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TITLE: The Dynamics of the Capital Coefficient of USSR Industrial Output:
Investment Process in Soviet Industry

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Preface

This report represents the result of research on the basic factors determining the condition and development of the current investment situation in the USSR. Of the innumerable questions that this problem raises, I have selected those which are most controversial and most fundamental. Originally, I only planned to study the dynamics of the capital coefficient in industry. But in the course of my research I came to the conclusion that it would be useful to broaden the topic, and I have tried to examine the principal characteristics of Soviet investment policies in industry in the 1970s. Although I have analyzed all the questions raised in the original plan, I think that the broader scope of this report has significantly increased its value.

I am of course well aware that the data underlying this work, taken from Soviet technical literature and statistical sources, do not reflect perfectly economic reality. Nevertheless, I believe that these data—in spite of all their shortcomings—permit us to reveal the basic tendencies in Soviet investment.

I would like to express my sincere gratitude to Professors Abram Bergson, Evsey D. Domar, and Vladimir G. Treml for their criticisms and suggestions, which have been extremely valuable. I have also taken into account the suggestions of Dr. Daniel L. Bond. For his assistance in this work I am also very grateful to Dr. James W. Gillula.
SUMMARY

Investment activity in Soviet industry is undergoing a period of decline unknown during the entire history of the USSR.

Investment resources are drying up because of the decline in the absolute increments to gross social product and national income.

The investment mechanism is increasingly spinning its wheels. In 1979, the growth of capital investment actually stopped, the volume of construction-installation work declined, the share of unfinished construction in capital investment attained a record level for the period since 1955, the growth of fixed capital stopped, and the amount of production capacity put into operation declined for most types of industrial production.

An ever greater part of capital investment was channelled into replacement, and the investment possibilities for expanding the scale of production and maintaining or increasing rates of economic growth declined correspondingly.

Capital expenditures per unit increase in output continued to grow.

All these phenomena are taking place simultaneously with a deteriorating demographic situation and a worsening of indicators characterizing the utilization of labor resources.

The key idea of investment policy under these conditions is the progressive shifting of investment flows into the development of existing production to the detriment of new construction. By this means it is proposed to combine more rapid amortization for updating and retooling industrial production facilities with growth in the volume of industrial output achieved through minimal capital investment.

However, the true state of affairs is revealed by the calculations of Soviet economic strategists. The high degree of wear and tear of the fixed assets of enterprises, especially industrial structures, results in excessive capital expenditures for their replacement and modernization. Retirements of fixed assets in the process of reconstruction of enterprises greatly exceed plan and design estimates. Construction work on the reconstruction and expansion of enterprises is significantly more complicated and more expensive than new construction. The level of scientific research in the area of equipment and industrial technology and the productive potential of machine-building increasingly limit the possibility, during reconstruction, of carrying out replacement on a fundamentally new technological basis, of introducing not improved but new equipment and new technologies and thus achieving a relative reduction in capital and labor expenditures. Thus
the reconstruction orientation of investment policy does not lead to a reduction of the capital coefficient or to an improvement of the investment sphere. The negative consequences of reducing investment in new construction are manifested in many areas of the economy, but their primary effect is to reduce the rates of technological progress in industry.

The growing orientation of industrial capital investment toward the expansion and improvement of existing facilities hinders the solution of one of the most important tasks of the development of industry and the Soviet economy as a whole -- the spatial deconcentration of industrial production and the creation of priority conditions for the industrial development of eastern regions of the country. Industrial enterprises in the western parts of the country, which produce 80 percent of industrial output, absorb more than 70 percent of industrial capital investment. With the increase in the share of reconstruction in capital investment, the investment quota of western regions also grows.

Such an investment policy increases the spatial polarization of the concentration of production of fuel-energy and raw material resources in the east and the production of manufacturing industry in the west, which has serious consequences for the economy of the USSR and increases its strategic-military vulnerability.

The factors that have been discussed are of a long-term nature. There is a great deal of inertia in the development of the investment sphere under conditions of a planned economy. Sharp changes in investment policy like those that took place in Soviet industry during the late 1950s and early 1960s with the development of "big chemistry" under Khrushchev, which led to a break in the investment structure that had developed over a long period of time, disrupted all branch and structural proportions of the investment process and produced chaos in investment activity for a long time. The repetition of such an experiment now is unlikely.

There is full justification for concluding that the trends that have been outlined here will continue to develop in the near future and will contribute to a worsening of the strained situation in the investment sphere of Soviet industry.
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I. CHANGES IN THE PATTERNS OF INDUSTRIAL CAPITAL INVESTMENT IN THE USSR

1. The Economic Situation in the Second Half of the 1970's and Investment Possibilities

The development of the Soviet economy in the second half of the 1970's differed qualitatively from earlier periods in that there was an absolute decline in the increments to capital and labor resources. In the second half of the 1970's (1976-1979) the average annual increment to employment in the state sector of the economy was 12 percent smaller than in 1971-1975, and the average increment to capital investment was 31 percent smaller. ¹ This is the first time that such a situation arose during the entire Soviet period (with the exception of the war years). Under these conditions the Soviet rulers were forced to reexamine both theoretical and practical approaches to economic growth.

Within the framework of a planned economy, the investment sphere is much more subject to direct control than labor resources, which are the result of long demographic processes. Therefore, the attention of Soviet economists is largely focused on improving the investment process at all stages. Among the factors that determine the nature of investment activity in the Soviet economy in the second half of the 1970's are the following:

-- the reduction in the size of the absolute increments to the gross social product. The average annual increment (in constant prices) declined from 45.9 billion rubles in 1971-1975 to 39.2 billion rubles in 1976-1979, or by 15 percent. ²

-- the reduction in the absolute increments to national income.

The average annual increment (in constant prices) was 17.6 billion rubles in 1971-1975 and 17.2 billion rubles in 1976-1979. ³
-- the stability of the relation between consumption and capital accumulation in national income (the share of accumulation was 26.3 percent in 1978)\textsuperscript{4} and the tendency to refuse to increase the share of accumulation to the detriment of consumption. Such a position is apparently a function of the realization of the dangers to the regime of any deterioration in the population's standard of living and of the need for economic incentives to stimulate labor productivity. However, in this regard it should be noted that, in contradiction to the directives of the 24th Party Congress, the output of the "means of production" has been growing more rapidly than consumer goods output. The output of means of production increased by 267 percent between 1965 and 1979, while consumer goods output increased by 239 percent.\textsuperscript{5}

-- the growing need to offset the decline in increments to the labor force through improved investment policies in order to maintain rates of growth of production.

-- the continuing redistribution of capital investment in favor of agriculture and, thus, the decline in the share of other branches of the economy. The share of all forms of agriculture in total capital investment increased from 23.4 percent in 1966-1970 to 27 percent in 1976-1978.\textsuperscript{6}

-- the need to allocate growing investments just to maintain existing output levels in connection with the declining growth of the output of fuels and raw materials, which is in turn due to the reduced possibilities for expanding the raw material base and the insufficient scale of geological-prospecting work.
the need for reducing the growing spatial disparity between the points of extraction of raw materials and fuel and their use. The amount of fuel transported from the east to European regions of the USSR increased from 130 million tons of standard fuel in 1970 to 360 in 1975. During this period the average length of haul for fuel increased by 22 percent, and total ton-kilometers of fuel shipments increased by 60 percent. 

Thus, on the one hand there is an obvious investment slump and a decline in the ability to invest, and on the other hand there is a growing need for a substantial increase in investment activity in order to slow the decline in the rate of economic growth.

2. The Decline in the Return on Capital (The Growth of the Capital/Output Ratio)

With the declining growth rates of basic factors of production, increased attention has been given to increasing the efficiency of their use. Soviet economists have created the concept of a special, intensive, type of expanded reproduction under the conditions of "developed socialism," which differs from the extensive type that is characteristic of socialism per se. In attempting to reflect reality, contemporary Soviet economic theory explains that the need for intensifying the reproduction process under conditions of "developed socialism" is due to the fact that the possibilities for economic development based on "extensive" factors, which previously resulted in high growth rates, are now exhausted. It follows from this that the only way to avoid a slowing of economic development is to increase the return on capital and labor.

However, in point of fact the return on both capital and on labor declined during the second half of the 1970's in comparison with the first half of the decade. The increase in national income per ruble of capital
investment for the economy as a whole in constant prices was 22 percent lower on the average during 1976-1979 than during 1971-1975. The average annual increment to produced national income per employee in material production (in constant prices) declined by 9.5 percent during this period.

Facing very limited possibilities due to the demographic situation for managing the economy by manipulating labor resources (more than 90 percent of the able-bodied population is employed), Soviet economic managers have to a large degree concentrated their efforts in the investment sphere. The increase in the intensiveness of production must be attained through a growth in labor productivity by supplying the labor force with ever more sophisticated and effective fixed assets. This means that the rate of growth of labor productivity must be greater than the growth of the capital/labor ratio. And this in turn implies an increase in the output/capital ratio. The intensification of production must be manifested in an increase in the return on capital or a reduction in the capital coefficient (capital/output ratio).

In fact just the opposite phenomenon is observed in the Soviet economy: the output/capital ratio is steadily falling both in the economy as a whole and in all of its branches.

The decline in the output/capital ratio in Soviet industry is an old trend which began back at the end of the 1950's. However, in the second half of the 1970's it took on a new scope. The output/capital ratio in industry, calculated as the increase in gross output per ruble of capital investment in industry (both in constant prices), with no lag considered, declined from 0.88 rubles in 1971-1975 to 0.56 rubles in 1976-1979, or by 36 percent.

It is possible that the decline in the output/capital ratio might have been compensated for by a reduction in current production expenditures. But
the facts refute this suggestion: the recoupment period of capital investment in industry increased from 5 to 11 years during 1960-1975 and it increased still further to 25 years by 1977, when it was three times greater than the established norm.¹¹

Nor can this trend in the output/capital ratio and the sharp jump in the investment recoupment period be explained by changes in the branch structure of industry. The share of branches with relatively low output/capital ratios has tended to decline, and there is no trend toward an increase in the share of branches with a relatively high ratio of current production expenditures to gross output.

The shift of extractive industry to the east also does not explain this phenomenon. The share of Siberia and the Far East in total national capital investment has remained practically stable over a period of many years at the level of about 15-16 percent.¹² Furthermore, the negative effects of the shift of industry to eastern regions on the output/capital ratio should in general not be exaggerated. Although the greater demands of the climate and other natural conditions are often emphasized, some favorable conditions in the east must also be taken into account—the larger coal seams in the coal industry, the richer ores in nonferrous metallurgy, and the better quality of timber in the lumber industry.¹³

There is a growing discussion in the Soviet economic literature about increasing ecological expenditures as a factor that is making new production capacity more expensive. However, this factor does not have a very significant effect on the capital intensiveness of production. Its share in the overall increase in the capital/output ratio in ferrous metallurgy, for example, is no more than 10-11 percent.¹⁴

The output/capital ratio depends to a certain extent on fluctuations in the utilization of productive capacities that were put into operation
earlier and that have no relation to investments made during the period being considered. This is especially significant in the Soviet economy since bringing new production capacity to full utilization can in some instances take years. This phenomenon is of particular importance during the period of extensive reconstruction of an industrial enterprise. It is not possible with available statistics to determine an output/capital ratio for industry as a whole or for its individual branches that is free of the distorting influence of this factor. However, data on the utilization of basic types of equipment in several branches of industry (electrical power, ferrous metallurgy, and cement)\textsuperscript{15} over a number of years do not reflect any deterioration in the utilization of productive capacities. It is unlikely that this is a factor underlying the decline in the output/capital ratio. Judging from these data and from trends in indicators reflecting the average number of shifts worked, the level of utilization of existing capacities has not changed substantially over time.

Thus, the share of newly activated fixed capital is declining, and the productivity of assets put into operation earlier is not showing any tendency to decline but has rather remained more or less stable. The decline in the output/capital ratio can, therefore, be explained only by an accelerating decline in the productivity of new assets.

3. \textbf{Two Basic Factors that Continuously Act to Increase the Capital/Output Ratio}

Two factors are inherent in the investment process in the USSR: a growth in the cost of new technology and equipment that is more rapid than the increase in its productivity, and an imbalance between the number of projects under construction and the material resources for carrying out this extensive construction program.
With respect to the first factor, there is a special directive in the "Basic Directions for the Development of the National Economy of the USSR during 1976-1980" adopted by the 25th Party Congress: "The most important requirement in developing new designs of machines, instruments, and apparatus must be to achieve the maximum economic effect while reducing their cost per unit of capacity" (my emphasis, B.R.).

The wholesale price indexes that are published and used in Soviet statistics on industrial output, including those for branches that produce fixed assets (the investment branches), show a favorable trend. The overall wholesale price index for all industry in 1978, with 1949=100, was 63. The corresponding indexes for the investment branches were 33 in machine-building and metalworking and 67 in construction materials. The price index rose only in the fuels and wood products branches. At the same time, the price index for the actual cost of construction-installation work also declined.

However, even in the opinion of some Soviet economists these data are not considered reliable. The price indexes are compiled on the basis of a narrow group of goods that are not representative of the entire volume of capital investment, and reductions in price are not common for the majority of new assets. Quite the contrary, investment output is characterized by an exceptionally high rate of price increases. It is precisely in branches of the investment complex (machine-building and construction materials) that a sharp and continuing increase in prices is taking place. In the authoritative opinion of V. Krasovskii, the source of price pressures in the Soviet economy is not fuel and raw materials prices but "... the most unregulated and uncontrolled change in prices in branches of the construction industry and investment machine-building."
The cost of the components of fixed capital—construction output and equipment—has increased steadily for many years (at least since the beginning of the 1960's), and this increase has been especially significant during the 1970's. The results of a study of trends in the prices of investment goods conducted by the USSR Stroibank showed that the increase was not less than 10 percent during 1971-1975. A single example that illustrates the scale of the phenomenon is that capital expenditures on the production of one ton of steel increased from 431.3 rubles during 1965-1970 to 586.1 rubles in 1971-1975 and to 760.5 rubles in 1976-1980.

Numerous data published in the Soviet press attest to the sharp increase in the cost per unit of capacity of equipment put into operation during the 1970's. Most common is the growth of the size and weight of equipment per unit of productive capacity. Thus, the conclusion may be drawn that there is a capital-using trend in the development of technology and equipment in Soviet industry, in which the growth in unit productive capacity has been exceeded by growing expenditures of resources.

The second continuing factor—the imbalance between the number of construction projects and the resources necessary to carry them out—is also a chronic phenomenon that intensified during the second half of the 1970's. While the rates of growth and the absolute increments to capital investment were declining, the overall estimated cost of newly begun industrial construction almost doubled in the period 1976-1979 as compared with 1971-1975. As a result the cost of all projects under construction was 8-9 times greater than the annual value of capital investment. This process is accelerating—the annual average value of uncompleted construction on productive projects increased by 34 percent between 1971-1975 and 1976-1978.
4. **Some Economic Characteristics of the Development of the Construction Sector**

A description of the current state of the investment sphere in the USSR would be incomplete without a look at economic indicators for the construction sector itself. The slowing of growth rates and decline in absolute increments that took place in the Soviet economy during the second half of the 1970's applies to this sector as well.

The average annual increment to output per worker in construction (output as recorded in Soviet gross social product accounts in constant prices per worker employed directly in construction-installation work) increased from 404.6 in 1966-1970 to 407.8 in 1971-1975, but declined to 210.0 in 1976-1978. The annual growth rate of fixed capital per worker (as a percentage of the previous year) increased from 6.8 percent in 1975 to 9.7 percent in 1978, and the annual growth rate of labor productivity in the corresponding years declined from 5.4 percent to 2.2 percent.

Thus, the return on fixed capital in construction is declining.

At the same time there has been a reduction in the increments to employment, especially in 1976-1978; the annual increase in employment (in thousands) was 266 in 1966-1970, 187 in 1971-1975, and 63 in 1976-1978. Given the trends noted, there should have been an increase in the average amount of equipment per construction worker. However, while fixed capital in construction increased in both absolute and relative terms during the second half of the 1970's, the increases in the amount of construction equipment were smaller. During the periods 1966-1970, 1971-1975, and 1976-1978, respectively, the average annual increases in the numbers of certain basic types of construction equipment were as follows (in thousands): excavators--6.8, 7.4, and 5.5; scrapers--1.8, 2.4, and 0.7; and bulldozers--6.6, 8.0, and 6.5. Only in the number of movable cranes was there a slight increase: 7.1, 9.6, and 10.0.
It is improbable that during 1971-1978 there was a significant increase in the unit productivity of construction equipment leading to a reduction in the number of machines needed. The contradiction between the continuing growth of the value of fixed capital (average annual growth rates of 12.8 percent in 1966-1970, 10.4 percent in 1971-1975, and 10.5 percent in 1976-1978) and the decline in the growth of the number of basic types of machines is very likely due to a sharp increase in prices of construction machinery that is not reflected in the Soviet price indexes. This leads to the conclusion that the amount of fixed assets per ruble of construction output is much lower in physical terms than in value terms.

The average current production costs in construction work, which decreased during 1971-1975, showed a tendency to increase during the second half of the 1970's.

5. Priority Investment in the Reconstruction of Existing Enterprises as the Main Means of Improving the Current Situation

The key idea of investment policy in the 1970's became to limit capital investment in the creation of new industrial enterprises and to redirect investment resources to increase productive capacities through the reconstruction, expansion, and modernization of existing enterprises. The path of "reconstruction" has been labeled in state and party documents as one of the main directions of economic policy, and it has become the object of a propaganda campaign. The voices of economists opposed to this all-encompassing emphasis on reconstruction, who call for seeking optimal proportions in the distribution of capital investments between the construction of new and the reconstruction of existing enterprises, are drowned out by the united proponents of reconstruction who see in it a clear advantage.
The scale of reconstruction has taken on such dimensions and the share of investment directed to it has become so great (more than two-thirds of all industrial capital investment), that it is fair to say that reconstruction has a decisive influence on the structure of investment and fixed capital, on the rate of turnover of capital expenditures, and on the pace and nature of technological progress in industry. The share of reconstruction in capital investments in individual branches of industry increased by the following amounts between 1970 and 1978 (in percent):³²

- electric and thermal power, from 20 to 32;
- ferrous metallurgy, from 60 to 81;
- chemical and petrochemical industry, from 45 to 64;
- machine-building and metalworking, from 63 to 77;
- wood and paper industry, from 57 to 74;
- construction materials industry, from 50 to 69;
- light industry, from 40 to 71; and
- food industry, from 66 to 73.

Only in the coal industry was there a reduction in the share of reconstruction due to the development of new coal deposits in eastern regions (the Kansk-Achinsk and others). It should also be taken into account that in the preceding decade the share of reconstruction in capital investment in all of these branches except construction materials either declined or remained stable.

The sharp increase in the number of industrial enterprises undergoing reconstruction led to a significant increase in their size. While the number of industrial enterprises increased very little between 1960 and 1975, the value of fixed capital per enterprise increased steadily and rapidly—from 2.5 million rubles at the beginning of the 1960's to more than 8 million rubles in 1975.³³
Although the stated goal of reconstruction is to reduce aggregate (capital and labor expenditures) the real concern of the economic leadership is to attain increases in output through reconstruction with lower relative capital expenditures than are required for new construction.

Before turning to an examination of the results of this policy, it is necessary to define "reconstruction." In this paper, as in the Soviet literature, this term is used in the broad sense, combining all forms of rebuilding and expanding existing enterprises. However, in Soviet planning and design, and in statistical accounts, three forms of developing existing enterprises are distinguished as alternatives to new construction: expansion (rasshirenie), reconstruction (rekonstruktsiia), and retooling (tekhnicheskoe perevooryzhenie).

In 1975 Gosplan and Gosstroy published the following definitions of these three forms in an attempt to encompass and regulate all the various types of work on rebuilding existing enterprises.

**Expansion**: The construction of second and later phases of existing enterprises on the basis of a new design, and also the expansion of existing basic production shops simultaneously with the expansion (increase in carrying capacity) of auxiliary and service facilities and communications. At the same time the technological level of the entire enterprise is raised and its economic operating indicators are improved.

**Reconstruction**: The complete or partial replacement of equipment and/or rebuilding of facilities without constructing new basic production shops or expanding existing ones. Reconstruction may be accompanied by the expansion and even new construction of auxiliary and service facilities.

It should involve the replacement of old equipment, the mechanization and automation of production, and the elimination of "bottlenecks." Reconstruction also includes the construction of new shops and facilities to replace those being liquidated when the old and new facilities are of the same capacity.
Retooling: Measures to raise the technical level of production without expanding the size of the enterprise. "Passive" components of fixed capital--buildings and structures--are essentially left untouched, but equipment is modernized, old machines are replaced with new ones, and new technology is introduced, i.e., primarily the "active" components of fixed capital are updated.

What are the essential ideas in these definitions? The formulation of "reconstruction" itself excludes the construction of new or expansion of existing shops and basic production facilities, except to replace equal capacities being liquidated. This requirement makes the definition of reconstruction itself devoid of any practical meaning.

The formulation of expansion is much more realistic. It is convenient because it erodes the boundary between expansion as such and the construction of actual new enterprises on sites adjoining existing facilities. This makes it possible to avoid the strict limitations placed on new construction, and branch and enterprise managers are taking advantage of this possibility to create new production facilities under the stamp of "reconstruction."

A condition that must be observed in doing this is that the newly created facilities must be spatially linked to the existing plant. However, nowhere--in none of the methodic or normative guidelines--is there any mention of permissible limits on the distance between the sites of the old and new facilities. They may be directly adjacent to each other or they may be separated by several miles, as was the case in the pseudo-expansion of the Zdolbunovskii and Katav-Ivanov cement plants, building #9 of the Krivoi-Rog metallurgical group, the Leninskii Komsomol automobile plant in Moscow, and many other enterprises.
Thus, a sort of hybrid has been developed from construction and reconstruction. The latter introduces an emphasis on augmenting the production capacities of industrial complexes that are already operating using infrastructure and raw materials supplies that are largely already in place, as well as the rebuilding of old facilities. But at the same time new facilities are also attached; new buildings, structures, and communications facilities are constructed based on new designs.

The restructuring of enterprises under the definition of "reconstruction" and "retooling" accounts for an insignificant share of total capital investment in existing facilities. Most of this total is allocated for "expansion." But this fact cannot be established from published statistical information since only data on the overall total for "reconstruction, expansion, and retooling of existing enterprises" is reported in the statistical handbooks issued by the Central Statistical Administration. Nonetheless, some fragmentary evidence gives an impression of the extent of reconstruction that does not involve the construction of new productive facilities. In 1974, of the total amount of capital investment in the reconstruction of existing industrial enterprises in Belorussia, only 15 percent did not involve the construction of new facilities.\(^{35}\) But it is precisely this form of reconstruction that is most effective from the standpoint of the established aims of this policy.

In economic circles there is an effort to disguise the fact that, in spite of state and party directives, true reconstruction is taking place in insignificant amounts. The predominant trend is toward a much more resource-intensive form of increasing capacity--new construction, spatially linked to existing enterprises and undertaken under the rubric of reconstruction and expansion.
Sometimes conflicting information appears, which reveals the true state of affairs. According to data of the Central Statistical Administration, the share of capital investment in reconstruction, expansion, and retooling of existing enterprises in ferrous metallurgy increased from 74 to 82 percent between 1972 and 1977. At the same time one of the directors of the state institute for the design of metallurgical plants, P. Shiriaev, stated that "... about 7 percent is directed toward reconstruction and 93 percent to new construction" (the reference is to the same period). The explanation for this contradiction is that the basic approach to increasing production capacity in ferrous metallurgy during the 1970's was the construction of new shops and production lines on sites adjoining existing plants. Plant-designer Shiriaev, using technical-economic design estimates, considers this type of investment as "new construction," while at the same time branch directors include it in planning and statistical materials as "reconstruction and expansion."

Substituting concepts leads to a substitution of meaning. This form of reconstruction is transformed from a means of economizing on investment resources to a very expensive form of increasing capacities.

A study of the effectiveness of capital investments in metallurgical plants during 1966-1980 done by the Central Economic Scientific-Research Institute of the RSFSR Gosplan showed that capital investments per ton of increase in output at new plants were about 55 percent of those for the reconstruction and expansion of existing enterprises. The authors of this study reached the conclusion that the branch had gone beyond the limits of economic effectiveness of the reconstruction and expansion of existing plants. Nonetheless, this form of increasing production capacities was included in all planning variants for the 1980's.
Branch directors, enterprise managers, planners, and designers who think sensibly realize that there are only negligible gains to be realized from the forms of resource-saving reconstruction defined under the headings "reconstruction" and "retooling." In some branches of industry there are no gains to be made. But it is important to branch directors and enterprise managers to include any variant of capital construction in the plan to attain an increase in productive capacity and to prove to departments that allocate capital investment and regulate its use that the variants proposed are the most economical and (of most importance) the least capital intensive. If there is a high-level directive to allocate capital investments primarily for reconstruction, then the proposals of branch and enterprise managers will be for reconstruction, even if in fact what is happening is the construction of a new enterprise adjoining an old one.

In order to understand the essence of the reconstruction of industry that is taking place in the USSR, it is necessary to examine the quantitative and qualitative aspects of how the physical plant of enterprises undergoing reconstruction is being updated within the framework of the basic aims that have been stated:

-- Updating must involve primarily the replacement of equipment and only to a minimal extent buildings and structures. It follows that the share of construction-installation work in total investment and the share of buildings and structures in total fixed capital must be significantly reduced. The share of equipment must increase correspondingly.

-- Equipment that is retired must be replaced by equipment that is more modern and capital-saving. It must make possible a reduction in current production expenditures and, thus, shorten the recoupment time of capital expenditures.
-- The period between the time when capital expenditures are made and when output increases begin must be shortened. Thus, construction time and the volume of uncompleted construction must be reduced. Let us look at how these goals are being realized.

6. Reconstruction and the Technical Structure of Capital Investment and Fixed Capital

Data characterizing the trend in the technical structure of capital investment are contradictory. According to official Soviet data reported in CEMA statistical handbooks the share of equipment is rising, but according to figures cited by some authors it is falling. Price trends differ for construction output and machine-building production, and this is a significant factor underlying changes over time in the technical structure of capital investment. A comparative analysis of these price trends for different components of investment would require a great deal of information and a separate detailed study, which is beyond the scope of this work. Therefore, our discussion will focus on one of the most authoritative scholars in this area, V. Fal'tsman, who carried out a study of changes in the technical structure of capital investment in the major branches of industry at the Central Mathematical-Economics Institute of the USSR Academy of Sciences. Comparing the trends of change in the share of capital expenditures on equipment and the share of reconstruction in capital investment for 1966-1970 and 1971-1975, he writes:

The growth of the share of expenditures on equipment in capital investment is usually associated with a change in the reproductive structure of investment—an increase in the share of reconstruction. However, analysis of changes in the reproductive structure for individual branches of industry reveals a different situation.
Fall'sman notes further that in all branches except machine-building the share of expenditures on reconstruction, expansion, and retooling grew substantially. At the same time the share of expenditures on equipment declined in four branches (ferrous metallurgy, machine-building, light industry, and food industry), and in all other branches this share either remained stable or increased negligibly.

The increase in the share of construction-installation work corresponds with the trend in the share of passive components of fixed capital. During the period 1955 to 1978, the latter fell from 51 percent to 48.4 percent; in 1970 it was 50.9 percent, and in 1976 it was 48.9 percent. 43

The decline in the share of passive components of fixed capital is explained by the drop in the share of structures (sooruzhenie)--from 21.2 to 19.1 percent during 1970-1978. There was no decline in the share of buildings, which is a major objective of reconstruction efforts. This share was 28 percent in 1950, 29.7 percent in 1970, 29.3 percent in 1975, and 29.3 percent in 1978. 44

It might be suggested that price factors influence the technical structure of fixed capital—the change in the shares of active and passive components is distorted by differing trends in the prices of machine-building and construction output. There certainly are indications in the specialist literature to the effect that the growth of prices of machinery has been substantially greater than the increase in the cost of construction output, and the share of equipment in fixed capital has, accordingly, increased. According to estimates of D. Palterovich 45 and V. Krasovskii, 46 the annual growth of the cost of equipment due to price increases in the 1960's was 2-2.5 percent. Judging from more recent literature the growth of prices on machine-building products has not slowed. 47 Consequently, if the effect of the price factor on the growth of the share of active components of fixed
capital were eliminated, trends in the technical structure would appear even less favorable.

Thus, the growing predominance of reconstruction in investment programs is not leading to an improvement in the technical structure of capital investment and fixed capital. Let us examine the reasons for this tendency.

First of all, do changes in the branch structure have an effect? An analysis showed that this factor does not influence the trend in overall indicators for industry of the technical structure of fixed capital. 48

7. **Reconstruction and the Renovation of Buildings and Structures**

Two factors hinder the reduction of the share of construction-installation work in capital expenditures and the share of passive components of fixed capital in Soviet industry.

The growth in the size of equipment and the scale of equipment assemblies:

The increase in the concentration of industrial production in the USSR has taken place as a result of the growth of the so-called "unit concentration" (agregatnoy kontsentratsii)--the increase of production capacities of equipment and assemblies--which is achieved in most branches of industry by introducing equipment of a much larger scale. This phenomenon is particularly apparent in branches of industry with a technology based on the use of large complexes of equipment such as metallurgy, chemicals, petrochemicals, construction materials, etc. According to estimates made by Ia. B. Kvasha, 49 the concentration of equipment complexes increased at an average annual rate of 5 percent during the 1960's. This process continued during the 1970's. The complexity and, thus, the cost of construction-installation work in building ever larger equipment complexes is further increased when work is done within existing enterprises.
The structure of construction-installation work itself has not remained stable. The share of installation work decreased by 13 percent in 1971-1975 in comparison with the previous five-year period. The share of construction work proper increased accordingly. Installation work is to a large extent associated with setting up equipment and equipment complexes. We may note, incidentally, that the practice in Soviet statistics of including installation work in construction output is not very appropriate. An increase in the share of capital expenditures on construction as the share of reconstruction rises contradicts the desired direction of change in the technological structure of investment and increases capital expenditures per unit increase of capacity attained by reconstruction.

The increase in expenditures on construction is explained by the need for a radical rather than partial (as planned) renovation of passive components of fixed capital in the course of reconstruction. This renovation takes place in two directions.

- First is the construction of new buildings and structures during the course of reconstruction.

- Second is the huge amount of work on the repair, alteration, and modernization of industrial facilities that is growing with the increase in the volume of reconstruction work and that is to a significant extent unplanned, unregulated, and poorly reflected in Soviet statistical accounts. The scale of this phenomenon was revealed at the time of the general inventory of fixed capital in 1972. It was determined then that when buildings and structures were rebuilt and machinery and equipment reinstalled during the reconstruction of enterprises (the expansion of buildings, increasing their height, replacing crane supports, etc.) the parts
razed were in many cases not written off since the assets continued to be formally carried on the books. The general inventory discovered billions of rubles of this sort of capital expenditures not written off.\textsuperscript{51}

The increase in the extent of renovation of the passive components of fixed capital, which was unavoidable given the massive reconstruction of enterprises during the 1970's, is explained by a peculiarity of the investment process in Soviet industry. This is that in spite of the high rates of growth and thus the extensive updating and renovation of fixed capital the deterioration of passive components worsened.

The retirement and scrappage of passive components due to physical wear and tear, judging from available statistics, did not exceed 0.5-0.8 percent of their average annual value during the 1970's.\textsuperscript{52} Even in the mid-1930's when about 50 percent of industrial capital investment went for the construction of new enterprises,\textsuperscript{53} the share of old production buildings constructed before the revolution was about 60 percent, and the share built in the previous century was 30 percent.\textsuperscript{54} Furthermore, it should be taken into account that the replacement value of industrial fixed capital declined by 7 percent during the years of the revolution and the civil war.\textsuperscript{55}

The effort to limit capital expenditures on buildings and structures as much as possible was always a characteristic feature of Soviet investment policy and always took an extreme form. It was reflected even in definitions and terminology: in the early 1930's the terms "unproductive capital" (neproduktivnyi kapital) and "productive capital" (produktivnyi kapital) were used for buildings and structures and for equipment, respectively.\textsuperscript{56} Subsequently they were transformed into "passive" and "active" fixed capital. These very designations indicate the need to reduce nonproductive, passive capital in any way possible. No effort is even made to determine the optimal
correlation between the passive and active components, which naturally cannot be the same in all climatic zones and in production facilities with different technologies. Only capital investments that achieve a minimum share of expenditures on passive components (in comparison with previous designs) are considered efficient.

Such a policy pursued over a period of 60 years yields its results; the striving for maximum savings on buildings and structures in constructing new industrial facilities led later to excessive expenditures on their repair, reconstruction, and modernization, which grew especially rapidly during the 1970's in connection with the massive reconstruction of enterprises.

The rebuilding, expansion, and modernization of buildings during reconstruction is not only carried out on the basis of capital spending but also consumes depreciation allowances for capital repair. In 1976 expenditures on capital repair in industry were 144 percent of depreciation allowances for this purpose, and in a number of branches this ratio exceeded 200 percent. At the same time depreciation allowances for capital repair of equipment were underutilized by 18.4 percent.57

In addition to physical wear and tear, there are other quite natural reasons for rebuilding industrial buildings and structures, especially the need for modernization in the light of technological progress. The development of such branches of industry as radiotechnical, electronic, precision machine-building, instrument building, and others has resulted in a sharp increase in the demands made on industrial buildings by the design and engineering of equipment, and these demands are growing rapidly. In old buildings, due to the technological requirements of a whole series of production processes, it became impossible to produce many types of products with sufficient precision and reliability. The comprehensive
mechanization and automation of production processes and the introduction
of assembly-line methods in the process of reconstruction required changing
the very principles of the overall layout of industrial buildings. The
need for increasing productivity and improving working conditions resulted
in a change in the technical characteristics of buildings--improved lighting
of workplaces, ventilation, etc. All of this together sharply increased
the role of passive components of fixed capital in carrying out the
reconstruction of facilities.

As a result of the strict limitations on investment in the rebuilding
of passive components of fixed capital, construction work undertaken during
reconstruction does not fundamentally solve the problem and lays the
foundation for still more expensive future reconstruction. Reconstruction
projects at enterprises follow one after another, and it would be natural
to carry out the reconstruction of passive components not only from the
standpoint of current needs. The construction of any sort of addition or
"mini-building" makes it possible to install new equipment immediately.
But each subsequent stage of reconstruction turns out to be more and more
expensive and difficult since continually locating new buildings at the
same enterprise and rebuilding existing ones becomes more complex, and the
scheme of technological links and transport ties becomes more and more
confused. The next alteration of buildings, structures, and pipelines
requires even more additional investments.

The only solution that might radically change the situation in the
future at many enterprises undergoing reconstruction and which apparently
could be realized (it has already been implemented in recent years in
priority branches of industry such as instrument building, radiotechnical
industry, and others) is the construction of prefabricated buildings at
large enterprises. The construction of prefabricated buildings, in turn, involves solving some extremely complex questions. One problem that arises is that of siting the new building, which must be drawn into the overall technological scheme of the enterprise. A new building requires space that, near the primary production shops, may be heavily used by communication lines, power facilities, and other supporting structures. Thus, the construction of such shops is possible only with the radical restructuring of the main technological part of the enterprise. And this in turn requires one-time expenditures that are incomparably larger than with ordinary reconstruction involving partial alterations of buildings. Furthermore, there would be a need for investments in the creation and retooling of existing enterprises in the related branches of the construction industry and construction materials.

The very idea of a steady decline in the passive share of fixed capital is not viable. It stands in contradiction to technical progress, which is causing fundamental changes in the functional load on buildings and structures.

According to the logic of things, the improvement of the technical structure of fixed capital should have involved not a contraposing but a blending of the active and passive components of fixed capital. The distinctions between them are in practice being eroded. A growing number of the structural components and types of engineering equipment of buildings perform some sort of active technological function, for example, ceiling braces that support cranes, air conditioning systems, etc. With the development of chemical and other industrial processes, the significance of structures such as settling basins, thickening tanks, cooling towers, etc., and various pipelines, conveyer belts, gas flues, and gas purifiers has
increased, i.e., assets that have a direct technological function but are
considered "structures" in Soviet statistics only because of their
construction origins and thus fall in the category of passive fixed capital.
Structures in the fuel and mining branches of industry play an exceptional
role in production technology. Classifying such structures as oil wells
and mine shafts in these branches as passive fixed capital is totally
inappropriate.

In objectively evaluating the trend in the technical structure of
capital, it should be noted that the increase in the passive share does
not in the least mean a reduction in economic efficiency. It may be just
the opposite. The effort to minimize the size of buildings leads in many
cases to a decline in production efficiency. When, for example, a cement
plant was constructed in the Urals with open-air klinker ovens (as was done
in Uzbekistan), fuel expenditures increased sharply in the winter because
the oven walls cooled down too much. Capital investments per ton of
cement were lower than in comparable plants in the Urals where ovens were
enclosed. But the growth in production expenditures due to fuel costs
turned out to be so substantial that the overall effectiveness of capital
investment in these plants could not withstand comparison with normative
coefficients.

Thus it is fair to conclude that the increase in the scale of the
rebuilding and modernization of industrial structures during the reconstruction
of Soviet industry is a quite natural phenomenon. But this also results in
the increase in the amount of construction-installation work, the cost and
labor-intensiveness of which is much higher in existing enterprises than in
the construction of new ones. Standard designs are not used for reconstruction,
the level of mechanization is much lower, and prefabricated components are
used to a lesser extent. Labor expenditures in the reconstruction of automobile plants, for example, are 60 percent higher than in the construction of new plants.\textsuperscript{58} Expenditures of materials are higher by a similar amount.\textsuperscript{59} For industrial construction in the machine-building and metalworking branch, the labor/output ratio for construction-installation work in the expansion and reconstruction of existing enterprises is 1.23-1.35 times higher than in the construction of new enterprises.\textsuperscript{60}

Another not unimportant factor that contributes to the higher cost of reconstruction work and lengthens project completion times is the insufficient number of construction-installation enterprises undertaking such work because they have no material incentives to do it. Therefore, the reconstruction of buildings and structures is most often carried out by small-scale repair-construction divisions of the enterprises themselves, and they are under-capitalized and operate with low labor productivity. In spite of the efforts to keep this sort of "in-house" work to a minimum, its share in the overall amount of construction work declined by only two percentage points between 1970 and 1978 (from 14 to 12 percent).\textsuperscript{61}

In recent years there has been some progress in this area: in several large production associations and in republic ministries, specialized repair-construction trusts are being formed to carry out repair-reconstruction work. However, this progress is proceeding very slowly.

In the light of all the above factors, it seems justified to conclude that one of the consequences of expanding the extent of reconstruction in industry is to raise the share of construction in capital investment, and this leads to the relatively more rapid growth of buildings and structures than of equipment in fixed capital. In other words, the results attained directly contradict the stated goal.
8. **Reconstruction and Updating Equipment**

Here we will examine two questions:

-- Is the stock of equipment being modernized more rapidly in conjunction with the emphasis on the reconstruction of existing enterprises rather than the construction of new ones?

-- Is retired equipment being replaced by equipment that is more modern and economically efficient?

Under conditions of declining rates of growth of fixed capital, the renewal of the stock of production equipment must to an even greater degree be accomplished by a more rapid rate of retirement. The higher depreciation rates introduced in 1975 work in this direction.

The Central Statistical Administration does not publish information that makes it possible to judge the real level of equipment retirements. First, data are given only for total retirements for highly aggregated groups of assets, of which equipment accounts for less than 70 percent. Second, the trend in retirements has been published separately for active and passive fixed capital only since 1973.

A more reliable basis for judging the trend in equipment retirement is the study of this question by Kvasha,\(^6^2\) which used data of the general inventories of fixed capital in industry in 1962 and 1972. Kvasha, who is a very qualified specialist, compiled a sample of various types of industrial equipment that was not only representative but unique in the history of Soviet industrial statistics. It included more than 35 percent of all equipment in Soviet industry. As a result of his calculations the retirement coefficient for 1962-1971 was determined to be 4.4 percent per year in terms of number of machines and 4.3 percent in terms of value. Taking into account some additional factors, Kvasha revised this average coefficient to 4.2 percent.
Kvasha's results refute the general impression about the insufficient level of retirement of equipment in Soviet industry. Other researchers, basing their calculations on manipulations of data in Soviet statistical handbooks, obtain a significantly lower coefficient of retirement--2.1 or 2.5 percent. The reason for the discrepancy is that Kvasha, working with concrete plant-level statistics, took into account not only the retirement of equipment for reasons of physical wear and tear (for which there are data in statistical handbooks) but also the equipment retired that had not yet exceeded its service life but was retired in the process of reconstruction.

The fact that a large amount of unamortized equipment is retired in the process of reconstruction is confirmed by the results of a study made by the experimental scientific-research institute of metal-cutting machinery, which encompassed various machine-building plants with a total of 228,000 metal-cutting machines. The study showed that about 40 percent of the machines retired were less than 15 years old, i.e., less than the standard service life, while 23 percent were less than 10 years old. In the group "less than 10 years," about 60 percent of the machines were written off not because of physical wear and tear but because they were obsolete, unsuitable for production, or of an inappropriate design, i.e., for subjective reasons. Note the following paradoxical fact: 24.6 percent of the machines in the "less than 10 years" group were written off because of obsolescence, while the corresponding proportion for all groups over 10 years was only 7.1 percent. When equipment that does not exceed the standard service life is written off during reconstruction, "obsolescence" is a convenient justification for writing it off.

It is unlikely that obsolescence is the real reason for writing off equipment that is not very old given the strict limitations on the amount
of new equipment and the existing correlation between the productivity and cost of new models—with each one percent increase in the productivity of new machines the price increases 2-4 percent. The extent to which fundamentally new electric, electrochemical, and laser methods of metal-working are used is expanding very slowly. Only 0.2-0.3 percent of all machines had numerically programmed controls at the beginning of the 1970's. Therefore the share of equipment retired because of obsolescence should be insignificant.

Enterprises are trying under the flag of reconstruction to use any means to write off as much equipment as possible (or sell or transfer it to other enterprises) and to receive as replacements new equipment financed by investment flows. Savings on repair more than offset the increased depreciation charges and payments for fixed capital associated with introducing new and more expensive equipment.

These conclusions are supported by studies done by V. Fal'tsman at the Central Mathematical-Economics Institute that involved calculations of the actual indicators of trends in the growth and renewal of the country's stock of equipment. The replacement coefficient (the share of the total value of equipment that is replaced) was 4.9 percent for Soviet industry in 1971-1975. We can assume that during the time period covered by Fal'tsman's calculations (compared with Kvasha's period) the rate at which equipment was retired increased.

A study of the structure of investment flows for equipment in the 1970's showed that the share of expenditures for replacement for various types of equipment was (in percent): hoisting-transporting equipment--52.0, metallurgical equipment--52.9, drilling equipment--66.3, chemical equipment--35.0, and instruments--39.2. Thus roughly half of equipment goes to replace withdrawals.
In sum, the growth of reconstruction leads to more intensified replacement of equipment. Let us try now to examine not the quantitative but the qualitative aspect of updating the equipment stock: to what extent is new technology used in replacing equipment, and does the newly installed equipment make possible lower capital and current production expenditures?

The possibilities for replacing discarded equipment with new types of machinery decreased in absolute terms during the second half of the 1970's. According to official Soviet statistics the number of models of new types of equipment developed on the average each year declined by 7 percent during 1976-1978 as compared with 1971-1975.\(^6^8\) At the same time the total output of machine-building increased. Apparently, the flow of new technology into industry is declining at the same time as machinery is being replaced more rapidly. It should also be considered that newly constructed enterprises have priority in receiving new, more productive equipment,\(^6^9\) and the replacement of equipment retired during reconstruction largely involves traditional and improved equipment. The new equipment in many instances has no technical or economic advantages over that which it replaces.\(^7^0\)

The problem is that the number of types of various machines produced is very limited; the parameters of equipment are overly standardized and not oriented to the individual needs of any given enterprise. And the development of unique, non-mass-produced types of equipment is an extremely complex matter under conditions of the Soviet planned distribution system for allocating orders to enterprises. The creation of non-mass-produced equipment by enterprises themselves has reached substantial proportions as the 1972 census of equipment showed.\(^7^1\) But the technical characteristics of such equipment are, as a rule, much lower than for similar types produced at specialized machine-building enterprises. It is primarily enterprises or construction projects that are especially important to the national
economy--above all, of course, the defense industry--that have the possibility of submitting orders for large-scale non-mass-produced equipment. Therefore, many enterprises are faced with a choice: either introduce mass-produced equipment into the framework of the existing enterprise, rebuilding structures to accommodate it, and reworking the system of communications and power supply, or partially modernize existing equipment, retaining the old technological base, but trying to increase its productivity. In cases where reconstruction requires updating large stationary machines or assemblies, many enterprises prefer just this approach. The extent of modernization of equipment is systematically growing. The average number of units of equipment modernized in industry were (in thousands) 135 in 1966-1970, 146 in 1971-1975, and 159 in 1976-1978.72

The process of updating equipment in reconstructing an enterprise largely involves retirement and replacement with new models for general types of production equipment and the partial modernization of specialized basic technological equipment that is specific to a particular type of production. Such modernization leads primarily to an increase in technical measures of productivity (e.g., output per hour), but does not have a positive effect on improving other economic indicators.

As noted above, the branch of industry with the highest share of capital investment in reconstruction of existing enterprises is ferrous metallurgy (over 80 percent). What sort of possibilities are there for reconstruction involving the introduction of fundamentally new equipment and technology in this key branch of heavy industry, whose lagging development hinders the entire Soviet economy?73 Characterizing technological innovations in production, the well-known Soviet specialists in metallurgy A. Vertman and E. Kalinnikov note that of the two most significant innovations
in the branch developed by Soviet scholars in 1950 (the continuous steel casting process) and in 1960 (combining continuous pouring with rolling), as of 1974 not one was introduced into production, and even development under industrial conditions had not begun.\textsuperscript{74} The authors believe that the reason for the low level of development and introduction of new technology in the branch is the "underestimation of the role and insufficient development of fundamental research." A comparison they make is evidence of this: only 0.5 percent of those employed in ferrous metallurgy in the USSR work in the sphere of scientific research, while in the Krupp firm of West Germany the corresponding share is 3 percent.

Certainly many examples of the development and introduction of new types of equipment and new technologies can be cited in such high-priority branches of industry as oil and petrochemicals, gas, and instrument building. But they do not set the general tone. The more typical situation is that in ferrous metallurgy.

Only in those cases when an increase in capacity at existing enterprises is attained through a radical change in technology and production equipment is there a tangible reduction in capital and current expenditures per unit increase in output. Then the cost of rebuilding buildings and structures, expanding production floor-space, communications, and the transportation network, and constructing new shops is recouped. Soviet economists also make this point.\textsuperscript{75}

Capital expenditures to increase the unit productivity of equipment in Soviet industry are growing systematically. And they are growing not only in cases where higher productivity is accompanied by improvements in the technical-economic and ergonomic parameters of equipment, but also in cases where no such improvement takes place. At the same time in many instances
the weight of equipment is growing at a faster rate due to the enlargement of models.\textsuperscript{76}

Thus, the more frequent case is the extensive development of equipment, which makes it possible to expand production capacities although reducing economic gains in the form of lower capital expenditures. Let us explain this with an example.\textsuperscript{77} According to data of the state institute for the design of heavy machine-building enterprises, with an increase in the capacity of power-blocks of thermal power stations from 25,000 to 50,000 kilowatts, the cost of equipment per kilowatt of capacity was reduced by 29 percent, while with an increase in capacity from 200,000 to 300,000 kilowatts, the reduction in relative expenditures on equipment was only 3-5 percent and relative expenditures on electric power equipment remained unchanged.

Such instances of diminishing savings of capital expenditures with increasing capacity are characteristic of the development of equipment in many industrial branches: chemical, food, construction materials, and others.\textsuperscript{78}

The effect of the introduction of new equipment and technology on reducing current production expenditures in Soviet industry as a whole can be judged from changes in expenditures per ruble of commodity output in industry, which were (in constant prices, as a percentage of the previous year): -1.0 in 1970, -0.7 in 1975, and -0.4 in 1978.\textsuperscript{79} In examining the trend in the change in expenditures for industry as a whole, it should be kept in mind that changes in the branch structure of industry had no effect (as noted above).

Characteristically, during 1975-1978 the share of wages in the structure of expenditures on the production of industrial output changed from 14.6
to 14.8 percent and the share of fuel and power remained unchanged, while depreciation increased from 6.4 to 7.1 percent. The structure of expenditures, although it is approximate, reflects the trend of the influence of technical progress on the economy.

The gains realized in the form of a reduction in the enterprise cost of production as a result of the updating of the production apparatus are decreasing.

9. **Changes in the Technical Level of Active Fixed Capital as Measured by Electricity Use**

On the basis of isolated examples it is easy to draw mistaken conclusions about an extensive and varied process like the renewal of the stock of equipment in Soviet industry. There can be no realistic indicators for directly evaluating changes in the technical level of equipment on such a massive scale. This can be done only with the aid of indirect characteristics, but there is no such aggregate indicator in the Soviet literature or statistical sources.

One possibility for characterizing the change in the technical level of the entire complex of industrial equipment is to examine the trend in the "coefficient of electricity use of active fixed capital"—calculated as the ratio of electrical energy consumed in industry to the value of active fixed capital in constant prices. The use of this coefficient is based on the following premise: the greater the ratio of energy consumed to fixed capital, the more technically progressive, all other things being equal, is the production apparatus. The mechanization and automation of production and the transfer of the control and regulation of production processes to systems of instruments are reflected in the more rapid growth of electric power consumption than of the active component of fixed capital. Note also that 70-75 percent of all electrical energy used in Soviet industry is
consumed in power processes, and this share has tended to increase during the 1970's. The share of electrical energy expended on technological needs (high-temperature, low-temperature, electrochemical, and other processes) amounts to about 25-30 percent and has shown a corresponding tendency to decline.\(^8\)

During the period 1940-1970, the coefficient of electricity use of active fixed capital showed an increasing trend.\(^8\) In the 1970's there was a clear trend to decline:\(^8\)

\[
\begin{array}{ccccccc}
0.0612 & 0.0712 & 0.0548 & 0.0521 & 0.0510 & 0.0494 \\
\end{array}
\]

However, the interpretation of this coefficient should not be oversimplified. Its use as an indicator of the technical level of fixed capital may raise the following questions:

-- has a shift in the branch structure of industrial fixed capital in favor of branches that are larger users of electric energy had an effect on the trend in the overall coefficient for industry?

-- has a reduction or increase in the intensiveness of use of electric energy-using equipment distorted the objective nature of the relation of energy use to fixed capital?

-- does the trend of fixed assets in value terms correspond to the trend in their productive potential?

Let us examine each of these factors in turn.

The branches with the highest levels of electricity use relative to fixed capital are ferrous metallurgy, construction materials, and the pulp and paper industry. The coefficients for this group of branches are 4.4 to 6.2 kilowatt-hours per ruble a year, while the coefficients for machine-building and the chemical industry are 2.4 to 2.8.\(^8\) A ranking
of branches by their shares in all electrical energy used in industry shows ferrous metallurgy first, machine-building second, and the chemical industry third. The share of ferrous metallurgy in industrial fixed capital declined during the 1970's, as did the shares of the two other most intensive users of electrical energy—construction materials and paper and pulp. The share of the chemical industry remained almost unchanged, and only the share of machine-building grew. In sum, the branch structure of fixed capital did not exert any significant influence on the trend in the overall coefficient of electricity use relative to fixed capital for industry.

During the 1970's for industry as a whole the number of hours of use of the installed capacity of electric motors and electrical apparatus used in industrial processes changed very little, i.e., the intensiveness of use of electric energy-using equipment remained at essentially the same level.

It is much more difficult to answer the third question since we need an indicator that at least indirectly characterizes the aggregate productive capacity of industry. In the author's opinion, the overall capacity of electric motors in use in industry may serve as such an indicator. The possibility of using this indicator for Soviet industry was established on the basis of extensive statistical material by Kvasha. There is a close correspondence in the growth trends of active fixed capital (in constant prices) and the capacity of installed electric motors which supports the conclusion that fixed capital in constant prices satisfactorily reflects industrial production capacity.

Thus, there are grounds for using the trend in the coefficient of electricity use of active fixed capital as an indicator of overall change in the technical level of these assets. And judging from the trend in this indicator, the qualitative level of active fixed capital introduced lagged behind its quantitative growth. This phenomenon was not apparent in earlier years.
10. **On the Results of Reconstruction**

In itself the idea of reconstruction, considered as the technical retooling of existing enterprises on a more modern basis making it possible to increase production and reduce costs with relatively low capital expenditures, is quite positive and commonly accepted. It is particularly appropriate in a period of declining investment growth. But this idea in its pure form must be distinguished from its implementation in the concrete conditions of the current state of the Soviet economy.

In establishing the advantages of reconstruction and the need for its further development, the leaders of the Soviet economy cite foreign, and above all American, experience. Academician Khachaturov, for example, in a monograph published in 1979,88 carefully noted the unfavorable aspects of reconstruction but argued nonetheless in the following way for the need to expand it: "The share of reconstruction in capital investment in our economy is growing, but it is still lower than in developed capitalist countries, above all in the USA."

Data on the amount of investment in reconstruction in industry in the USA that are used in Soviet sources are taken primarily from the annual McGraw-Hill survey of business plans for new plant and equipment. However, the data given in these publications in this author's opinion do not correspond to data of the Soviet Central Statistical Administration on the amount of capital investment in "reconstruction, expansion, and retooling of existing enterprises" either according to definition or to the methodology of distributing capital expenditures. But even if these data are used, expenditures on modernization and replacement did not exceed 56 percent of the total amount of investment in manufacturing industry in the USA in 1976-1978.89
What can there be in common between the reconstruction of industrial enterprises in the USSR and the USA? They have nothing in common with respect to either the material, technical, and construction base, or the method of carrying out reconstruction, or the availability of labor resources. In the USSR the primary aim of reconstruction is to increase the volume of output, while in the USA it is to improve or change qualitative characteristics or to reduce production costs. In the USSR the share of capital investment in equipment and, correspondingly, the share of equipment in fixed capital in 1975 was 33 percent; in the USA it was 87 percent. Thus, the character of production processes, the technical composition of capital, and the availability and level of technical progress in producers goods are so different in the two countries that comparison makes little sense.

Together with difficulties of an economic nature, organizational and methodological problems that arise in the planning of reconstruction work should also be mentioned. These problems are connected with the impossibility of standardizing the varied types of reconstruction of enterprises that arise due to the unique conditions of each individual plant or factory. Attempts to develop a system of norms for expenditures of capital investments and other resources per unit increase in capacity from reconstruction have led nowhere. There is a lack of coordination in the basic methodological guidelines. To date there is still no fixed definition of the criteria of economic effectiveness for reconstruction. And without a methodic and normative base—the fundamental instrument of planning—attempts to regulate and control capital investments in existing production facilities and to evaluate the economic benefits of such investments prove unsuccessful.

In putting a stake in reconstruction in forming their investment policy, Soviet planners did not take into account the fact that it would encompass
such a large share of not only the active but passive components of fixed
capital. The maximum permissible coefficient of renewal of assets under
reconstruction according to guidelines of the Institute of Economics of the
Academy of Sciences is 0.5. However, in practice this coefficient
frequently reaches 0.8.

Generalizing the experience of reconstruction of industry in the USSR,
a leading Soviet specialist in the economics of capital investment,
academician Khachaturov, wrote in the work cited above: "Reconstruction is
effective when the replacement of equipment with more modern equipment does
not require substantial and expensive construction-installation work."

Though one may agree with this thesis, in light of the facts discussed
above it is impossible to consider the reconstruction that has been carried
out in the Soviet Union effective.

11. Reconstruction and Changes in the Structure of
Capital Investment

A natural consequence of the reinvestment process taking place in
Soviet industry, which is of great significance because of the number of
enterprises involved, is the restructuring of industrial capital investment:
the growth of the share of expenditures on replacement and, correspondingly,
the reduction in the share of net capital investment—for expansion.

Misgivings about this correlation between net new investment and
replacement investment during a period of declining rates of economic
growth began to appear among Soviet economists especially in the early
1970's. Given the decline in rates of growth of gross social product and
national income (and now declines in absolute increments as well) and the
stabilization of the share allocated for capital accumulation, they have
studied the possibilities of using depreciation payments for expanding the
production base. All the more so since such a use of depreciation payments corresponds fully with the Marxist scheme of reproduction. And there is growing interest not so much in the distribution of capital investment between "net" and "compensatory" as in determining what portion of total depreciation allowances can be used not for replacement but for the expansion of fixed capital.

Just this effort to gain an understanding of economic processes when greater significance is given to depreciation allowances as a source of expanding the economy explains the growing interest in work done by E. Domar in the early 1950's and the attempts to use his work as a starting point in developing a new concept. The essence of this concept is that it is by no means necessary that a reduction in investment out of national income must lead to a decline in rates of economic growth. The decline in the growth of capital investment resulting from reduced rates of growth of (and absolute increments to) national income can be offset from the excess of depreciation allowances over requirements for replacing fixed capital each year.

This idea is supported using a model developed by Domar. An important prerequisite of the model, which makes it possible to apply it to the Soviet economy, is the assumption of straight-line depreciation with no scrap value. Soviet economists have introduced into Domar's model the condition that, unlike traditional models of economic growth where depreciation allowances (D) are equal to real replacement (R), depreciation allowances serve as an element of capital accumulation. In the interpretation of Soviet economists, Domar's model establishes the mathematical relation between the growth of the "final product" (the sum of national income and depreciation) and the share of net investment (G - D, where G is gross investment) in national income.
The growth of the final product is proportional to the accumulation of fixed capital financed from both national income and depreciation. Therefore, the capital coefficient in this model is defined as \( v = \frac{(G - R)}{\Delta P} \), while in traditional growth models this coefficient is equal to \( \frac{(G - D)}{\Delta (P - D)} \), since the effect of increasing output is related only to net investment out of national income.

Soviet economists focus their attention on excess depreciation allowances used for growth \((D - R)\). They arrive at the optimistic conclusion that the value of \((D - R)\) is growing and that the growth of fixed capital will increase as a result, compensating for a reduction in the possibilities of financing capital investment out of national income.

Is this feasible? The equations in Domar's model are essentially functions of the product of the service life of assets \(r\) and the rate of growth of capital investment \(m\). Given constant prices of fixed capital, the structure of gross capital investment depends only on two independent variables, \(r\) and \(m\). However, as shown above, the price of fixed assets in the USSR is increasing. Domar explained that under conditions of increasing prices of fixed assets the disparity between \(D\) and \(R\) is reduced, i.e., a larger part of depreciation allowances is used for purposes of replacement than is the case when prices are constant. Changes in \(r\) and \(m\) are acting in the same direction in the USSR: the service life of producers goods is being reduced in connection with the 1975 reform of depreciation rates, and the rates of investment, like their absolute increments, are also declining. The massive demand for unamortized fixed assets aggravates the reduction of the gap between \(D\) and \(R\). Thus, calculations based on an increase in \((D - R)\) are unfounded, and the possibility of increasing investment from depreciation allowances is not growing but, quite the opposite, declining.
According to calculations made using the real level of replacement estimated below and data on depreciation allowances in current prices, the ratio of actual expenditures on replacement to total depreciation charges (in percent) has been increasing as follows: 41 in 1970, 48 in 1975, and 64 in 1978. If it is also taken into account that the prices of the fixed assets used as replacements are substantially higher than the book value or the replacement value (as a result of the 1972 revaluation) of the replaced assets, then the gap between D and R is even smaller. (D - R), as a source of net investment, decreases in direct proportion to the acceleration of price increases on the output of investment branches and the reduction of the rate of investment growth.

Without pretending to achieve great accuracy, we will try to break down total capital investment into net and compensatory investment. In order to determine R, we will use the value of the coefficient of replacement of equipment obtained by Fal'tsman for industry as a whole during 1971-1975--4.9. This coefficient, as mentioned above, seems to be the most reliable since it was calculated on the basis of firm-level data on equipment balances. The value 4.9 was determined as the average for 1971-1975. But in 1975 a reform of depreciation was instituted, as a result of which depreciation allowances for renovation for industry as a whole increased by 40 percent, and the average service life of productive fixed assets in industry was reduced from 25.6 to 21.3 years or by 16.8 percent. The rate of retirement of fixed assets did not increase to an extent corresponding to this reduction in service life, but it did increase. There is a significant gap between the theory and practice of depreciation in the USSR--between its accounting and actual aspects. A financial base for speeding up the replacement of equipment is being created. However, it does not correspond to physical
resources: balances of the production and distribution of the output of investment branches do not allow a sufficient quantity for replacement. Just this is the reason for the paradoxical situation that service life was reduced while the share of fixed assets retired due to wear and tear (according to official statistics) increased only slightly: 1.4 percent in 1974, 1.6 in 1975, and 1.5 in 1976. This is true of both active and passive components of fixed capital. But, as noted above, official statistics do not reflect the real retirement of fixed capital. After the introduction of new depreciation rates, it must have speeded up since the consequences of writing off unamortized assets during reconstruction became less painful for enterprises. It should be correct to assume that, given all of the circumstances discussed, the coefficient of replacement of equipment increased from 4.9 in 1975 to at least 6.0 by 1978. At the same time, given the difference of 0.7 percentage points between Kvasha's data, which relate to 1962-1972, and Fal'tsman's for 1971-1975, we will use a coefficient of 4.2 for 1970. With these coefficients of equipment replacement of 4.2, 4.9, and 6.0 for 1970, 1975, and 1978, respectively, we can determine the share of capital investment in equipment that is used for replacement.

It is more difficult to determine the replacement share of capital investment in passive assets. However, it seems possible to do this on the basis of the relation between active and passive components in the overall amount of assets retired. As already mentioned, data of this type that are published in the statistical yearbooks do not reflect the true state of affairs. According to estimates of the deputy director of the Institute of the Economics of Construction attached to the Moscow Engineering-Construction Institute, R. Merkin, the share of buildings and
structures in the total value of fixed capital retired in machine-building in 1970 was 27.2 percent. As an indication of the lack of correspondence of the official data on the retirement of passive assets to the real situation, the share of buildings and structures retired due to wear and tear in machine-building in 1973 (the first year for which such data were published) was reported to be only 2 percent.

In branches of the construction materials industry the actual share of passive assets withdrawn during 1969-1972 was 30-33 percent.

As stated above, the share of passive assets in the total value of capital retired increases proportionately with the expansion of the scale of reconstruction. On this basis, we will assume the following hypothetical relations of passive to active assets in fixed capital retired: 30-70 for 1970, 40-60 for 1975, and 45-55 for the end of the 1970's.

Calculations of the expenditures on replacement of fixed capital retired are given in table 1.

| Table 1. CALCULATION OF ACTUAL CAPITAL EXPENDITURES ON REPLACEMENT |
|---------------------------------|--------|--------|--------|
| 1. Industrial fixed capital in constant prices (billions of rubles) | 255    | 385    | 479    |
| 2. Share of equipment in industrial fixed capital (percent)          |        |        |        |
| 3. Value of equipment (billions of rubles) -- 2/1                   | 100.0  | 146.7  | 184.4  |
| 4. Share of replaced equipment (percent)                             | 4.2    | 4.9    | 6.0    |
| 5. Value of replaced equipment (billions of rubles) -- 4x3           | 4.2    | 7.2    | 11.1   |
| 6. Share of active components (equipment) in fixed capital replaced (percent) | 70     | 60     | 55     |
| 7. Total value of active and passive fixed capital replaced (billions of rubles) -- 5/6 | 6      | 12     | 20     |
| 8. Capital investment in industry in constant prices (billions of rubles) | 29.3   | 39.8   | 46.5   |
| 9. Share of capital investment for replacement (percent) -- 7/8       | 20     | 30     | 43     |
The continuing decline in net investment \((G - R)/G\), both in absolute and relative terms, and the growth of compensatory expenditures, \(R\), leads to a slowing of the expansion of the productive potential of industry and, thus, to a reduction in the size of increments to the final product, \(\Delta P\).

In broad terms, the restructuring of the investment mechanism in the direction of reinvestment which took place during the 1970's was a natural process that was conditioned by the nature of previous stages of economic development in the USSR. During the period of industrialization (the 1930's), investment policy was based on new construction. Between 1924/25 and 1932/35, the share of new construction in the total amount of industrial capital investment increased from 14.2 to 46.3 percent,\(^{106}\) which became possible because of an increase in the share of capital accumulation in national income during that period from 15.9 to 26.9 percent.\(^{107}\) Even in those years an imbalance arose between financial resources and the physical possibilities for capital construction. Given such high rates of growth under conditions of extremely strained investment resources, the low technical level of construction and installation work, and the strict limitations on investment in passive assets, the quality of the capital created—especially industrial facilities—was very low.

The war had a very substantial effect on the condition of industrial fixed capital. Industrial enterprises evacuated to eastern regions of the country were located either in the buildings of old plants, with additions of buildings, structures, and communications facilities where extremely necessary, or in new sites involving new construction. In either case the construction and installation of the equipment shipped in was carried out during very difficult war-time conditions, in the shortest possible period of time, with many temporary structures, and without sufficient design and
planning work. In subsequent years, allocations for the reconstruction of these enterprises were very meager. In the post-war years, in the process of rebuilding enterprises destroyed or damaged in the war, all partially damaged foundations and building frames and all walls and other structural elements left intact were used. It was necessary to begin production in a very short period of time, and a large amount of equipment brought from Germany as reparations was installed in existing enterprises in the process.

In the 1950's the attainment of still higher rates of industrial development in conjunction with such massive investment programs as the construction of the Volga-Don canal, the Angaro-Yenisei hydroelectric and industrial complex, and the opening of the virgin lands, to say nothing of the arms programs, intensified the strain in the investment sphere to the limits and made it impossible to allocate sufficient resources for the replacement of worn-out assets. The retirement of fixed capital during these years was the lowest of the entire 50-year period (for which data are available) from 1928 to 1978: in 1951-1955, the coefficient of withdrawal of fixed capital in industry was 0.9-1.3.\textsuperscript{108} The wear and tear of fixed assets proceeded to such an extent that their use in production was impossible without an unavoidable increase in expenditures on repair. Expenditures on the repair of industrial fixed capital in 1955 were 60 percent higher than in 1951.\textsuperscript{109}

In the 1960's the situation did not change; the accumulating needs for replacing fixed assets continued to grow.

The huge and growing scale of replacement in the 1970's, which grew with the expansion of reconstruction, represented a reinvestment echo—a brake on the policies of earlier years. And the effects of these earlier policies bred in the form of the extensive replacement needed were all the
greater since so few resources had been spent to maintain and renovate assets in the past.

In examining the effect of reconstruction on the modernization of productive capacity in industry, one other important aspect of the problem must not be forgotten. The replacement of fixed capital that is retired has no independent economic form. It is an abstract category, an accounting value, and not a concrete form embodied in capital investment. We may, of course, also speak of the replacement of a unit of capacity rather then a unit of value.\textsuperscript{110} From this standpoint it is correct to view the creation of new enterprises as replacement. Is this path not more efficient from all points of view? Studying the factual data characterizing reconstruction and comparing it with analogous indicators for new construction\textsuperscript{111} makes it possible to answer this question affirmatively.

The reinvestment cycle in Soviet industry, which began in the 1970's and continues today, is a natural phenomenon that corresponds with economic theory. But because of the cyclical nature of investment processes it should be expected that the peak of replacement, which is natural for a period of declining growth rates of investment, should be supplanted by a growth in the share of net investment, which is characterized by a surge in investment. But the question is: can the onset of a sharp increase in investment be expected in the near future?

Given the realities of contemporary Soviet conditions, this theoretical scheme is upset by the effects of several economic and political factors.

The slowdown in technical progress in producers goods causes the qualitative level of fixed capital to lag behind its quantitative growth. As a result the growth of the productive potential of fixed capital declines and the accumulation of resources to ensure a rise in investment slows down.
II. TRENDS IN THE REGIONAL STRUCTURE OF CAPITAL INVESTMENT

1. General Patterns of Change in the Spatial Structure of Capital Investment

For the USSR, a country with extremely great climatic, geographic, and socio-economic differences, the regional aspect of economic development, in general, and investment, in particular, is of great significance. Overcoming the spatial gap between the basic concentrations of economic resources is a necessary condition for the effective functioning of its economy. The main spatial direction for solving this problem is the East-West geographical axis.

The West (the European part and the Urals) accounts for 25 percent of the area of the country and 76 percent of the total population; nearly four-fifths of all fixed capital is concentrated there, and more than four-fifths of gross industrial output and three-fourths of gross agricultural output is produced there. At the same time, by far the largest part of the natural resources is concentrated in the eastern macrozone (Siberia, the Far East, Kazakhstan, and Central Asia), which is much less developed economically. Within this macrozone, a particularly important role is played by Siberia and the Far East -- regions which are very rich in natural resources but which are experiencing huge demands for labor resources (less than 11 percent of the population of the USSR lives here). (See Table 1.)

The acceleration of economic, and above all industrial, development of the eastern regions was one of the main strategic tasks of economic policy of the USSR from the very beginning of its existence. Therefore, a central question in analyzing the regional aspect of the investment process is the trend of redistribution of capital investment from the West to the East and the study of factors contributing to this trend.

In this respect it is important to establish the extent to which
Table 1. Comparative Economic Characteristics of the European and Asiatic Macrozones of the USSR (USSR = 100)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>European Macrozone</th>
<th>Asiatic Macrozone</th>
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<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Siberia</td>
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<tr>
<td>Area</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>Population</td>
<td>78</td>
<td>22</td>
</tr>
<tr>
<td>Energy Resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>potential</td>
<td>9</td>
<td>91</td>
</tr>
<tr>
<td>proven</td>
<td>27</td>
<td>73</td>
</tr>
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</table>


The investment activity of the Soviet state was really oriented toward priority development of the Asiatic part of the country: what was the mechanism of spatial redistribution of capital investment, and how did it work to ensure the attainment of established goals? Were these goals achieved? What are the likely trends in the regional structure of capital investment in the immediate future?

The data presented in Table 2 provide a basis for judging how the spatial orientation of investment flows changed during the entire Soviet period through 1975.

For the period as a whole there is a weak trend toward an increase in the share of the Asiatic part of the USSR. However, at the end of the period (1971-1975), this trend is curtailed and, moreover, a certain inclination to reverse this direction emerges — the share of the European part begins to increase somewhat. Throughout this period, the share of the Asiatic macrozone in total capital investment did not once exceed 30 percent.

Deviations from this basic trend require special explanations. During the period in question, there were fundamental changes in both the domestic...
### Table 2. Shifts in the Regional Distribution of Capital Investment, as a percentage of the USSR as a whole (prices comparable within periods)

<table>
<thead>
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</thead>
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<tr>
<td>European macrozone</td>
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<td></td>
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<tr>
<td>(incl. the Urals)</td>
<td>75.9</td>
<td>79.4</td>
<td>79.5</td>
<td>77.6</td>
<td>73.3</td>
<td>79.4</td>
<td>76</td>
<td>74</td>
<td>71.4</td>
<td>70.0</td>
<td>70.9</td>
</tr>
<tr>
<td>Asiatic macrozone</td>
<td>24.1</td>
<td>20.6</td>
<td>20.5</td>
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<td>26.7</td>
<td>20.6</td>
<td>24</td>
<td>26</td>
<td>28.6</td>
<td>30.0</td>
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<tr>
<td>Eastern zone (Far East and Siberia)</td>
<td>14.8</td>
<td>13.5</td>
<td>13.3</td>
<td>15.0</td>
<td>18.0</td>
<td>13.0</td>
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<td>15.7</td>
<td>16.3</td>
<td>16.2</td>
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<tr>
<td>West Siberia</td>
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<td>4.4</td>
<td>4.0</td>
<td>3.7</td>
<td>6.1</td>
<td>4.4</td>
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<td>6.2</td>
<td>5.9</td>
<td>6.5</td>
<td>7.1</td>
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<tr>
<td>East Siberia</td>
<td>4.5</td>
<td>4.2</td>
<td>3.5</td>
<td>3.8</td>
<td>4.1</td>
<td>4.1</td>
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<td>5.6</td>
<td>5.4</td>
<td>5.1</td>
<td>4.6</td>
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<tr>
<td>Far East</td>
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<td>4.8</td>
<td>5.7</td>
<td>7.6</td>
<td>7.8</td>
<td>4.5</td>
<td>4.8</td>
<td>3.9</td>
<td>4.4</td>
<td>4.7</td>
<td>4.5</td>
</tr>
<tr>
<td>Southeastern zone</td>
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<td>7.1</td>
<td>7.2</td>
<td>7.4</td>
<td>8.7</td>
<td>7.4</td>
<td>8.7</td>
<td>10.3</td>
<td>12.9</td>
<td>13.7</td>
<td>12.9</td>
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<td>of which:</td>
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<tr>
<td>Kazakhstan</td>
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<td>3.3</td>
<td>3.4</td>
<td>3.5</td>
<td>4.7</td>
<td>3.7</td>
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<td>6.4</td>
<td>7.6</td>
<td>7.4</td>
<td>6.8</td>
</tr>
<tr>
<td>Uzbekistan</td>
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<td>2.0</td>
<td>2.1</td>
<td>2.1</td>
<td>2.3</td>
<td>1.9</td>
<td>1.8</td>
<td>2.0</td>
<td>3.0</td>
<td>4.0</td>
<td>3.8</td>
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<td>Tadzhikistan</td>
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<td>0.9</td>
<td>0.6</td>
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<td>0.5</td>
<td>0.6</td>
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<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
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<td>0.6</td>
<td>0.7</td>
<td>0.8</td>
<td>0.8</td>
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<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Kirgizstan</td>
<td>0.4</td>
<td>0.3</td>
<td>0.4</td>
<td>0.8</td>
<td>0.6</td>
<td>0.5</td>
<td>0.7</td>
<td>0.6</td>
<td>0.8</td>
<td>0.9</td>
<td>0.7</td>
</tr>
</tbody>
</table>
Table 2 (cont.)

Sources: An insignificant part of capital investments during 1946-1959 and 1951-1956 was not distributed among macrozones in the sources used. Data are for capital investment of state and cooperative enterprises and organizations (excluding collective farms) for all periods, except 1971-1975, for which collective farms are included.

Data for Siberia in 1966-1970 were divided into West and East Siberia using data from Narkhoz RSFSR 1970, p. 320. Data for Siberia as a whole were taken from Problemy teorii i praktiki razmeshcheniya proizvoditel'nykh sil SSSR. Moscow, Nauka, 1976, p. 83.

Before 1964, Tyumen oblast was a part of the Ural economic region. Since 1965 it has been part of the West Siberian region.

For Turkmenistan, figures for 1940, 1965, 1970, and 1975 were taken from Narkhoz handbooks. All other years were calculated by extrapolation.

All other data are from Narkhoz handbooks for the USSR, RSFSR, Kazakhstan, Uzbekistan, Tadzhikistan, Turkmenistan, and Kirghizstan, and from M. B. Mazanova, "Territorial'nye proportsii razvitiia proizvoditel'nykh sil strany", in Problemy, 1976, p. 83.
and foreign policies of the Soviet government, which had a decisive influence on the country's economic development, including investment strategy and tactics. One of the most significant events in this regard was the Second World War.

In analyzing the entire period, 1918-1975, it is useful to distinguish the following four subperiods: reconstruction (1918-1928), pre-war (1928/29 - June, 1941), war (1941-1945), and post-war (1946-1975). Within the post-war subperiod, we may also distinguish the years of reconstruction of war damage (1946-1950) and the Sovnarkhoz period (1957-1965). In our opinion, there were qualitatively new features determining the regional structure of investment in the 1970s, and their effect on the investment process will continue to emerge in the 1980s.

The relatively high share of the Asiatic macrozone as a whole during the reconstruction period (1918-1928) can be explained by the efforts of the Soviet government to consolidate the outlying districts in the process of forming the USSR, and by the economic stimulation of this process in these regions. The rulers of each republic considered industrialization as a catchword, as a necessity for the universal development of their own economy, and the theory of the closed economy for a republic was advanced. Such a position was taken, for example, by the government of Kazakhstan, whose share of capital investment in the country in those years was about 6 percent -- quite a bit higher than in all subsequent years until the sharp increase connected with the opening of the Virgin Lands.

The situation changed with the beginning of the first Five-Year Plans. First, the central rulers were already sufficiently powerful to overcome the emergence of autarchic tendencies in various areas. The so-called "nationalist-deviants" were crushed in all republics, and the principle of centralized
development of the Soviet economy triumphed fully.

Secondly, the industrialization of the Asiatic part of the country objectively required an "industrial head-start" for the more developed European macrozone. Therefore, investment branches of industry in the European regions (those creating basic fixed assets) received priority in the distribution of capital investment in the years of the first two Five-Year Plans (1928/29 - 1932 and 1933-1937), and the share of the Asiatic macrozone declined significantly.

The opposite pattern of two regions within the Asiatic macrozone -- West Siberia and the Far East -- stands out against the background of this general trend. A decisive feature of investment activity in West Siberia in the 1930s was the construction of the Ural-Kuznets Combine, which accounted for 35.6 percent of all capital investment in industry in Siberia during the First Five-Year Plan. 113

In the Second Five-Year Plan, there was an increase in investment activity in the Far East, which is explained by the growing tensions in relations between the USSR and Japan and the resulting forced efforts to strengthen the military potential of the Far East. In 1940 this region accounted for 9.5 percent of all fixed capital put into operation (excluding collective farms), while the share of Siberia was 8.8 percent. 114 Never, neither before nor after this period, did the Far East occupy such a dominant position in Soviet investment policy. The share of eastern regions is rising precisely for this reason. The share of Siberia, Kazakhstan, and Central Asia changed little during this entire 30-year period.

A sharp reorientation of the entire regional structure of investment took place during the war years (1941-1945) as a result of the relocation of the country's military-industrial base to the eastern regions. Investment
shares increased during these years in the Eastern zone (primarily due to West Siberia) and in the Southeast zone (primarily Kazakhstan). During the war years, average annual capital investment increased by 23 percent in West Siberia, while at the same time it declined in East Siberia and the Far East.

The significant decline in the share of the Asiatic macrozone during the first post-war five-year period is explained by the necessity of shifting investment resources for the reconstruction of war damage to the economy of the European part of the country. (The industry of eastern regions did not suffer from military actions.)

The share of the Asiatic macrozone in the spatial allocation of capital investment grew during the entire post-war period through the beginning of the 1970s. This process was quite restrained in the Eastern zone of the Asiatic macrozone, but it was much more dynamic in the Southeastern zone.

Post-war investment activity in Siberia was governed by the implementation of three major comprehensive investment programs — the creation of the Angara-Yenisei complex, the development of the oil and gas fields of West Siberia, and the construction of the Baikal-Amur Mainline and economic development of areas adjacent to it.

With respect to the Far East, investment activity slowed in the 1950s with the disappearance of the military threat from Japan, but was activated anew with the spread of the conflict with China in the 1960s and 1970s.

During the entire period, 1950-1975, the share of the Eastern zone remained almost stable (an increase of only one percentage point).

The most significant factor in the increase of the Southeastern zone was the redistribution of capital investment in favor of Kazakhstan in connection with the development of the Virgin Lands, which began in March and April
of 1954 and continued through the entire Khrushchev era. Another notable phenomenon is the two-fold increase in the share of Uzbekistan during the 1960s. Of importance here was the intensification of irrigation construction in the Syr Daria and Amu Daria river basins and the growth of extraction and processing of rare nonferrous metals in the republic. But the most significant factor was the development of the natural gas industry in Uzbekistan, which began in the early 1960s.

For the other Central Asian republics (Turkmenistan, Tajikistan, and Kirghizstan), whose combined share of investment did not exceed 2.5 percent, the extent of their participation in the spatial allocation of capital investment remained essentially unchanged.

The data in Table 3 were calculated to check the conclusions outlined above. Therefore, not only investment but other characteristics of the investment process were included — fixed capital installed and the volume of construction-installation work. For a further analysis, the Eastern and Southeastern zones are compared not with the entire European USSR but only with a group of the most industrially developed regions: the Northwest, Central, Volga, Don-Pridnepr, and Ural economic regions, which are historically the industrial nucleus of Russia.

Table 3 shows that the share of regions grouped as zone 1 in total national capital investment declined substantially (by almost 11 percentage points) during the period considered, which certainly represents an appreciable shift in the spatial structure of investment. But during this period the share of regions in the other two zones (that is, the entire Asiatic macrozone) increased by only 2.7 percentage points. The share of the Eastern zone remained unchanged, although there was a slight increase at times during the period.
Table 3. Trends in Indicators Characterizing Spatial Shifts in Investment (as a percentage of the USSR as a whole)\(^a\)

<table>
<thead>
<tr>
<th>Year</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
<th>Zone 1</th>
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<td>41.1</td>
<td>14.0</td>
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<td>1975</td>
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<td>17.3</td>
<td>41.3</td>
<td>13.7</td>
<td>18.0</td>
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</tbody>
</table>

\(^a\) Zone 1 includes the Northwest, Central, Volga, Don-Pridnepr, and Ural economic regions (according to the existing scheme of regionalization used in the USSR). Zone 2 includes Kazakhstan and the Central Asian economic region. Zone 3 includes the West Siberian, East Siberian, and Far East regions.

An analysis of the data of Table 3 leads to the conclusion that first, the share of regions in the first group (the industrial nucleus) remains high in spite of a decline, and, secondly, the decline in the share of this group was halted in the 1970s, and the overall spatial structure of capital investment in the country stabilized. Data on fixed capital installed and the volume of construction-installation work support these conclusions.

Thus, did the investment policy of the USSR stimulate a reorientation of industrial development from West to East to any significant extent? During the entire period, 1918-1975, there was no sharp change in the spatial distribution of capital investment in favor of the eastern regions. The increase of five percentage points in the share of the Asiatic part of the USSR in capital investment during this period (Table 1) is not evidence of an investment effort sufficient to overcome the inertia in the territorial location of industrial production in the USSR.

2. On Economic Regionalization in the USSR

Studying the nature of economic development in the USSR and, inter alia, trends in the spatial structure of capital investment, on the basis of the existing system of regionalization (the 18 economic regions) is of little practical sense.

First, the existing system of economic regions is somewhat obsolete. It was instituted in 1961-1963, although the eastern regions of the RSFSR (West Siberia, East Siberia, the Far East) were formed back in 1939. During this time there were substantial quantitative and qualitative changes in the spatial structure of the economy. New industrial centers and major territorial-industrial complexes were formed, and new cities and urban agglomerations appeared.
Secondly, the planning of economic development, especially of industry (and, therefore, investment planning) was always dominated by a branch, and not a regional, principle. Efforts to harmoniously combine these two principles in the planning, organization, and administration of the economy were never successful. Even where regional planning, in a weak subordinate form, was introduced, the objects of planning were administrative subdivisions such as oblasts, autonomous republics, and union republics rather than economic regions. The economic councils in the 18 large economic regions, which were created in the 1960s and eliminated in the 1970s, were quite artificial entities. Their functions were diffuse and they played no practical role in the planning and organization of the economy. Thirdly, the impression of an economic region in the USSR as a more or less closed spatial-economic system cannot be accepted. Such ideas were developed in the 1930s and were even embodied in the targets of the Third Five-Year Plan ratified by the Eighteenth Party Congress (1939). This plan included clear directives on the need to ensure comprehensive economic development in the large economic regions of the country and on the cooperation of enterprises within economic regions. However, in practice Soviet planning, from the beginning of the post-war period to the present (with the exception of 1957-1965), has not been oriented toward the spatial integration of the economy but toward maximum centralization. And the methodology of economic regionalization in the 1960s and 1970s was governed by this task.

Production specialization on an all-union scale has become the basic factor underlying the formation of economic regions. An industrial branch or, more often, an industrial complex is the basis for the development of a region, determining its economic profile, its participation in the regional division of production, and its main national economic function. All other branches of the economy are viewed as additional or auxiliary. Thus, it is not the
internal logic of the economic life of a region that assumes primary importance, but external relations with the hierarchy of the system above and with analogous neighboring systems.

From this standpoint, for example, the West Siberian economic region (according to the existing system of regionalization) should be divided into two independent regions: Northern (the Tyumen, Tomsk, and Omsk oblasts), with oil and gas extraction and refining and a petrochemical complex, and Southern (the Kemerovo and Novosibirsk oblasts and Altai krai), with coal mining, coke chemistry, and machine-building.

Distinguishing this sort of region is especially useful for the study of the regional structure of capital investment since territorial-production complexes, both those that have already been created and those that are being developed, are formed on the basis of long-term investment programs. This applies in large measure to the Asiatic macrozone, with its relatively less developed economy that is still forming.

In constructing such economic regions, the boundaries of administrative oblasts, krais, and union republics must be taken into account. Although a national-political factor underlies the formation of the union republics and other national territorial units, there is also an extra-national, noneconomic statewide administrative imperative in this structure. For example, the Chimkent oblast in southern Kazakhstan is organically tied to Uzbekistan from the point of view of both the regional division of production and the national affiliation of the population, but administratively it is part of the Kazakh SSR. The eastern Donbass (the Rostov oblast of the RSFSR) is economically and ethnically inseparable from the Ukrainian Donbass.

During the several dozen years of their development, the union republics have acquired many features of comprehensive economic systems. For political reasons the central leadership must take note of the natural appearance of
centripetal forces in the economic development of national republics. Quite frequently the leaders of union republics, especially if they are members or candidate members of the Politburo (Shcherbitskii from the Ukraine, Kunayev from Kazakhstan, Aliyev from Azerbaydzhan, etc.), try to establish some sort of industrial production on the territory of their republics for purely autarchic purposes and in spite of the economic inexpediency from the point of view of all-union interests.

Taking into account all of the factors examined above, in analyzing trends in the spatial structure of capital investment an attempt was made to approximate as much as possible the objectively existing regional structure of industry. To accomplish this, large structural components of the unified industrial complex of the USSR were distinguished within the Asiatic macrozone.

3. Analysis of Regional Trends in the Structure of Capital Investment in the Asiatic Macrozone

By studying the appropriate Soviet sources, including materials of the Council for the Study of Productive Forces of Gosplan, it was possible to distinguish 15 territorial-production complexes (economic regions) of the first order within the Asiatic macrozone to be used as a basis for the analysis of trends in the regional structure of capital investment. The results of this analysis are illustrated in Cartogram 1.118

The zones of greatest concentration of investment activity -- the new regions of the West Siberian plain (the Ob-Irtish region) and the Angara-Yenisei region -- stand out clearly. Large-scale construction has been carried out to a lesser extent in the southern zone of West Siberia and in the Zabaikal region. Industry is quite well-developed in the Kuznetsk-Altai region, and a significant surge in investment here is possible only with a change in the existing industrial structure -- primarily by creating new branches of machine-
building. In comparison with the Angara-Yenisei region, there is less possibility in the Baikal-Amur region for the development of energy- and metal-intensive production and the wood-products complex.

The unevenness of investment activity illustrated by the cartogram continued in 1975-1980. The major construction projects included in the Basic Directions for the Development of the USSR National Economy during 1976-1980, adopted by the Twenty-Fifth CPSU Congress, were primarily in the West Siberian plain and the Angara-Yenisei region. The basic increment to capital investment in Siberia during (at least) the first half of the 1980s will also be directed toward the further development of the economic structure and external ties of the Ob-Irtish region. First the scale of oil and natural gas extraction will be increased, which involves, in particular, the construction of several lengthy pipelines and plants for the processing of by-product gas. Secondly, two major petrochemical centers are being created -- at Tobol and Tomsk. Within the Angara-Yenisei region, the Bratsk-Ust-Ilimsk territorial production complex is being formed, and the creation of the Sayansk complex is being continued.

Thus, the Ob-Irtish and Angara-Yenisei regions will continue to take a leading position in the regional structure of capital investment in the Asiatic macrozone. The importance of the Baikal-Amur region is increasing. A further expansion of the intensiveness of investment flows in the direction of the Pacific Ocean region can be expected as a result of the USSR's strategic military aims.

But the regions distinguished on the cartogram are not homogeneous with respect to their internal composition. A more complete impression of the nature of the spatial distribution of capital investment can be obtained by further dividing these regions. The lowest level of the spatial administrative hierarchy of the USSR for which economic analysis is possible, given the
limitations of published economic information, is the oblast (krai). In order to more thoroughly analyze the essence and peculiarities of investment policy within the Asiatic macrozone, a statistical analysis of trends in capital investment was carried out at the oblast level for Kazakhstan using data for 1960, 1965, 1970, and 1975. The results of this analysis are shown in cartograms 2-5. 119

Three oblasts have continued to receive priority in the allocation of capital investments within Kazakhstan — in southern Kazakhstan, Alma-Ata oblast (the administrative, cultural, and scientific center of the republic); in central Kazakhstan, Karaganda oblast (the Karaganda coal basin); and in northern Kazakhstan, Kustanai oblast (the center of the mining industry). Capital investment has grown at the highest rates in the Manghishlak oblast of western Kazakhstan (the oil-gas industry).

It can be concluded that on the scale of all-union investment planning, the Kazakh SSR is viewed as a raw materials base of national significance, and its industrial development is stimulated primarily in this direction.

A basic feature that emerges in studying investment activity in the Asiatic macrozone is that the spatial allocation of capital investment is governed by centers of activity, and the centers stimulating the most intense investment activity are the areas of concentration of fuel-energy and raw material resources.

Investment activity in these centers is directed primarily toward the development of branches of specialization. Less attention is paid to earmarking resources for the support and development of other links of the economy, including manufacturing industry. Let us take the Kustanai oblast as an example. About 80 percent of industrial output there is in branches of specialization. The share of other branches serving the requirements of the
oblast's economy is less than 16 percent, and only 5 percent is in branches servicing the population. In Manghishlak oblast the share of branches of specialization is 85 percent, and in Karaganda oblast it is more than 70 percent.

These data illustrate the contrast in the distribution of capital investment between extractive and manufacturing branches of industry, between branches of national specialization and the concomitant production and social infrastructure.

4. Trends in the Spatial Redistribution of Industrial Production in Favor of Eastern Regions

What are the results of such an investment policy? Is the spatial redistribution of industrial production from West to East stepped up, and is the structure of industry in the Asiatic macrozone improved? These questions can be answered on the basis of the data in Table 4, which were taken from a source published in 1979.

Table 4. Shares of the European and Asiatic Macrozones in Industrial Output (in percent)

<table>
<thead>
<tr>
<th>Branch</th>
<th>European Macrozone</th>
<th>Asiatic Macrozone</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Industry</td>
<td>81</td>
<td>19</td>
</tr>
<tr>
<td>Electric power</td>
<td>75</td>
<td>25</td>
</tr>
<tr>
<td>Fuel</td>
<td>66.8</td>
<td>33.2</td>
</tr>
<tr>
<td>Chemical and petrochemical</td>
<td>86.9</td>
<td>13.1</td>
</tr>
<tr>
<td>Machine-building and metalworking</td>
<td>86.3</td>
<td>13.7</td>
</tr>
<tr>
<td>Timber and woodworking</td>
<td>72.7</td>
<td>27.8</td>
</tr>
<tr>
<td>Construction materials</td>
<td>75.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Light industry</td>
<td>81.1</td>
<td>18.9</td>
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<tr>
<td>Food</td>
<td>81.3</td>
<td>18.7</td>
</tr>
<tr>
<td>Other</td>
<td>85.8</td>
<td>14.2</td>
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</table>

One of the focal points of the planned development of Soviet industry was the improvement of its spatial proportions, the industrial development of the eastern regions of the country, and the spatial deconcentration of industrial production. The fact that during almost 60 years the share of the entire Asiatic macrozone, with its basic fuel-energy and raw material potential, reached only 19 percent of the nation’s industrial production indicates that the stated goal was not achieved.

Let us examine in more detail the trend in the industrial development of Siberia, which accounts for more than one-half of capital investment in the Asiatic macrozone. Tables 5 and 6 give an impression of changes in the role of Siberia in national production in the major branches of industry.

Without the rapid growth of the fuel branches (the oil and gas of the Ob-Irtish region), the share of Siberia in the nation's industrial production would have been essentially stable.

Let us note the following facts:

-- The share of extractive branches in industry was 2.3 times greater in Siberia than in the USSR as a whole in 1975. The branch structure of industry in the country as a whole is shifting toward an increased share for manufacturing branches, while in Siberia the relative shares of extractive and manufacturing branches is not changing. The share of extractive branches in industrial gross output in 1970 was 9.0 percent for the USSR and 18.8 percent for Siberia. By 1975 this share declined to 8.2 percent for the USSR as a whole but remained unchanged at 18.8 percent for Siberia. There is every reason to assume that during the second half of the 1970s the share of extractive branches in Siberian industry either remained stable or increased with the accelerated growth of oil and gas extraction.

-- Among the manufacturing branches, Siberia's share of national
production is in most cases declining (chemical and petrochemical, construction materials, food) or remaining unchanged (machine-building). Only the shares of light industry and timber and woodworking are increasing.

The change in the shares of electrical power deserve particular attention. While Siberia's share increased by 2.6 percentage points during the ten years, 1965-1975, it increased by only 0.7 points during 1970-1975. And Siberia's share of the national increment in the production of electrical power (Table 6) actually declined. This fact contradicts directives of Party Congresses and other government decisions regarding the development of electrical power in Siberia.

In sum, the data presented in Tables 5 and 6 provide a sufficient basis for concluding that there has been no significant shift in the spatial distribution of manufacturing industry in favor of Siberia, and this while Siberia's role as a raw material and fuel-energy base for the country was growing sharply.

The data in Tables 4, 5, and 6 characterizing the shares of the Asiatic macrozone, including Siberia, in national production of two manufacturing branches -- chemical and petrochemical and machine-building -- deserve particular attention. As apparent from Table 4, their shares are the lowest among all branches of industry. At the same time the relatively more rapid growth of these two branches in the Asiatic macrozone is of decisive significance both for the balanced development of the economy of eastern regions and for the more efficient operation of these branches as a whole.

It is useful to examine briefly the factors that determine the location of chemical and machine-building enterprises in Siberia and to use these two branches as examples to outline the conditions that predetermine the rate at which the country's manufacturing industry shifts to the east.
### Table 5. Shares of Siberia in USSR Gross Output of Branches of Industry (in percent)

<table>
<thead>
<tr>
<th>Branch</th>
<th>1965</th>
<th>1970</th>
<th>1975</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Industry</td>
<td>8.2</td>
<td>8.5</td>
<td>8.8</td>
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<tr>
<td>Electric power</td>
<td>13.6</td>
<td>15.5</td>
<td>16.2</td>
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<tr>
<td>Fuel</td>
<td>14.6</td>
<td>17.0</td>
<td>22.1</td>
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<td>Chemical and petrochemical</td>
<td>12.0</td>
<td>9.5</td>
<td>9.7</td>
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<tr>
<td>Machine-building and metalworking</td>
<td>7.5</td>
<td>8.1</td>
<td>7.5</td>
</tr>
<tr>
<td>Timber and woodworking</td>
<td>14.9</td>
<td>14.9</td>
<td>15.4</td>
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<td>Construction materials</td>
<td>9.0</td>
<td>9.1</td>
<td>8.6</td>
</tr>
<tr>
<td>Light industry</td>
<td>4.2</td>
<td>5.0</td>
<td>5.8</td>
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<tr>
<td>Food</td>
<td>6.9</td>
<td>6.7</td>
<td>6.6</td>
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### Table 6. Shares of Siberia in the Increments to Industrial Gross Output in the USSR During Five-Year Periods (in percent)

<table>
<thead>
<tr>
<th>Branch</th>
<th>1961-65</th>
<th>1966-70</th>
<th>1971-75</th>
</tr>
</thead>
<tbody>
<tr>
<td>All industry</td>
<td>8.2</td>
<td>9.2</td>
<td>9.6</td>
</tr>
<tr>
<td>Electric power</td>
<td>16.1</td>
<td>19.0</td>
<td>18.0</td>
</tr>
<tr>
<td>Fuel</td>
<td>23.6</td>
<td>24.1</td>
<td>38.4</td>
</tr>
<tr>
<td>Chemical and petrochemical</td>
<td>16.4</td>
<td>6.4</td>
<td>10.0</td>
</tr>
<tr>
<td>Machine-building and metalworking</td>
<td>5.6</td>
<td>8.8</td>
<td>6.7</td>
</tr>
<tr>
<td>Timber and woodworking</td>
<td>35.5</td>
<td>14.9</td>
<td>17.9</td>
</tr>
<tr>
<td>Construction materials</td>
<td>9.7</td>
<td>9.2</td>
<td>7.5</td>
</tr>
<tr>
<td>Light industry</td>
<td>4.3</td>
<td>6.5</td>
<td>8.6</td>
</tr>
<tr>
<td>Food</td>
<td>8.6</td>
<td>6.2</td>
<td>6.0</td>
</tr>
</tbody>
</table>

Chemical and petrochemical

Preconditions against:

-- The construction of chemical enterprises requires relatively greater expenditures of capital and labor resources.

-- The distance of production from the main consumers of chemical products is an additional negative factor.

Preconditions for:

-- Siberia is the primary national base for the extraction and processing of chemical raw materials -- oil, gas, coal, mineral-chemical, and wood chemistry raw materials.

-- Siberia is a region that uniquely combines raw material and fuel-energy resources, which is especially important for the chemical and petrochemical branch -- one of the major users of electrical and thermal power among all industrial branches.

-- About 40 percent of the water resources of the USSR are located within Siberia. The water requirements of chemical and petrochemical complexes of various structure and capacity range from 30 to 500 million cubic meters per year. One modern factory producing plastics consumes as much water as a city of 400,000. From 300 to 1,000 cubic meters of fresh water are used in the production of one ton of synthetic fibers. Therefore, as a rule, chemical and petrochemical enterprises must be located close to major rivers on land that is fertile and suitable for irrigation. The damage to agriculture in locating chemical and petrochemical complexes in Siberia is one-half to one-third as great as in the Volga region and the center of the European part of the country, and the damage is one-fifth to one-sixth as great in southern regions -- the Ukraine, North Caucasus, and Central Asia.

-- Chemical and petrochemical enterprises require a great deal of land, which Siberia has but which the European regions do not. From 1,500 to 3,000 hectares of land, or more, is needed for a petrochemical complex including oil...
refining and petrochemical enterprises and the area needed for a safety zone, auxiliary enterprises, and transport and communications facilities.

-- The location of quite energy-intensive chemical and petrochemical enterprises in the European macrozone requires increased shipments of fuel from Siberia. The construction of these enterprises in Siberia makes it possible not only to significantly reduce expenditures on transporting fuel but to use cheaper brown coal, which is mined by the open-pit method, as their fuel supply. The savings of expenditures on the development of the fuel-energy base and fuel transportation compensates for the more expensive construction of petrochemical enterprises in Siberia.

-- An important factor that contributes to the higher efficiency of locating petrochemical and chemical enterprises in Siberia is the possibility of achieving a higher degree of concentration than in the European part of the country. The availability of large resources of by-product gas and gas condensate, as well as other types of natural raw materials, makes it possible to build maximum-capacity installations and to combine enterprises for the comprehensive processing of raw materials. This factor has a great effect on the economic indicators for the development of the petrochemical industry. Thus, large-scale production installations make it possible to reduce capital investments per unit of output by one-third or one-half and to reduce operating costs by 20-30 percent. Combining enterprises for the comprehensive utilization of raw materials may result in a reduction of capital expenditures per unit of output of 20-30 percent and a 7-10 percent reduction in operating costs.

-- The low technological level of chemical production in Siberia is another reason for the need to construct new chemical enterprises in this region. The level of technology employed here is in most instances much lower than the national norm. For example, the only two plants that use the
technology of producing ammonia from solid fuel (the least advanced of existing technologies) are located in Siberia. The overall ammonia capacity of the Kemerovo nitrogen fertilizer plant is about one-third of the unit capacity of modern installations. The capacities of all Siberian plants for the production of plastic and synthetic resin (excluding caprolactum) are less than the average capacity of modern plants. And this is under conditions in which the concentration of raw material, fuel, and water resources and available land creates the prerequisites for using installations with large unit capacity.

-- With respect to the negative factor of distance from the users of chemical products, the growth of demand within Siberia must be taken into account. According to estimates of the Institute of Economics and the Organization of Industrial Production, by 1990 the requirements for plastics in the Siberian economy will increase by a factor of 10-12 in comparison with 1975, and the needs for chemical fibers will increase by 5-7 times.125

Thus, the favorable conditions existing in Siberia that have been listed not only neutralize the effects of the greater expense arising from the larger capital expenditures per unit of output and the need to attract additional labor resources, but they put Siberia first among all regions according to the economic efficiency of developing the chemical and petrochemical industry.

**Machine-building**

The need for the greater development of machine-building in the Asiatic macrozone in general and for shifting the center of gravity of several types of machine-building production -- construction and road-building machinery, public service, chemical, and oil equipment, and the automobile industry -- to the eastern regions, in particular, is obvious and has been supported by calculations based on fact. We will take this as axiomatic and will not list
all the "pros" and "cons" for this branch. We will only note several factors that are of significance in this regard.

-- The combined share of the machine-building branches listed above amounts to only 3.3-3.5 percent of total machine-building output in the Asiatic macrozone. 126

-- A particular factor in the location of machine-building in eastern regions, which is especially significant in Siberia, is the fact that the types of machinery and equipment produced do not correspond to the specialization of the economies of these regions. The leading machine-building plants in Siberia are primarily oriented toward the external, national market. While for the European macrozone trade in machine-building products is primarily within the zone, for Siberia the opposite is the case -- trade is with regions of other zones. While shipments outside the zone account for only 12 percent of the exports of machine-building products from European regions, and imports from other zones account for only 20 percent of all imports, only 26.5 percent of Siberia's machine-building output is used within the region, and three-fourths is exported, including 52 percent to European regions of the USSR. 127 On the other hand, due to the narrowness of specialization of production, the unevenness of development of individual branches, and the lack of comprehensive development (especially in East Siberia), the flow of machinery and equipment to Siberia from western regions of the country is continuously growing. And Siberia's imports from European regions include equipment that is metal-intensive, large-scale, and difficult to transport. Thus, although Siberia's production of energy equipment is twice as great as its requirements, a large quantity of steam turbines and condensers are imported from the Urals and from European regions of the country; although production and consumption are equal, a large part of requirements for tractors
and agricultural machinery is supplied by western regions; the types of hoisting-transporting equipment produced do not meet local needs -- significant shares of certain products are both exported and imported. The production of construction and road-building machinery is less than half of total requirements. Only a small share of needs are covered by local production. There is absolutely no production of excavators and a quite insignificant output of crushing-grinding and other equipment for the metallurgical and mining industry in eastern regions.

The unfavorable correlation between machine-building and the extremely developed repair sector also attests to the insufficient level of development of machine-building in Siberia. The share of repair work here has reached 25.4 percent. 128

The lack of correspondence of the specialization of the machine-building industry to the needs of the economy of Siberia developed to a large extent under the influence of historical conditions. Machine-building in eastern regions began to develop during the Second World War when enterprises of national significance were evacuated there from western regions. Therefore, the specialization of machine-building in Siberia was formed under the influence of the demands of wartime. But sufficient time has passed since the war. The top priority consideration in making decisions about the specialization and location of machine-building plants during the post-war period was the need to satisfy national requirements without consideration of the level of requirements within the region itself for a particular type of machinery or equipment. Furthermore, the location of sources of metal and parts suppliers and other regional factors of both an economic and noneconomic nature were not taken into account.

-- As a rule, the optimality of the location of branches of machine-
building within the country is evaluated from the standpoint of economic expedience for the branch. It was precisely for this reason that plants with quite different types of production were located in regions of the Asiatic macrozone, which excluded specialization in the production of certain types of goods within regions and cooperation of different stages of production. This, in turn, had a negative effect on economic performance.

-- It is thought that the construction of machine-building enterprises in eastern regions requires greater capital investments. However, first, this does not apply equally to all eastern regions, since not only within the Asiatic macrozone but also within Siberia not all regions have identical natural and economic conditions for their development.

Secondly, the higher capital investments in constructing machine-building plants in Siberia in previous years was due largely to the greater expenditures on auxiliary and service facilities than in western regions where the infrastructure was already developed. But the reserve capacity of infrastructure in western regions is gradually being exhausted. It is already necessary to develop new infrastructure when major industrial projects are constructed in relatively small cities. Thus, for example, in constructing the major Tol'iatti automobile complex it was necessary to build the infra-structure anew, beginning with external access roads, communications networks, and municipal services, and finishing with trade, cultural, and everyday service establishments.

At the same time, new machine-building enterprises can be constructed in certain cities of eastern regions where investments would be required only in expanding the infrastructure that has already been developed. Thus, in the future there will be a narrowing of differences in the amount of investment in infrastructure needed in constructing machine-building enterprises
in eastern and western regions, especially in the southern part of Siberia, regions with more favorable climatic conditions, and those that are already relatively developed.

Due to the high population density and the high degree of spatial concentration of industry in western regions, the construction of new machine-building plants requires ever greater amounts of valuable agricultural land, which inevitably leads to greater costs of construction in these regions. At the same time Siberia has sufficiently large quantities of available land that can be used for major industrial and urban construction with less damage to agriculture.

--- The conditions that limit the development of machine-building in Siberia are the shortage of labor and the use of available labor primarily in the extractive branches of industry that are of national significance and determine the specialization of these regions. But the following circumstances must be kept in mind. In evaluating the expedience of locating machine-building enterprises in Siberia and the Far East, the fact that machine-building is one of the main conditions for the development of large cities in the country is ignored. Among the major cities of Siberia (not counting Tyumen, which has especially favorable conditions contributing to rapid urban growth), the fastest growth during 1965-1975 was in Ulan-Ude, and the slowest was in Chita. This is explained by the sharp acceleration of machine-building in Ulan-Ude and the weak development of this branch in Chita. Therefore, from the standpoint of attracting population, settling these regions, and developing them fully, the need for the development of machine-building is clear.
5. **Trends in the Industrial Development of Individual Oblasts (Krais) of Siberia**

We have examined shifts in the branch structure of industry in Siberia as a single region. But a no less important aspect of the spatial development of industry is the trend of industrial production within this huge region. Data which characterize this process are given in Table 7.

As is apparent from this table, in most oblasts of Siberia there was a decline in average annual rates of growth from one five-year period to the next.

<table>
<thead>
<tr>
<th>Region</th>
<th>1961-75</th>
<th>1961-65</th>
<th>1966-70</th>
<th>1971-75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siberia</td>
<td>8.8</td>
<td>8.6</td>
<td>9.4</td>
<td>8.2</td>
</tr>
<tr>
<td>Altai krai</td>
<td>8.30</td>
<td>9.45</td>
<td>8.15</td>
<td>7.35</td>
</tr>
<tr>
<td>Kemerovo oblast</td>
<td>6.50</td>
<td>7.25</td>
<td>6.65</td>
<td>5.65</td>
</tr>
<tr>
<td>Novosibirsk oblast</td>
<td>9.05</td>
<td>8.60</td>
<td>9.40</td>
<td>9.15</td>
</tr>
<tr>
<td>Omsk oblast</td>
<td>9.70</td>
<td>10.15</td>
<td>10.0</td>
<td>8.95</td>
</tr>
<tr>
<td>Tomsk oblast</td>
<td>7.10</td>
<td>7.55</td>
<td>7.40</td>
<td>6.40</td>
</tr>
<tr>
<td>Tyumen oblast</td>
<td>14.80</td>
<td>7.10</td>
<td>15.30</td>
<td>22.25</td>
</tr>
<tr>
<td>Krasnoyarsk krai</td>
<td>9.95</td>
<td>10.65</td>
<td>10.65</td>
<td>8.60</td>
</tr>
<tr>
<td>Irkutsk oblast</td>
<td>9.15</td>
<td>9.95</td>
<td>9.00</td>
<td>8.45</td>
</tr>
<tr>
<td>Chita oblast</td>
<td>6.90</td>
<td>6.20</td>
<td>6.80</td>
<td>7.75</td>
</tr>
<tr>
<td>Tuva Autonomous Republic</td>
<td>8.85</td>
<td>11.45</td>
<td>7.40</td>
<td>7.80</td>
</tr>
<tr>
<td>Buryat Autonomous Republic</td>
<td>9.15</td>
<td>9.15</td>
<td>10.10</td>
<td>8.30</td>
</tr>
</tbody>
</table>


The exceptions are the Tyumen oblast in West Siberia and Chita oblast in East Siberia. The most rapid industrial growth was in the Tyumen oblast (oil and gas), followed by Krasnoyarsk krai. Precisely these areas were focal points...
for capital investment in Siberia. But Krasnoyarsk krai is losing its leading position while Tyumen oblast is continuing to develop rapidly.

6. Reasons for the Slow Shift in the Territorial Structure of Manufacturing Industry

The economic and strategic military advantages of the priority development of the manufacturing branches of industry in the eastern regions are sufficiently clear to the Soviet leadership. What is standing in the way of a more decisive reorientation of investment flows from the West to the East in order to eliminate the growing disproportion in the regional distribution of industry? Two factors are hindering a more rapid shift of manufacturing industry to the East.

First is the emphasis of capital investment on reconstruction under conditions of sharply declining investment activity in the country as a whole. The orientation toward investing in existing enterprises rather than creating new ones results in the existing regional distribution of capital investments being maintained. The reconstruction of industry in the European macrozone, which produces 80 percent of the country's industrial output, absorbs a corresponding share of national capital investment.

No more than 7 percent of capital investment in the development of machine-building in the USSR in 1971-1975 was in the Asiatic macrozone. The overwhelming share of this investment went for the reconstruction of plants in the European macrozone. During the period 1965 to 1975, the share of the Asiatic macrozone in total machine-building output in the country declined by 3.3 percentage points, and the share of the European macrozone increased by a corresponding amount.

The development of the chemical and petrochemical industry of the USSR is also proceeding along the path of reconstruction, expansion, and modernization.
of existing enterprises, primarily in the European macrozone. Precisely for this reason the share of the Asiatic macrozone in the national output of this branch declined from 15.1 to 13.1 percent during 1965-1975.131

The increase in the share of reconstruction in industrial capital investment in the USSR contributes to the increase in the share of the European macrozone in the regional distribution of capital investment.

The second factor is the domination of the branch principle of planning and management of the economy and the subordination of investment planning to this principle. Let us consider this factor in more detail.

Soviet economic theory distinguishes two basic principles for the organization of the economy and, correspondingly, two basic principles for constructing the system of economic planning: branch and territorial. The ultimate goal of planning was formulated back in 1920 in a resolution of the Ninth Party Congress: "The organizational problem is to maintain and develop vertical centralization along the lines of the departments while combining it with the horizontal coordination of enterprises along the lines of economic regions, where enterprises of different branches of industry and different economic significance must share one and the same sources of local raw materials, transportation facilities, labor, etc."132 However, the realization of the idea of a harmonious combination of branch and regional planning turned out to be impossible.

There has been an antagonism between these two principles during the entire period of existence and development of the Soviet economy. Excessive manifestations of the territorial principle ("localism" in Soviet political jargon) are, as a rule, suppressed more severely than hypertrophy of the idea of the centralized branch planning and functioning of the economy. With the exception of the Sovnarkhoz period (1957-1965), which was discussed above,
harsh and all-encompassing centralism has ruled the planning of the economy. The interests of comprehensive economic development are ignored not only in oblasts, krais, and the economic regions that exist more in theory, but in union republics.

This tendency became especially clear in the second half of the 1940s and the beginning of the 1950s. In directives for the Fifth Five-Year Plan, 1951-1955, adopted by the Nineteenth Party Congress, there was no even a separate section for union republics. Targets for the spatial location of production were included only in the branch sections of the plan. The extreme degree of centralization of the control of the economy in ministries was also evident in the elaboration of annual plans, which also had neither sections nor individual indicators for the comprehensive development of the economies of republics. The share of industry subordinated to union republics in 1930 was 30 percent, and republics directly allocated only 5 percent of total national capital investment. All other capital investment was allocated by union ministries, and they considered local interests only after all other factors and then only to the extent necessary for the proper functioning of all-union production facilities.

At the end of 1953 tendencies toward decentralization of administration and planning began to appear, and they led to the complete transfer to the regional principle of economic administration in 1957. In 1961, 93 percent of industry was under the direction of union republics, and they controlled 77 percent of capital investment. Republic Gosplans carried out all long-term and current planning for their territories. The directives for the Sixth Five-Year Plan adopted by the Twentieth Party Congress included an entire section on the development of the economies of republics and, for the first time in the post-war period, on the location of production.

In 1965 the economy of the USSR was returned to the branch principle
and ministries were reestablished. At the same time an attempt was made to find the optimal correlation between the branch and territorial principles of economic planning. With respect to investment planning, republics continued to compile capital investment plans but only for enterprises subordinate to them, although they were also to participate in the preparation of plans for all-union industries located within their boundaries.

However, in most cases the participation of the planning commissions of union republics in the formation of capital investment plans of union ministries is actually purely formal. They merely sum up the various branch plans and projections worked out by ministries. Republic planning commissions retain rudimentary regional planning bodies, which are dependent on branch planning organs for the information they need. All concrete preliminary calculations and estimates are made by branch scientific and design institutes subordinate to branch ministries, and the proposals of regional planning bodies can be based only on these estimates. This, of course, limits, the possibilities of local economic planning and administrative organs to influence the development of their republic or region in a particular direction.

In the 1970s the branch basis of all links of the economy was strengthened, including the planning of capital investment. True, the disregard for the comprehensive development of republics, individual regions, and oblasts is not as blatant as at the beginning of the 1950s. It is mitigated by several concessions made to local authorities. Apparently dissatisfaction with the state of things on the part of the leadership of republics and oblasts forced the Soviet rulers to adopt a less strict branch system of economic management. Evidence of this is the resolution on improving regional planning adopted by the CPSU Central Committee and the USSR Council of Ministers in 1979. However, this resolution does not make any sort of substantial change in the
existing practice. Investment planning in industry and the regional distribution of investment resources continue to remain with union ministries, which represent branch interests and give the highest priority to satisfying the requirements of projects of all-union significance.

Why does the branch method of planning and the branch organization of industry hinder the improvement of its regional distribution?

All investment activity of industrial branch ministries is governed by the need to increase the volume of output in the shortest possible time in order to fulfill production plans, and they face strict limitations on capital investment and directives from above to channel the largest part of its into the reconstruction of existing enterprises. The basic idea of capital investments is to save the branch from the immediate danger of failure, during the current five-year plan. And the question of long-term planning of the branch is relegated to secondary status. Such a pragmatic approach keeps branch ministries from giving serious and responsible consideration to long-term planning of the development and location of industrial branches and to general guidelines and optimizing calculations that must objectively consider all negative and positive aspects of the construction of new enterprises in eastern regions.

Ministries strive to carry out their investment programs primarily in large and medium-size cities, reconstructing and expanding enterprises located there. This makes it possible to use the city's labor, scientific resources, and infrastructure to accelerate the creation and putting into operation of new production capacities.

But the main attractive force, which determines the direction of investment in regions that are already developed, is the availability of construction capabilities in these regions. This seemingly secondary factor is in practice
very often decisive in the regional location of new facilities and the expansion and reconstruction of old enterprises.

7. The Construction Sector as a Factor in the Regional Distribution of Capital Investment, and Investment Activity in Eastern Regions

The impact of the branch imperative on regional planning and investment activity is manifested not only in the spatial distribution of the capital investments of industrial branch ministries but in the branch organization of the construction sector itself.

The organizational structure of construction in the USSR has undergone a complicated evolution: the breaking up of construction production between various departments and economic committees in the 1920s and 1930s; its integration into a single administration (Narkomat) in 1939; the differentiation of construction along branch lines in the post-war period, when specialized construction ministries were created for industrial branches (metallurgy and chemicals, oil, coal, power) and, at the same time, ministries of transport and urban construction; the elimination of construction ministries and the transfer of a large part of construction to the sovnarkhozes during 1957-1965; and the return to the branch principle of dividing construction after the branch principle of organization in industry was reinstituted in 1965.

Since the end of the 1960s, the largest part of construction resources has again been concentrated in specialized construction ministries, whose main functions are to construct enterprises of individual branches of industry (the Ministry of Industrial Construction, Ministry of Construction of Enterprises of Heavy Industry, Ministry of Construction of the Oil and Gas Industry, etc.).

When the specialized construction ministries were created, the need to coordinate the branch and territorial aspects of industrial development was
taken into account. All-union and union-republic construction ministries were created as territorial-branch ministries. Together with the narrow branch orientation of their basic activity, they were also to perform construction-installation work for certain technologically related branches and housing construction within their regions of operation. However, this idea was not realized in practice. The production programs of construction ministries were so overloaded with high priority demands to build industrial facilities that housing was constructed in very insufficient amounts and only in areas where major industrial projects were being built.

But the idea of the branch specialization of construction was also not fully realized. Enterprises of specialized construction ministries were transformed into universal construction enterprises that performed all types of construction work in their areas of operation. In the Tyumen oblast, for example, even the enterprises of such specialized construction ministries as the Ministry of Transportation Construction and the Ministry of Power Construction perform general construction work in housing, cultural and service facilities, and agriculture. In 1974 only 15 percent of the work of the USSR Ministry of Industrial Construction was directly related to its specialization, and the corresponding figure for the Ministry of Construction of Enterprises of Heavy Industry was about 30 percent. It is important to emphasize that general construction work (housing construction, etc.) is performed only in conjunction with the building of production facilities, i.e., it is governed by the demands of branch expedience, the branch investment program, and branch dislocation.

Thus, large construction enterprises (trusts) that perform work of a universal nature are located in areas with the highest concentration of investment activity. Such enterprises are stationary, and, being governed by the law of development of all Soviet organizations, they strive to maintain
and expand their activity.

A general construction trust, which frequently counts among its employees tens of thousands of persons, is in effect a conglomerate of various production and transportation enterprises, specialized shops, etc., even including subsidiary agricultural farms to supply its workers with food products.

This organizational system as it has developed is responsible for a characteristic trait of construction output in the USSR — its low mobility. In areas where territorial-production complexes or major industrial facilities are being developed, a construction base is created, which includes construction trusts and enterprises producing construction materials and components. Large centers of the construction industry appear in such areas while the construction program is being carried out. New construction bases are created in the eastern regions of the country only in exceptional cases when very major investment programs such as that in Tyumen is carried out.

The construction bases that already exist are a powerful factor in making decisions about the spatial allocation of capital investments in the development of any sort of manufacturing industry. Thus, the decision to construct a Volga automobile plant near Kuibyshev (Tol’iatti) was made with due consideration to the existence in that region of a powerful construction base that remained, with a tremendous, unutilized production potential, after the construction of the Kuibyshev hydroelectric station. The availability of a construction base is a factor that supersedes all economic calculations and all considerations of equalizing the regional proportions of the distribution and development of industrial production.

Construction in the newly developing regions of Siberia is carried out according to the organizational stereotype existing in the developed regions of the country. But the immobile nature of the organization of construction is
absolutely inappropriate in developing regions. The shortage of construction organizations and the difficulty of having work done by contractors creates a field of gravity around the existing construction bases, attracting enterprises of various branches of industry to carry out their construction programs. Investment activity builds up around existing construction bases located largely in western regions of the country, and as a result investment resources are drawn away from the less developed regions of Siberia and the Far East.

Construction in the eastern, and especially the northeastern, regions is complicated by a number of problems. We will note only the following two:

First is the completely inadequate development of the production of local construction materials, parts, and components. Thus, in Tyumen oblast in 1975, ten years after the beginning of the development of the Tyumen oil and gas region, carrying out the construction program required importing from other (primarily western) oblasts and regions 94.4 percent of metal components, 80.2 percent of reinforced concrete, 59.5 percent of wooden components, 77 percent of nonmetallic materials (stone, gravel, etc.), 61.5 percent of the brick, and 68.2 percent of clay filler. The colossal costs of transporting construction materials are increased still further by the extremely complex route: freight from western regions is shipped through Tyumen to Omsk, and then it is shipped on the Irtish and Ob rivers to the central and northern zones of Tyumen oblast.

The second problem is the inadequate level of mechanization of construction. The value of fixed productive capital per ruble of construction-installation work is 22 kopecks in construction enterprises in West Siberia, 29 kopecks in East Siberia, and 34 kopecks in the country as a whole. And it must also be considered that in many regions of Siberia with severe climatic conditions construction equipment wears out quicker and breaks more often than
in other regions of the country. Thus, in the oil and gas regions of the West Siberian plain automobiles, bulldozers, scrapers, and tractors operate for only 30-35 percent of their normal service lives. The productivity of construction equipment in Siberia is substantially lower than in other regions of the country. For example, the work rate of excavators in Takutiia is reduced by 40 percent during the winter. The operation of all construction mechanisms is periodically interrupted in order for the personnel operating them to warm up. A very insignificant amount of construction equipment is produced for operation under special northern conditions.

The problem of the social infrastructure of Siberia deserves special attention since its insufficient development has a significant impact on the growing deficit of labor resources in construction. However, this problem is an independent aspect, which extends beyond the problem of the construction complex and requires a more detailed explanation.

With respect to the construction sector itself, we have focused attention only on the most important factors that determine the nature of and trends in industrial construction in the eastern regions. Primary among them is the branch principle of carrying out investment programs, which results in conservatism in the organization of construction that hinders its movement to the east.

8. Investment in the Development of the Social Infrastructure in the Northeastern Regions of the USSR

A serious obstacle to increasing the level of investment activity in the eastern regions of the USSR is the growing labor deficit due to insufficient investment in social infrastructure. According to the logic of things, the share of the Asiatic east in capital investment in the nonproductive sphere
of the Soviet economy should be higher than in the regions of the European west. However, this is not the case. For example, the share of capital investment in the nonproductive sphere in the Irkutsk oblast in the 1970s was 23 percent, while the corresponding share for the USSR as a whole was 33 percent.\footnote{141}

Investment in the development of the social infrastructure is lagging considerably behind population growth in the regions undergoing industrial development, and precisely this is the reason for the limited extent to which the population settles permanently in new areas, the growing labor turnover, and the labor shortage, especially of skilled workers. Thus, at the point of highest investment activity in the Asiatic part of the USSR -- the Nizhnevartovsk oil and gas region (Tyumen oblast) -- where the population grew by a factor of 2.5 in one four-year period (1971-1974),\footnote{142} the population growth rate during 1965-1975 was 1.3 times greater than the rate of growth of capital investment in the social infrastructure.\footnote{143} As a result only 30 to 50 percent of those persons who moved into the region settled permanently, and most of those who left did so within the first two years.\footnote{144}

The results of a sociological study carried out by the Institute of Economics and the Organization of Industrial Production in newly developing industrial regions of West Siberia showed that the main reason for the outflow of population was the housing shortage.\footnote{145} Thus, the amount of new housing provided is the main indicator of the development of the social infrastructure. It would be natural to assume that the share of the Asiatic macrozone in the amount of new housing completed in the country, and especially the share of its northeastern regions, is increasing. However, an analysis of available statistics does not support this presumption. In 1971-1975 as compared with 1966-1970, the share of the Asiatic macrozone in new housing completed remained stable (24.7 and 24.6 percent, respectively),\footnote{146} while the share of Siberia
and the Far East increased by 0.7 percentage points. And here it should be considered that the amount of new housing completed in the USSR as a whole stabilized, and even declined during 1975-1978.

In order to determine quantitatively the role assigned to the construction of housing in the Asiatic macrozone in Soviet investment policy, we calculated the ratio of the amount of housing completed (in square meters) to the value of fixed capital installed (in millions of rubles) for the USSR as a whole and major regional subdivisions. The values of this ratio for the period 1966-1975 are given in Table 8.

Table 8. Ratios of New Housing Construction to the Value of Fixed Capital Installed for the USSR and Major Zones*

<table>
<thead>
<tr>
<th>Year</th>
<th>Zone I</th>
<th>Zone II</th>
<th>Zone III</th>
</tr>
</thead>
<tbody>
<tr>
<td>1966-1970</td>
<td>1.72</td>
<td>2.14</td>
<td>1.20</td>
</tr>
<tr>
<td>1971-1975</td>
<td>1.28</td>
<td>1.32</td>
<td>0.88</td>
</tr>
<tr>
<td>1970</td>
<td>1.46</td>
<td>1.58</td>
<td>1.05</td>
</tr>
<tr>
<td>1971</td>
<td>1.42</td>
<td>1.52</td>
<td>0.95</td>
</tr>
<tr>
<td>1972</td>
<td>1.38</td>
<td>1.43</td>
<td>0.97</td>
</tr>
<tr>
<td>1973</td>
<td>1.30</td>
<td>1.32</td>
<td>0.87</td>
</tr>
<tr>
<td>1974</td>
<td>1.22</td>
<td>1.26</td>
<td>0.86</td>
</tr>
<tr>
<td>1975</td>
<td>1.13</td>
<td>1.15</td>
<td>0.78</td>
</tr>
</tbody>
</table>

* Housing in square meters, fixed capital installed in constant prices, millions of rubles. Zone I includes a group of the most industrially developed regions of the European USSR (Northwest, Central, Volga, Don-Pridnepr, and Ural), Zone II is Kazakhstan and Central Asia, and Zone III is Siberia and the Far East. Sources: See notes to Table 3 and reference 146.

Judging from the data in this table, housing construction is assuming a smaller and smaller role in Soviet investment activity. But it is more important to note that this decline is much more substantial in regions of the
Asiatic macrozone than in the European zone.

In light of the facts outlined above, this phenomenon does not seem paradoxical. But it is in sharp contradiction to the logic of the economic development of the eastern regions. It becomes quite clear that the overriding direction of investment is toward productive construction to carry out the narrowly assigned tasks of the present day: to achieve an increase in production in the shortest possible time and by any means.

However, ignoring the necessity of increasing the investment quota of social infrastructure leads to the opposite results. By further and further postponing investment in social infrastructure and permitting an ever greater gap between the increasingly strained investment efforts to expand production capacity and investment in social infrastructure, especially housing, the leadership of the Soviet economy increases the imbalance between the requirements for labor resources and their availability in the eastern regions. The flow of population out of these regions grows, while a positive balance of migration is a decisive condition for fulfilling production programs there.

The lag in the development of social infrastructure as a whole, and especially the lag in housing construction, has in the course of events become one of the main reasons for the reduced rates of growth of oil and gas production in West Siberia. The fact that a conference on stimulating construction in the oil and gas regions of West Siberia was held in the CPSU Central Committee in April 1980 under the direction of Central Committee Secretary for Industry, V. I. Dolgikh, is evidence of growing concern by the Soviet leadership about this matter. One of the central questions of the agenda was a discussion of "the serious shortcomings in the construction of housing". The unusual nature of this conference is reflected in the fact that the participants included not only directors of construction ministers, Gosplans, and the responsible members of the Party staff, but the directors of major
construction organizations that carry out housing construction in Moscow, Leningrad, and the capitals of union republics. It follows from the resolutions of the conference that precisely these organizations must undertake the construction of housing in Siberia. Such measures are taken by the Soviet leadership only in extraordinary cases. Thus, after the earthquake in Tashkent the reconstruction of the wrecked city was assigned to construction organizations from Moscow, Leningrad, and other major cities. The very fact that such a conference was held in 1980 and the sense of the resolutions adopted there suggests the following:

-- First, in carrying out the construction program for the Ob-Irtish territorial-industrial complex, a very difficult situation was created that threatened the fulfillment of plans for the extraction of oil and gas.

-- Secondly, the key question in view of the exacerbation of the labor shortage is the accelerated construction of housing and other parts of the social infrastructure.

-- Thirdly, the construction industry in Siberia is in no condition to handle the volume of work that is needed.

This latter fact is a consequence of a long-term tendency to concentrate investment resources overwhelmingly in the development of the construction sector in western regions of the European USSR to the detriment of eastern regions of the Asiatic macrozone.
CONCLUSION

In the second half of the 1970s, there was a significant decline in the rate of growth of investment. The trend of investment activity during this period was characterized not only by reduced rates of growth but by a drop in the average annual increments of capital investment in all branches of the economy, including industry. At the same time, the increase in capital expenditures per unit of increase in production capacity continued in most industrial branches.

The decline in increments to gross social product and national income, the impossibility of increasing the share of capital accumulation in national income at the expense of consumption due to the danger of internal political complications (the spectre of events in Poland must certainly make the Soviet rulers uneasy), and the need to increase investment in agriculture and transportation -- these are the main factors that govern investment policy in Soviet industry at present and, apparently, will continue to shape it in the near future.

An important feature of the investment process in industry is the significant and accelerating decline in the share of capital investment for expansion and, correspondingly, the growth of the share for replacement in gross capital investment. The exacerbation of these factors in the second half of the 1970s is the result of above-optimal rates of growth of fixed capital over a long period of time and a system of depreciation rates that encourages ignoring the objective need for a modern renewal of fixed capital.

Under the existing conditions the main direction of industrial investment policy has been a strict limitation on investment in new construction and a shifting of investment resources primarily to reconstruction and the development of existing enterprises. Implementing these ideas is seen as a panacea for all ailments of the investment sphere and, above all, as a decisive
condition for reducing capital expenditures per unit increase in output. No attempt is even made to determine, on the basis of economic criteria, the optimal allocation of capital investment between existing production and the construction of new enterprises. An increasing number of enterprises without the appropriate technological or economic prerequisites is being drawn into the sphere of reconstruction and expansion.

The idea of Soviet economic strategy is that the savings of capital investment per unit increase in production capacity from reconstructing and expanding existing enterprises rather than building new ones is to be achieved by installing new progressive equipment while only partially modernizing an enterprise's fixed capital and keeping most of it in operation. The key point is to minimize expenditures on updating the so-called "passive" part of fixed capital (industrial buildings and structures), and the major effort is toward updating production equipment.

However, the practice of carrying out the reconstruction of enterprises does not lead to the planned results. The share of capital expenditures on equipment is not growing, and in several branches of industry it is even declining. The share of buildings in industrial fixed capital is not falling, and the share of equipment is also remaining unchanged. These shortcomings of attempts to modernize the technical structure of capital investment and fixed capital are explained by the following circumstances.

First, the most widespread form of increasing production capacity at existing enterprises is not so much the partial modernization of functioning assets, encompassing primarily production equipment, as the construction of essentially new enterprises on the sites of the old ones or near them. In the process of this sort of reconstruction the largest part of industrial structures and other facilities, as well as equipment, is updated. Furthermore, the new construction is done on the production sites of existing enterprises
or on adjacent land. Construction equipment and the very organization of construction are not well suited for carrying out this sort of work. Therefore, its cost and labor-intensiveness is much higher, and construction periods are in most cases longer than in the construction of new enterprises, which is done by industrial methods on vacant construction sites.

Secondly, as a rule the extent to which fixed assets are retired and replaced during the reconstruction of enterprises exceeds all plan projections and makes the calculations of efficiency, which underly the decision to allocate capital investment for reconstruction, unrealistic. The increase in the amount of assets written off is due to the introduction of new, higher depreciation rates in 1975 and to the reduction of the share of capital repair in these rates and a proportional increase in the share of renovation. The accumulation for several decades of old, overamortized assets due to insufficient retirements, failure to observe depreciation rates, and the economically unjustified hypertrophy of repair to keep assets in working conditions, i.e., the continuing violation of the laws of developing and maintaining fixed capital in pursuit of high rates of growth -- all this is manifested in the 1970s with the emphasis on reconstruction of enterprises. It is impossible to implement in most cases without fundamentally updating industrial structures as well as productive equipment. The inevitability of the massive replacement of assets, especially the passive component, is the rock that is holding industry down in its efforts to achieve capital-saving increments to production at existing enterprises.

The second part of the two-fold goal of reconstruction is to update equipment to a new, substantially more progressive, technical level. But this is also not sufficiently realized. Investment machine-building does not have the scientific and production potential to quantitatively and qualitatively
satisfy the growing requirements of enterprises undergoing reconstruction. Improvements in the technical level of newly installed equipment are lagging further and further behind the growth of fixed capital (in constant prices). The number of new models of equipment developed is declining. A quite significant trend is emerging: the cost of new equipment is growing faster than its productivity.

The goal of reconstruction in Soviet industry is more to achieve quantitative than qualitative results. The output of reconstructed enterprises is more likely to be improved than qualitatively new. New enterprises are better suited for creating fundamentally new equipment. Therefore, a reduction in investment in new construction, all other things being equal, narrows the possibilities for creating new technology that uses new energy and raw materials resources (not only the most abundant) but has different qualitative features. This has the effect of reducing technological progress. Thus, a vicious circle is created: the wider the scale of reconstruction the less are the possibilities for carrying it out effectively on a fundamentally new technological basis that ensures savings of capital and labor resources while increasing the volume of output.

In light of these facts there is reason to conclude that the growing trend toward priority investment in existing facilities will not lead to a quicker return on investment and will not create the prerequisites for raising production growth rates, but will slow down technological progress in the Soviet economy. The phenomena that have been noted will become more widespread in the immediate future since long-term investment policy in the Soviet Union is based on increasing the share of investment in existing production. Another factor that must be considered is the inertia that is characteristic of investment processes, especially on such a massive scale as Soviet industry.
behind the growth of the productive sphere of the economy. This distortion in investment in the economic development of eastern regions (this relates largely to Siberia, the Far East, and Kazakhstan) creates a growing difficulty of carrying out construction and production programs in their sectors of specialization. These difficulties are due to the insufficient potential of the construction sector, the poor condition of the transportation network, and the lag in the construction of housing and other components of the social infrastructure behind the population's needs. The latter circumstance is a decisive factor in the growing labor deficit in the most important regions of industrial development in Siberia and the Far East. The existing order of priority in Soviet investment practice when developing new regions -- the primary orientation toward creating basic production facilities to the detriment of the development of infrastructure -- is clearly manifested currently in the development of the oil and gas deposits of West Siberia. There is little disagreement even among Soviet economists about the bankruptcy of this practice. However, the increasing limitations on investment resources and their subordination to the tasks of "the present" forces them to follow this path. The violation of normal proportions for the harmonious development of territorial-production complexes in less developed regions in pursuit of the quickest possible expansion of capacity in a region's specialized production strikes the main goal like a boomerang -- it constrains the growth of output causing underfulfillment of plans.

But the point is not only that the rate of growth of manufacturing branches and the productive and nonproductive infrastructure is lagging behind the growth of extractive branches. This phenomenon is not specific to the development of pioneering regions only in the USSR. The more important point is that the narrowing of the spectrum of investment activity in the eastern
The decline in the investment resources of the economy as a whole and the reorientation toward replacement and the development of existing facilities significantly limits the regional maneuverability of investment policy in the USSR. While the overwhelming majority of raw material and energy resources are increasingly concentrated in the Asiatic part of the country and especially in the northeast, the spatial distribution of capital investment continues its primary orientation toward European regions where 80 percent of industrial production and the largest part of manufacturing industry is concentrated. Moreover, judging from the first half of the 1970s the investment quota of the Asiatic macrozone has even tended to decline somewhat. Reconstruction of industry in the European regions absorbs a growing part of capital investment and hinders its redistribution in favor of eastern regions.

This trend in the regional distribution of investment contributes to the growing spatial gap between the concentrations of raw material and energy resources and their users and processors. The growing polarization of the location of the extractive and manufacturing branches of industry on the vast territory of the USSR creates an excessive burden on the entire transportation system and especially on the main railroad arteries, whose condition is deteriorating sharply and whose development is lagging behind the requirements of the economy.

Investment in the industrial development of eastern regions is more and more concentrated on the primary goal — accelerating the production of raw material and energy resources. This orientation of investment flows results in a worsening of the disproportions in the economies of eastern regions between the development of extractive and manufacturing branches and between the development of basic branches of national specialization and the auxiliary service links of the economy (construction, transportation, etc.). The social infrastructure and, above all, housing construction lags further and further
regions because of the investment stress in the nation's economy and the continuing priority given to western regions in the regional distribution of capital investment contributes to a slowing of the shift in the regional structure of manufacturing industry and electric power to the east.

The greatest investment efforts of industrial branch ministries, whose functions include planning and carrying out capital investment, are focused on the reconstruction of existing enterprises in the European part of the USSR where the productive and social infrastructure is already developed. The possibility of not creating the infrastructure anew allows construction time to be reduced and provides savings of capital expenditures. However, the gains achieved by such a tactical policy leads to strategic losses both for branches of industry and for the economy as a whole. It is in branch interests to open new enterprises with modern technology near new sources of raw materials and energy. Ultimately only this approach, which involves increasing one-time capital expenditures, will provide radical qualitative and quantitative changes in production and accelerate and increase the returns on capital and labor resources in a branch. It is in the interests of the national economy as a whole to reduce the spatial gap between the production of raw materials and energy and their users and to accelerate technical progress by creating new technology.

But the greatest task, whose fulfillment hinders the spatial orientation of capital investment outlined above, is the regional deconcentration of industrial production as a military strategic factor. During the entire history of the development of the USSR, in the event of war the Soviet rulers have painfully felt the vulnerability of the economy of a huge country to a high degree of spatial concentration of industry. Precisely for this reason an attempt was made to improve the distribution of the military-industrial potential. In particular, this goal was the basis for making the decision
about investing in the construction of the Ural-Kuznets combine or the creation of an aviation and shipbuilding industry in the Far East at the end of the 1920s and the beginning of the 1930s. The extensive investment program in the 1950s and 1960s to create the Angara-Yenisei complex, a new energy base for the eastern part of the country, was essentially determined by this factor. The need for comprehensive development and settlement of the eastern border regions is dictated by the strategic military interests of the USSR. However, investment efforts were never significant enough to overcome the age-old trend in the geography of Russian industry. The collision between the realization of the need to implement a long-term investment program of regional deconcentration of manufacturing industry and comprehensive development of eastern regions on the one hand, and investment to achieve the short-term goal of a maximum increase in the volume of production in existing industry of western regions on the other, was always the main contradiction of the regional aspect of investment policy in Soviet industry. This contradiction has become especially acute now as a result of the investment slump and the increasing spatial polarization of the extractive and manufacturing branches of industry.

*   *   *

Economic literature and statistical data of recent years, and also the plan projections for 1981-1985 published on February 2, 1980, provide a basis for concluding that the trends in the investment process in Soviet industry examined in this work will continue to develop, at least during the first half of the 1980s. Thus, the investment situation in industry during 1981-1985 will be the following:

The economy's possibilities for investing will be reduced. The decline in rates of growth and absolute increments to capital investment will proceed
more rapidly. A period of stagnation in the investment sphere will begin, and it will be transformed into a decline in the second half of the 1980s. As the scale of investment activity is reduced, the share of investment in replacement will increase and the share for expansion will decline correspondingly. The orientation of investment toward modernization will be strengthened. Priority will to a still greater degree be given to small forms of reconstruction. The rate of replacement of fixed capital will increase. Expenditures on reconstruction will provide increments to output relatively quickly, but they will not create the prerequisites for a substantial expansion of the scale of production. Increases in production capacity will be achieved by larger and larger relative capital expenditures. Investment activity will be further concentrated in the European part of the country, and thus the solution of the problem of shifting manufacturing industry from the overburdened western regions to the eastern regions with their undeveloped industrial structure will be further delayed.

The development and implementation of new directions in long-term investment policy are confronted by the inevitability of fundamental structural and regional shifts. Realizing the need for major long-term investment programs with different leading branches, the Soviet rulers cannot look beyond the framework of their short-term impulsive decisions in making their investment policy.

There is one other question in this regard that has not been treated in this work but which cannot be omitted. There is no doubt that a very important factor which has disrupted the entire investment sphere during the 1970s is the increasing diversion of resources for military purposes. Data that would make it possible to quantitatively characterize this phenomenon are not available. However, it seems obvious that the development of the
political situation both within and outside the USSR is pushing the regime toward a building up of military forces. There are sufficient grounds to presume that the negative effects of this factor on the rates of growth and the efficiency of the investment process will at the least not be weakened.

A sober assessment of the situation makes it possible to assert that only a change in economic priorities and in internal and external political strategy could offer a sufficient impulse for an upsurge in investment. Only if the Soviet leadership rejects the traditional course of attaining above-optimal rates of growth, and only if — at least temporarily — the expansionist direction of their foreign policy is weakened, could the conditions for a revival of investment activity in the country arise.

Perhaps such a situation will be created in the USSR in the foreseeable future, but this is a question of political rhetoric.
Notes

6. Ibid., p. 346.


18. Ibid., p. 360.


20. Ibid., p. 110.


24. Ibid., pp. 41, 366.


27. Ibid., p. 359.

28. Ibid., p. 358.


31. Here and below, unless otherwise specified the term "reconstruction" is used to refer to any form of renovating an existing enterprise. A more precise definition is given below.


34. "Instruktivnoe pis'mo Gosplana SSSR i Gosstroia ot 6 Fevralia 1975g."
   no. VI-4-D-10-D, Biulleten' normativnykh aktov ministerstv i vedomstv
   SSSR, 1975, no. 5, pp. 47, 48.
35. P. Kapitula et al., Fondoemkost' obshchestvennogo proizvodstva. Minsk:
   Nauka i tekhnika, 1977, pp. 78-79.
37. Metodika i praktika opredeleniiia effektivnosti kapital'nykh vlozhenii
   i novoi tekhniki. no. 28, Moscow: Nauka, 1976, p. 49.
38. Ibid., no. 26, 1976, p. 119.
39. In Soviet economic terminology the "technical structure" means the
   division of capital investment into expenditures on construction-
   installation work and on equipment, and the division of fixed capital
   into "passive" components (buildings and structures) and "active"
   components (equipment).
40. See, for example, Soviet ekonomicheskoi vzaimopomoshchi, Statisticheskii
   Moscow: Statistika, 1979, pp. 184-207.
41. Compare the figures cited in Struktura kapital'nykh vlozhenii SSSR i
   SShA. Moscow: Ekonomika, 1965, p. 83, with those in L. Smyshliaeva,
   Ekonomicheskii rost i proportsii kapital'nykh vlozhenii. Moscow:
42. V. Fal'tsman, "Intensifikatsiia razvitiia proizvodstvennogo apparata,"
   Voprosy ekonomiki, 1978, no. 1, p. 34.
43. Data for 1950 and 1955: TsSU SSSR, Promyshlennost' SSSR: statisticheskii
   sbornik. Moscow: Gosstatizdat, 1957, p. 16. For other years: Narkhoz
44. Ibid.


50. Fal'tsman, "Intensifikatsiia," 1978, p. 27.


55. M. Braun, Osnovnoi kapital promyshlennosti SSSR. Moscow: Gosizdat, 1930, p. 36.

56. Ibid., p. 59.


59. Ibid., p. 194.


Smyshliaeva, Ekonomicheskii, 1976, p. 146.
65. Ibid., p. 61.
67. Ibid., p. 29.
68. Narkhoz 1978, p. 94.
70. Ibid.
78. Ibid., p. 71.


82. Ibid., p. 41.


85. Nar'khoz 1978, p. 130.


90. Ibid.

91. Institut ekonomiki AN SSSR, Ural'skii nauchnyi tsentr AN SSSR, Metodicheskie polozheniia po opredeleniiu ekonomicheskoi effektivnosti kapital'nykh vlozhenii na rekonstruksiiu i rasshirenie deistvuiushchikh promyshlennykh predpriiatii. Sverdlovsk, 1975, p. 5.


A. Tsygichko, "Zamena sredstv truda v promyshlennosti SSSR i ShA," Voprosy ekonomiki, 1972, no. 10; and others.

104. Author's personal experience.
108. Data through 1955: Kvasha, Amortizatsiia, 1959, p. 100; since 1956: the yearbooks Narkhoz for the corresponding years.
112. S. Nurmukhamedov et al., Ocherki istorii sotsialisticheskogo stroitel'ka

113. A. S. Moskovskii, Formirovanie i razvitie rabochego klassa Sibiri v


116. The principle of territorial planning was triumphant during these years
as the sovarkhozes were created. However, the role of the reform of
the administration and planning of the economy carried out then in
raising the level of regional planning should not be exaggerated.
Autarchic tendencies in the economic development of regions were
definitely strengthened, but as before no comprehensive plans for the
development of major economic regions were compiled. And even in this
period the national economic plan was not an organic combination of
regional plans.

117. V. R. Pavlenko, Territorial'noe planirovanie v SSSR. Moscow: Ekonomika,
1975, p. 63.

118. The information that was the basis for calculations for cartogram 1
was taken from Narkhoz RSFSR statistical handbooks for the corresponding
years.

119. The information that was the basis for calculations for cartograms 2-5
was taken from the Narkhoz Kazakh SSR statistical handbooks for the
corresponding years.

120. Effektivnost' regional'noi ekonomiki Kazakhstana. Alma-Ata: Nauka,

121. Ibid.

122. L. I. Gramoteeva, Tekhniko-ekonomicheskie problemy razmeshcheniiia


124. Ibid.


128. Ibid., p. 216.


130. Ibid., p. 141.

131. Ibid., p. 140.


133. Ibid., vol. 6, 1971, pp. 342-366.


135. Ibid., p. 65.


139. Ibid., p. 122.


143. Ibid., p. 60.

144. Ibid., p. 61.


147. Pravda, April 15, 1980.
SHIFTS IN THE DISTRIBUTION OF FIXED CAPITAL INVESTMENT
BY BASIC ECONOMIC REGIONS OF THE USSR.

[cartogram #1]
1. Ob-Irtish region: Omsk, Tyumen, Tomsk provinces.
7. Western Kazakhstan region: Ural'sk, Guriev, Manghishlak, Aktyubinsk provinces.
12. Western Uzbekistan region: Samarkand, Bukhara, Kashkan Daria, Surkhan Daria, Khorezm provinces, Karakalpak Autonomous Republic.
15. Turkmen region: Turkmen Republic.

0-425 2651-3075 4821-5245 7371-7795
426-950 3076-3500 5246-5670 7796-8300
951-1375 3501-3925 5671-6095
1376-1800 3926-3970 6096-6520
1801-2225 3971-4395 6521-6945
2226-2650 4396-4820 6946-7370
THE DISTRIBUTION OF CAPITAL INVESTMENTS AMONG
THE OBLASTS OF KAZAKHSTAN.

[cartogram #2]
The distribution of capital investments among the oblasts of Kazakhstan (million rubles) 1960
The distribution of capital investments among the oblasts of Kazakhstan (million rubles) 1965
The distribution of capital investments among the oblasts of Kazakhstan (million rubles) 1970
The distribution of capital investments among the oblasts of Kazakhstan (million rubles) 1975