resources (labor and capital) are being used at a given point of time.

The dynamic aspect of economic performance, or economic growth, may be viewed in terms of investment coefficient and the rate of productivity of investment:

$$\frac{\Delta Y}{Y} = \frac{I}{Y} \times \frac{\Delta Y}{I} \qquad (1), \text{ or}$$

if net output, Y - in the economy as a whole or in any of its branches or industry groups - increases by ΔY when new investment is I, then the rate of output increase, $\Delta Y/Y$, can be taken to be equal to I/Y multiplied by $\Delta Y/I$, where I/Y is the rate of investment (investment coefficient), and $\Delta Y/I$ is the rate of productivity of investment. In other words, the rate of achieved growth equals the product of investment coefficient and the marginal productivity of capital.

The main topic of the thesis, i.e., our inquiry into the relationship between investment and growth in the Soviet economy, in the ex-post sense, is based upon this growth formula.[1] It includes the three magnitudes which, in accordance with the purpose of this study, will be examined in the subsequent chapter, and namely:

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[1] There is a basic difference between this formula and the Domar growth model (E.D. Domar, "Expansion and Employment", in the American Economic Review, March, 1947). The former serves as a method for investigation and assessment of the past performance of a given economy; the latter attempts to determine the conditions under which full employment in the economy can be maintained over time.

(a) Rate of growth $\frac{\Delta Y}{Y}$,

(b) Investment coefficient $\frac{I}{Y}$, and

(c) Rate of investment productivity $\frac{\Delta Y}{I}$.

Investment coefficient, expressed in per cent, is the part of national product withdrawn from consumption and allocated for investment. As a general rule, an increased volume of investments, i.e., a higher investment coefficient, will tend to increase the rate of economic growth, due to the increase in productive capacity resulting from additional investments. But, since various sectors and branches of the economy differ from each other as to their rates of capital productivity, the size of the increment in national output will greatly depend on the proportion of the total available investments funds each of them have been allocated. The rate of productivity of capital for various sectors of the economy is very different. There are big differences in the rate of productivity of capital as between housing, services, transportation or manufacturing. These differences are great enough so that the average rate of productivity of capital in the economy as a whole will be fairly sensitive to the actual distribution of investments among sectors. Therefore, a faster growth may be expected if investment is directed into the sectors with higher rates of capital productivity.

The rate of productivity of investment is the relation of new capital investment to the increment in production resulting from such investment. A distinction should be made between the average productivity of capital for a certain activity or for the economy as a whole, and the marginal (or incremental) productivity of capital. The former is the ratio of total output to total capital invested, and the latter is what we have referred to above as investment productivity, i.e., the relation of new capital investment to the increment in production resulting from such investment.

Productivity of capital is measured, assuming other factors (labor) fixed, by capital/output ratio, i.e., by the quantity of capital used to produce one unit of output. Thus, if the capital/output ratio is rising over time, it means that the capital stock is rising at a faster rate than output, more capital is needed to produce one additional unit of output. Conversely, if capital/output ratio declines, less capital is needed to produce the same amount of output. The capital/output ratio $(\frac{C}{Y})$ is actually the inverse of capital productivity $(\frac{Y}{C})$.

According to Hood and Scott,[2] there are five outside

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[2] Wm.C. Hood and Anthony Scott, Output, Labor and Capital in the Canadian Economy, Royal Commission on Canada's Economic Prospects (1959), pp. 262 - 272.

forces that may influence the rate of productivity of capital. First, there is the size, richness and accessibility of natural resources, including agriculture. Any expansion of output of raw materials and foodstuffs, after it has reached a certain level, will, under the conditions of diminishing returns, require ever increasing capital investments. Due to the working of the law of diminishing returns, the output per unit of additional capital will tend to decrease, i.e., the rate of productivity of capital will decline. Second, there are some types of capital goods, characterized by technological indivisibilities, such as transport, communications, power stations, which require massive investments while the demand for their services is, at least in the short run, less than capacity for which they were designed. This will also tend adversely to affect the rate of capital productivity. Third, there may be a shift in the industrial composition of the national output from industries with low capital/output ratio to industries with high capital/output ratio, e.g. from manufacturing to mining. Fourth, a change in the relative availability of labor and capital may affect the capital/output ratio. Over the long run, there will always be a tendency to substitute a less expensive (more abundant) factor of production for a more expensive (or scarce) one. The increase in the supply of capital relative to that of labor is likely to have an influence on increasing the capital/output ratio (but not necessarily).

Fifth, there is the impact of a major technological (innovational) change involving installation of a large volume of new capital goods. Some of these capital goods may replace older types made obsolete; others, however, will be installed in what are, in fact, new industries. To the extent that the latter type of installation takes place, it is unlikely that the new capital goods will immediately reach their expected efficiency, and we would expect the capital/output ratio to be higher than that existing before innovation and probably higher than that which will eventually rule in the new industry.

The static aspect of economic performance, i.e., the effectiveness with which given resources (labor and capital) are being used at a given point of time, and the mutual interdependence between capital and labor productivity may be demonstrated in the following formulas:

$$Y = C \times \left(\frac{Y}{L} \times \frac{L}{C}\right) \quad (2), \text{ or}$$

$$Y = L \times \left(\frac{Y}{C} \times \frac{C}{L}\right) \quad (3).$$

Y stands for national income (output), C for capital, and L for quantity of labor employed, or man hours worked, $\frac{Y}{L}$ and $\frac{Y}{C}$ stand for labor and capital productivities, respectively, and $\frac{L}{C}$ and $\frac{C}{L}$ indicate the labor/capital and capital/labor ratios at a given point of time.

Applied to the economy as a whole, or to its various sectors and branches, both formulas may be useful helping us investigate and assess the effectiveness with which the productive resources (labor and capital) of the given economic system are being used, as compared with other economies or with the same economy in time. All this may be of importance to the development of appropriate national economic policies. In the analysis of Soviet economic growth and investment productivity in 1958-1964 both dynamic and static aspects of economic performance, as presented in this chapter, will be referred to.

For purpose of this study the Soviet concepts of national income, capital and investment will be applied, and the underlying data taken from the Soviet published statistical yearbooks. The choice of Soviet national accounts has been made for two main reasons. Firstly, recalculation of Soviet national income, and its components, in order to make them comparable with corresponding magnitudes in our western national accounts, is an enormous task. Attempts of this kind have already been made by some students of Soviet economy but no one succeeded in presenting an estimate of Soviet national income which would prove satisfactory and generally accepted. Even the most illuminating study of Soviet national income made by Abram Bergson[3] did not satisfy many

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[3] Abram Bergson, The Real National Income of Soviet Russia since 1928, Harvard University Press, Cambridge, Mass., 1961.

critics. The estimates of Soviet national income that have been brought forth are not uniform. They differ substantially as to the volume of Soviet output and its rates of growth because of differences in method of computation, weights used, adjustments made, coverage and so on. To attempt another recalculation of Soviet national income in order to fit it into the western theoretical fromework might lead us far beyond the scope of this study, which is limited to exploring trends in Soviet economic growth and investment productivity. Secondly, there has been a marked change in the policy of the Soviet government on the publication of statistical information at least for the last ten years. A sharply increasing volume of more or less integrated statistical information is being released and higher reporting standards observed. Because of these gains in respect of quantity and quality of statistical data available, the study of Soviet economy has become much more rewarding than it was even in the recent past.

In the application of the Soviet concepts of national accounts there are several points which could cause confusion in the minds of those accustomed to western concepts. Therefore, a few words of explanation may prove useful at this point. The Soviet concept of national income is in line with the Marxist theory of economic growth, in distinguishing between "productive"

and "unproductive" activities, only the former being considered as generating a real product. The national income therefore consists of the total value of the material product. In the Soviet Union this value is deemed to equal the sum total of the final selling prices of material goods, at accrued value, less capital consumption allowances. Since final selling prices contain turnover (sales) tax, this means that such taxes are included in the national income, which becomes an equivalent of a kind of "net national material product at market prices".

This material net product originates in the following sectors of the economy: Mining and manufacturing, construction, transport (of commodities) and communications, and production services, i.e. services of state agencies in charge of material and equipment supplies. In Soviet practice, the national income, or net national product, is built up from the production side by means of data concerning the activity of productive enterprises in the sectors listed above. It is, of course, equal to the sum of incomes generated in the process of production, i.e., to personal incomes of those engaged in the productive sectors, plus profits of the state owned enterprises and collective farms, and other portions of the net product, including turnover tax and state

profit deductions, which form part of the final selling prices of material goods.

The Soviet national net product is divided between consumption and accumulation of capital. The accumulation fund includes: investment in fixed capital, plus (or minus) total value of physical change in stock inventories. The rest of the national product is deemed to consist of the consumption fund, part of which is distributed in the form of personal incomes to "productively" and "nonproductively" engaged citizens, and part is put at disposal of institutions of various kinds, including state administration and defence.

The Soviet statisticians distinguish between investments in fixed productive assets and fixed nonproductive assets which contribute indirectly to the process of material production. Fixed productive assets include the means of production which serve the production process over a long period. They include: factory buildings and installations, power plant and machinery, transportation equipment, tools and implements, and productive livestock. Fixed nonproductive assets include living accomodation, buildings, installations and equipment of institutions and organizations connected with education, health services, administration, the arts, research and development, and so on.

Thanks to a system of controls over the use of resources

which enables them to direct the gross national product to the ends they choose, the Soviet planners are independent in the determining of the share of investment in the total output. They have, to a major extent, been able to disregard the desires of the population for a higher standard of living, and have sacrificed the possibilities of increases in consumption in favour of a high rate of investment; furthermore, since consumer sovereignty does not exist in the Soviet economic system, resources are directed towards the production of what the planners want produced which may often differ from what consumers would like to have produced.

CHAPTER II

SOVIET INVESTMENT AND GROWTH, 1958 - 1964

A STATISTICAL ANALYSIS

In the early stages of economic development the Soviet planners have enjoyed the advantage of a relative high productivity of capital because their main objective was industrialization, and manufacturing industry is a sector of the economy where productivity of capital is relatively high. This advantage seems to disappear as the Soviet economy is approaching the stage of maturity. In order to achieve an all-round economic growth the Soviet planners are compelled to allocate an ever increasing proportion of the available investment funds to other, heretofore neglected sectors of the economy characterized by a high capital/output ratio, such as housing and transport. Moreover, confronted with the conditions of increasing costs in primary industries, and particularly in agriculture, they find that relatively more capital is required now to secure a further expansion of output in these sectors than in the past.

This chapter will examine the pattern and trends in the distribution of Soviet capital stock and investments, and present a summary analysis of Soviet economic growth in terms

of investment coefficient and investment productivity for the period 1958-1964.

The Sector Distribution of Capital Stock and Investment

In the latter part of 1959 an inventory and revaluation of the capital stock took place in the Soviet Union in order to get more accurate data on fixed assets in the economy, to provide a more accurate basis for determining depreciation allowances and to determine the real wear-and-tear of capital. Capital stock was inventoried as of January 1960 and valued at its replacement cost in terms of prices which had been in force since July 1, 1955.[1] In the first round, subject to revaluation were state and cooperative enterprises and organizations. Two years later, in 1962, a similar revaluation of collective farms' fixed assets was carried out.

The availability of Soviet capital accumulation data enables us to obtain quite adequate notion of the structure of Soviet capital stock by sectors of the economy and of the change in the distribution over the years under study. Together

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[1] A detailed account and assessment of the Soviet capital revaluation in 1960 appears in Norman M. Kaplan, "Capital Stock", in Abram Bergson and Simon Kuznets (ed.), Economic Trends in the Soviet Union, Harvard University Press, Cambridge, Mass., 1963, pp. 96-116.

with the data on investments, they may shed some light on the trends in the Soviet capital formation policy.

The percentage distribution of Soviet capital stock and investments among the various sectors of Soviet economy in 1950 and during the period under study are shown in Tables 1 and 2, as computed from the data on capital stock and investments in the Appendix (Table A-1 and A-2).

TABLE 1

Percentage Distribution of Capital Stock by Sectors of the USSR Economy, 1950-1964, selected years

Sector	1950	1958	1960	1962	1963	1964
Productive	52.3	57.5	56.8	57.7	58.6	59.1
Mining and Manufacturing	21.0	26.4	26.7	27.9	28.5	29.1
Construction	1.4	1.8	1.7	1.8	1.8	1.9
Agriculture	13.6	14.0	13.0	13.0	12.9	13.2
Transport and Communications	14.5	12.6	12.3	12.6	12.2	12.2
Production Services	1.8	2.7	3.1	2.4	3.2	2.7
Non-Productive	47.7	42.5	43.2	42.3	41.4	40.9
Housing	39.2	31.7	31.9	28.5	29.2	28.4
Social Services	8.5	10.8	11.3	13.8	12.2	12.5
Total	100.0	100.0	100.0	100.0	100.0	100.0

As one may conclude from Tables 1 and 2, mining and manufacturing sector still plays a prominent role in the Soviet strategy for development. Its share in total capital stock is growing steadily, from 26.4 per cent in 1958 to 29.1 per cent in 1964, indicating that, in the opinion of Soviet planners, the process of industrialization of the country is far from completed. This view is confirmed also by the proportion of

TABLE 2

Percentage Distribution of Investments by Sectors of the USSR Economy, 1950-1964, selected years

Sector	1950	1958	1960	1962	1963	1964
Productive	68.0	60.5	61.3	64.2	64.9	67.4
Mining and Manufacturing	38.2	33.8	35.0	36.7	36.0	36.9
Construction	2.6	2.8	2.9	2.6	2.5	2.8
Agriculture	14.9	15.7	14.0	16.0	16.4	17.9
Transport and Communications	12.3	8.2	9.4	8.9	10.0	9.8
Non-Productive	32.0	39.5	38.7	35.8	35.1	32.6
Housing	18.2	25.1	22.5	19.0	18.2	16.1
Social Services	13.8	14.4	16.2	16.8	16.9	16.5
Total	100.0	100.0	100.0	100.0	100.0	100.0

total investment capital appropriated to mining and manufacturing: the share of mining and manufacturing in total investment grew from 33.8 percent in 1958 to 36.9 percent in 1964. The share of transport and communications in total capital stock is rather small if one considers the vast territory of the Soviet Union and the relatively high volume of capital required by this highly capital-intensive sector of the economy. Its share in total capital stock even slightly declined in the period under study from 12.6 to 12.2 per cent, notwithstanding the fact that the proportion of investments funds allocated to this sector increased from 8.2 per cent in 1958 to 9.8 per cent in 1964, and amounted to 10.0 per cent in 1963. This can be explained by a sharp increase in the rate of obsolescence resulting from the conversion of the Soviet railroad system to diesel and electric locomotives which has started in the late 1950's. Agriculture presents a similar case: in spite of a sharp increase (especially in the three last years of the period) of its share in total investment, its share in total capital stock declined from 14.0 per cent in 1958 to 13.2 per cent in 1964. This decline may be attributed to the crop failure in 1963 when large quantities of livestock had to be slaughtered because of the lack of adequate fodder supplies. A sector of lower priority, housing had to absorb all the strains in the Soviet investment planning, caused by the decline of Soviet

growth, as far as appropriations of investment funds were concerned. Its share in total capital stock and investments decreased steadily since 1958. Social services, which include fixed assets of institutions and organizations connected with education, specialized training, health services, research and development, were kept at more or less the same level, as regards capital and investment distributions, with some gains towards the end of the period.

In order to shed some more light on the trends in the Soviet policy of capital formation in the period under study, two comparisons will now be attempted: indexes of capital stock and investment by sectors of the economy will be compared, as computed from Tables A-1 and A-2 in the Appendix, and then the sectors concerned will be ranked in terms of the ratio of annual investment to capital stock. This is shown in Tables 3, 4 and 5.

The primary findings in regard to the rate of growth of capital stock (Table 3) are: the overall annual average rate of capital formation between 1958 and 1964 was 11 per cent; capital stock of productive sectors increased at an annual average rate of 12.5 per cent, and that of non-productive sectors at an annual average rate of 10.8 per cent; mining and manufacturing, construction and social services showed the highest rates of growth, 14.7, 13.8 and 16.9 per cent respectively; agriculture and transport and communications were lagging behind, their annual average rates of

TABLE 3

Indexes of Capital Stock by Sectors of the Economy in the USSR, 1958-1964, selected years

(1958 = 100)

Sector	1958	1960	1962	1963	1964
Productive	100	121	144	162	175
Mining and Manufacturing	100	124	151	170	188
Construction	100	120	138	159	183
Agriculture	100	114	135	145	160
Transport and Communications	100	118	143	151	163
Non-productive					
Housing	100	123	129	145	153
Social Services	100	128	187	180	201
Total Capital Stock	100	122	144	158	170

growth were 10 and 10.5 per cent, respectively.

During the same period, the part of investments directed into productive sectors of the economy largely exceeded, as may be seen from Table 4, the part appropriated for non-productive sectors. The respective annual average rates of growth were 11.5

for productive, and 4.5 per cent for non-productive sectors. Transport and communications was the leading sector with an average annual rate of growth of 14 per cent. It was followed closely by social services,

TABLE 4

Indexes of Investment by Sectors of the Economy in the USSR, 1958-1964, selected years

(1958 = 100)

Sector	1958	1960	1962	1963	1964
Productive	100	123	142	150	169
Mining and Manufacturing	100	126	141	149	167
Construction	100	122	124	127	142
Agriculture	100	109	135	147	174
Transport and Communications	100	140	147	172	184
Non-productive	100	120	121	125	127
Housing	100	109	103	102	98
Social Services	100	137	153	164	176
Total Investments	100	122	133	140	153

12.7 per cent, and agriculture, 12.3 per cent. Investment in mining and manufacturing increased at a slower pace, at annual average rates of growth of 11 per cent. This is quite understandable if one considers the base, 33.8 per cent of the total

investment in 1958 (see Table 2), from which the growth rates have been computed. Construction was left behind all other sectors, except housing, with average annual rates of growth of 7 per cent. Investment in housing declined steadily since 1960 so that by 1964 it was lower than in 1958.

Still more insight into the Soviet policy of capital formation may be gained by ranking the sectors concerned in terms of the ratio of investment to capital stock. Table 5, and the rankings based thereupon, indicate that during the period under study construction and social services were the sectors of the economy relatively most favoured by Soviet planners as regards the distribution of investment funds. We may assume that the increase of production facilities, plant construction, technological advance, research and development, and the supply of trained manpower, held a prominent place in the Soviet strategy for growth. The last three years of the period were marked by a rapid shift of agriculture, from the fourth to second place. Transport and housing remained at the bottom of the scale during the whole period which is rather normal for these sectors of the economy.

The preceding analysis can be expanded to include other aspects of the Soviet policy of capital formation, such as, for instance, structural shifts within the industrial sector imposed

TABLE 5

The Ratio of Investment to Capital Stock by Sectors of the Economy in the USSR, 1958-1964, selected years

Sector	1958	Rank	1960	Rank	1962	Rank	1963	Rank	1964	Rank
Productive										
Mining and Manufacturing	1.29	3	1.31	3	1.31	2	1.26	4	1.26	4
Construction	1.55	1	1.69	1	1.44	1	1.38	1	1.47	1
Agriculture	1.12	4	1.08	4	1.23	4	1.27	3	1.35	2
Transport and Communications	0.63	6	0.76	5	0.69	5	0.82	5	0.80	5
Non-productive										
Housing	0.79	5	0.70	6	0.66	6	0.62	6	0.56	6
Social Services	1.33	2	1.43	2	1.23	3	1.38	2	1.32	3

by technological change. But even at this stage, concentration of investment funds on "growth-oriented" sectors of the economy and emphasis on technological advance can be regarded as a distinctive feature of Soviet strategy for growth. The determination of Soviet planners to force the pace of economic growth to the utmost greatly influences the allocation of investment funds. Hence a marked stress upon construction of new plant and upon those branches of industry which provide energy, fuels, plant equipment and industrial raw materials. These producers' goods industries absorbed 87.7 per cent of the total investment, appropriated for mining and manufacturing in the period from 1959 to 1964, while a rather modest 12.3 per cent of the total was earmarked for consumers' goods industries.[2] Relatively high investments in social services, which include investments in fixed assets of organizations and institutions connected with education, health services, research and development, reflect the importance Soviet planners attach to the development of human resources, and the role technological advance plays in their strategy for growth. Although investments into higher and specialized education, and into research and development are not shown separately in Soviet investment statistics, their magnitude may be approximated from the state budgetary

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[2] Narodnoe Khoziaystvo SSSR v 1964 Godu, p. 516.

appropriations which, for instance, in 1964 amounted to 7 billion rubles out of a total government spending of 92.2 billion rubles, in addition to a further 3 billion rubles spent on education by other organizations (notably, trade unions and large industrial organizations),[3] i.e., a total of 5 to 6 per cent of national income.

National Income and Investment Rate

Another striking feature of Soviet strategy for growth is a relatively high rate of investment. Roughly 25-28 per cent of the national income in the Soviet Union goes into the investment fund. The rate of investment in the USSR for the period under study is shown in Table 6.

The high level of investment rates in the Soviet Union is all the more remarkable if we keep in mind the relatively low level of Soviet output and the other demands on it. During most of the years when the Soviet regime was plowing back such a large portion of the national product for investment, it was also taking a very large share for defence, and other non-consumption purposes of government. The second thing which makes this high rate of investment remarkable is that in terms of per capita income, the Soviet

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[3] Ibid., pp. 772-773.

TABLE 6

The Rate of Investment in the USSR, 1958-1964

(constant 1958 billion rubles)

Year	National Income	Investment	Investment as percentage of Nat. Income
	b.r.	b.r.	%
1957	113.3	--	--
1958	127.7	30.0	26
1959	137.3	34.0	26
1960	147.9	36.7	26
1961	157.9	38.3	25
1962	166.9	40.2	25
1963	173.7	42.2	25
1964	189.4	45.9	26

Source: Narodnoe Khoziaystvo SSSR v 1964 Godu, pp. 575 and 513.

Union is more nearly comparable to some of the less developed countries, where characteristically the rate of investment is quite low, than it is to the United States. But the startling thing is that the rate of investment in the Soviet Union is higher than that in the United States.[4] The high rate of investment and the corres-

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[4] An average of 17.9 per cent, in the post-World War II years, Simon Kuznets, "A Comparative Appraisal", in Abram Bergson and Simon Kuznets, (ed.), Economic Trends in the Soviet Union, Harvard University Press, Cambridge, Mass., 1963, p. 360.

pondingly rapid rate of growth of the Soviet economy come from the tight control over resources which the Soviet planners possess. This control makes possible the reinvestment of a much larger share of the national product than would be the case if Soviet citizens had freedom to influence the levels of current consumption.

In spite of the high rate of investment maintained for years and in spite of a concentrated effort of Soviet planners through their investment policy to widen and strengthen the Soviet industrial potential, a marked slow-down in the rate of Soviet economic growth has taken place in the last yew years, as may be seen from Table 7.

The year of 1958 was the last of a trend of rapid growth of the Soviet economy, following post-war recovery, at an average annual rate of 10.8 per cent for the period 1949-1958. In 1959, a downward trend set in and the rate of growth began to decline reaching its bottom of 4 percent in 1963, due mainly to the crop failure of that year, when only 107.5 million metric tons of grain were harvested as compared with 140.2 million metric tons in 1962.[5] In spite of a substantial improvement of agricultural output since 1964, the Soviet economy has not as yet succeeded to reach the annual rates of growth it had enjoyed before 1958. As compared with

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[5] Narodnoe Khoziaystvo SSSR v 1964 Godu, p. 249

T A B L E 7

Growth of Net National Product in the USSR, 1949-1964

(constant 1958 billion rubles)

Year	Net National Product b.r.	Increase b.r.	Percentage Change %
1949	49.2	--	--
1950	55.7	6.5	13
1951	62.5	6.8	12
1952	69.3	6.8	10
1953	76.1	6.8	9
1954	85.2	9.1	12
1955	95.4	10.2	12
1956	106.3	10.9	11
1957	113.4	7.1	7
1958	127.7	14.3	12
1959	137.3	9.6	8
1960	147.9	10.6	7
1961	157.9	10.0	7
1962	166.9	9.0	5
1963	173.7	6.8	4
1964	189.4	15.7	8

Source: Narodnoe Khoziaystvo SSSR v 1964 Godu, p. 575, for the years 1958-1964
Ya.B. Kvasha, "Kapitaloemkost", in B.G. Venzher et al., Proizvodstvo, Nakoplenie, Potreblenie, Moscow, 1965, p. 113 and 129, for the years 1949-1957.

an average of over 10 per cent for the preceding nine years, 1949-1958, the average annual rate of growth for the last six years, 1959-1964, has been only 6.5 per cent. This trend persisted through 1965 and 1966, with the respective rates of growth of 6 and 6.4 (estimated) per cent, as reported in current Soviet economic literature.[6]

As will be seen from the further analysis of the Soviet experience, the efficiency of utilization of available resources is as important as the rate of investment; and that at a certain stage of development only an all-round pattern of allocation of resources may ensure a sustained growth.

Investment/Output Ratios

As explained in Chapter I, the rate of productivity of investment is the relation of new capital investment to the increment in production resulting from such investment. With given rates of growth of net national product (Table 7) and investment coefficients, or rates of investment (Table 6), in the Soviet economy 1958-1964, we can now deduce the corresponding investment productivity rates for the same period, by referring to formula 1 (see p. 5). Thus, the rate of investment productivity

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[6] O. Nekrasov, "Povishenie effektivnosti obschestvennogo proizvodstva", in Voprosy Ekonomiky, September 1966, p. 89.

will equal the rate of growth divided by investment coefficient, i.e.,

$$\frac{\Delta Y}{I} = \frac{\Delta Y}{Y} \Big/ \frac{I}{Y} \cdot$$

By dividing investment coefficient by the rate of growth we obtain the investment/output ratio which is a measure of productivity of investment:

$$\frac{I}{\Delta Y} = \frac{I}{Y} \Big/ \frac{\Delta Y}{Y} \cdot$$

Assuming other factors (labor) fixed, we may say that the higher the investment/output ratio the lower is the productivity of given investment, the more investment capital is needed to produce one more unit of output.

The pertaining figures for the Soviet economy 1958-1964, as a whole, and for its productive sectors, i.e., the rate of growth, investment coefficient and investment/output ratios, are derived from Tables 6 and 7, and from Tables A-1 and A-2 in the Appendix, and shown in Table 8.

As one may conclude from Table 8, the steadily increasing investment/output ratio, which is tantamount to decreasing productivity of investment, was the cause of a marked decline of the Soviet rate of economic growth in the period from 1958 to 1964; and this in spite of high levels of investment maintained throughout the period.

TABLE 8

The Rate of Growth of Net National Product,
Investment Coefficients, and
Investment/Output Ratios, in the USSR,
1958-1964

	1958	1959	1960	1961	1962	1963	1964
Growth Rate	.12	.08	.07	.07	.05	.04	.08
Investment Coefficient							
a. Whole Economy	.26	.26	.26	.25	.25	.25	.26
b. Productive Sectors	.16	n.a.	.16	n.a.	.16	.16	.17
Investment/Output Ratio*							
a. Whole Economy	2.09	3.54	3.46	3.83	4.46	6.20	2.92
b. Productive Sectors	1.27	n.a.	2.12	n.a.	2.86	4.03	2.25

* Cumulative capital investment for each year in constant 1958 rubles divided by increase in output for same year.

In 1958, when a record increase of 14.3 billion rubles of national income was attained, the investment/output ratio was among the lowest since 1950, according to computations made by Ya.B. Kvasha.[7] Starting in 1959, the rate of Soviet growth began

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[7] Ya.B. Kvasha, "Kapitaloemkost", in B.G. Venzher et al., Proizvodstvo, Nakoplenie, Potreblenie, Moscow, 1965, p. 113.

to slow down, and more and more investment rubles were needed to produce one ruble of additional output. In spite of the fact that the fixed assets of productive sectors of the economy increased, during the period between 1958 and 1964, 75 per cent, an increase of national income of 47 per cent was achieved at the same time. In 1963, the year the Soviet Union was adversely affected by a crop failure, the Soviet investment/output ratio reached its record high, 6.20 for the economy as a whole, and 4.03 for its productive sectors. There cannot be any doubt that, agriculture being an important sector of the Soviet economy contributing up to 30 per cent to Soviet national income, such a steep rise in the investment/output ratio was due, to a great extent, to the poor harvest of that year. It is only natural that in the following year (1964), which brought along a record harvest, the investment/output ratio improved significantly, from 6.20 to 2.92 for the economy as a whole, and from 4.03 to 2.25 for its productive sectors.

However, the reported annual rates of Soviet economic growth for 1965 and 1966 (estimated), 6 and 6.4 per cent, respectively, do not suggest that a significant upturn in the level of productivity of Soviet investment has taken place, or is to be expected in the near future in view of ever growing needs for investment funds in transport and communications, development of new, less accessible sources of supply of energy, power and raw

materials, and in view of increasing public pressure for more housing and other essential social services. All this calls for large amounts of investment capital. Being mostly capital-intensive, these investments will, in the short run at least, tend to increase the investment/output ratio for the economy as a whole. However, this tendency of rising capital/output ratio may, to a certain extent, be neutralized if the Soviet rulers succeed in carrying out their planned economic reforms (to be discussed in the subsequent chapters) which are intended to improve the methods of resource allocation and make the use of capital more efficient.

CHAPTER III

PROBLEMS OF SOVIET INVESTMENT PLANNING AND MANAGEMENT

In simple words, the problems of Soviet investment planning and management to-day, lie in the fact that the old system of centralized allocation of resources, devised originally to support rapid industrialization, has not adapted well to the intricate tasks of a mature economy.[1] The relative simplicity of goals during the early stages of Soviet growth, with few and well defined priorities, was a factor in achieving rapid growth. Industrial success, however, has led to a situation where the innumerable interconnections between sectors and areas, the necessity to keep track of ever larger numbers and varieties of products and the ever-widening consequences of any planning decision became such as to frustrate the authorities responsible for planning. As a consequence, actual economic results diverged more and more from planners' intentions. A trend of diminishing returns on invested capital set in followed by increase in the capital/output ratio and decline in the over-all rate of growth. The connection between the slow-

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[1] This point has been made by Wassily Leontieff in "The Decline and Rise of Soviet Economic Science", in The Soviet Economy: A Collection of Western and Soviet Views, Harry G. Shaffer (ed.), Appleton-Century-Crofts, New York, 1965.

down of Soviet growth and Soviet methods of investment planning and management, and the recent economic reforms in the Soviet Union as well, may be better understood if one examines the basic principles which underlie the Soviet investment process.

Organizational Aspects

The Soviet concept of "capital investment" refers to investment in fixed capital. The "capital investment plan" is prepared centrally for the whole economy and is regarded as one of the most important parts of national economic plan. Decisions concerning the rates of growth of total output require, first of all, an increase in the productive capacity of various sectors of the economy. In this way investment demand for expansion in the productive capacity of the capital goods industries is mainly function of the government's own decision about the future development of various sectors of the economy; all of this, of course, makes investment planning much easier in a centrally planned economy than in one which follows consumers' wishes.

The main source of investment funds are profits of the state-owned enterprises, the greater part of which is transferred to the state budget by way of "deductions from profits" (a profit tax), and the "turnover tax" (a sales tax). The major

part of investment in the state sector is financed by non-returnable budgetary grants (subsidies). However, a sizeable and increasing share is financed from enterprises' own resources, primarily from a portion of profits which are not transferred to the state budget, and the depreciation funds. With minor exceptions these "internal financial sources of enterprises" are kept for the state-owned enterprises by the state investment banks and can only be withdrawn when and if the expenditure is justified by the investment plan. Outside the state sector, investments made by collective farms and producers' cooperatives are financed from their own financial sources and from bank credits. Private residential housebuilding, which at its peak in 1960 amounted to 2.7 billion rubles, or 32 per cent of total residential construction of that year[2], is financed from private savings of individuals.

Investment projects are divided into three groups:

(a) Above-limit (sverkhlimitnye) investments, or those which exceed a certain specified amount for a particular branch of the economy; each such project has to be approved by the government of the U.S.S.R. and is prepared by the central planning office.

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[2] Narodnoe Khoziaystvo SSSR v 1964 Godu, pp. 511 and 606.

(b) Below-limit (nizhelimitnye) investments, or those which do not exceed the specified amount; they form part of aggregate sums allocated for investment purposes to the given sector.

(c) Extra-limit (vnelimitnye) investments, or those which are financed from the "internal sources of enterprises" and are not included in the central plan; these are usually relatively small outlays for expansion or modernization of existing plants.

There are also somewhat different distinctions between centralized and decentralized investments, the latter sometimes being confusingly designated as "extra-limit" investments. Centralized investments are those covered by the central investment plan, and include "above-limit" and "below-limit" investments if expenditures on these is provided for in the plan. Decentralized investments are financed from sources not covered by the plan at all, such as, for instance, the enterprise fund. Of course, these "unplanned" investments are subject to a strict control; thus, special regulations specify which types of investment projects are allowed and which are forbidden to be financed in the decentralized way. Then control over allocation of materials and equipment provides a further means of preventing diversion of resources into forms not desired by the central authorities.

This organization of investment planning gives the central planners a great degree of control over the economy but it

requires an extensive and expensive bureaucratic machine which is overburdened with too many details. As the central planners cannot solve all problems before the beginning of the planning period, they are forced to make continuous changes in the plan to adjust to circumstances and avoid excessive rigidity. The Soviet experience demonstrates that overcentralization is dangerous, that planning which completely overrules such factors as profitability, the rate of interest and the price mechanism leads to arbitrary decisions which are not always right economic decisions. Above all, it shows that investment planning is not an easy task, not even in the highly centralized economy of the Soviet type.

Doctrinal and Institutional Difficulties

Investment planning in the Soviet type economies is handicapped by some doctrinal and institutional features of the system. There has been, first of all, the conflict between the Marxist labor theory of value, which leads to the underestimation of the cost of capital, and the logic of resource allocation which has to take into consideration that capital is the scarce factor which has to be carefully economized. According to Marx's theory of value only labor creates value, and such returns as the interest which capitalist gets on his investment or the landlord for the use of his land represent exploitation rather than compensation for

some productive service which has been supplied by the owner of capital or the land. Capital contributes nothing to production and it would be therefore absurd, once the power of the capitalists is overthrown, to require payment for the use of capital. In line with this general position, an interest charge for the use of capital has not been made in the Soviet economic system until recently. Enterprises were given their capital in the form of grants and were not required to pay anything for the use of it. In practice this rule has only been applied to long-term fixed capital allocated from the state budget. Interest charges have been applied to short-term working capital, on rather unimportant loans for private house construction or to collective farms. As the existing system was such as to promote fulfillment or over-fulfillment of the production goals whatever the cost, the allocation of fixed assets as a free grant without interest charge did not induce the economic use of available capital or the efficient choice in the use of capital in the preparation of investment projects. On the contrary, this made a capital-intensive variant more attractive and led the managers to apply for more capital than they could hope to obtain, and gave them no incentive to attempt to decide rationally how much capital they required. Since some at least of the central decisions were influenced by application from below, all this in no way helped in finding the

best use for available investment funds. As a result, some investments were made where apparently a better utilization of existing productive capacity could have achieved the same production goal. There was unwarrantable stockpiling of machines and equipment, and the general practice of building new plants rather than enlarging existing ones, although the latter would have usually involved smaller investment outlays and brought the results sooner than the former. For a number of years Soviet planners have been warned against building excessively large plants but a tendency toward the so-called "gigantomania" was difficult to eliminate. The same applied to the tendency to create temporarily excessive productive capacity for an unnecessary long period. The choice of the degree of capital intensity, which in practice presents itself often in the form of the choice between a higher investment outlay at present, which will result in a relatively low level of operating costs in the future, and a lower investment outlay now, but relatively high operating costs later, was made in practice without much regard to the time factor which involves intertemporal calculations based on some device similar to the rate of interest.

The second institutional-practical obstacle is the price system. Prices of materials and of final products, often bear no rational relationship to one another, to their relative scarcity, or to their utility from the stand-point of the user. Consequently

the relative profitability of this or that project could be quite misleading as a guide to action. Comparative advantages for development of various industries and all calculations of the efficiency of investment projects can only have a very limited reliability, due to arbitrary pricing system.

In the Soviet Union prices of factors are set not by a process of supply and demand, but by administrative order. Most prices are set by high-level organs of the government. Once set, they remain in effect for fairly extended periods of time, though they are overhauled from time to time. This kind of stable, fixed price system is vitally important for purposes of planning and control. The process of drawing up cost plans, of planning investment, of estimating profits, and of making all other business calculations is much easier when prices are known and stable. The cost figure used as a basis for most prices is the planned average cost of production of the enterprises producing the commodity in question, so that in practice, prices have usually departed considerably from the actual costs of production. Moreover, the prices customarily do not include any charges for rent or capital, and even calculations of cost of production have often been distorted by underestimating the real costs of depreciation and obsolescence. As a result of these peculiarities in the pricing and accounting system the price placed on a good has often been an inaccurate

measure of what it really costs to produce it, and this has led to misallocation of resources.

Methods of Planning Investments

Let us now examine the actual methods which the Soviet planners apply in making investment decisions. There are three main kinds of such decisions: how much to invest, where to invest, and how to invest, which involves the choice among alternative investment projects. The first type of decisions is the determination of the overall rate of investment, the second refers to the allocation of the total investment fund among various sectors of the economy and the third is connected with the choice among the alternative ways of producing the same output.

Until quite recently the official belief in all Communist countries was that the first two types of decisions were purely political and therefore economic calculations should be limited to the third type only. The planners apparently were not aware that the productivity of investment, over a period of time, may decline as the volume of investment increases and that excessive limitation of consumption may tend to reduce labour productivity because of the lack of incentives and perhaps malnutrition in a more extreme case. They believed the relationship between investment and the rate of growth of national income was a causative one:

the larger the proportion of national income devoted to investment, the higher will be the rate of growth. Since, for a number of political, military, social as well as purely economic reasons, it was desirable to achieve the highest possible rates of growth, the largest possible proportion of national income was allocated to investment, resulting often in excessively high rates of investment which led to considerable economic and social disturbances (forceful collectivization in the Soviet Union in 1929-1930, political upheavals in Poland and Hungary in 1956). It was only quite recently that this attitude changed. It was realized by Soviet economists, and political leaders as well, that an excessive rate of investment, one which forces consumption down below the generally accepted minimum levels, may cause not a higher but a lower rate of growth of the national income, and that the determination of the overall rate of investment is not a purely political matter, and that there are economic factors which have to be taken into consideration.[3]

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[1] A. Notkin, "Tempy i optimum proizvodstvennogo nakoplenia i potreblenia", in Voprosy Economiky, August 1964.
S. Shatalin, "Tempy i proportsii ekonomicheskogo razvitia", in Voprosy Ekonomiky, January 1966.

The second type of investment decisions, that is, where to invest, can be subdivided into two groups. First, there is a choice between the development of the productive and non-productive sectors, or more precisely, the determination of the proportion of investment applied for the development of the productive and the non-productive sectors of the economy. From the point of view of the Soviet theory of economic growth and investment policy a distinction should be made between those investment outlays which result in the creation of the productive capacity and which tend directly to increase the volume of goods (productive sectors of the economy) and those investment outlays which influence the production of goods in an indirect way (non-productive sectors of the economy), particularly investments in education facilities, specialized training, research and development.

The neglect of the non-productive sphere may result in a lower labour productivity, less efficient management and a hampering of technological progress. In such a case there will be a tendency for the capital/output ratio to grow and the same volume of "productive" investment will result in a lower rate of growth than that which could have been achieved

otherwise.[4] It seems that the concept of optimization could be applied here also, although it may not be possible to find in practice the optimal distribution between the two types of investment. Presumably, this problem has not been discussed by the Soviet economists who tend to concentrate on the calculation of the efficiency of productive investment. Using the words of a Soviet economist "the proportion between productive and non-productive investments is, in fact, set by (1) the structure of the national product, and (2) the necessity to meet ever increasing productive and other needs of the society and personal needs of the working people".[5] This means that the final word on the distribution of investment funds between productive and "non-productive" sectors of the economy belongs to the political leadership.

The allocation of productive investment among various sectors of the economy constitutes the second group of decisions which are concerned with the question where to invest. This decision is based on the following three principles:

(a) Marx's theory of extended reproduction, which was interpreted by Lenin as the rule for the priority development of that segment of the economy which produces producers' goods,

(b) the so-called "law of planned, proportional economic

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4 P. Malishev, "Proportsia mezhdu proizvodstvennym i neptoizvodstvennym nakopleniem", in Voprosy Ekonomiky, June 1965.
5. Ibid., p. 40.

development", and

(c) the principle of "leading links".

The theory of extended reproduction, whatever its drawbacks, has two merits. It is a dynamic theory which links the size of the total national product in the second period to the input of capital in the first period and it stresses the importance of structural changes in the process of economic growth. The theory has influenced the Soviet economists to think about growth not only in the aggregate but also in the structural terms, and stress that the increase of national income depends not only on the gross amount of investments but also on their allocation to the various sectors of the economy, with due regard to the proper balance and co-ordination among the branches. In practice Marx's theory was understood to require that the investment plan should allocate as much investment as possible for the development of capital goods industries. It was stressed that the "theory of socialist industrialization" did not mean a parallel development of all branches of manufacturing industry; rather, this theory required that the rate of investment in producers' goods industry should exceed the rate in consumer goods industry; and furthermore, that rates of investment in the machine building and other privileged industries within the producers' goods industry should exceed the rate for the group as a whole.

Another principle on which the allocation of investment among various sectors of the economy should be based according to the Soviet theory is the so-called "law of planned, proportional economic development", which is in effect only a requirement of internal consistency of the plans. This "law" should not be interpreted as a requirement of the balanced growth of the economy. On the contrary, it has to be used together with the third principle, that is the principle of "leading links", which is the rule that the plan should secure first the main and decisive goals in the most important branches of the economy and develop other branches only to the extent which would be required to achieve main goals. In practice, the allocation of investments among various sectors of the economy seems to depend on arbitrary decisions. The policy based in part on more or less arbitrary decisions has, as the experience of the Soviet Union demonstrates, resulted in the long-run lack of balance between the development of manufacturing industry and agriculture and disproportions among different branches of manufacturing industry.

In the absence of the rate of interest and a rational price system, the Soviet investment project makers were forced to look for other devices which would help them make rational investment decisions when faced with the problem of choice among alternative investment projects, or alternative ways of producing the same output. They got around the obstacle of Marxist inter-

pretation of capital and interest by using what is called the "pay-off" or "recoupment" period. This is the period of time during which the investment outlay in question will pay for itself in the form of saved annual operating costs. In a case when two investment projects of different capital intensity are considered, the formula for the recoupment period may be given as

$$\frac{I_1 - I_2}{C_2 - C_1} = T$$

where I stands for the sums invested, C for operating expenses, in the two variants which are being compared, and T is time, i.e., the period of recoupment. If T is smaller than the recoupment period, fixed by the planning authorities, preference will be given to the more expensive alternative. Conversely, if T is larger the cheaper variant should be chosen. In other words, if the additional investment in the more expensive variant, i.e., $I_1 - I_2$, can be paid off in saved annual operating costs, which is $C_2 - C_1$, in five years or less, then the more expensive variant will be chosen. There is a valid reason for making such decision: lower annual operating costs in the more expensive variant will pay off the additional investment in the five-year period and constitute a net gain afterwards; the less expensive variant will require higher annual operating expenses from the

start and after the five-year period when the initial difference in the amount of investment outlays for the two projects will be paid off.

For instance, suppose that two investment variants are considered concerning construction of a new textile plant. Variant A, with relatively more labor input, requires an investment outlay of 2 million rubles. Variant B is more expensive because most of the auxiliary work is to be mechanized in the proposed plant; it requires larger investment, say, 2.5 million rubles. The projected annual operating expenses in proposal A amount to 200 thousand rubles; in proposal B an annual saving of 100 thousand rubles in annual operating cost may be achieved. Then

$$\frac{I_2 - I_1}{C_1 - C_2} \quad \text{or} \quad \frac{2{,}500{,}000 - 2{,}000{,}000}{200{,}000 - 100{,}000} = 5.$$

The recoupment period is 5 years, i.e., in five years the additional investment of 500,000 rubles in variant B will be paid off. Since the standard recoupment period for this branch of industry is five years, the more expensive variant B will be accepted; the return on investment in case B is such (20 per cent) as to justify the larger investment outlay.

Thus the planners managed to bring the condemned rate of return on capital in through the back door. The anti-Marxist

implication of this practice was soon realized and denounced by the orthodox Soviet economists.[6] There followed a long controversy in which the necessity for such device was made clear, and in the end it was decided to allow the pay-off period to be used openly. A "temporary standard method" for calculating effectiveness of investment was issued as an official instruction in 1956 in which the recoupment concept was formulated in forms which could be applied in all the relevant planning offices. The instruction introduced standard permissible periods of recoupment, different for each of the sectors of the economy. The limits were claimed to be fixed on empirical basis, although they seemed to reflect priority of some sectors; the recoupment period was in general much longer in heavy than in light industry.

A definitive instruction, known as "A Standard Method of Determination of the Economic Effectiveness of Capital Investments and New Techniques" ("Tipovaia Metodika ekonomicheskoi effektivnosti kapitalnykh vlozhenii i novoi tekhniki"), which is now in force, was issued in 1960. This instruction seems to represent a victory for those Soviet economists and project-makers

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[6] Some of the Soviet articles criticizing the recoupment period approach are available in English translation. To name two of them, A.I. Kats, "Concerning a Fallacious Concept of Economic Calculations", and A. Boiarskii, "On the Proper Relationship between Mathematics and Economics in a Socialist Society", in Harry G. Shaffer (ed.) op. cit.

who have been advocating the use of a planning device similar to the rate of interest for the calculation of the efficiency of investment.

A further step toward a more rational method of allocation of investment resources was made by the plenum of the central committee, C.P.S.U., in September, 1965, when the principle that capital is a scarce resource and its use must be paid for was adopted. The new scheme introduced "profitability" - calculated as gross sales minus costs, divided by the firm's capital - as the principal standard of performance, so that now the firm is encouraged to economize on its capital, heretofore used wastefully because it was granted free to the enterprise from the state budget; it will now strive to reduce, not pad, input costs, including capital.

The recent economic reform in the Soviet Union re-established capital in its function as a factor of production which, because of its scarcity, has to be economized and the use of which has to be paid for. The reform represents also a major step towards decentralization of investment planning and management. From now on the manager of a Soviet firm will play an important role in the process of resource allocation.

The methods of a centralized investment planning and management, which might have been effective in the early stages of industrialization and post-war recovery, proved to be

hampering growth and less effective when confronted with the intricate tasks of a mature, diversified economy. A marked decline in economic growth and in the productivity of investment since 1959 was admittedly one of the main reasons for the reform.

CHAPTER IV

STRUCTURAL CHANGES IN SOVIET INVESTMENT PATTERN

The Soviet method of development was a series of leaps forward, of which successive five-year plans were a formal expression, and within them there was a concentration of publicity and resources on some particular sectors considered to be of key importance. This key sector approach ("unbalanced") to the problem of development was greatly facilitated by the abundance of surplus farm labour which could with relative ease be extracted out of agriculture; by the availability of rich, relatively underdeveloped natural resources; and by the possibility to borrow technology from abroad, technology which corresponded to a much advanced stage of development.

These advantages seemed to disappear as the Soviet economy approached the stage of maturity, and the old "growth-oriented" pattern of investment seemed now to hamper rather than to promote further expansion. The persistent decline in rate of growth in the past few years forced the Soviet planners to re-examine and revise their investment policy. Though they were still able to impose upon the economy a high rate of investment, they had now to modify, in view of changed conditions, the old

pattern of resource allocation, the primary goal of which had been the change of economic structure, rapid industrialization and military build-up. To ensure further expansion the strategy of "great leaps forward" of the industrialization period had to be abandoned in favour of a more all-round development characteristic of a mature economy. The new investment policy required major shifts in the pattern of allocation of investment funds, mainly from low to high capital/output ratio sectors or to sectors subject to the law of increasing costs, such as agriculture.

In this chapter, three main factors which forced the Soviet planners to make major shifts in their investment pattern will be examined: (1) the conditions of diminishing returns in agriculture and other primary industries, (2) the increasing labour scarcity, and (3) the need for independent technological advance.

Natural Resources - a Problem of Increasing Costs

The distorting lag of Soviet agriculture behind manufacturing industry is perhaps the most widely known feature of Soviet development. The ability of Soviet regime to finance industrialization at the expense of the agricultural sector, through forcible collectivization and the system of compulsory deliveries of grain and other staple food products at low, government fixed prices, was one of the factors which promoted the rapid

rate of growth achieved early in the Soviet economic development. However, this strategy has its limits. In such a situation a stage must be reached sooner or later when one cannot extract any more out of agriculture without a drastic change in the policy of investment, pricing and incentives.

A statistical survey of the growth of Soviet agricultural output for the past 18 years is provided in Table 9. The underlying data are derived from Table A-3 in the Appendix. For purposes of this analysis the period of 18 years is divided into three six-year cycles so as to make them coincide, at the same time, with three major changes in Soviet agricultural policy as regards prices, incentives and investments.

By the end of Stalin's era in 1952, Soviet agriculture was in a state of stagnation, mainly because of inadequate, considering the massive destruction of farm capital stock during World War II,[1] investments into farm structures, machinery and equipment. Moreover, compulsory delivery prices for grain and other food products, which had little changed for the past twenty

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[1] In 1945 the value of the farm capital stock in the USSR in constant rubles was 34 per cent lower than it had been in 1940, Narodnoe Khoziaystvo SSSR v 1964 Godu, p. 258.

years, provided little if any incentive for collective peasants to work harder. The average percentage annual increase of output in the period from 1947 to 1952 was a modest 3.8 per cent; it was still less, 1.3 per cent, if calculated for the second half of the period, i.e., from 1949 to 1952.[2]

TABLE 9

Average Annual Increase of Gross Output and Investment in Soviet Agriculture, 1947-1964

(constant 1958 billion rubles)

	1947-1952	1953-1958	1959-1964
Output	1.020	3.240	1.200
Investment	1.847	4.145	7.415
Investment/ Output Ratio	1.82	1.27	6.18

One of the first steps taken by Stalin's successors in 1953 was to embark on a broad program to increase agricultural output, involving changes in planning and administration, delivery

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[2] This and the subsequent computations of average percentage annual increases of Soviet agricultural output are derived from Table A-3 in the Appendix.

requirements, investment and prices.[3] The first five years, following the change of agricultural policy saw a marked improvement in Soviet agricultural output. The average percentage annual increase for the period from 1953 to 1959 was an impressive 10 per cent as compared with 3.8 per cent in the preceding period. Combined with the reclamation of virgin lands in Kazakhstan, the new policy of increased investments and incentives brought fairly rapid progress from the low levels reached in Stalin's time.

But after 1958 fortune changed. The vagaries of the reclaimed virgin lands and unfavourable weather conditions (especially in 1963) made the harvests less abundant. Poor harvests, in turn, hit livestock: animal production in 1964 was scarcely higher than in 1958. This and the government's policy of prices on grain deliveries, set at a very low level again in 1958 in order to finance the Seven Year Plan investments in other sectors of the economy, were greatly responsible for the slow growth of agricultural output in the early 1960's. The average percentage annual increase of agricultural output declined to 2.6 per cent, and the investment/output ratio rose to 6.18 (see Table 9), the highest level for the whole period.

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[3] Lazar Volin, "Agricultural Policy of the Soviet Union", in Bornstein and Fusfeld (ed.), The Soviet Economy, A Book of Readings, Richard D. Irwin, Inc., Homewood, Ill., 1962.

The lag in agricultural output influenced the overall rate of growth in two ways. First, poor performance in agriculture, a major sector of the economy, contributing 25 to 30 per cent of national income (see Table A-3 in the Appendix and Table 7, page 29), dragged the average rate for the whole economy. Second, lagging supplies of raw materials and the necessity to expend precious foreign exchange (itself cut by curtailed food exports) on imported food, held back the growth of manufacturing sector. In fact, the Soviet economy reached a stage where agriculture became the key bottleneck and where without further increases in agricultural output further progress could have been seriously hampered. A drastic increase in the rate of investment in agriculture since 1963 checked the downward trend in Soviet agricultural output to a certain extent. But the Soviet planners did not stop there. They felt that more fundamental changes in the policy concerning prices, incentives and allocation of investment funds were needed to ensure all-round development of agriculture. Following their recommendations, a "new approach" to agriculture was adopted by the March, 1965, plenum of the party central committee. State policy concerning grain deliveries and prices was changed so as to improve the collective farms' terms of trade: compulsory deliveries to the state were reduced and were to be bought at higher base prices, and were to remain unchanged for a six-year period; and the farms would be able to sell additional output, beyond the compulsory

deliveries, to the state at prices 50 per cent higher than the procurement prices. Furthermore, the "material-technical base" of agriculture was to be enlarged: capital investments into agriculture financed from the government budget would total 71 billion rubles during the current five-year plan period ending in 1970, twice as much as in the preceding five years; larger number of specialists and technicians, plus better repair facilities, would accompany greater quantities of machinery provided on easier financial terms; and government's programs of agricultural research and training would be significantly expanded.[4]

The Soviet leaders have serious reasons to seek a "breakthrough" in farming. Nearly half the population still lives in the countryside. Over 26 per cent of the labor force is still employed in farming (see Table 11, page 66). They must genuinely hope that increased investments into agriculture will ultimately yield results. With almost all potentially arable land in use further advance requires very considerable intensification of methods of cultivation indeed. Low productivity and high crop fluctuations can be fought in three ways. Water control and irrigation prevent the extremes of flood and drought; fertilizers

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[4] V. Matskevich, "Ekonomicheskie Problemy Dalneyshogo Razvitiya Selskogo Khoziaistva", in Voprosy Ekonomiky, June, 1966, and M. Terentiev, "Torzhestvo Leninskikh Metodov Rukovodstva Selskim Khoziaistvom", in Voprosy Ekonomiky, April, 1965.

improve growth where the soil conditions are unfavourable; large scale mechanized farming makes it easier to beat the weather and get the crop safely in. Each of these remedies call for large outlays of investment funds. However, under the conditions of diminishing returns, agricultural output cannot be expected to grow at the same, still less at a faster rate than the rate of growth of the capital stock used to produce it. It seems that this is the case of Soviet agriculture as its capital/output ratio may suggest. Calculated for the three best crop years of each of the 6-year cycles, from 1947 to 1964, the Soviet average capital/output ratio shows a long-run tendency to increase, from 0.67 in 1950 to 0.97 in 1958 and to 1.22 in 1964.[5]

Agriculture was not the only sector where the Soviet planners, confronted with the working of the law of diminishing returns, were forced to make major shifts in their pattern of resource allocation. This is especially true with regard to the supply of raw materials for manufacturing industry. Consumption of minerals has grown enormously since the beginning of massive industrialization in 1928. Hence the search for an adequate supply of minerals took the Soviet mining industry either deeper underground

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[5] These capital/output ratios are derived from Tables A-1 and A-3 in the Appendix.

or farther into the regions of the East, away from the centers of production and population. Either way, it required ever greater input of capital or expansion of transport to produce and deliver new raw material. Moreover, heavy expenditures had to be made on social capital, transport, housing and communal services in the non-settled regions of Siberia, where important mineral and fuel sources had been located. The importance of the eastern regions and their share in the total output of energy, fuels and raw materials may be seen from Table 10.

T A B L E 10

Percentage Share of Eastern Regions in

Total Soviet Output of Selected Basic Industries

Industry	1940	1964
Electric Power	22.1	41.5
Coal	35.9	49.7
Natural Gas	0.03	14.6
Iron Ore	28.7	32.8
Pig Iron	28.5	37.6
Steel	32.0	41.5

Source: Narodnoe Khoziaystvo SSSR v 1964 Godu, p. 148.

The development of the eastern regions must have been quite exacting in terms of investment outlays. Especially costly investments had to be made into housing, transport and other social overhead before even the extraction of raw materials could have started. According to figures of the Central Economic Research Institute of the Russian S.F.S.R. (Soviet Federative Socialist Republic), the average cost of any construction in the eastern regions is 15 to 20, and sometimes even 50 per cent higher than in populated areas.[6]

Yet part of the explanation for the very rapid expansion of earlier years lies in the fact that it was possible to utilize much more intensively readily accessible natural resources, already existing railways and urbanized areas. This led, of course, to a great strain on railways and to acute over-crowding in the cities, but it did make possible the concentration of investment funds on industrial growth.

For many years housing and transport were relatively neglected sectors of the Soviet economy. Especially housing has always been an acute problem in the Soviet Union. The process of rapid industrialization led to a marked overcrowding in the cities and deterioration in housing standards. In the 1950's housing standards deteriorated even further; war destruction was of such

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[6] T. Khachaturov, "Povishenie Effektivnosti Kapitalnykh Vlozheniy", in Voprosy Ekonomiky, February, 1966, p. 6.

proportions that this process continued in spite of much larger investment allocations to housing. By 1958, according to Janet G. Chapman, "... the 1928 per capita urban housing space has still not been regained",[7] so that further investments into housing became most urgent. To the extent that Soviet planners were forced to devote a considerable investment share to this high capital/output ratio sector, the rate of Soviet economic growth was checked in the period between 1958 and 1964. The share of housing in total investments in 1958 was an impressive 25.1 per cent (Table 2). Although it declined to 16.1 per cent in 1964, its volume in absolute terms remained almost at the same level throughout the period under study.

As far as transport and communications are concerned, relatively little was done since 1928 to enlarge the road and railroad network or renew the rolling stock. Resources allocated to this sector did not exceed the most urgent needs so that in the late 1950's a major disproportion between the transportation requirements of the economy and available facilities developed which led to delays in deliveries and disruption of production schedules. Now the solution of the transportation problem could not be delayed any longer. An ever increasing part of available resources had to be shifted to this sector. The annual volume of

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7 Janet G. Chapman, "Consumption", in Abram Bergson and Simon Kuznets, op. cit., p. 242.

of Soviet investment outlays on transport and communications almost doubled between 1958 and 1964 (Table A-2). Yet the share of that sector in total capital stock of the economy remained unchanged during that period (Table 1, page 17), mainly because of the conversion of the railroad system to diesel and electric locomotives resulting in a sharp increase in the rate of obsolescence of the old capital assets. As any technological change in its early stage, this shift contributed much to the decline of the investment/output ratio in Soviet transport and communications, from 3.51 in 1958 to 5.30 in 1963, according to computations made by Ya. B. Kvasha.[8]

Labor - a Problem of Scarcity

Until recently man-power resources in the Soviet Union have been abundant, compared with capital. The recruitment and allocation of labour for manufacturing industry in the past never caused major difficulties to Soviet planners having at their disposal a large reservoir of surplus farm labor. The period of labor abundance, however, is drawing to a close as the Soviet economy is approaching the stage of maturity. For the last 15 years average annual rates of increase of total labor force declined from 2.3 per cent in the period from 1950 to 1955, to 1.3 per cent in the 1955-1960 period, and reached their bottom, 0.9 per

[8] Ya. B. Kvasha, op. cit., p. 138.

cent [9], in the 1960-1965 period. These circumstances, due to a great extent to the loss of actual and potential population in World War II, "have compelled the Soviet Union to face rather suddenly the problem of increasing scarcity of human resources".[10] It seems that the Soviet economy has reached a situation where there is no more farm surplus labor available, at least in the quantity as it was the case in the past. By now labour, particularly skilled labour, seems to be relatively as scarce as capital in both agriculture, due to the low level of mechanization, and manufacturing. If the continuing demands of manufacturing and services are to be met, more labour has to be supplied by means of an absolute reduction in the agricultural labour force, i.e., by substituting capital for labour.

The changes in the distribution of Soviet labour by major segments of the economy are shown in Table 11.

TABLE 11

Percentage Distribution of Total Soviet Labor in Selected Years

Sector	1950	1958	1964
Productive	86.2	84.1	80.4
Farm	48.7	38.8	26.4
Non-farm	37.5	45.3	54.0

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9 Warren Eason, "Labor Force", in Abram Bergson and Simon Kuznets, op. cit., p. 45.

10 Ibidem, p. 41.

(cont'd.)

Sector	1950	1958	1964
Non-productive	13.8	15.9	19.6
Education, Health, Research and Development	7.7	10.2	13.5
Others	6.1	5.7	6.1
Total	100.0	100.0	100.0

Source: Narodnoe Khoziaystvo SSSR v 1964 Godu, p. 544.

This change in the relative scarcities of labor and capital has shifted the center of attention of Soviet planners to the problem of marginal adjustments in the employment of land, labor and capital. Under the conditions of increasing labor scarcity, the effective utilization of that factor of production has become one of the major problems of Soviet investment policy.

The decline of labor supply can be offset by the increase of labor productivity. This can be achieved in two ways: by mechanizing manually performed production processes, or by introducing new, improved machinery and equipment that will make it possible to obtain increased output with the same quantity of labor. Both measures have broad implications as far as capital investments and capital/output ratio are concerned. In the case of mechanization, a part of investment funds, which otherwise could be utilized for creation of additional production facilities, will have to be withdrawn merely to replace labor without adding much

to output. As long as output remains unchanged, any additional capital invested to replace labor will tend adversely to affect the over-all capital/output ratio. But there will be one important gain: labor productivity will rise as less workers will be required now to produce the same amount of output.[11] And this is of utmost importance in a situation where the problem of labor scarcity is to be solved. A technological change, i.e., implementation of improved techniques, on the other hand, implies a costly, in terms of investment outlays, research and development, and experimentation; it also requires development of new skills

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[11] This can be easily demonstrated by referring to formulas 2 and 3 (page 9):

Period 1 $$Y = 100L \times \frac{Y}{10C} \times \frac{10C}{100L} = 10L \times \frac{Y}{100L} \times \frac{100L}{10C}$$

Period 2 (additional 2 units of capital have been invested to substitute for 10 units of labor)

$$Y = 90L \times \frac{Y}{12C} \times \frac{12C}{90L} = 12C \times \frac{Y}{90L} \times \frac{90L}{12C}$$

$$\frac{Y}{12C} < \frac{Y}{10C} \quad , \quad \frac{Y}{90L} > \frac{Y}{100L} \quad .$$

The substitution of labor by capital, 2C substitute for 10L, will, output remaining unchanged, result in the increase of productivity of labor, $\frac{Y}{90L} > \frac{Y}{100L}$, but at the same time the productivity of capital will decline, $\frac{Y}{12C} < \frac{Y}{10C}$. Thus, other things being equal, increased productivity of labor will result in the decline of capital productivity.

and specialized experience. Both, mechanization and technological change, increase the replacement needs due to the increase of capital stock and accelerated rate of obsolescence.

The low level of output per worker in the Soviet economy[12] reflects some specific features of Soviet development. The Soviet Union had carried out a very uneven program of mechanization. It frequently happened that they gave great attention to mechanizing some of the production processes in industry while others were overlooked and continued to be performed by essentially manual methods. For instance, they were reluctant in mechanizing such operations as material handling, intraplant transportation, repairs and other such service functions.[13] Part of the explanation lies in a poor organization and technology. But the most important reason for low labor productivity is that the Soviets were using wastefully the resource they had in greatest abundance. When capital was the bottleneck factor, but there was plenty of labor, it was rational to substitute labor for capital, even though it meant high labor input per unit of output. For the same reason, it made sense for the Soviets to keep every scrap of capital in

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[12] The productivity of the Soviet non-farm worker is 40 to 50 per cent that of his American counterpart, according to Soviet sources (Narodnoe Khoziaystvo SSSR v 1964 Godu, p. 67.).

[13] V. Yagodkin and I. Maslova, "K Voprosu ob Ispolzovanii Rabochey Sily", in Voprosy Ekonomiky, June, 1966.

service as long as it could be made to function. They could always find manpower to operate the old assets and at the same time supply labor with new production facilities.

However, increasing scarcity of labor in the late 1950's compelled the Soviet planners to change their methods in the use of labor from extensive to intensive. Now a scarce factor, labor had to be economized, mainly by way of mechanization of manual work and technological change, both contributing to the increase of labor productivity. By raising the productivity of labor the Soviet planners could expect to be enabled to meet the difficulties posed by increasing scarcity of labor. The extent and direction of mechanization and technological change in the Soviet economy can be approximated from Table 12.

T A B L E 12

Capital Stock per Person Employed, by Sectors of the USSR Economy, 1958-1964, selected years

(constant 1958 rubles)

Sector	1958	1960	1963	1964
Mining and Manufacturing	3,690	4,042	4,956	5,206
Construction	1,108	1,147	1,489	1,676
Agriculture	1,076	1,357	1,884	2,087*
Transport and Communications	5,527	5,928	6,608	7,141

* Figures for agriculture are taken from Narodnoe Khoziaystvo SSSR v 1964 Godu, p. 258, others derived from Table A-1 and A-4 in the Appendix.

In general, mechanization and technological change require the use of progressively more capital goods which leads, in the short-run period at least, to an increase of capital/output ratio. In these terms we may partly explain the decline of Soviet investment productivity since 1958. The Soviet economy has been undergoing a technological revolution that requires a substantial shift of investment funds into new, or heretofore neglected areas of economic activity, and this shift may have unfavourably affected the Soviet capital/output ratio.

The Need for Independent Technological Advance

It seems fairly certain that rapid technological progress has been an important factor in the high rate of growth of the Soviet economy in the past. Most of Soviet technology was borrowed from abroad at no cost to economy. The Soviet planners could import the technology in its perfected form, and thus they were able to bypass a long and costly period of research and development.

Since the Soviet economy, roughly speaking, caught up with many of the developed countries, the borrowing advanced technology could not be practiced to the same extent as it had

been the case in the past. One had to rely more and more on domestic research and development for technological innovations, and to move through all varying, intermediate slow stages towards advanced production technology.

The development of any innovation proceeds slowly, step by step. In the process, a considerable amount of resources is spent in intermediate, experimental phases of invention, and along the way there are many failures, with attendant waste of resources, and some outlays for experimentation never pay off. Research and development programs are carried on by specialized industrial establishments with special equipment and machinery, division of labor, and production in the form of continuous stream of innovation projects. All this requires large-scale financing so that only a few nations can afford to bear the cost of an independent technological advance.

Technological advance also requires high level of education and special training. It involves a number of different stages, including basic research, the application of basic scientific knowledge to practical problems, and innovational activity at the level of productive establishment, adoption in practice of new machines, products or materials. Involved at all stages of this process is education. There must be people trained in the complicated knowledge and techniques underlying

scientific research; there must be people who are competent to implement these ideas; and when an innovation is finally placed in the factory, there must be someone trained to use it intelligently. The role of trained manpower at this level becomes particularly important when technological progress involves innovations like automatic production lines and computers. Technological change has far-reaching implications: it makes some skills obsolete and creates demand for new skills. There is a general upgrading of the labor force and to a large degree the professional and skilled workers are of new kinds. From top management to the production-line worker, technological change requires new kinds of training.

No integrated statistical data on the cost of research and development and technological change in the Soviet Union are published, but there cannot be much doubt that a considerable share of available resources are involved. This includes costly investments at all stages of research and development, into experimentation that precedes actual implementation of new techniques, and into development of new skills and specialized experience. Some insight into the extent of these activities may be obtained from statistics on professional and specialized personnel employed in the Soviet economy, and research and

development in particular. This is shown in Table 13.

T A B L E 13

Number of Graduates of Specialized Secondary and Higher Educational Institutions Employed by Selected Sectors of the USSR Economy, 1958 - 1964

(in thousands)

Sector	1958	1964
Mining and Manufacturing	1,102.7	2,293.8
Specialized Secondary	748.3	1,650.2
Higher	354.4	643.6
Construction	191.0	446.6
Specialized Secondary	119.1	302.9
Higher	71.9	143.7
Agriculture	370.7	456.8
Specialized Secondary	268.1	341.2
Higher	102.6	115.6
Transport and Communications	214.5	440.0
Specialized Secondary	158.8	344.6
Higher	55.7	95.4
Research and Development	413.3	903.9

(cont'd.)

Sector	1958	1964
Specialized Secondary	148.0	317.7
Higher	265.3	586.2

Source: Narodnoe Khoziaystvo SSSR v 1964 Godu, p. 562.

Moreover, there are some areas of research and development, carried by the Soviet Union, which do not directly contribute, at least at the present stage, to the advancement of production techniques or enhance the growth of national product, such as space exploration, atomic energy, or defence production. Yet, although enormously expensive, these activities have to be carried on for prestige or other motives, if only in the hope that some of the products of related research and development may eventually find their way to the production line.

Soviet outlays on research and development, technological change, education and specialized training presumably lay claim to a considerable share of investment funds. Although most of these expenditures will pay off in terms of increased labor productivity in the future, at this stage they heavily contribute to the increase of the over-all capital/output ratio in the Soviet economy. This is the cost of technological revolution the

Soviet Union seems to be undergoing at present time, and the price must be paid in order to secure sustained economic growth.

SUMMARY AND CONCLUSIONS

The possibility to impose a high rate of investment upon the economy and to allocate the available investment funds among sectors with a low capital/output ratio are some of the reasons why the Soviet economy was able to grow so rapidly. However, the methods of a centralized investment planning and management, which might have been effective in the early stages of industrialization and post-war recovery, seem to be hampering Soviet economic growth and less effective when confronted with the complexity of tasks of a mature economy. This may well be one of the main reasons for the retardation of Soviet growth and the decline in the rate of productivity of Soviet investments in the recent years. At this stage, limitations of a centralized decision-making do not allow the Soviet planners to attain the internal consistency of their investment plan and to provide it with short-run flexibility. The investment policy based in part on more or less arbitrary decisions results in scattering investment funds in many projects, and, in the long-run, in a lack of balance between the development of the various sectors and branches of the economy. The more mature grows the Soviet economy the more difficult it is for Soviet planners to achieve a sustained, balanced growth.

Investment planning and management in the Soviet-type economy is handicapped by some doctrinal and institutional features of the system that do not induce the economical use of capital or the choice of capital economizing methods in the preparation of investment projects. The allocation of fixed capital as a free grant without interest charge and an inadequate system of managerial incentives are among the factors which lead to a wasteful use of capital. The deficiencies in both investment planning and management have undoubtedly contributed to the decline in the rate of productivity of Soviet investment since 1958.

The rapid rate of Soviet growth in the past was also greatly facilitated by the availability of rich natural resources and surplus farm labor, and by the possibility to borrow the technology which had been perfected for many decades in the pioneer industrial countries. These advantages in growth enjoyed by the Soviet economy until recently seem to disappear as it approaches maturity. First, there are the conditions of increasing costs in agriculture and other primary industries. With all readily accessible arable land now under cultivation, a further growth of agricultural output can be achieved only through intensification of cultivation methods, i.e., by way of massive investments in farm machinery and equipment, fertilizers, irrigation and other land improvement projects. Also the search for an adequate supply of

minerals takes the Soviet mining industry far away from the centers of production and population. This requires greater input of capital and increase in transport facilities to produce and deliver new raw materials. Second, there is a change in relative scarcities of labor and capital as the period of labor abundance is drawing to a close. Now a relatively scarce factor, labor must be economized by way of capital-intensive methods of production, in particular large-scale mechanization of manually performed production processes. Third, having more or less caught up in its technological level with western nations, the Soviet economy must make independent advances in technology which implies costly investment outlays on research and development and on education.

The ever increasing stock of fixed assets and an accelerated rate of obsolescence, due to the technological change, makes it impossible for the Soviet economy to keep the replacement needs at a low level as in the past. Now a major part of investment funds must go just to compensate for the wearing out of the old or replace the obsolete capacity rather than adding new.

To sum up, the recent retardation of Soviet growth and the decline in the rate of productivity of Soviet investment may be attributed to the interaction of two different sets of factors: built-in doctrinal and institutional deficiencies of investment planning and management, which might prove to be of transitory nature

in view of the recent economic reform adopted by the Soviet Union, and long-run tendencies which accompany the process of maturing of the Soviet economy, i.e., the conditions of increasing costs and scarcity of labor.

The Soviet economy has to pay the price for becoming a mature economy - a decrease in the rate of productivity of investment. And it seems that even if the doctrinal and institutional difficulties plaguing the Soviet economy are some day removed the cost of remaining an advanced nation will still have to be paid in terms of an increased capital/output ratio as the experience of western industrialized nations shows.

APPENDIX

This appendix consists of four tables:

TABLE A-1

Distribution of Capital Stock by Sectors of the USSR Economy.

TABLE A-2

Distribution of Investments by Sectors of the USSR Economy

TABLE A-3

Output and Investment in Soviet Agriculture

TABLE A-4

Number of Employed Persons by Selected Sectors of the USSR Economy.

The underlying data for these tables are taken from Soviet statistical yearbooks published by the Central Statistical Administration in Moscow.

T A B L E A-1

Distribution of Capital Stock by Sectors of the USSR Economy, 1950-1964, selected years

(constant 1958 billion rubles)

Sector	1950	1958	1960	1962	1963	1964
Productive	75.9	158.7	192.4	229.9	255.3	278.0
Mining and Manufacturing	30.5	72.7	90.3	111.2	124.2	137.0
Construction	2.0	4.9	5.9	6.8	7.8	9.0
Agriculture	19.8	38.6	44.2	52.1	56.2	62.0
Transport and Communications	21.1	35.0	41.6	50.3	53.0	57.0
Production Services	2.5	7.5	10.4	9.5	14.1	13.0
Non-productive	69.2	116.8	145.8	168.3	180.0	193.0
Housing	56.9	87.5	108.0	113.4	127.1	134.0
Social Services	12.3	29.3	37.8	54.9	52.9	59.0
Total	145.1	275.5	338.2	398.4	435.3	471.0

Sources: Narodnoe Khoziaystvo SSSR v 1964 Godu, Moscow, 1965, p. 68.

Narodnoe Khoziaystvo SSSR v 1963 Godu, Moscow, 1964, p. 53.

T A B L E A-2

Distribution of Investments by Sectors of the USSR Economy, 1950-1964, selected years

(constant 1958 billion rubles)

Sector	1950	1958	1960	1962	1963	1964
Productive	7.543	18.175	22.508	25.811	27.433	30.965
Mining and Manufacturing	4.236	10.149	12.854	14.713	15.130	16.965
Construction	.289	.838	1.030	1.050	1.081	1.206
Agriculture	1.661	4.728	5.172	6.415	6.983	8.242
Transport and Communications	1.357	2.460	3.452	3.633	4.239	4.552
Non-productive	3.541	11.837	14.197	14.339	14.781	14.973
Housing	2.023	7.536	8.275	7.729	7.714	7.394
Social Services	1.518	4.301	5.922	6.610	7.067	7.579
Total	11.084	30.012	36.705	40.150	42.214	45.938

Sources: Narodnoe Khoziaystvo SSSR v 1964 Godu, Moscow, 1965, pp. 513-514.

Narodnoe Khoziaystvo SSSR v 1962 Godu, Moscow, 1963, p. 134.

TABLE A-3

Output and Investment in Soviet Agriculture,

1947 - 1964

(constant 1958 billion rubles)

Year	Output	Investment
1947	26.1	.948
1948	28.9	1.101
1949	30.0	1.201
1950	30.4	1.810
1951	29.0	2.034
1952	31.2	2.140
1953	32.3	2.163
1954	34.2	3.227
1955	37.6	4.385
1956	42.5	4.673
1957	44.1	4.907
1958	48.5	5.526
1959	48.7	6.021
1960	49.8	6.227
1961	51.3	6.882
1962	51.9	7.454
1963	48.0	8.213
1964	54.9	9.695

Source: Narodnoe Khoziaystvo SSSR v 1964 Godu, pp. 247 and 517.

TABLE A-4

Number of Employed Persons by Selected Sectors of the USSR Economy, 1958-1964, selected years

(in thousands)

Sector	1958	1960	1963	1964
Mining and Manufacturing	19,675	22,291	25,057	25,933
Construction	4,421	5,143	5,237	5,370
Transport and Communications	6,332	7,017	7,718	7,982

Source: Narodnoe Khoziaystvo SSSR v 1964 Godu, page 546.

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