

THE STRUCTURE AND GROWTH OF SOVIET INDUSTRY: A COMPARISON WITH THE UNITED STATES

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I. INTRODUCTION

SUMMARIES are always treacherous, particularly when treating such a complex subject as the structure and growth of Soviet industry. One may present either a detailed picture of a narrow aspect of the topic or a bold sketch of the subject in the large. The latter approach seems most appropriate here, but it should not be undertaken or studied without an awareness of the importance of things left unsaid. Few topics of the day are more controversial than the question of Soviet economic growth. Scholars who have devoted their professional careers to this subject reach vastly different conclusions, on matters of both fact and interpretation. We are a long way from the scholarly ideal of agreement.

For this reason, it is as important to know how conclusions are reached as what they are. And there is the dilemma: full documentation, usually tedious and complex in this field, cannot be presented in a summary statement. Nor can all the necessary qualifications be kept constantly before the reader. This essay represents an effort to compress voluminous materials and qualifications, with all the unavoidable vices of a summary. It draws on preliminary findings of a broad study of Soviet economic growth sponsored during the last five and a half years by the National Bureau of Economic Research. Since the study has not yet been completed, the findings are subject to revision before the final report is published. That report will, of course, contain a documentation of the basic statistics.

Any summary of Soviet industrial performance must start with a few words on the difficulties of appraising it. The student of the Soviet economy takes his data from the official Soviet press, and therein lie unusual troubles. Some may find it hard to believe that Soviet statistics are "really" worse than others, because every specialist in no matter what field quickly becomes convinced that no data could be as bad as those he is forced to work with. Why call the kettle black when it is probably no grayer than the pot?

Let us acknowledge at once that all statistics contain faults and errors. Let us also acknowledge that no government or other agency resists the temptation to stretch figures to its own account if it feels it can get away with it.

Representative government, competitive scholarship, and free public discourse are the Western institutions that have counteracted error and misrepresentation in statistics, imperfectly to be sure, but at least to some degree.

The peculiar difficulties with Soviet statistics stem, in the first instance, from the system of authoritarian, centralized planning—from what has been called a “command economy.” Published statistics come from only one source: the state. There are no independent sources to restrain each other or to be used as checks against each other, except to the extent that related figures published by different state agencies might not be fully coordinated before publication. At the same time, the suppliers of data to the central authorities—the economic and administrative units—have a stake in the figures they report, since their performance is judged on the basis of them. The Soviet statistical authorities do not hide their concern over the misreporting that results from this feature of the economic system.

A second set of difficulties stems from the crusading nature of Soviet communism. Statistics are grist for the propaganda mill. Knowing the ideological views of Soviet leaders, one cannot expect them to dispense facts in a passive and detached manner.

For both broad reasons, Soviet statistics are selective and of varying reliability and ambiguity. The policy of selectivity has two rather opposing results as far as statistics on physical output are concerned. On the one hand, some areas of poor performance are shielded from view, being underrepresented in published data. On the other hand, some of the more rapidly expanding economic activities associated with the military sector are also not reported on. It is impossible to determine the net bias of the sample of published data: whether there is, on this count, a net over- or understatement of growth.¹

A few broad generalizations can be made about the reliability of the published statistics. In the first place, absolute output is probably overstated in the case of most industries, particularly for the years within the Plan period, though the degree of overstatement cannot be determined. In the second place, growth in output is also probably overstated relative to a prerevolutionary or an early Soviet base, but not necessarily over other parts of the Soviet period. Over some of the latter years growth may be overstated, over others understated, and over still others more or less accurately reported. This will vary from industry to industry and from one situation to another.

Whatever the faults of data on output of individual industries, they are more reliable than official aggregative measures, such as the official Soviet index of industrial production. Although the details underlying this index have not been made public, Western specialists are generally agreed that, from

¹ These brief comments apply to the condition of economic statistics since 1956. Between 1938 and 1956, statistics on physical output of individual industries were not published at all in the Soviet Union, with a few minor exceptions.

what they know about the construction and behavior of the index, it exaggerates industrial growth, though apparently less in recent than in earlier years.

There are other factors in addition to the defects in basic statistics that make it difficult to construct meaningful measures of aggregate industrial production. Soviet prices generally do not reflect relative costs of production; the industrial structure has shifted radically over short periods of time; growth rates have differed widely from sector to sector; growth has been interrupted at critical points by major disturbances; and so on. Finally, quantitative growth has not been accompanied by the general improvement in quality that has characterized industrial development in most Western countries.

These considerations make it difficult to summarize Soviet industrial performance in terms of mere numbers. But summaries are useful and necessary, and they cannot be fully qualified at every point without turning them into the voluminous reports they are supposed to summarize. In the summary to follow, the necessary qualifications are intended to be implicit throughout, and they should be kept in mind to dull the edge of deceptively sharp figures.

II. SOVIET INDUSTRIAL GROWTH

Growth in output.—Soviet industrial output multiplied between 5 and 6 times over the period 1913–55 (see Table 1 and Chart 1).² Performance varied widely among sectors, with output multiplying 16 times in the case of machinery and equipment, 9 times in the case of intermediate industrial products, but only 3 times in the case of consumer goods. The average annual growth rate was 4.2 per cent for industry as a whole, 6.8 per cent for machinery and equipment, 5.5 per cent for intermediate industrial products, and 2.6 per cent for consumer goods (see Table 2).

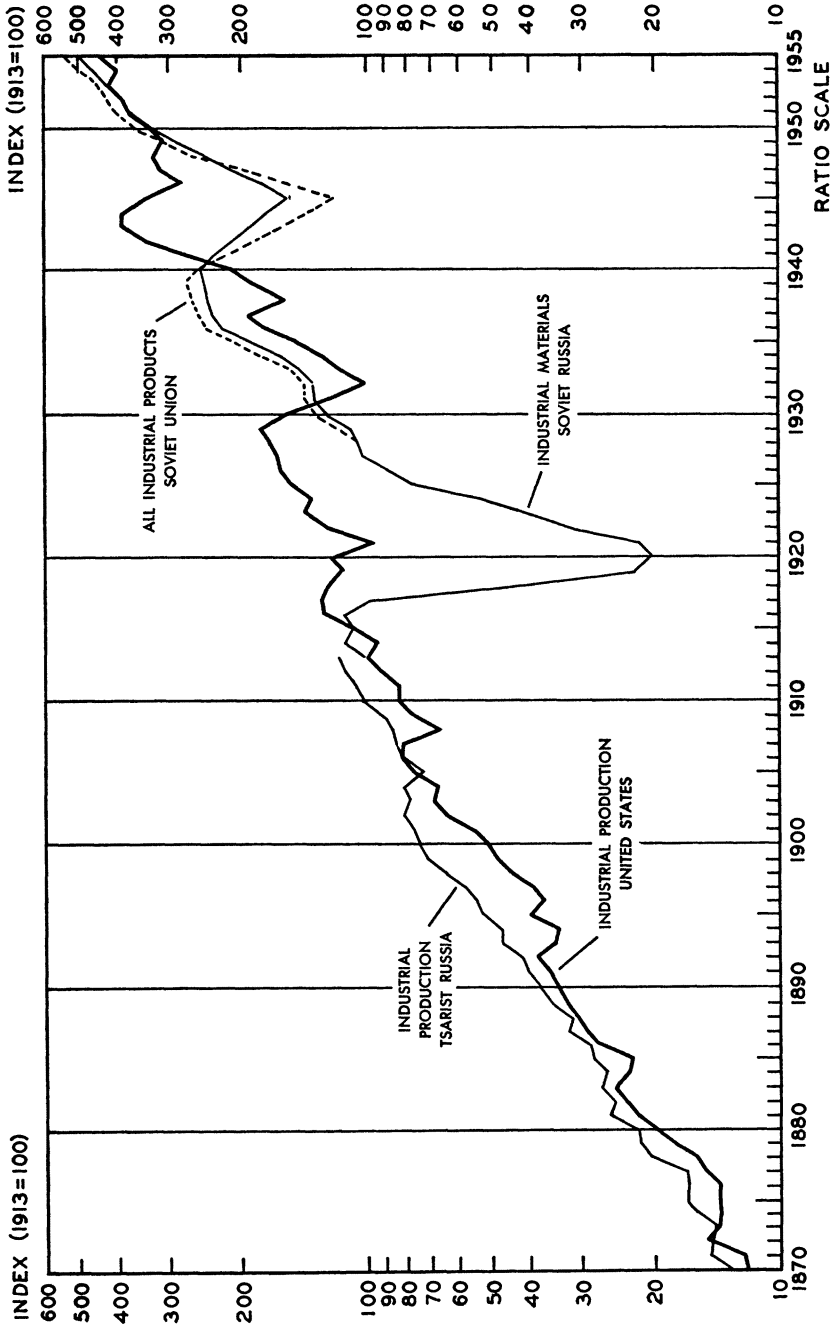
Some of this growth is attributable to the territorial expansion that took place during and after World War II. We have estimated that the acquired territories added about 11 per cent to industrial output, and, if we suppose that this relation would also have held true in 1955, the average annual growth rate for all industry over the Soviet period would have to be reduced from 4.2 per cent to 3.9 per cent to eliminate the effects of territorial expansion. The assumptions underlying such an adjustment are, of course, somewhat arbitrary.

The dispersal of growth trends (unadjusted for territorial expansion) may be seen more clearly by examining a finer breakdown of industries. For a sam-

² Industry includes manufacturing, mining, logging, fishing, and generating of electricity. For the purpose of this summary, aggregate Soviet output is measured by a comprehensive index based on moving Soviet weights. That index directly covers almost all categories of products except military end items and the more heterogeneous categories of machinery. Alternative indexes using different product coverages, weighting systems, and weight bases give results dispersed about those given by the comprehensive index with moving weights.

CHART 1

INDUSTRIAL PRODUCTION: TSARIST RUSSIA, SOVIET UNION, AND UNITED STATES, 1870-1955



ple of 70 industries, growth rates ranged from an average annual decline of 0.9 per cent to an average annual increase of 16.8 per cent; the middle half of these growth rates ranged between increases of 2.5 per cent and 8.5 per cent. The median was 5 per cent, which is higher than the weighted average of 4.2 per cent shown by the production index. Industries producing consumer goods dominate a distinct lower region of growth and are essentially confined to it, while other industries are concentrated about a higher region.

TABLE 1
INDEXES OF INDUSTRIAL PRODUCTION FOR RUSSIA, SOVIET UNION, AND
UNITED STATES: BENCHMARK YEARS, 1870-1955
(1913 = 100)

	TOTAL OUTPUT		OUTPUT PER PERSON ENGAGED IN INDUSTRY ^a		OUTPUT PER HEAD OF POPULATION	
	Russia or Soviet Union ^b	United States	Soviet Union	United States	Russia or Soviet Union	United States
1870.....	13	12	...	...	21	29
1875.....	17	14	...	...	25	30
1880.....	22	20	...	...	36	38
1885.....	28	23	...	...	36	39
1890.....	38	35	...	...	55	54
1895.....	52	39	...	...	59	56
1900.....	74	50	...	...	77	65
1905.....	72	74	...	...	69	91
1910.....	102	85	...	...	61	88
1913.....	118	...	...	...	99	100
1913.....	100	100	100	100	100	100
1920.....	20	125	...	...	20	113
1928.....	102	172	110	149	93	138
1933.....	150	119	85	139	123	91
1937.....	258	194	121	158	195	145
1940.....	265	213	117	169	178	156
1945.....	119	342	...	...	124	234
1950.....	384	365	138	215	252	232
1955.....	558	454	167	246	358	264

^a Persons engaged measured in full-time equivalents.
^b For 1913, first figure applies to Tsarist territory; second, to interwar Soviet territory. Otherwise, current territory. Index covers civilian products only.

The over-all growth rate is lower for the Soviet period than for the last forty-odd years of the Tsarist period, when the growth rate was 5.3 per cent a year according to our index (see Table 2). Although the latter is based on a weak foundation of data and might have come out differently if better data had been available, one may allow for substantial relative overstatement of Tsarist growth, presuming all the error in that direction, and still conclude that it was faster than growth over the entire Soviet period. As to individual industries, higher growth rates in the one period are not systematically related with either higher or lower growth rates in the other. Here again, the sample is small, covering only 23 industries, and conclusions must therefore be tempered.

There has been a rather striking inverse relation between the rapidity of growth in an industry over the Soviet period and its "stage of development" at the beginning of the period. For a sample of 48 industries, those whose outputs were smallest relative to the United States in 1913 have shown a strong tendency to grow fastest. The tendency is even more pronounced when the Plan period is considered by itself, the stage of development in this case being measured as of 1928 and the growth over 1928-55. A growth pattern of this sort is to be expected of any country undergoing rapid industrialization, but in the Soviet case the evidence suggests it has been accentuated by

TABLE 2
AVERAGE ANNUAL GROWTH RATES FOR SOVIET INDUSTRY: OUTPUT, LABOR
PRODUCTIVITY, AND PER CAPITA OUTPUT, SELECTED PERIODS
(Per Cent)

PERIOD	INDUSTRIAL MATERIALS ^a	ALL CIVILIAN INDUSTRIAL PRODUCTS			Consumer Goods
		Total Output	Intermediate Products	Machinery ^b	
1913-55.....	4.0	4.2	5.5	6.8	2.6
1913-28.....	0.1	0.1	0.5	0.4	- 0.2
1928-55.....	6.2	6.5	8.4	10.6	4.3
1928-40.....	8.0	8.3	11.9	15.7	4.8
1940-55.....	4.7	5.1	5.6	6.7	3.7
1928-37.....	9.6	10.9	15.0	26.3	5.5
1950-55.....	9.6	7.7	9.0	2.6	10.0
Output per Person Engaged ^d					
1913-55.....	1.0	1.2	0.2	1.4	1.2
1913-28.....	0.7	0.7	1.4	- 0.2	0.3
1928-55.....	1.3	1.6	2.7	2.3	1.9
1928-40.....	0.2	0.5	3.3	1.7	0.9
1940-55.....	2.0	2.4	2.2	3.5	2.5
1928-37.....	0.1	1.1	4.8	6.3	1.0
1950-55.....	5.4	3.9	5.7	- 1.5	5.9
Output per Head of Population					
1913-55.....	3.1	3.3	4.6	5.8	1.7
1913-28.....	-0.5	- 0.5	- 0.1	- 0.2	- 0.8
1928-55.....	5.0	5.3	7.2	9.4	3.2
1928-40.....	5.6	5.9	9.4	13.1	2.4
1940-55.....	4.7	5.1	5.6	6.7	3.7
1928-37.....	8.6	9.9	14.0	25.2	4.6
1950-55.....	7.2	5.9	7.2	0.9	8.2

^a Output per person engaged derived by dividing index for industrial materials by index for all persons engaged in industry. That is, for purposes of this calculation, the index of industrial materials is taken to represent an index of total industrial production.

^b Output does not explicitly cover military end products while employment does. Hence growth in labor productivity is probably understated.

^c Territorial gains may be approximately excluded from growth rates in the first two columns by subtracting the following percentage points: 1913-55, 0.3; 1928-55, 0.4; 1928-40, 0.9.

^d Persons engaged measured in full-time equivalents.

planned design, as effort to "overcome and surpass the leading capitalist economies."

Growth has varied widely not only among industries, but also over different spans of time. The early years were marked by external and internal wars, so that measurable industrial output dropped by 80 per cent between 1913 and 1920. By 1927 or 1928 industrial output had roughly recovered to its 1913 level in quantitative terms, though a general deterioration in the quality of industrial goods over this period meant that the recovery was less complete. Moreover, it was uneven even if no allowance is made for deterioration in quality: the 1913 level of output was not achieved in the case of consumer goods, while it was somewhat exceeded in the case of all other products.

With the institution of the First Five Year Plan at the end of 1928, growth accelerated rapidly and generally except in the area of consumer goods. The acceleration continued through the Second Five Year Plan and extended into consumer goods. Against a background of political purges and partial wartime mobilization, the pace of industrial growth slackened in the succeeding three years of the shortlived Third Five Year Plan, and such growth as took place may be attributed to territorial expansion. The growth of output over 1937–40 is understated by our comprehensive index because it does not reflect the partial conversion of certain industries, principally chemicals and machinery, to military-type products. Output of industrial materials grew by 10 per cent over this period, while output of all civilian products grew by only 3 per cent. By the end of 1940, industrial output stood at about 2.6 times its level in 1913 and 1928; or, if territorial gains are excluded, at about 2.3 times its earlier level.

World War II brought with it a sharp decline in output—offset in large part by Lend-Lease shipments—and heavy losses in manpower and capital. Recovery was swift in the Fourth Five Year Plan, being aided by collection of reparations and other economic policies in Eastern Europe, so that the pre-war level of industrial output was apparently regained by 1948 or 1949. Rapid growth was maintained through the Fifth Five Year Plan, where our study largely ends. Industrial output multiplied about 2.1 times between 1940 and 1955.

Over the Plan period (1928–55) the average annual rate of growth was 6.5 per cent for all industry (6.1 per cent if territorial gains are excluded), 8.4 per cent for intermediate industrial products, 10.6 per cent for machinery, and 4.3 per cent for consumer goods. The growth rate has tended to slow down or retard: for all industry, it was 8.3 per cent a year over 1928–40 (7.4 per cent if territorial gains are excluded) and 5.1 per cent over 1940–55; or, if the war years are removed from consideration, it was 10.9 per cent a year for 1928–37 and 7.7 per cent for 1950–55. There is a similar retardation in growth for each of the categories of intermediate industrial products, machinery, and consumer goods,

As in other countries, retardation in growth has been general for individual industries, narrowly defined. The available evidence indicates that most industries experienced a slower growth over the Soviet period than over the late Tsarist period, and over the later Soviet years than over the earlier ones. Moreover, most of the industries with retardation in growth from the Tsarist to the Soviet period also had retardation within the latter.

Growth in output and employment.—The number of persons engaged in Soviet industry, expressed in full-time equivalents, multiplied 3.3 times between 1913 and 1955. Thus, 60 per cent of the growth in output may be attributed to expanded employment and 40 per cent to increased labor productivity. Put another way, persons engaged increased at an average annual rate of 2.9 per cent; labor productivity increased only 1.2 per cent, ranging from 0.7 per cent a year for construction materials to 4.3 per cent a year for electricity.

Growth in labor productivity, as we have measured it, has fluctuated from period to period, but there has been an underlying trend toward acceleration. Employment apparently grew slower than output between 1913 and 1928, 1933 and 1937, 1940 and 1950, and 1950 and 1955; it apparently grew faster between 1928 and 1933 and between 1937 and 1940, both periods of radical structural change in industry. The decline in labor productivity over 1937–40 is overstated somewhat because growth in output is understated by our comprehensive output index. Chemicals and machinery are probably the major industries for which the decline is overstated. For industry as a whole, labor productivity would be shown as rising slightly if industrial materials were used to measure industrial output. The average annual growth rate in labor productivity rose from 0.7 per cent for 1913–28 to 1.6 per cent for 1928–55; from 0.5 per cent for 1928–40 to 2.4 per cent for 1940–55; and from 1.1 per cent for 1928–37 to 3.9 per cent for 1950–55 (see Table 2).

Growth in output and population.—While industrial employment was multiplying 3.3 times between 1913 and 1955, population multiplied only 1.4 times. Expansion of the industrial labor force has been achieved, particularly in the earlier phase of industrialization, by drawing upon a large supply of under-utilized labor, attached primarily to agriculture. It follows that growth in industrial output has been more rapid per head of population than per worker: 3.3 per cent a year as compared with 1.2 per cent.

Soviet demographic statistics are sketchy and subject to many doubts, so that it is particularly difficult to say anything with confidence about fluctuations in per capita output. According to Soviet data as modified and interpreted by Western scholars, population within Soviet boundaries grew at an average annual rate of 0.6 per cent over 1913–28, 0.9 per cent over 1928–37, 6.4 per cent over 1937–40 (because of territorial expansion), —0.9 per cent over 1940–1950 (because of war and its aftermath), and 1.7 per cent over 1950–55. Despite a rather erratic relationship between growth in population

and industrial output over different spans of years, growth rates have tended to move in the same direction for both total and per capita output. Thus the average annual growth in per capita output rose from -0.5 per cent over 1913–28 to 5.3 per cent over 1928–55; within the Plan periods, it fell from 5.9 per cent over 1928–40 to 5.1 per cent over 1950–55, or from 9.9 per cent over 1928–37 to 5.9 per cent over 1950–55 (see Table 2). We therefore see a contrast between retarding growth in output per head of population and accelerating growth in output per worker.

III. INDUSTRIAL GROWTH COMPARED: SOVIET UNION AND UNITED STATES

What to compare.—The Soviet record of industrial growth may be placed in perspective by comparing it with the record of other countries. This is not so easy as it might seem, not only because it is difficult to design relevant comparisons, but also because so little is known about the course of industrial development in most countries. The latter factor alone has forced us, with our limited time and resources, to concentrate on comparisons with the United States, a country with relatively abundant historical statistics. The United States is an obvious first choice for comparative study in any case, since it presents a striking contrast in economic system while being similar in size and resource endowment. But while comparative study reasonably starts with the United States, it should not end there, and we may hope that others will take up where we have left off.

Comparative study may help us in answering two quite different questions. First, we are interested in knowing, for a variety of reasons associated with the current state of world affairs, which country has shown the more rapid industrial growth over recent years, so that we may have some basis for intelligent guesses about relative growth over the very near future. Second, we are interested in knowing which country has been able to generate the more rapid industrial growth under conditions in which “physical” capacities for growth have been roughly equivalent. Our quest here is for a more fundamental test of the growth-generating efficiency of vastly different economic systems under comparable circumstances, a matter of concern for the longer view.

The first question is obviously easier to deal with than the second, because it requires only a description of the “facts” of growth in the two countries over the same span of years. Of course, the facts are in dispute, and the quantitative evidence of growth is more representative and reliable for the United States than for the Soviet Union. But this problem must always be faced, whether the issues at hand are analytical or purely descriptive. The essential point is that, in making comparisons of concurrent growth trends, we are primarily concerned with what is or has been happening, not with why it is or has been happening. Our attention is focused on trends likely to be carried forward over an immediate future by their own momentum, in the absence of revolutionary change in conditioning factors.

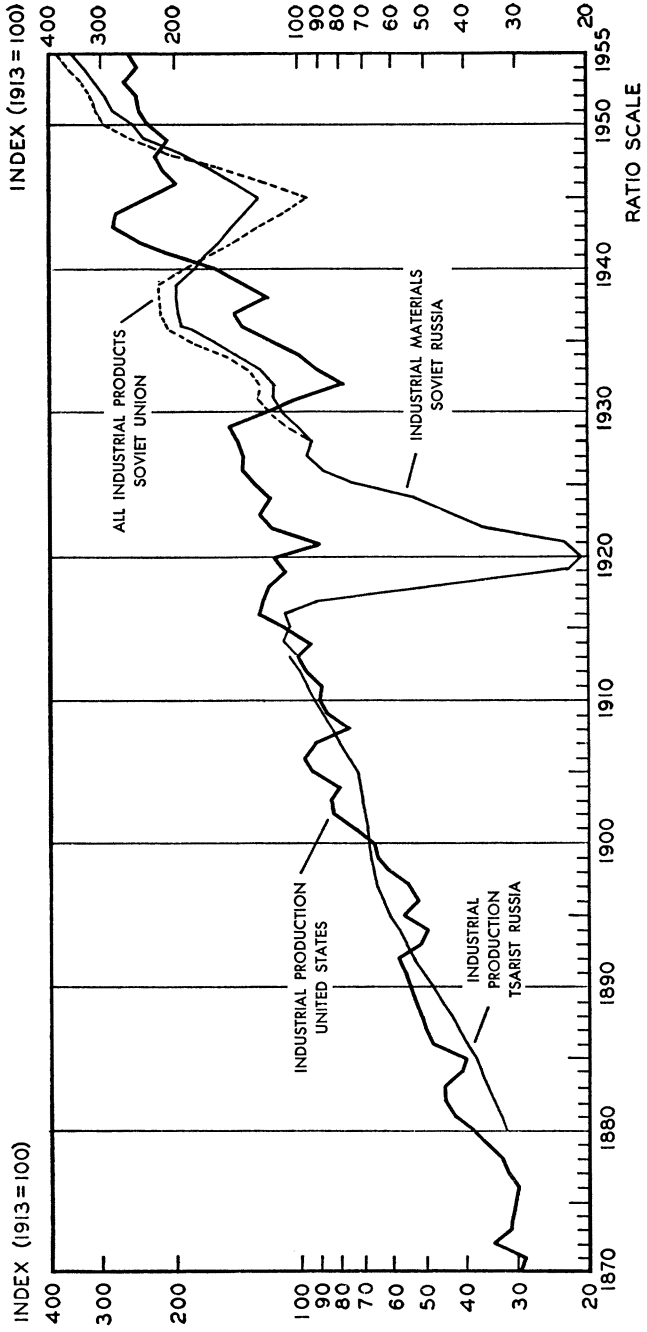
The second question involves a complex problem of analysis that by its nature defies definitive solution. We try to find historical periods in two countries in which important determinants of growth are the same in both cases, while the economic systems differ. To do this we need to know, first, what factors affect growth in what degrees and, second, what periods of history in the two countries are comparable. Neither economic theory nor history blesses our task: theory is mute and history mischievous. At best, the periods chosen will be "comparable" only in some rather crude sense. Even so, the exercise is worth doing, as an early step in the successive approximations that mark the path to knowledge.

If industrial economies do undergo comparable stages of development in some meaningful sense, setting those American and Soviet periods side by side carries with it an important byproduct in addition to direct comparison of growth. It enables us to project Soviet developments into a context with which we are more familiar, and thereby to reason by analogy in directions where direct evidence is lacking. There are also great hazards in reasoning by analogy, but judiciously applied it enriches our knowledge of the likely growth and present status of Soviet industry. Our vision of Soviet industrial growth is clarified by associating it with American developments bracketing the turn of the century, but at the same time the analogy must not be taken too far. The sets of industrial conditions in the two periods abound with anachronisms relative to each other.

Contemporaneous growth.—Over the same spans of years, industrial output has generally grown faster in the Soviet Union than in the United States (see Table 3 and Chart 1). This seems to be an old story since it was apparently true of the Tsarist era as well: according to our indexes, Russian industry grew slightly faster than American industry over the period 1870–1913, the respective average annual rates being 5.3 and 5.1 per cent. The differential is similar for the Soviet period as a whole: output grew over 1913–55 at an average annual rate of 3.9 per cent in the Soviet Union, when adjusted to remove territorial gains, as compared with 3.7 per cent in the United States. Growth has apparently been faster in the Soviet Union than in the United States for all major sectors of industry except foods, textiles, and related products (see Chart 3).

Over the Plan period Soviet growth in percentage terms has outdistanced American growth by a wider margin, making up for a differential in the other direction for the earlier years. American output grew at the same rate over both sets of years—namely, 3.7 per cent a year—while the Soviet rate rose from 0.1 per cent for the pre-Plan years to 6.1 per cent for the Plan years, territorial gains excluded. In turn, relative performance has varied within the Plan period itself. Over 1928–40, industrial output grew 7.4 per cent a year in the Soviet Union as compared with only 1.8 per cent in the United States, reflecting accelerated activity in the one case and depressed

CHART 2
 INDUSTRIAL PRODUCTION PER HEAD OF POPULATION: TSARIST RUSSIA, SOVIET UNION, AND UNITED STATES, 1870-1955



activity in the other. Over 1940–1955, on the other hand, the average annual growth rate was similar in both countries: 5.1 per cent in the Soviet Union and 5.2 per cent in the United States.

Moving to the recent postwar years 1950–55, we find the Soviet growth rate of 7.7 per cent a year exceeding the American rate of 4.5 per cent by a significant margin. A discrepancy in favor of the Soviet Union has persisted through 1958, though the Soviet growth rate has tended to decline somewhat, as far as one can see from the defective published data. It is too early to say whether the decline is permanent or only temporary, whether this reflects a

TABLE 3
GROWTH RATES FOR INDUSTRY IN TSARIST RUSSIA, SOVIET UNION, AND UNITED STATES: OUTPUT, LABOR PRODUCTIVITY, AND OUTPUT PER CAPITA
SELECTED CONCURRENT PERIODS
(Per Cent)

	Output		AVERAGE ANNUAL GROWTH RATE Output per Unit of Labor			Output per Head of Population	
	Russia or Soviet Union ^a	United States	Soviet Union per Person Engaged ^b	United States Per Person Engaged ^b	Per Manhour	Russia or Soviet Union	United States
	1870–1913 . . .	5.3	5.1	n.a.	n.a.	n.a.	3.7	2.9
1913–55	3.9 ^c	3.7	1.2	2.2	2.7	3.3	2.4
1913–28	0.1	3.7	0.7	2.7	3.6	–0.5	2.3
1928–55	6.1 ^c	3.7	1.6	1.9	2.2	5.3	2.5
1928–40	7.4 ^c	1.8	0.5	1.1	2.4	5.9	1.0
1940–55	5.1	5.2	2.4	2.5	2.0	5.1	3.6
1928–37	10.9	1.3	1.1	0.7	2.4	9.9	0.5
1950–55	7.7	4.5	3.9	2.7	2.2	5.9	2.8

n.a.: Not available.

^a For Soviet Union, measured by index for all civilian industrial products.

^b Persons engaged measured in full-time equivalents.

^c Adjusted to exclude territorial gains (see Table 2).

persistent retardation or a temporary fluctuation. It is also too early to say what is happening to the tempo of American industrial growth. In any case, the record for postwar years and for other peacetime years in the Plan period suggests that Soviet industrial growth will continue to be more rapid than American growth over the near future.

The picture of comparative growth in output per head of population is much the same as what we have just sketched for total output (see Table 3 and Chart 2). But when we turn to output per unit of labor—or labor productivity—we find something quite different (see Table 3 and Chart 3). In all but one of the periods covered in our summary of comparative growth trends in output, labor productivity, as we have been able to measure it, grew faster in the United States than in the Soviet Union. This conclusion holds for output per person engaged in industry—the only extensive measure of labor productivity we have for the Soviet Union—and it probably holds for output per

CHART 3

INDEXES OF OUTPUT, EMPLOYMENT, AND LABOR PRODUCTIVITY BY INDUSTRIAL GROUPS: SOVIET UNION, 1913-55, AND UNITED STATES, 1909-53

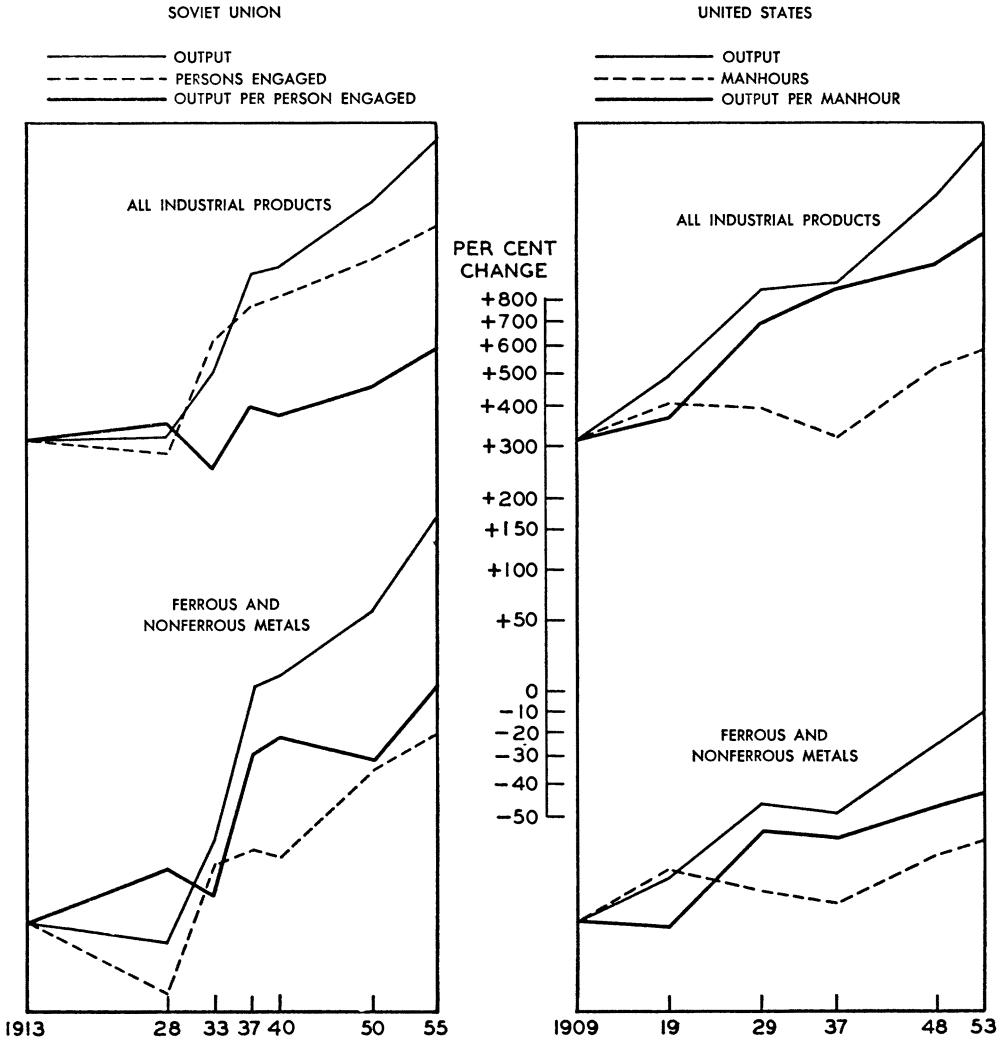


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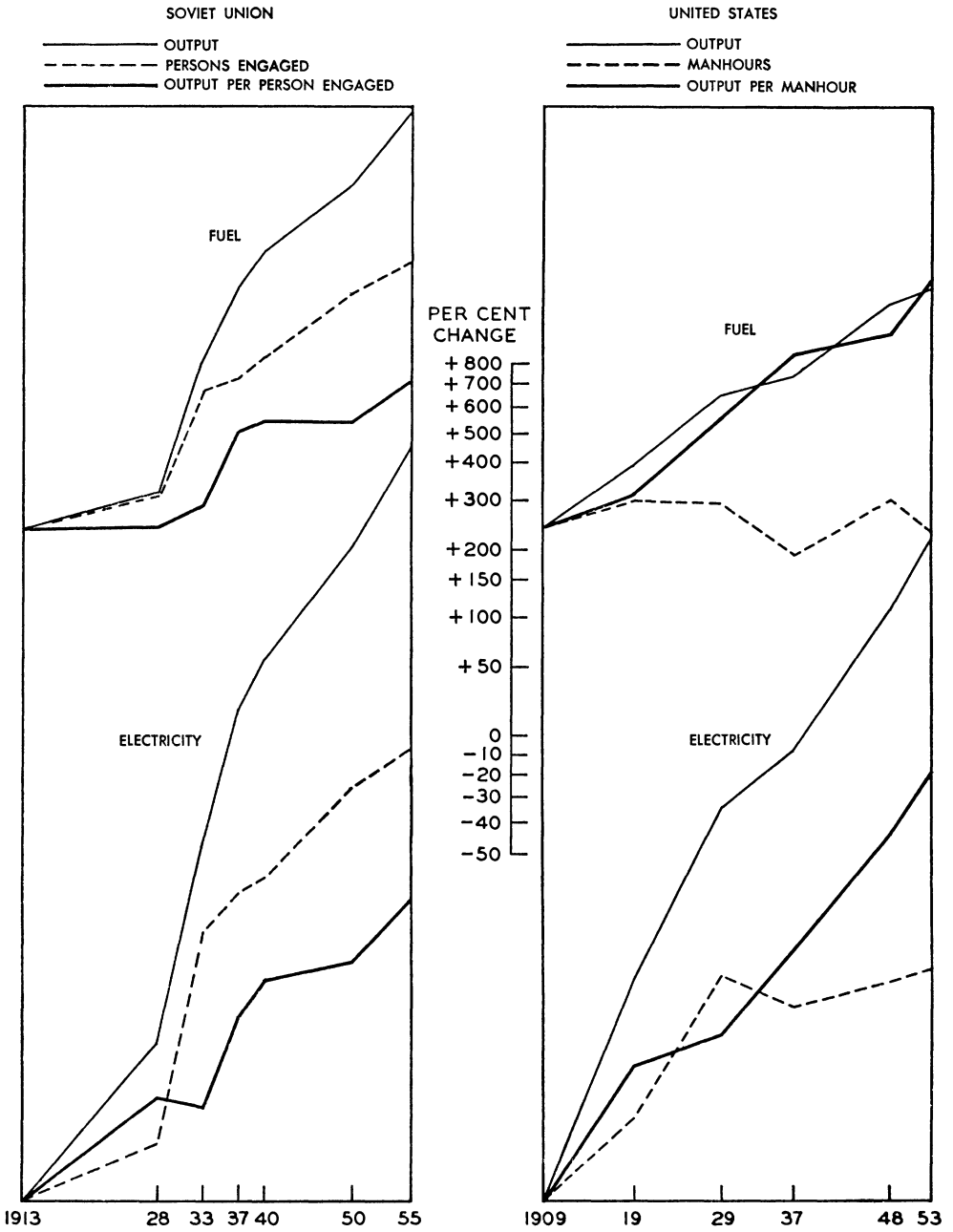


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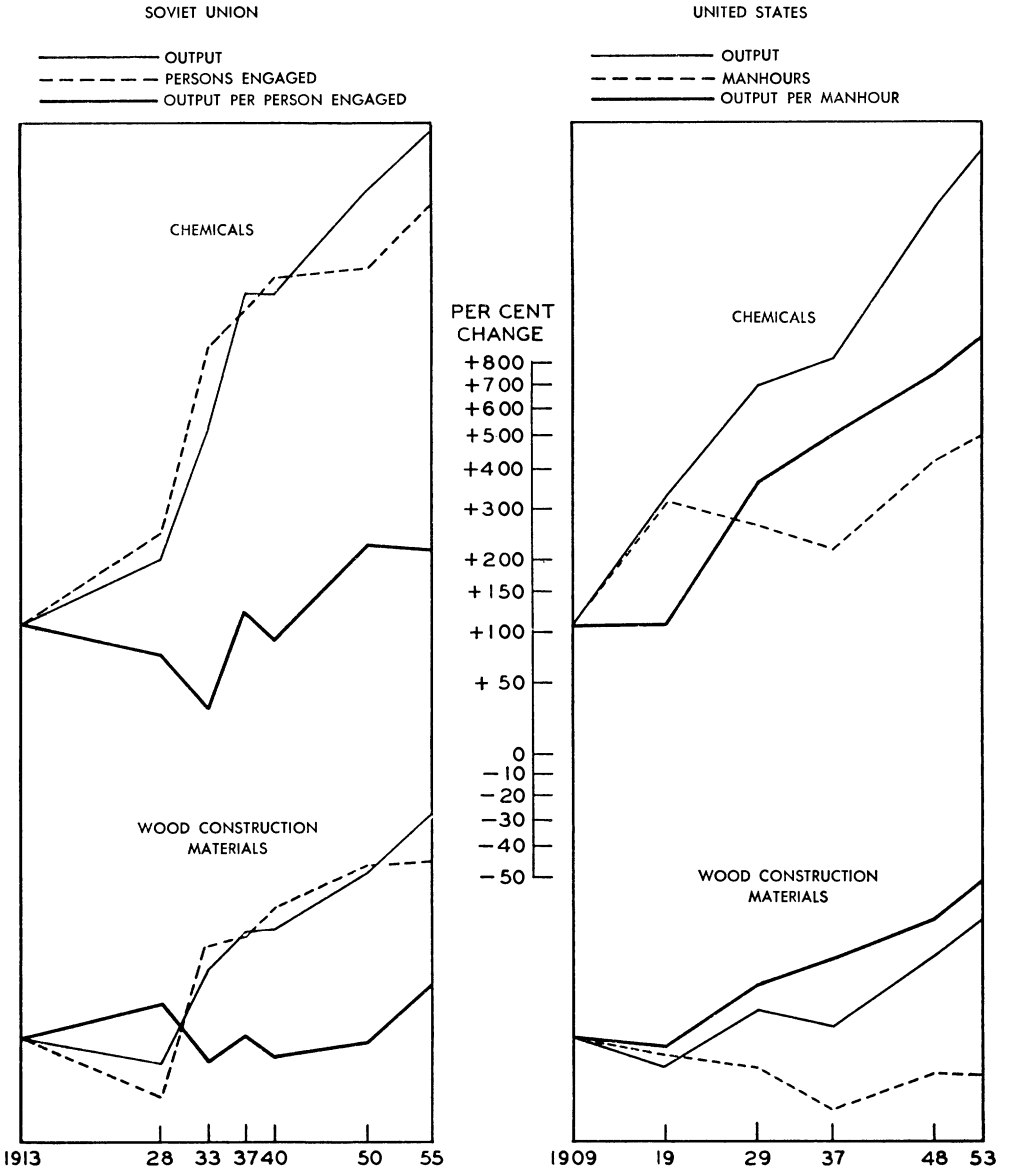


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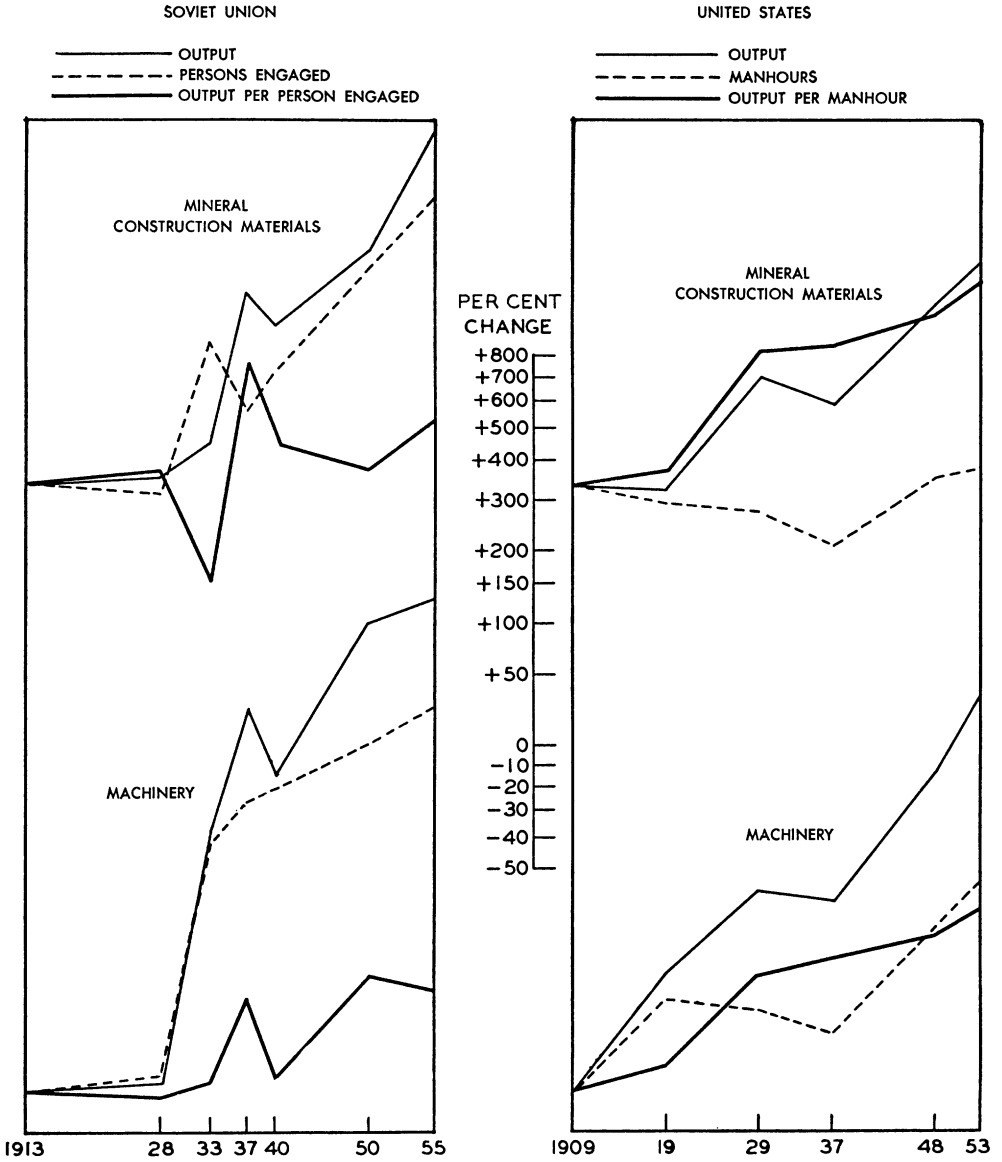
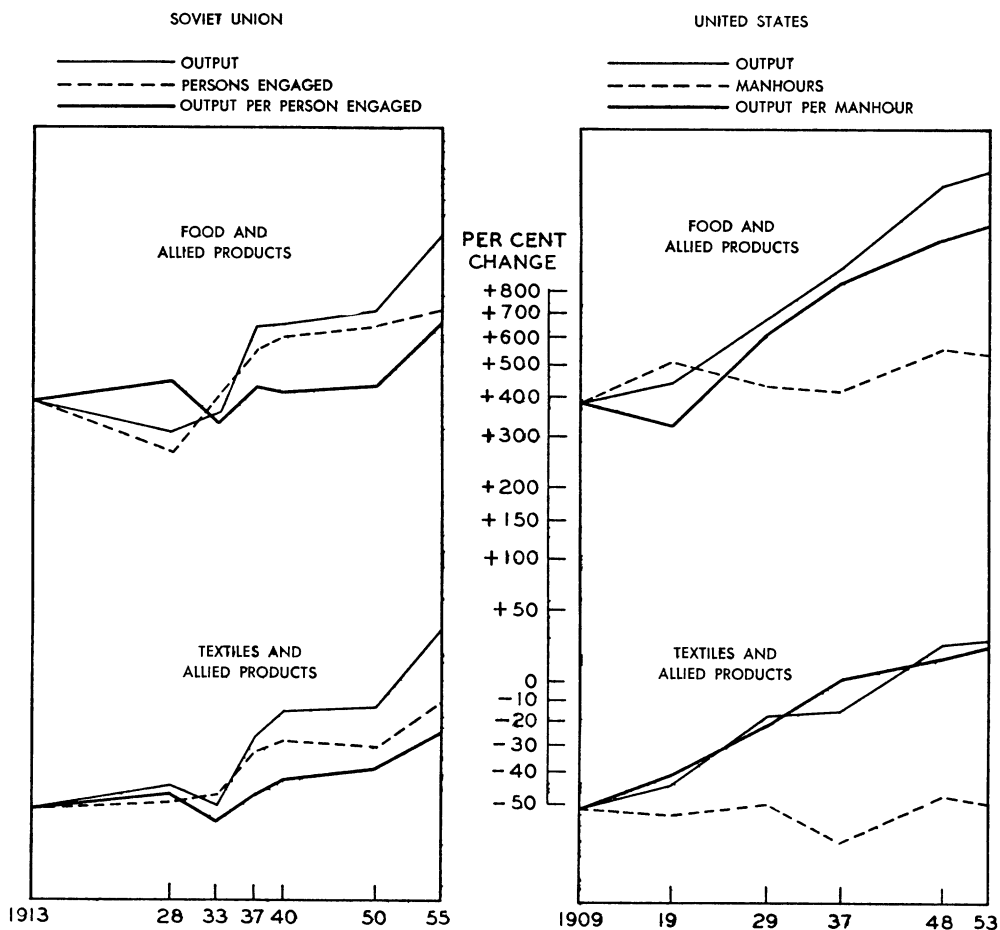


CHART 3—Continued



manhour, since average hours of work did not change significantly in the Soviet Union, at least between 1928 and 1955.

In the United States, growth in industrial output has come mainly from improved labor productivity: over 1913–55, output multiplied 4.5 times while employment multiplied only 1.8 times and man-hours only 1.5 times. In the Soviet Union, on the other hand, growth in output has come mainly from expanded employment, as we have seen. The contrast is sharp: improved labor productivity accounted for 67 per cent of the growth in output in the United States, but for only 40 per cent in the Soviet Union. Labor productivity grew at 2.2 per cent a year in the United States (2.7 per cent based on man-hours) as contrasted with 1.2 per cent in the Soviet Union.

We should immediately note, however, that this conclusion applies to a long period of time, and that growth in labor productivity seems to be drifting in opposite directions in the two countries, a development that could reverse the relations so far observed. The one period in which labor productivity grew faster in Soviet industry is the most recent covered by our study: 1950–55. This is indicative of a broader phenomenon: growth in industrial labor productivity has been accelerating in the Soviet Union, but retarding in the United States.

The comparisons so far have been based on various indexes computed directly for each country, and they can be roughly checked by another, essentially independent set of estimates that, at the same time, reveals some interesting information of its own. Evaluating Soviet output of industrial materials in current American prices and adjusting the figure to cover the whole of industry, we may estimate industrial production in the Soviet Union as a fraction of the level in the United States in 1913, 1928, and 1955. The estimates represent only rough orders of magnitude; constructed in different ways and with better data, they might vary as much as 10 per cent, possibly more, in either direction. For example, American products are generally of better quality than Russian counterparts, and the differential has tended to widen over the Soviet period, except in special cases of machinery and ordnance. Yet both American and Soviet products are evaluated at the same prices, thus overstating Soviet production. Similarly, output of Soviet products tends to be overstated in official statistics. Other errors of unknown direction are introduced by estimating procedures. Despite such shortcomings, these estimates cannot be dismissed as inherently worse than other summary indexes calculated for the Soviet Union.

According to these estimates, Soviet industrial output rose from 15 per cent of the American level in 1913 to 23 per cent in 1955; similarly, output per head of population rose from 11 per cent to 19 per cent (see Table 4). On the other hand, output per worker fell from 25 per cent to 21 per cent, and output per manhour from 23 per cent to 18 per cent. These findings are generally

consistent with our more direct calculations, indicating that industrial output and output per capita grew faster in the Soviet Union than in the United States, while labor productivity grew more slowly.

At the same time, these estimates imply more rapid growth for Soviet industry than our direct indexes. In the case of total output, Soviet growth is indicated as 49 per cent faster than American growth over 1913–55; in the case of per capita output, 77 per cent faster. Hence, if we calculate Soviet growth indirectly on the basis of the American production index, Soviet output is indicated as multiplying 6.8 times (6.1 times excluding territorial gains) and per capita output, 4.6 times.³ By direct calculations, the two multiples are 5.6

TABLE 4
RELATIVE VALUE ADDED AND LABOR PRODUCTIVITY OF INDUSTRY
SOVIET UNION AS A PERCENTAGE OF UNITED STATES,
1913, 1928, 1955

	SOVIET UNION AS A PERCENTAGE OF UNITED STATES		
	1913	1928	1955
Value added of industry ^a	15.2	8.8	22.7
Persons engaged ^b	60.8	48.7	109.6
Man-hours.....	64.7	53.1	129.2
Value added per person engaged.....	25.0	18.1	20.7
Value added per man-hour.....	23.4	16.6	17.6
Value added per head of population....	10.8	7.0	19.1

^a Evaluated in 1914 U.S. prices for 1913, 1929 U.S. prices for 1928, and 1954 U.S. prices for 1955.

^b Measured in full-time equivalents.

(5.0 excluding territorial gains) and 3.9, respectively. Put alternatively, output is shown as growing at 4.7 per cent a year when calculated indirectly as compared with 4.2 per cent when calculated directly; excluding territorial gains, the two rates are 4.4 per cent and 3.9 per cent. Similarly, growth in per capita output is 3.7 per cent a year when calculated indirectly, but 3.3 per cent when calculated directly; growth in output per worker, 1.7 per cent when calculated indirectly, but 1.2 per cent when calculated directly.

We may pause here to note that our figures on the recent size of industry in the Soviet Union relative to the United States are rather lower than conventional Western estimates, which seem to place Soviet industrial output in 1955 at about 33 per cent of the American level.⁴ If there is no dispute over the relative size of Soviet industry in 1913, the conventional view implies that Soviet industrial output multiplied some 10 times between 1913 and 1955,

³ Our index of industrial production in the United States is 454 for 1955 with 1913 = 100; on a per capita basis, 264 (see Table 1). The Soviet indexes calculated indirectly are taken as 149 per cent and 176 per cent of the respective American indexes.

⁴ See, e.g., Joint Economic Committee, *Soviet Economic Growth: A Comparison with the United States* 11 (1957).

which would mean a growth rate of 5.6 per cent a year on the average, substantially higher than the rate of 4.2 per cent found in our study.

The industrial distribution of employment (Table 5) is the only information we have for comparing the changing structure of industry in the two countries. In both countries, the share of employment in the so-called heavy industries, particularly machinery and allied products, has been growing at the expense of the share in food processing and textiles and apparel. However, consumer durables account for a much larger fraction of machinery and equipment in the United States than in the Soviet Union. In the mid-1950's, the following major industrial groups accounted for a larger fraction of persons engaged in Soviet industry than in American industry: fuel, wood construction products, mineral construction products, and food and allied products. The following groups accounted for a smaller fraction: ferrous and non-ferrous metals, electricity, chemicals, machinery and allied products, and textiles and allied products.⁵

"Comparable" growth.—Once industrialization has gotten under way in a country, the pace of industrial growth at any moment would seem to depend on the resource potential, the state of industrial arts, the prevailing level of industrial output (i.e., the extent to which potential is being utilized), and that catchall, the economic system. The process of economic growth is mysteriously complex and cannot be summarized in these brief comments. But this is not the place to discuss the manifold preconditions and environmental factors essential for sustained economic growth. We take it for granted that industrialization and the accompanying process of growth are a fact in the Soviet Union, just as they were, more incipiently, in Tsarist Russia. We are therefore concerned here only with the more fundamental conditioning factors, making that growth faster or slower than it would otherwise be. As far as such things can be quantified, the larger the resource potential, the more advanced the technology, and the smaller the output, the more rapid the growth in output will be, given the economic system. None of these factors can be clearly defined, but they can all be represented by certain more or less adequate indicators. Our immediate problem is to find indicators that will allow us to select periods in Soviet and American industrial history that are comparable except with respect to economic system.

⁵ Employment in production of military products is included under machinery and equipment in the case of the Soviet Union and under both that category and metal products in the case of the United States. The relative importance of military production in the two countries has not been discussed in this paper because of the formidable difficulties in making estimates for the Soviet Union. By a very roundabout procedure, I have estimated that the value of Soviet military production (excluding atomic energy) in 1955 was about 42 billion rubles, or about \$6 billion to \$10 billion. The value of American production was around \$13 billion in the same year (Statistical Abstract of the United States 242 (1958)).

TABLE 5
 PERCENTAGE DISTRIBUTION OF PERSONS ENGAGED BY MAJOR INDUSTRIAL GROUPS
 SOVIET UNION AND UNITED STATES, BENCHMARK YEARS^a
 (Per Cent)

	SOVIET UNION ^b				UNITED STATES ^c						
	1913	1927/28	1933	1937	1950	1955	1909	1929	1937	1948	1953
Ferrous and non-ferrous metals.	7.4	5.3	5.8	5.3	6.3	6.0	7.9	7.8	8.6	7.8	7.6
Fuel.....	5.5	7.6	7.3	6.3	8.0	8.0	10.2	9.1	8.4	6.8	5.3
Electricity.....	0.3	0.5	1.0	1.1	1.5	1.6	0.9	2.9	2.8	2.2	2.2
Chemicals.....	1.2	1.9	2.8	3.0	2.8	3.3	3.2	4.9	5.0	5.8	5.9
Wood construction materials ^d ..	18.7	14.6	18.2	16.5	17.8	15.3	13.3	9.6	8.4	7.3	6.6
Mineral construction materials.	4.0	4.2	5.3	3.0	5.1	6.2	6.5	4.6	4.2	4.5	4.2
Machinery and allied products.	12.0	14.2	28.4	30.3	31.5	32.4	21.1	27.8	28.0	35.3	41.5
Machinery and equipment.....	(5.1)	(7.4)	(8.2)	.....	(16.1) ^e	.....	(12.4)	(19.0)	(19.3)	(25.1)	(29.8)
Metal products ^f	(5.4)	(5.2)	(4.3)	.....	(12.4) ^e	.....	(8.8)	(8.7)	(8.7)	(10.2)	(11.7)
Repair shops ^g	(1.5)	(1.6)	(15.9)	.....	(3.0) ^e	.....	n.a.	n.a.	n.a.	n.a.	n.a.
Food and allied products.....	18.7	15.2	11.1	12.6	10.4	9.5	10.7	9.8	10.8	9.7	8.8
Textiles and allied products ^h ..	32.2	36.4	20.2	21.9	16.5	17.7	26.2	23.5	23.8	20.6	17.9
Total.....	100.0	99.9	100.1	100.0	99.9	100.0	100.0	100.0	100.0	100.0	....

n.a.: Not applicable.

^a Omits printing and publishing industries. Persons engaged measured in full-time equivalents.

^b Breakdown for 1937-55 applies to production workers only.

^c Based on unpublished data of John W. Kendrick.

^d For Soviet Union, includes paper and paper products.

^e Broken down by percentage distribution implied by official Soviet data on gross production, Industry of the USSR, p. 203 (Moscow, 1957).

^f For the United States, includes ordnance in the narrow sense; other military products are covered by machinery and equipment. For the Soviet Union, all military products except ammunition and explosives seem to be covered by machinery and equipment.

^g Repair shops are not covered by U.S. industry. They cannot be eliminated from Soviet data from 1937 onward.

^h For the Soviet Union, includes furniture from 1937 onward.

What is a good indicator of resource potential? If we may judge from the general practice of comparing economies in per capita terms, it would seem that population is typically used as the indicator of resource potential. But it is often a poor indicator since populations grow in response to economic development and differently in different economies. Moreover and more importantly, population can grow from immigration as well as from natural increase. As a concrete example for the problem at hand, in the United States the expanding industrial labor force in the latter part of the nineteenth century was recruited in important measure from economically underutilized population in other countries, including Russia.⁶ The expansion in the Soviet Union during the twentieth century came, on the other hand, from the large internal pool of underutilized population. Hence, as compared with the Soviet Union, population understates the resource potential of the nineteenth century United States.

The resource potential of an economy is more adequately described by the volume of natural resources at its disposal, including climate and terrain. If this can be precisely and accurately measured, it remains to be done. In the meantime, we are perhaps justified in making the impressionistic judgment that the Soviet Union and the United States have roughly similar resource potentials. Both countries are rich in natural resources, though the endowments of specific resources obviously differ. Against the larger size of the Soviet Union must be offset the substantial climatic and topographical disadvantages—at least in the present state of civilization. Although in total area the Soviet Union is about one and a half times larger than the United States, in inhabitable area it is probably no larger at all. Other relevant things the same—like tastes, technology, population, economic system, and so on—we suppose that the two countries would be able to support roughly equivalent levels of industrial production on the basis of resource endowments.

This leads us to suppose further that, if the state of industrial arts and the aggregate level of industrial output were the same in the two countries, differences in the rate of growth of industrial output should be attributable to differences in economic systems. Unfortunately, we cannot standardize both level of output and state of technology simultaneously in the two countries. To find dates at which output was roughly equivalent, one must go back a number of years in American history. Thus, as we shall see, the level of Russian output in 1913 within the interwar Soviet territory was reached in the United States around 1885 or earlier. But the state of industrial arts—at least the available body of technology—was less advanced in the United States of 1885 than in the Russia of 1913; the same body of technical knowledge, if

⁶ Foreign born accounted for about 18 per cent of the net increase in total gainfully occupied population or labor force over 1870–1900. See S. Kuznets and E. Rubin, *Immigration and the Foreign Born*, Occasional Paper 46, at p. 46 (National Bureau of Economic Research, 1954).

not skills, has been available to the two countries at roughly the same dates in history. Therefore, when we standardize the level of output from which growth starts—as we are about to do—any difference that we observe between growth rates in the two countries must be attributed to differences in both technology and economic system. While the effects of each cannot be fully isolated, we can at least say in whose favor difference in technologies operates and thereby narrow the range of ignorance.

These remarks make the issues seem simpler than they are, because they presuppose that the periods to be compared represent normal times. This is, of course, not so for the Soviet Union, unless we view periodic disasters as a part of normal times there. Since the founding of the Soviet Union, no span of years longer than a decade has been free from major disturbances or recoveries from them. As we have emphasized before, we cannot possibly know which period has had a growth rate similar to what would be expected from a long stretch of normal years, and we must therefore choose several Soviet periods, representing differing circumstances, in making comparisons with American industrial growth.

Subject to the outlined qualifications, a Soviet period would have as its counterpart an American period whose terminal years had the same total industrial output, unadjusted for differences in population, as obtained in the Soviet Union in 1913 and 1955, or whatever years we might wish to choose. If industrial output is measured by weighted aggregates, the Soviet periods 1913–55 and 1928–55 are “comparable” with the American period 1877–1913; that is, for both countries industrial output started and ended at roughly the same levels within these periods, in so far as we are justified in making such broad intertemporal and international comparisons.⁷ If output is measured by the median performance of a large group of individual industries, the Soviet periods are comparable to the American period 1885–1920. The dating of these periods implies that it took only 34 or 35 years in the United States to register the growth made over 42 years in the Soviet Union—or, if the pre-Plan years are ignored, over 27 years.

We must remind ourselves that these periods are comparable only with respect to two of the factors influencing rate of growth: resource potential and prevailing level of industrial output. They are not comparable with respect to the state of the industrial arts. The advantage—a substantial one—is in favor of the Soviet Union, since it has had the technology of the twentieth century at its disposal in working out its industrialization. One can only dream about what difference it would have made to American industrial growth in the nineteenth century if it had proceeded under twentieth century technology.

⁷ The American dates are derived as follows. Soviet industrial output was 15 per cent of the American level in 1913. Looking back into American industrial history, we find that output in 1877 was also around 15 per cent of the level of 1913. A similar procedure gives the American date 1913 as roughly equivalent, in level of output, to the Soviet date 1955.

The choice of comparable stages of development in the industries of the Soviet Union and the United States is, therefore, unavoidably hazy and arbitrary to some degree. We shall summarize here the records of industrial growth in the Soviet Union and the United States over periods of equal length that are comparable in the sense that the beginning year in each case represents roughly the same level of output in the two countries.

We start with the longest period studied for the Soviet Union, 1913–55. The growth rate over this period—3.9 per cent a year, excluding gains from territorial expansion—is slower than the rate for a comparable American period: 5.0 per cent a year over 1877–1919 or 4.8 per cent over 1885–1927 (see Table 6). On a per capita basis, the Soviet growth rate is higher: 3.3 per

TABLE 6

GROWTH RATES FOR INDUSTRY IN SOVIET UNION AND UNITED STATES:
OUTPUT AND OUTPUT PER CAPITA, SELECTED
"COMPARABLE" PERIODS^a

PERIOD FOR SOVIET UNION	AVERAGE ANNUAL GROWTH RATE				PERIOD FOR UNITED STATES
	Output		Output per Head of Population		
	Soviet Union	United States	Soviet Union	United States	
1913–55	3.9 ^b	5.0	3.3	3.0	1877–1919
	...	4.8	...	3.0	1885–1927
1928–55	6.1 ^b	5.6	5.3	3.5	1877–1904
	...	5.3	...	3.3	1885–1912
1928–40	7.4 ^b	7.0	5.9	4.7	1877–89
	...	4.5	...	2.6	1885–97
	...	6.3	...	4.8	1939–51
1950–55	7.7	8.0	5.9	5.9	1908–13

^a Periods are comparable for growth in output only, not output per capita. See text.

^b Adjusted to exclude territorial gains.

cent a year as compared with 3.0 per cent. But we must recall the misleading nature of comparisons of per capita rates, in view of the fact that population growth overstates growth in resource potential in the United States as compared with the Soviet Union.⁸ For lack of data in both countries, we cannot compare growth in labor productivity.

If we turn to the Plan period, 1928–55, we observe that the Soviet growth rate, again adjusted to exclude territorial gains, is higher than for a comparable American period: 6.1 per cent a year as compared with 5.6 per cent over 1877–1904 and 5.3 per cent over 1885–1912. The difference in per capita rates is even larger in favor of the Soviet Union. We therefore do not observe com-

⁸ If population were taken as a guide to industrial potential, we might identify as comparable "stages of development" those periods in which industrial output per head of population was the same in both countries. This procedure is not only difficult to justify for reasons just stated, but it is also impossible to apply. The Soviet level of industrial output per capita in 1955 corresponds roughly with the American level in 1887; the Soviet level in 1913 was lower than the American level in 1860, the earliest year for which aggregate industrial output can be calculated. Similar results are found by taking the median dates at which per capita output of a large group of industries were the same in both countries.

parable American periods in which the speed of industrial growth has matched that during the Plan period in the Soviet Union.

For the shorter spurts of growth, the Soviet performance also seems to have the edge, although not so clearly. The Soviet growth rate over 1928–40 is almost matched by the American rate over 1877–89, but it exceeds by a wide margin the American rate over 1885–97. In a sense, this period of Soviet growth may be likened to the twelve years in the United States following the Great Depression; in both cases, growth was beginning again after a decade of depression and stagnation. The Soviet rate is faster in this comparison as well: 7.4 per cent a year as compared with 6.3 per cent.

We conclude this summary of growth over comparable periods on an exceptional note: Soviet industrial growth over 1950–55 may have been a bit slower than American growth over 1908–13. The point of this is that it proves nothing. The experience of a five-year period, plucked from history, carries no permanent message with it.

IV. SOME TENTATIVE OBSERVATIONS

What can be said about Soviet industrial achievements? In the first place, they have been impressive. In terms of its ability to generate sheer growth in industrial output—leaving aside the question of how much the growth has cost, what product mix has evolved, and how the products have been put to use—the Soviet system of centralized direction has proved itself to be more or less the peer of the market economy, as exemplified by the United States. This much seems beyond dispute even in the face of the questionable reliability of Soviet statistics.

Of course, the character of Soviet industrial growth has not been the same as in other Western economies. Enhancement of state power has been the primary objective, the consumer being treated essentially as a residual claimant. Investment goods and ordnance have been emphasized at the expense of consumer goods; and other important sectors of the economy—agriculture, construction, and consumer services—have been relatively neglected to help foster industrial expansion. At times, large groups of the population have been sacrificed or made to work in forced labor to promote internal economic policies. Leisure has shown little tendency to grow. This is all well known but deserves repetition to place Soviet industrial achievements in perspective. The character of industrial growth being so different from elsewhere in the West, there is a sense in which the two sets of achievements cannot be compared at all.

The last point should be underlined: the pattern of industrial growth observed in the Soviet Union would never be duplicated by a market economy. Sovereign consumers would not choose the paths of growth chosen by Soviet rulers. This raises the awkward question of whether a highly generalized measure of growth has much meaning even as an indicator of expansion in

productive capacity available for whatever use it may be put to. It can be demonstrated that measures of economic growth, as they are conventionally made in the form of index numbers, depend in fact on the path of growth—on the uses to which productive capacity is put.⁹ If we bowed to the stern dictates of logic, we would be able to compare Soviet and American industrial growth only if both economies served either consumer welfare or state power. But that is ruled out by the very difference in social order whose influence on growth we wish to assess. This dilemma can be mastered only by admitting it—by avoiding the delusion that there is some single-dimensional, neutral measure of growth, equally meaningful for all types of economies.

The question of economic waste is a related matter and equally difficult to treat. Growth is measured in terms of things “produced,” not in terms of things usefully consumed. In a market economy, the two magnitudes are similar but not at all identical: mistakes are made by both entrepreneurs and consumers, rendering some productive activity worthless. The same kinds of mistakes are made in the Soviet Union, probably on a larger scale since centralized planning is involved. In addition, because of the weak position of most buyers, substandard goods often pass for standard quality, goods are damaged and spoiled in transit beyond normal experience in a market economy, and so on. Although Soviet industry does not experience business cycles as they are known in market economies, it is periodically faced with the need to re-allocate resources on a large scale, and the accompanying waste that would appear in the form of temporarily unemployed resources in a market economy will appear, at least in part, in the form of unwanted accumulation of inventories. It is difficult enough to say something sensible about which type of economy has the more waste inherent in it. It is even more difficult to say what all this has to do with problems of measuring growth. Unless wastage has, in some meaningful sense, been growing at different rates in American and Soviet industry, there is nothing to be gained by taking account of this factor as far as comparing growth of industrial output is concerned.

These qualifications serve as warnings against careless comparisons of either the relative size or the relative growth of Soviet and American industry. In particular, broad aggregative measures of industrial output tell us nothing about capacities for specific tasks, such as waging war or promoting consumer welfare. While Soviet industrial output in 1955 may have been, in the aggregate, less than a quarter of the American level, production directly available for military purposes was undoubtedly a larger fraction, and production available for consumers a smaller one. Similarly, growth in the two areas has differed in the same way in the two countries.

It remains also to be noted that the quantitative achievements of Soviet industry have not been understated by Soviet authorities. The official Soviet

⁹ See, e.g., my article, *On Measuring Economic Growth*, 65 *J. Pol. Econ.* 51 (1957).

index of industrial production embodies a myth that should be dispelled from the popular mind. On this matter, Western scholars speak as one, though they may disagree as to the gravity of the myth. The official Soviet index shows industrial output as multiplying 27 times between 1913 and 1955; the indexes presented here, based on official Soviet data on physical output and unit values and constructed according to conventional Western methods, show output as multiplying 5 to 6 times. If our indexes are taken as reasonably accurate, the official index contain a four- to fivefold exaggeration of growth over this period.

Somewhere in these generalizations and the mass of figures behind them lie lessons of history. The trick is to find them. The interesting lessons point to the future in one way or another, for the main purpose of history is as prologue: to help us to foresee what is likely to come if things continue developing as they have been; or barring that—and it generally will be barred—at least to help us to understand why things are happening as they are.

My task is largely finished in providing the stuff from which the lessons will be drawn. But I cannot evade the responsibility for stating some opinions. And so I venture with great hesitation into the field of lesson-drawing, leaving it quickly once my minimal obligation is fulfilled.

As one looks to the immediate future—the next five years, say—it seems reasonably certain that industrial growth will proceed more rapidly in the Soviet Union than in the United States, in the absence of radical institutional changes in either country. This conclusion does not seem to be in doubt even when all due allowance is made for the shortcomings of Soviet data. It is more doubtful that industrial growth in the Soviet Union will be faster than in other rapidly expanding economies, such as Western Germany, France and Japan.

Over the more distant future—the next generation, say—the outlook is veiled, even if we might suppose there would be no important changes in the economic systems of either West or East, a most improbable assumption. There is no definitive evidence that the Soviet economic system has been able to generate more rapid industrial growth over the long run than the traditional private enterprise system of the West. Despite the fact that the Soviet Union was able to inherit an advanced Western technology at little cost, industrial growth over the entire Soviet period has been less rapid than in the United States over the forty years bracketing the turn of the century, a period more or less comparable in other important respects. It has also been less rapid than growth in the last half century of the Tsarist era, a less comparable period.

On the other hand, if Soviet performance is best illustrated by achievements over the Plan period, the Soviet record of industrial growth appears more exceptional. Which period is more representative of long-run growth trends: 1913–55 or 1928–55? There are good arguments to be made for both, and in-

evitable difference of opinion will be finally resolved by the course of history alone—which suggests the virtue of avoiding a dogmatic position one way or another.

In any case, the future will not be a simple reflection of the past. Growth has not been a mechanical process in either the United States or the Soviet Union. The driving force within the American economy has been private initiative mobilized by the incentives inherent in a free society. The trend of the day is in the direction of choking off incentives. One foreboding economic symptom is the slackening speed at which resource productivity has been growing in American industry. Incentives are being strangled and nothing is being put in their place to drive the machinery of growth. There is in fact only one thing to put in their place: the whiplash. The Soviet system has made clever use of both knout and honey, and the latter has been rapidly supplanting the former. If this evolution continues, the balance of economic growth will surely tip further in Russia's favor, since—fortunately, from the broader point of view—the West does not intend to take whip in hand.