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The Industrialization of Soviet Russia in the First Half Century

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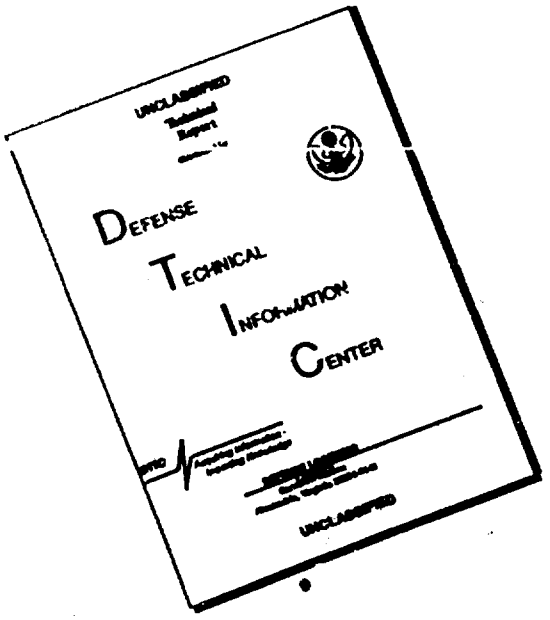

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The Industrialization of Soviet Russia in the First Half Century

by
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FOREWORD

This paper was prepared for publication with the presentations at the Sixth Conference on World Politics held in West Berlin in September 1967. It will be published, probably in the Fall of 1968, in Kurt London (ed), SOVIET UNION: FIFTY YEARS OF COMMUNISM, The Johns Hopkins Press, Baltimore, Md.

The scope and structure of the essay and the first and concluding sections were the responsibility of the primary author. Mr. Modig was particularly responsible for the "Record of Performance" section and for spelling out the Stalinist model.

The authors are indebted to RAC for financing the trip to Berlin and to the Institute of Sino-Soviet Studies, George Washington University, for providing the financial resources necessary to complete the paper.

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The Industrialization of Soviet Russia in the First Half Century

INTRODUCTION

The purpose of this paper is to survey the industrial-development process in Russia for the first half century of Soviet rule. Soviet industrialization was in part a continuation of trends and fulfillment of aims predating the revolution; the material preconditions for economic development and the necessary motivation were both present in 1913. This continuity between tsarist and Soviet objectives explains the reference to Soviet Russia in the title. The aim of this paper is to provide a brief survey of economic performance over the period and to give some understanding of the basic planning mechanism rather than to analyze or, indeed, to appraise the record against normative standards. In this the focus is on those periods in which Joseph Stalin was the dominant figure and influence on the course of Soviet economic development. These were the periods in which a unique Soviet pattern was developed, distinctive from tsarist or Western counterparts.

LENINIST PATH FOR ECONOMIC DEVELOPMENT

The Leninist route to economic development has been the orthodox policy of the USSR over the course of the first 50 years. In 1920 Lenin enunciated his formula, "Communism is Soviet rule plus electrification of the entire country."[1] Electric power was broadly interpreted to refer to machine building and by official implication to all energy and basic-metals output. Thus the economic conditions for attaining the ultimate historical stage of communism depended economically on the expansion of heavy industry. From time to time these key sectors were given anatomical designations, e.g., machine building was the heart, electric power the eyes, and steel the bread to feed the body economic. To be sure, the colorful references to the Leninist route for the attainment of communism invited incredulity, especially since they appeared to be stressed at times when attainment of the abundance of communism seemed least likely, e.g., in the early twenties, the first few years of the thirties, and immediately after WWII. Still, if there was a continuing thread throughout the 50 years, it was the devotion to the so-called Leninist path of heavy industrial emphasis on economic development.

The changes that took place during the 50 years could be divided into three periods or stages: 1917–1928, 1928–1955, and 1955–1967. During the first period, a basically rural-agricultural Russian economy recovered from the devastation of war and revolution—the pre-WWI level of overall economic performance of 1913 was reattained by 1928.[2] During the second period, dominated by Joseph Stalin, an urban-industrial base was established in the Soviet Union. By 1955 the problems and opportunities had changed to those of superimposing an advanced industrial sector on the industrial base and of integrating the in-

dustrial base with neglected sectors such as agriculture and urban infrastructure. The 50 years are dominated by the middle Stalinist period. In the first period the base was refurbished for Stalinist development, and in the third period new economic and political conditions led to modification of the Stalinist pattern.

The goal of the Stalinist period was the establishment of an industrial base in Soviet Russia. Many Russian leaders and economists considered this aim unattainable. Those politically divergent elements who felt that industrial development was necessary and attainable in Russia—Count Witte, M. Tugan-Baranovskiy, and V. I. Lenin—did not represent a majority view.[3] The eventual Soviet establishment of an urban-industrial base fulfilled a Russian as well as a Soviet aspiration.

Industrial growth was narrowly defined in Soviet plans as the expansion of the production of basic metals, energy, and machines. This selective development laid the foundation for investing in additional productive capacity—capacity for meeting future requirements of either producers or consumers as well as capacity for producing the sinews of war. Thus the high rate of increase in the output of steel, coal, electric power, and machines ensured in 1955 an absolute level of production well above that of 1928. Moreover the urgency with which the selected sectors were developed was reflected in the geographical concentration of industrial capacity; the older, developed European regions continued to dominate the newer Siberian regions some distance from the traditional centers.

To achieve the Stalinist goals of economic development, an urban-industrial economy had to be established as a second, more advanced economy on the base of the rural-agricultural economy inherited from the tsars. The means for accomplishing this end may be simply summarized: The planners or economic sovereigns—especially Joseph Stalin, the autocrat—acted as if the maximum increase in the physical output in key industrial sectors in as short a time as possible were the only objective. All other economic choices were to be determined by their relation to that central objective. To be sure, the needs of the military were provided for at a given level in this planning process along with a minimum allowance for maintaining consumption levels and certain other communal activities. With this single-objective system, the value of all economic activity was imputed to, or derived from, its relation to the aim of maximizing heavy-industrial output. Indeed the needs of tempo—rapidly expanding industrial output—tended to dominate all Joseph Stalin's Russia.

Stalin may have outlived the political viability of his system. By 1955, the terminal year of the Five Year Plan period in which he died, his central economic objective had been attained and the Soviet Union was ready for a new stage. The imperatives of the third stage were sharply competitive: (a) military-space needs called for a further advance over the narrow industrial base—the establishment of more sophisticated metals, energy, and machines beyond the traditional reliance on steel, coal, and general-purpose machines; (b) modernization of the established industrial base was required to improve the efficiency of labor, raw materials, and capital use; and (c) a widening of the economic-development process in the USSR became necessary to broaden the industrial base and to integrate the rural-agricultural economy into the urban-industrial base created under Stalin.

The post-Stalin period has been dominated by attempts to go beyond the industrial base established under Stalin by simultaneously building on the base

and widening its effective economic impact. The legacy of Stalin's model and the record of Soviet industrial accomplishment deserve a closer examination before appraising this current post-Stalin dilemma in the options open to Soviet planners in economic development.

RECORD OF PERFORMANCE

The record of performance may answer four questions: How rapidly did the Soviet economy grow? What level did it attain? Where was the new productive capacity located? What type of economic activity expanded? Thus the economic record examines the rate, level, distribution, and composition of development.

Rate

The accepted standard of national economic performance has come to be the average-annual-growth rate of the Gross National Product (GNP); for example, the US rate over the last decade has been about 3.6 percent and from 1911 to 1966 about 3.1 percent.[4] For the Soviet Union, however, there is no single agreed-on GNP rate but rather a range of estimates.[5] The Soviets say that from 1913[6] to 1963 their economy grew at an average annual rate of 6.85 percent.[7] Some Western estimates are 2.1 percent (Stanley Cohn[8]), 3.1 percent (Warren Nutter[9]), and 4.8 percent (calculated from data gathered by Peter Wiles[10]).

TABLE 1

Average Annual GNP Growth Rates in the USSR, 1928–1940 and 1948–1966

(In percent)

Information source	1928–1940	1948–1966	50-year average,[7–10] 1913–1963
Soviet data[a]	13.3	9.2[b]	6.85
Western estimates[c]	3.5–10	6.7[d]	2.1–4.8

[a]Calculated from national income data in Narodnoye Khozyaystvo S.S.S.R. (The Economy of the USSR), Central Statistical Agency of Council of Ministers, Moscow, 1956, p 36; Strana Sovetov za 50 Let (The Country of the Soviets for 50 Years), Central Statistical Agency of Council of Ministers, Moscow, 1967, p 28.

[b]1945–1966, 9.5 percent; 1950–1966, 8.9 percent.

[c]1928–1940: Peter Wiles, "Statistics on the Soviet Economy," The ASTE Bulletin, The Association for the Study of Soviet-Type Economies, University of Pennsylvania, IX (2): 10, 11 (1967), which incorporates work by A. Bergson and S. Kuznets (1928–1950, using both 1928 and 1937 weights) and Wiles (1926–1929). 1948–1966: 6.7 percent is a representative Western estimate for 1948–1964. Most sources agree that the Soviet GNP growth rate after 1950 averaged about 7.1 percent until the 1959–1964 period when it slowed to an average 5.3 percent (Stanley H. Cohn, "Soviet Growth Retardation: Trends in Resource Availability and Efficiency," in "New Directions in the Soviet Economy," US Congress, Joint Economic Committee, 1966, p 107.) For the postwar years before 1950 there are fewer data. Calculations from GNP indexes by Bergson indicate that the annual rate for 1948–1950 was about 9.3 percent (Ref 2, p 303, based on 1937 ruble-factor costs).

[d]1948–1964.

Such a 50-year annual average includes periods of excessive economic dislocation—WWI, the Revolution and Civil War, and WWII. With war and recovery periods excluded, the record improves to that shown in Table 1.

More specifically than the GNP rate, the rate of growth of industrial production provides an important measure of performance. The avowed Soviet goal was not the general expansion of the GNP but the maximization of one narrow component of GNP, the heavy-industrial sector. A Russian saying is "ne vsyo merit' na svoy arshin"—don't measure everything by your own yardstick. Table 2 reflects the Soviet yardstick by comparing growth in heavy-industrial production with growth rates for various other sectors of the Soviet economy.

TABLE 2

Average Annual Growth Rates in Selected Sectors of the Soviet Economy[a]

(In percent)

Sector	1913–1963	1928–1940	1948–1966
All industry			
Official Soviet data	8.2	16.8	13.2
Western estimates	4.7[b]	12.9[c] (Hodgman)	9.6–9.9[d]
		10.5–11 (Jasny)	
		8.4 (Kaplan-Moorsteen)	
		6.3 (Nutter)	
All heavy industry (group A goods)	10.0	21.2	9.6
Machines and metalworking	12.7	26.3	13–15
Chemicals	11.2	22.3	14.6–17.4[e]
Electrical energy	11.2	20.7	12.4
Steel	6.0	12.8	9.6
Coal	6.0	13.7	5.9
Cement	7.3	10.1	15.0
Transport (volume)	6.0	—	—
Light industry (group B goods)	6.0	—	—
Agriculture	1.6	—	—

[a]All annual rates (except b–d) calculated from Soviet data in Narodnoye Khozyaystvo SSR, Central Statistical Agency of Council of Ministers, Moscow, 1956, pp 63, 67, 71, 74, 79; Narodnoye Khozyaystvo SSSR v 1964 Godu, Central Statistical Agency of Council of Ministers, Moscow, 1965, pp 59, 63, 157, 169, 174, 200; Strana Sovetov za 50 Let, Central Statistical Agency of Council of Ministers, Moscow, 1967, pp 29–30, 51–53.

[b]Warren Nutter, lecture at Sino-Soviet Institute, The George Washington University, Washington, D. C., 18 Dec 67.

[c]Calculated from compilation of quoted indexes in Robert C. Campbell, Soviet Economic Power, Houghton Mifflin Co., Boston, Mass., 1966, p 124.

[d]James H. Noren, "Soviet Industry Trends. . . ," New Directions in the Soviet Economy, US Congress, Joint Economic Committee, 1966, p 281, adjusted to 1948 with Nutter, "The Structure and Growth of Soviet Industry," Comparisons of United States and Soviet Economies, US Congress, Joint Economic Committee, 1959, p 97.

[e]14.6 percent from 1950 to 1966; 17.4 percent from 1946 to 1966.

Although Western sources usually give lower estimates of these growth rates, Western and Soviet sources agree on one important point: Heavy-industrial production has steadily grown much faster than other sectors—almost 1½ times faster than the GNP and about 6 times faster than agriculture, according to Soviet data.

Moreover an examination of certain representative Five Year Plan periods, when growth was comparatively good, indicates even better absolute and relative industrial performance. Table 3 indicates growth rates during the second (1933–1937) and fifth (1951–1955) plan periods.

TABLE 3

Soviet Average Annual Sectoral Growth Rates, 1933–1937 and 1951–1955

(In percent)

Sector	Second plan period, 1933–1937	Overall period, 1928–1940	Fifth plan period, 1951–1955	Overall period, 1948–1966
Steel	25	12.8	10.5	9.6
Electricity	22.0	20.7	13.4	12.4
Cement	9.5	10.1	17.2	15.0
Coal	14.8	13.7	8.5	5.9
Machines and metalworking	23.0	26.3	16.7	13–15

[a]Calculated from Soviet data in Narodnoye Khozyaystvo S.S.S.R., Central Statistical Agency of Council of Ministers, Moscow, 1956, pp 63, 67, 71, 74, 79; Narodnoye Khozyaystvo S.S.S.R. v 1964 Godu, Central Statistical Agency of Council of Ministers, Moscow, 1965, pp 59, 63, 157, 169, 174, 200; Strana Sovetov za 50 Let, Central Statistical Agency of Council of Ministers, Moscow, 1967, pp 29–30, 51–53.

Level

The Russian economy inherited by the Soviets was overwhelmingly an agricultural one. In 1913 agriculture contributed over 56 percent of the net national income, whereas industry's contribution was only 21 percent.[11] About 75 percent of the population depended on the agricultural economy. Moreover in the first years revolution and civil war slowed agriculture and paralyzed industry. As late as 1928 the share of industry in the Soviet economy was far less than in other economies at corresponding levels of development.[12] Thus the level of industrial output at the start of the Soviet period was extremely low. But low as the industrial level was, most of the preconditions for building an urban-industrial base on the predominantly rural-agricultural underpinnings had been met by the time the Soviets took power. The tsarist legacy included a national railway network of 39,000 miles of track,[13] enabling the Soviets to keep construction of new mileage at the minimum necessary to support industrial expansion. There were also some established urban centers, a good communications system, a large government bureaucracy, and a sizable number of well-educated people.[14] Without the tsarist legacy of an urban-industrial infrastructure, the Soviets would have faced a double problem when they set out to build the industrial base—expanding fixed assets and building infrastructure. With sufficient infrastructure inherited, resources could be and were concentrated on direct industrial investment, as shown by the difference between rates of investment in industry and rates of investment in infrastructure after 1928 (see Table 4).

One measure of performance was the levels of industrial output achieved by the middle 1950's at the end of the Stalin era, as indicated in Table 5. Such basic indicators measure industrial development, the "sinews of national power."

TABLE 4

Growth of USSR Capital Stock by Sector, 1928–1960[a]

(1928 = 1)

Sector	1928	1940	1960
Industrial production			
Industry	1	6.4	28
Construction	1	25.3	188
Infrastructure			
Transport	1	2.9	9
Communications	1	10.0	19
Housing	1	1.8	4
Agricultural production			
Agriculture (excluding livestock)	1	1.8	5

[a]Calculated from data in Strana Sovetov za 50 Let (The Country of the Soviets for 50 Years), statistical handbook, Central Statistical Agency of Council of Ministers, Moscow, 1967, p 34.

TABLE 5

USSR Levels of Industrial Output, 1913 and 1955, and Engineers Graduated in 1955 Compared with US Levels in 1955 and Engineers Graduated in 1959

Industry	US, 1955[a]	USSR		
		1913[b]	1955[c]	World rank, 1955
Electric power, billions of kwh	629	2.0	170	2
Coal,[d] millions of Stons	493	32.1	304	2
Steel,[e] millions of Stons	117.0	4.7	50.0	2
Cement,[f] millions of Stons	55.0	2.0	24.8	2
Oil,[g] millions of bbl	2484	74	508	3
Engineers graduated, thousands	38[h] (1959)	—	75[i]	1

[a]US Dept of Commerce, Bureau of the Census, "Statistical Abstract of the United States: 1957," US Govt Printing Office, Washington, D. C., 1957, pp 947, 949–950.

[b]Strana Sovetov za 50 Let, Central Statistical Agency of Council of Ministers, Moscow, 1967, pp 58–61.

[c]Narodnoye Khozyaystvo CCCP (The Economy of the USSR) statistical handbook, Central Statistical Agency of Council of Ministers, Moscow, 1956, pp 63, 67, 69, 71, 79.

[d]Excluding lignite and brown coal.

[e]*Total crude-steel production (including ingots and steel for castings; excluding wrought iron).*

[f]All hydraulic cement used for construction, including portland, aluminous, natural, etc.

[g]Including shale oil but excluding natural gasoline, USSR data in metric tons converted to barrels using US Department of Commerce conversion factor: 1 bbl (42 gal) = 139.07 kg.

[h]US Dept of Health, Education, and Welfare, Higher Education, journal of Office of Education, Dec 61, pp 12–13.

[i]Vysshyeye Obrazovaniye v S.S.S.R. (Higher Education in the USSR), Central Statistical Agency of Council of Ministers, Moscow, 1961.

These measures indicate that by 1955 the basic industrialization stage of Soviet economic development was over. Figure 1 illustrates the resultant change in structure of the Soviet economy from 1913 to 1958.

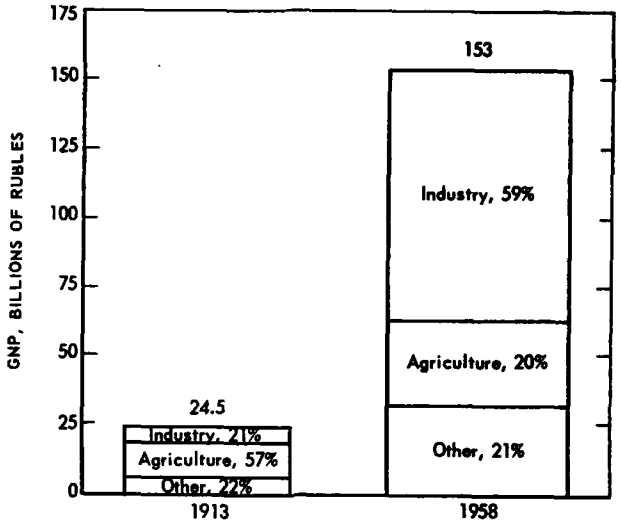

Fig. 1—Size and Sources of Soviet GNP, 1913* and 1958†

*1913, S. N. Prokopovitch, quoted in Peter Wiles, "Statistics on the Soviet Economy," The ASTE Bulletin, The Association for the Study of Soviet-Type Economies, University of Pennsylvania, (IX) 2: 25 (1967).

†1958, size: Nancy Nimitz, "Soviet National Income and Budget, 1956–58," Santa Monica, 1962 (in market rubles); composition: Narodnoye Khozyaystvo SSSR v 1964 Godu, Moscow, 1965, p 67.

Composition

The record of performance shows that the composition of industrial production remained relatively constant in at least two respects.

First, the structure of Soviet industry was resistant to rapid change. Production functions (the technology-governed formulas for producing various industrial goods) changed little over most of the Stalin era. Since the "mix" of producers' inputs required to make a given industrial output changed slowly in response to technological innovations, proportions between various heavy-industrial products tended to remain fixed. The Soviets preferred the large industrial output attainable by expanding an unsophisticated coal-iron-steel-cement economy. For example, the industrial base continued to be built on coal-derived energy sources long after a mixed coal/oil energy base became technically feasible. The quality of the mixed coal/oil base would have been higher in terms of efficient use of resources, but the output, in terms of maximum possible immediate increase in Btu energy equivalents, would have been lower. Throughout industry, output of a relatively small number of products was maximized by using simpler production formulas rather than accepting

TABLE 6

Planned Capital Investment in State Industry in the USSR, 1928/1929–1933[a]

(In millions of 1926/1927 rubles)

Area	Planned input
Russian Soviet Federated Socialist Republics	10,494
Central region	2,998
Leningrad region	1,055
Siberia region	662
Far East region	310
Other regions	5,469
Ukraine	4,521
Other republics	1,533
Total	16,548

[a]From Pyatiletniy Plan (Five-Year Plan), Vol 3, USSR Gosplan, Moscow, 1930, p 568, quoted in Violet Conolly, Beyond the Urals, Oxford University Press, Oxford, 1967, p 68.

TABLE 7

Share of USSR Industrial Output Produced in European Russia including the Urals, 1913–1960[a]

(In percent)

Product	1913	1928	1940	1960
Steel	100	99.9	89.4	90.7
Iron	100	99.9	98.5	96.4
Rolled steel bars and shapes	100	99.8	88.7	88.6
Coal	92.3	86.0	71.3	64.1
Electric power	97.9	97.5	90.8	78.4
Chemicals				
Fertilizer	100	100	93.1	84.1
Sulphuric acid	100	100	95.8	81.3
Calcined soda	99.9	99.5	97.5	96.9
Caustic soda	100	100	100	90.9
Synthetic yarn	—[b]	100	100	81.5
Machine tools	100	100	98.4	92.9
Metallurgical equipment	na[c]	na[c]	100	92.9
Tractors	—[b]	100	100	87.8
Cement	95.2	96.5	86.5	78.6

[a]Strana Sovetov za 50 Let (Country of the Soviets for 50 Years), Central Statistical Agency of Council of Ministers, Moscow, 1967, pp 58–61.

[b]No production.

[c]Not available.

the loss of time inherent in transition to new formulas that would be more efficient in use of resources but initially less productive.[15]

Second, the blend of factors of production (materials, labor, capital) has also remained rather constant. Austerity was practiced in the use of scarce capital, but labor and raw materials were generally not economized. In capital terms, this policy meant producing with older machinery for as long as possible. The emphasis was on repair, not replacement, of capital stock. Depreciation rates allowed on capital stock were low by Western standards, and obsolescence was a foreign concept.[16] In labor terms, the policy meant increasing output by adding workers rather than by increasing the productivity of the individual worker, although industrial labor productivity also inevitably increased as the pool of skilled labor grew. Improved labor productivity was more the byproduct of industrial expansion than the result of labor-saving investment.[17] Thus Soviet planners apparently preferred to sacrifice the variety of end products (on the industrial-output side) and high-quality factors of production (on the industrial-input side) in order to maximize output in a few heavy-industrial sectors.

Distribution

In building their industrial base, the Soviets could have altered the geographical pattern of the location of industry to ensure a more even economic development of their country. Such a policy would have been in accord with Lenin's and Stalin's original declared policy on the nationalities, i.e., assuring the equal distribution of output through the development of the economies of all of the far-flung national areas of the new Soviet state.[18] But in practice such a policy would have sacrificed the advantage of inherited tsarist infrastructure, and the record of performance in this category shows that most of the industrial base was actually built where the skilled labor, cities, and transport already existed to some extent—in or adjacent to European Russia.[19]

The first Stalinist Five Year Plan allotted more rubles for investment to the Leningrad area of European Russia alone than to all the regions of Siberia and the Soviet Far East combined. (Table 6 provides details of the first Stalinist investment plan.) In 1913, 95 percent or more of industrial production was in European Russia. As recently as 1960 the overwhelming bulk of such production was still in European Russia, including the Urals (see Table 7). Even without Ural production, more than half the production of most industrial sectors was in European Russia.[20]

As can be seen, the geographical center of gravity of industry has moved somewhat eastward over the years. But this movement appeared to be primarily in response to the strategic relocation of industry (e.g., during the German occupation in WWII) and the comparative attraction of rich Siberian resources coupled with the gradual depletion of natural resources in European Russia. Such movement apparently did not occur because of the Stalinist priorities but despite them.

STALINIST ECONOMIC MODEL

Representative Periods

What Soviet policies were responsible for the particular pattern of economic growth that has occurred? The foregoing summary of the record has noted the significant industrial increments achieved during such periods as

the second Five Year Plan (1933–1937) and the fifth Five Year Plan (1951–1955). Although these were not the only periods during which a normal[21] series of annual plans was carried through, they appear to be representative of the Stalinist system. In this attempt to describe characteristic economic processes these two periods should be of particular interest, for Stalinist formulas were most operative in such periods.

Conceptual Model

All political leaders, in choosing among their economic policy alternatives, and economists, in solving their technical problems, are aided by economic models of varying sophistication. These models range from sophisticated mathematical models (such as those now employed in the US and other industrialized nations for projecting national economic trends) to simple conceptual models implicit in any decision-making process. Central to the conceptual model is the simplifying assumption, often postulated in economic theory in the "as if" form. For example, a basic premise in the study of Western market economics is that each entrepreneur acts "as if" the prime goal were the maximization of his enterprise's profits. And although economists know that this picture of the firm does not fully correspond with reality, they often proceed "as if" it were so, for the sake of simplicity and because of the insights that the supposition allows.

Any model that the Soviets used under Stalin in guiding their economic policy must be described in this conceptual form. Under Stalin's planning, statistical discipline was too loose, conditions too chaotic, and revisions of plan targets too frequent to suggest seriously that an explicit, complex, and mathematically rigorous model was followed.[22] However, the general consistency of Soviet economic decisions suggests that it would be equally inaccurate to assume that there was no model at all. Rather, it appears that Soviet patterns of action very definitely conformed to a simple but inclusive conceptual economic model. It is in this sense that reference is made to a "Stalinist" economic model and an attempt made to specify its central features.

Application of Tempo

"Tempo" in the Soviet usage meant mobilization and concentration of resources to achieve one primary set of economic goals. In implementing the Stalinist economic model, Soviet planners have acted "as if" the maximization of output of only one sector of the economy—heavy industry—were important. They have acted "as if" the interest of the other sectors could be safely ignored or held constant (ceteris paribus) while heavy-industrial output was expanded as rapidly as possible. And finally, they have acted "as if" production of the other sectors were of value only insofar as it provided additional increments of materials, labor, and capital for the expansion of the heavy-industrial sector. These "as if's" gave the Soviet planner a set of simple imperatives in planning resource allocation.

First, allocate to the military establishment the resources (labor, materials, capital) needed to fulfill strategic requirements.

Also lay aside the minimum amounts of resources needed for consumption and the preservation and necessary growth of the infrastructure.

Second, maximize the flow of resources into the heavy industrial sector.

Then specify how resources are to be combined to maximize output. (The Soviet planner assumed that fixed functional relations held between units of steel, energy, and machine equivalents. A simple application of these production functions helped him determine the crude end-product mix, as well as proportions between industrial inputs and proportions between factors of production. These production functions changed little over time.)

Third, distribute residuals of unrequired or unsuitable resources among other sectors such as agriculture and light industry.

Categorization by End Use

Viewed analytically the aggregate of available factors of production was equal to the previous year's material product plus the total labor force and capital stock, and the available resources could be divided into the following three categories of use:

(1) Strategic requirements
(2) Consumption and infrastructure
(3) Heavy industry

Such a division corresponds to the Western practice of regarding the GNP as divisible into several categories by end use as shown in the accompanying tabulation.

End use of GNP	
Consumption	Investment
Public	Replacement
Defense	Net investment
Education	
Administration	
Other services	
Private	

However, the Soviet planner in practice acted as though his end-use categories were structured differently. The Western public-consumption category for defense was of such importance to the Soviets that it was brought out to stand alone as term 1. All other consumption, replacement investment, and net investment to nonpriority sectors became term 2. And net investment to heavy industry became term 3. The process to be performed on each of these terms differed in accordance with its priority. Resource allocation to 1 was stipulated to the planner "from above," 2 was to be held to the lowest level at which these sectors could still effectively support expansion of heavy industry, and 3 was to be maximized.

Application of the Plan

In the maximization process for heavy industry, limits were imposed by the maximum possible shift of new labor into the urban-industrial work force from the countryside. A second limit was the availability of capital. Importation of foreign capital goods was limited by the availability of Soviet agricultural

and primary commodities for export,[23] and increments of domestically produced capital by the rate of domestic saving that could be maintained. The third limit of course was the availability of materials, and the size of the supply plan was set largely by the previous year's production record.

In general, as discussed earlier, emphasis was on quantity of factors of production rather than on their quality. Hence production formulas were adapted that best utilized the available proportions of labor, capital, and materials, and these production functions then remained relatively fixed, tending to prefer the use of basic undifferentiated materials and machinery to the proliferation of many highly differentiated ingredients in the production process. Since capital was the scarce factor and unskilled labor was plentiful, large-scale use of the latter was often made to conserve the former. Of course with the passage of time the increased output of heavy industry itself increased the share of capital, and labor productivity inevitably went up. In general, however, the increase in productivity was slow throughout the Stalin era.[24]

Implementing the Plan

Control of the Industrial Sector. The basic simplicity of the procedure just outlined and the narrowness of scope of the sectors requiring detailed planning made centralization of planning both attractive and possible. A basic feature of the planning process was the optimal tautness of the production goals set. Soviet leaders were always optimistic to the maximum degree in setting targets; such planning "tautness" was then relayed down through the planning hierarchy.[25] The industrial sector was most heavily planned, with the most detailed control mechanisms governing its performance. However, control mechanisms were devised for nonpriority sectors as well; these mechanisms, although less numerous, were sufficient to ensure that the other sectors made their necessary contributions to the main goal of building the industrial base.

In the industrial sector, a set of annual plans for production, material supply, labor, finance, and investment controlled in detail the economic activity within the sector. The yearly elaboration and balancing of these plans were the responsibility of Gosplan, the State Planning Committee, which received each year a few dozen highly aggregated production[26] and investment targets from above and, in coordination with the Branch Ministries for each type of industry, distributed detailed individual plans to the basic industrial enterprises below. Gosplan did the planning largely by means of a crude but effective system of materials balancing. At the Stalin-to-Gosplan level, tautness was embodied in the optimism of targets passed down and in the demand for very short construction times in building new plants. To the enterprise the plans appeared as a set of orders, hopefully coordinated, specifying what it was to produce, how much labor and materials it was entitled to acquire, from whom and at what prices, the buyer(s) of its production, how much they would pay, investment for expanding the enterprise, and so forth. At the planner-to-enterprise level, tautness was embodied in the high production quota assigned to the enterprise and the scanty allocations of materials, equipment, and labor with which the enterprise manager had to work.

Central planning in its strictest sense was limited to what were called "funded" items—producers' goods that could be obtained by an enterprise or ministry only if it had a fund, or allotment quota, for the item in the form of

an account of earmarked rubles in the State Bank.[27] Other items were centrally planned but not strictly funded, and there were several thousand items in this second category. Between them the two categories comprised the vast majority of all producers' goods.[27]

As can be seen, the Supply-Production Plan and the Finance Plan interlocked to control the individual enterprise's acquisition of the most important material inputs. Similarly, investment was controlled by the Investment Plan together with the Construction Bank. In order to sign a contract with a construction enterprise to begin an expansion in plant, a production enterprise had to have the project funded in the Construction Bank as well as approved in the Investment Plan (Ref 22, pp 145–46). The Investment Plan also covered much of nonindustrial investment; hence its effect over the whole economy was to ensure that heavy industry got all the increments of capital it could absorb, whereas within the industrial sector it distributed investment among alternative projects, thus substituting for the interest mechanism of Western market economies.

Relaxation of Ceteris Paribus. Outside the industrial sectors the Stalinist economic model made less detailed but very definite demands on the other sectors in the name of heavy industry, and positive and negative mechanisms existed to make sure that these demands were met.

In agriculture the market mechanism was abolished in favor of negative controls, which by direct procurement would better ensure adequate food supplies for urban workers, agricultural raw materials for industry, and grain for export—all at levels of compensation that did not increase the real income of the agricultural population because procurement was not at market prices. The essential features of the agricultural mechanism were control of the agricultural plot through the collective-farm arrangements and fixed quotas of produce (chiefly grain) to be delivered to the state—at low fixed prices set by the state. Applied rigorously these instruments even decreased real per capita income of the rural population, thus serving as a positive incentive for the farmer to join the growing industrial labor force in the cities.[28]

In foreign trade the creation of a state monopoly over trade secured absolute control over imports and assured that capital-goods imports were maximized and consumer-goods imports were minimized.[29]

For labor the progressive piece-rate system provided incentives without the necessity of increasing significantly the production of consumer goods. Low real wages[30] helped to secure a high labor-participation ratio by making two- and three-worker households an economic necessity for most of the urban population. Labor unions, which had earlier secured wage increases in excess of productivity increases, were made an instrument of state policy.

Negative mechanisms included the worker's labor book, which tied him to his place of work, harsh legal punishments for absenteeism, and a labor draft that controlled an unprecedented shift of labor from agriculture to industry.[31]

Over the whole consumption sector of the economy, the principal means for keeping consumption low and forced savings high were the low supply allocations, investment allocations, and targets for enterprises in the light-industrial sector on the one hand and high retail prices to consumers on the other. Prices on producers' goods were kept low for the industrial buyer, but the price of consumers' goods was high because of an added "turnover" tax,

which taxed away excess consumer purchasing power and at the same time was a principal source of revenue for the state budget, out of which most of the Investment Plan was financed. Throughout the Stalin era, almost half the money paid by the population for consumer goods was tax.[32] Moreover, differentiated retail prices increased consumers' preferences for such staple items as bread, which was relatively cheap and which from the state's point of view represented satisfaction of basic consumption needs at minimum cost to the state.

Negative mechanisms to enforce least-cost consumption included strict laws against black-market activities and, on occasion, revaluation of the ruble.[33]

The system followed the logic of building a narrowly defined industrial base in as short a time period as possible on a rural-agricultural base. The cost was high, but the objective was attained.

REVISIONS OF THE STALINIST MODEL

Post-Stalin Environment[34]

The successful establishment of the industrial base by the early 1950's provided opportunities and necessities for further development. This development process required further expansion of the narrow industrial base and widening of the base to satisfy more completely the broad requirements of the economy as a whole. In effect the economic plant had to be simultaneously deepened and widened, and this new task made some modification of the Stalinist economic formulas necessary.

The military-space requirements demanded that new, unique, sophisticated industrial capabilities for modern weaponry be developed and added to the established base. Steel, coal, and simple machinery could not meet the needs of nuclear missilery as they had the conventional requirements for rifles, tanks, and airplanes. Large-scale nonferrous metals, exotic fuels, and sophisticated-machinery output had to be developed after the Soviet decision to exploit the strategic opportunities dramatized by their Sputnik success.

At the same time that an advanced tier of the Soviet industrial base was being established, the refurbishing and broadening of the existing base became imperative. It became increasingly costly simply to rely on increments of labor, raw materials, and capital from nonpriority sectors instead of shifting to more efficient factor combinations. Increases in industrial output had to come from an improvement in the efficiency of the use of labor and other factors rather than from the continued addition of the same resources. The delayed demographic impacts of the low WWII birthrate appeared in the 1950's as a trough in the annual number of males reaching 18 years of age. Moreover this effect coincided with the apparent exhaustion of the regime-defined surplus of peasants. The deceptively large rural labor force in agriculture included far too many grandmothers (babushkas), and even the available males were not easily trainable for required industrial tasks. Likewise further deferment of investment in transportation, housing, and other nonpriority elements of the Soviet infrastructure could not be tolerated. Railroads bore the brunt of transport demands but continued to rely on coal-fired steam locomotion. As average hauls became longer and even petroleum products were being moved by rail (instead of by

pipeline), a point of negative economic returns may have been reached. Even the conventional industrial base still supporting military requirements was affected by labor-saving requirements; a series of reorganizations reduced drastically the number of men at arms. The Army's conversion of rifle divisions into mechanized divisions was characterized by an exchange of added firepower and mobility for reduced manpower.

Beyond the deepening and widening of the industrial base there was a third, broader, more ambiguous requirement for meeting the demands of the economy as a whole. The integration of the broader needs of the economy challenged directly the central features of the Stalinist model.

First, military-allocations levels can be only provisionally set aside, both in the aggregate and in the trade-off between alternative military uses (e.g., missiles in place of conventional divisions). The fluctuating military budgets of Khrushchev and his successors bear witness to the fact that defense is now a variable rather than a preferred "given."

Likewise, consumption is no longer a nonpreferred "given." Production to provide for improved living conditions is a variable—if only as a stimulant to productivity.

Second, the simplifying assumptions of fixed product relations are increasingly untenable as the structure of heavy industry becomes more complex, servicing technologically advanced space programs, traditional military and investment projects, and new requirements in the economic infrastructure.

Third, no longer can Soviet planners treat light industry, transportation, and agriculture as though they were primarily suppliers of "surplus" labor, raw materials, and capital for heavy industry—and consumers of whatever residuals are left after heavy-industrial output is maximized.

Institutional Stagnation[35]

Likewise under challenge are the control mechanisms set up to meet the central objective of the Stalinist model: balanced estimates planning, collectivized agriculture, and foreign trade monopoly, as well as the coercive institutions controlling urban labor and management. Institutions universally tend to outlive the original purpose for their creation, and the persistence of the administrative status quo in the Soviet Union is perhaps even stronger than in other societies.

The effectiveness of the Soviet institutions designed to implement the Stalinist model has turned on the participation of the Soviet Communist Party. The role of the party under Stalin became closely interwoven with the institutions for economic control. Changes have been made—the labor camps have been closed, and the application of terror to economic administrators has been reduced or virtually eliminated. Challenges have been permitted even to the collective form of agriculture. But challenges are not changes: new central planning methods have yet to be adopted.[36] Collectivization continues in agriculture, and foreign trade is still a monopoly. The institutional structure of Stalinism in economic development remains basically unchanged, if not unmodified.

New Economic Stage

The Soviet Union may be characterized economically as three countries: (a) an advanced urban-industrial nation rivaling the US and outstripping all other nations in strategic weapon and space technology; (b) a developed indus-

trial economy exceeding the industrial nations of West Europe and Japan in output but lagging behind them in the broad range of industrial technology; and (c) a rural-agricultural economy with all the problems of the developing nations in the southern hemisphere of the world. The US has largely integrated its variants of the three-tiered Soviet economy. US agriculture could be described, with some qualification for the subsistence-farming fringe, as a branch of industry. The advanced economy is less convertible than other sectors, but the technological gap between it and other US industry does not approach that existing in the USSR.

Perhaps the three Soviet economies can continue to coexist. The attendant problems of strategic considerations and regional differences may militate against compartmentalization. Even if the three-level economy continues, the choice among the sectors and within the sectors will be difficult. The Soviets cannot avoid the eventual substitution of a concept of optimizing—choosing among alternatives—to replace the concept of maximizing—primary emphasis on a single objective. Choices will be difficult. With a slowing growth rate all felt needs cannot be met. But how are the Soviets to allocate the shortfalls among defense, investment, and consumption? The best choices by any consistent application of criteria require better professional economic judgment than is possible while the institutional stagnation in economic administration continues. The pervasive role of the party in economic administration is at least partly responsible for the stagnation. But the party will hardly delegate away control that was carefully built up for it under Stalin—the major economic decisions are too important. How the Soviets balance professionally derived efficiency and party control will determine the character of this latest stage in economic development of the Soviet economy.

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5. The results of various calculations of the Soviet GNP growth rate differ from each other because of differences in approach to such computational questions as: What year's set of prices should be used in calculating the total market basket of goods and services? What years are to be bases? How is double counting avoided? How should annexed territory be counted?
6. The initial point chosen was 1913 rather than 1917 because of the better statistical data available for the prewar year.

7. As measured by Soviet data on national income (proizvodstvo natsional' novo dokhoda). Since 1940 the GNP rate has varied from the national income rate by less than 0.2 percent, according to Soviet data. Strana Sovetov za 50 Let, Central Statistical Agency of Council of Ministers, Moscow, 1967, p 28; Narodnoye Khozyaystvo S.S.S.R. v 1964 Godu (The Economy of the USSR in 1964), Statistical Yearbook, Central Statistical Agency of Council of Ministers, Moscow, p 59.
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12. Corresponding points in terms of per capita income. See Stanley H. Cohn, Ref 8, p 83.
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18. A "Plan of Scientific-Technical Tasks," written by Lenin 6 April 1918, outlines principles of national location of industry, i.e., the location of new industry closer to raw materials sources, reducing transport costs and developing the "eastern regions." [V. I. Lenin, Sochinenia (Collected Works), Moscow, 1950, Vol 27, p 288; also Pravda, 4 Mar 24.] The Party's declared policy conformed to Lenin's position in the early years: "It is the Party's task to help the toiling masses in the non-Russian nations [within the USSR] to overtake central Russia, which has forged ahead." [Vse' soyuznaya KP v Resolyutsiyakh i Resheniakh S'ezdov, Konferensii, i Plenumov Ts. Komitetov (The All-Union Communist Party in Resolutions and Decisions of Congresses, Conferences, and Central Committee Plenums), Pt I, 1898–1925, Moscow, 1954, p 559.]
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32. Robert Campbell, Table 2, footnote c, p 87.
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36. For more detailed discussion of themes sketched out herein, see Vladimir Treml in John P. Hardt (ed), Toward a Soviet New Economics, Underlying Trends, The Johns Hopkins Press, Baltimore, Md., forthcoming, 1968.