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have tended in recent years to gain ground in terms of total output, they have continued to lose ground in terms of per capita output.

To anticipate questions that must have arisen in the minds of many, let me say right away that this has been a recital of the raw historical record for the Soviet era as a whole, which cannot serve in itself as an adequate guide to future performance. Bad years of growth—e.g., 1913-28—have been indiscriminately mixed with good, and the conditions producing those bad years may never recur with the same intensity. Such analysis has the same faults as focusing solely on the best years of growth; here, too, there were many peculiarities not likely to persist over the long term. A proper appraisal of underlying trends requires that attention be paid to both short and long periods. But we can attend to only one thing at a time, and the essential purpose of this brief paper is to bring the picture of growth trends into focus by looking at long-range performance. Needless to say, the study now under way at the National Bureau will give much more detailed attention to the problems mentioned here.

While digressing on qualifications, it is worth pointing out that Soviet products seem to be generally inferior in quality to their American counterparts, even to those produced many years earlier. Moreover, quality seems to have deteriorated in many industries over at least parts of the Soviet era. The inferiority and deterioration are most marked for consumer goods, but they also hold for many industrial materials. It has not been possible to make allowance for these factors, and hence the lags and their changes are biased in favor of the Soviet Union. This matter is apart from the question of how reliable Soviet data are on the quantitative side, quality ignored. On that score, it hardly seems likely that Soviet authorities have practiced the art of understatement in heralding their achievements.

### III

Let us now return to the main theme and examine more closely the suggestion that industrial development in the Soviet era, unadjusted for population, is similar to, though slower than, our own during the period 1880-1920.<sup>3</sup> This inference has been drawn from an analysis that was not confined to a single period of growth in the United States. On the contrary, about half the comparisons between Soviet and American industries involved American periods ending earlier than 1920 and the other half involved periods ending later. Hence there has been some picking and choosing among different periods in American industrial

<sup>3</sup> It would be interesting to go into the question of comparable periods of industrial development on a per capita basis, but this would take us back to a period in American history where data on production are too meager to support a careful study.

history in order to obtain levels of American output equal to those of Soviet output, and the picture might not look the same if attention were confined to 1880-1920 alone.

Suppose we compute growth rates for that period for as many American industries as possible and compare them with Soviet rates for 1913-55 (see Table 3). We see that in 22 out of 31 industries growth was significantly more rapid in the United States than it has been in the Soviet Union. This does not on the face of it contradict the conclusion drawn from study of lags.

Of course, even if it were true that the growth rate for every industry were higher in the United States than in the Soviet Union, it would still be possible that an over-all weighted index of growth would be lower. This could come about if the Soviet rates for some industries were higher than the American rates for others, and if there were a sufficiently strong positive correlation between Soviet rates, on the one hand, and the ratios of Soviet to American weights, on the other. In fact, the Soviet rates are not even all lower industry by industry, and therefore the only relevant question is the correlation. The only way to find an answer is to make weighted indexes, and this should certainly be done. It is worth pointing out, however, that there is a very strong negative correlation between Soviet growth rates and the industry-by-industry ratios of Soviet to American output, the latter taken for the year 1913 (see Table 3). It would therefore seem unlikely that there would be a strong positive correlation between Soviet growth rates and any sensible relative weights one might choose.

Let us then accept tentatively the conclusion that industrial growth over the Soviet era has proceeded at a pace not any higher than that for the United States from 1880 through 1920. What else might this imply? The pertinent issue here is whether American industrial growth has tended to slow down over the long term. If there has in fact been such a retardation, it has not left an unambiguous imprint in the statistical record. To be sure, the Great Depression of the thirties brought about a sharp fall in the growth rate for the years bracketing it, but recent trends would suggest that this was a cyclical, not a secular, phenomenon. In any event, few economists who have studied American industrial growth find adequate evidence of a significant and steady retardation in the rate of industrial growth as conventionally measured. If such over-all retardation has not taken place and if Soviet industry has not grown faster than our own grew from 1880 through 1920, it would then seem reasonable to suppose that it has not grown faster than ours over a more recent period—say, the last forty years, or the Soviet era itself.

This conjecture is puzzling, indeed, in the light of what one observes

TABLE 3  
GROWTH RATES COMPARED IN THE SOVIET UNION AND UNITED STATES, 31 INDUSTRIES  
(Per cent)

	AVERAGE ANNUAL GROWTH RATE*				Ratio of Soviet to U.S. Output	
	Soviet Union		United States		1913	1955
	1880-1913†	1913-55	1880-1920	1913-55		
Iron ore.....	7.1	5.0	5.8	1.4	16	71
Pig iron.....	7.3	5.0	5.9	1.9	14	52
Steel ingots.....	8.7	5.8	9.1	2.7	13	47
Rolled steel.....		5.5	6.6	2.7	15	48
Primary blister copper.....	7.3	6.0	7.6	0.8	5	42
Lead.....	0.9	13.7	4.9	1.2	0.3	38
Zinc.....	4.6	11.1	7.8	2.0	0.7	22
Electric power.....		11.2	34.1	7.6	7	30
Coal.....	7.5	6.4	5.1	-0.3	6	92
Coke.....		5.6	6.9	1.2	11	67
Crude petroleum.....	10.4	5.0	8.1	5.6	27	22
Natural gas.....		13.9	15.5	6.8	0.2	3
Soda ash.....	17.0	5.4	10.3	4.4	20	33
Mineral fertilizer.....		11.6	6.4	5.6	3	34
Paper.....		5.5	5.8	2.9	6	15
Sawn wood.....		3.9	1.5	-0.2	14	79
Cement.....		6.6	10.3	3.0	11	47
Window glass.....		3.5	3.8	2.0	60	106
Railroad passenger cars.....		1.2	3.8	-3.5	38	271
Railroad freight cars.....		3.1	5.3	-2.0	8	63
Butter.....		3.6	7.6	1.6	31	72
Vegetable oils.....		2.2	8.9	3.1	77	43
Fish catch.....		2.4	0.7	2.0	108	129
Soap.....		3.5	4.0	-0.8	15	73
Sugar.....	5.6	2.0	8.1	1.7	73	83
Canned food.....		8.8	6.2	4.5	2	16
Beer.....		2.0	1.6	0.9	11	17
Cigarettes.....		5.6	12.1	8.0	125	50
Cotton fabrics.....	4.7	2.0	3.6	1.4	35	46
Silk and synthetic fabrics.....		5.7	7.5	5.8	18	21
Woolen and worsted fabrics.....		2.1	1.3	-0.3	30	81

\* Geometric mean of the ratio of output for terminal years, minus one. U.S. output taken wherever possible as centered nine-year moving average.

† For blank spaces, adequate data not found. Output covers Czarist territory excluding Finland.

when he compares concurrent Soviet and American growth rates for individual industries. The Soviet rates are almost all higher by considerable amount (see Table 3). The key to the puzzle may well lie in the fact that this is, as already mentioned, essentially a comparison of young Soviet industries with mature American ones; and, although there is no easily discernible retardation in over-all American industrial growth, there certainly is as a general rule—in the Soviet Union as well as the United States—unmistakable retardation in growth of individual industries as they get older and larger (see Table 3 for some evidence). If I may use an imperfect analogy, each son will ultimately catch up to his father in height, and brothers of different age will differ less and less in height as they get older. A whole population, on the

other hand, may maintain a quite stable average height or rate of increase in average height. As far as industrial growth is concerned, the point is that attention must be given to both new and old industries, to ones being born and ones dying, and in every case to the weights it seems proper to attach.

Let me illustrate these issues by returning to the specific example of steel ingots. For the period 1913-55, Soviet output grew at an annual rate of 5.8 per cent (based on data for terminal years), while American output grew at only 2.7 per cent. As a result, Soviet output rose from about an eighth of American output at the beginning of the period to almost a half at the end. The significance of this development from the point of view of industrial growth is, however, not as clear as it might seem; for, as we noted earlier, it was about 30 years ago when American output reached half its present level, but it was only about 20 years before 1913 when it reached an eighth of its level at that time. That is to say, it took only 20 years for American output to multiply eight times up to its level of 1913, but it took almost 30 years for it to double up to its level of 1955. In terms of annual rates, American output grew at 9.1 per cent from 1880 through 1920, but at only 2.7 per cent from 1913 through 1955. It is quite possible, in view of the great efforts being put into steel production in the Soviet Union, that retardation in growth will not be as marked there as it has been in the United States. But the history of the Soviet steel industry certainly implies that there will be some retardation. The following comparisons of Soviet annual growth rates for the output of steel ingots are informative: 1880-1913, 8.7 per cent, compared with 1913-55, 5.8 per cent; 1928-37, 17.2 per cent, compared with 1948-55, 13.6 per cent.

I do not wish to argue that there is no significance in the tendency for certain Soviet industries to approach their American counterparts more and more closely in size. Quite to the contrary, it is easy to think of several important problems for which this is a very important consideration, and any study of Soviet industrial growth would be seriously incomplete without explicitly revealing this widespread phenomenon. The only point being made is that this type of analysis is not adequate for assessing "general" industrial development. The concept of industrial growth must somehow take account of expansion in breadth as well as length. Paying attention solely to a fixed list of industrial products—especially to a list supplied by Soviet authorities—is a deficient approach, even if some method is used to weight products by importance.<sup>4</sup> This point may be underscored by observing

<sup>4</sup> The essential point to keep in mind here is the austere nature of Soviet industry in contrast to American industry. American growth has taken place in large part through proliferation of commodities designed for similar functions, through improvements in quality, and through addition of new services, both directly and as embodied in improved commodities. Soviet growth has taken place mainly through expanded output of standard

that the decline of some industries in the United States—as coal, soap, and railway equipment—is in a real sense a sign of progress: the supplanting of worse by better means of doing the job. Are, then, gains by the Soviet Union on the United States in output of coal, for instance, to be viewed as indicating more rapid industrial advance?

#### IV

Even in a discussion as incomplete as this one admittedly has been, it would be improper to conclude without emphasizing once again that we have been looking, from a few restricted points of view, at the record of industrial achievement posted by the Soviet Union over the entire period of its existence. The years under review include the two world wars, a violent revolution, and a severe civil war—altogether some eleven years of turbulence, a fourth of the period. They also cover experience under both a planned and an “unplanned” economy, and these in turn have had disturbances of a severity that may not be encountered again. There are obviously questions raised about how trends are to be interpreted over times such as these.

At a minimum, account must be taken of the best years of growth, which come down essentially to the periods 1928-37 and 1948-55. These short spurts of growth have, of course, been much more rapid than growth over the Soviet period as a whole. As already mentioned, there are good reasons for doubting that the performance in these short periods can be sustained over the long haul. A number of unique circumstances that favored rapid expansion are not likely to be encountered again—including, for instance, the absorption of a vast idle labor force and the sudden inheritance of Western technology. However this might be, any judgment of Soviet industrial development should give all due weight to performance under the best of conditions.<sup>5</sup>

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products. This is, of course, an oversimplification, but it serves well enough here to point up a significant difference. As a few specific examples of the austere path of Soviet development, one might note the persistently limited varieties of textiles, the retention of basic tractor models for two to three decades, and the slow progress made in packaging consumer products. When one leaves the realm of “industry,” the contrast is sharpened. Nothing remotely similar to the expansion of service trades in this country has taken place in the Soviet Union. It is perhaps well to stress that these remarks are directed to the question of “general” industrial development, not to performance in special areas. In particular, nothing that has been said is inconsistent with Soviet successes in developing new and increasingly deadly weapons of war, and in producing them in large quantity.

<sup>5</sup>It is difficult to understand the argument that only the recent years of growth are of any interest; i.e., that long-range performance is irrelevant for assessing growth trends. However, in view of comments on this paper by Professor Grossman, it may be well to indicate the general behavior of lags with 1928 as a bench mark year. For total output, the median lag was 28 years in 1913, 45 years in 1928, and 34 years in 1955; the median change in lags was an increase of 15 years for 1913-28 (based on data for 31 industries) and a decrease of 9 years for 1928-55 (based on data for 32 industries). For per capita output, the median change in lags was an increase of 15 years for 1913-28 (based on data for 17 industries) and an increase of 0 years for 1928-55 (based on data for 24 industries). That is to say, of the 24 industries for which changes in per capita lags can be computed over the period 1928-55, half showed an increase and half a decrease.