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by an economy, even though growth in some significant meanings of economic capacity is neither greater nor smaller than it would have been had an alternative course been followed. In any event, what applies to the best of conditions applies with magnified force to the Soviet Union. If sound and relevant judgments are to be made on Soviet economic growth, the evidence must be summarized in a variety of ways, only one of which is the broad production index.

I want to suggest some of these ways, and to explore one in some detail. Despite the ambitious title originally assigned to this paper, my discussion will have to be limited to industrial growth, since that is the area I have been working in. The data that will be presented have been drawn from a study under way at the National Bureau of Economic Research; they are, of course, preliminary and subject to revision. In any event, a full explanation of what lies behind them will be published when the study is completed. It must be said here that all Soviet data are based ultimately on information published in the Soviet Union; and, though efforts have been made to remedy the most obvious deficiencies, no scholar can have a clear conscience in working with Soviet data as if they were fully reliable. A few additional remarks will be made on this crucial point at the conclusion of this paper.

II

Suppose we raise the following question: How successful has the Soviet Union been in matching the industrial achievements of the United States? One way to approach an answer is to make an industry-by-industry comparison of Soviet and American growth in physical output, in each case confining the comparison to periods in which American and Soviet industries were of equivalent size.¹ A comparison

¹ Any study of individual industries involves the many familiar problems of defining each industry in a relevant way and of finding comparable industrial categories for different economies. The problem of definition has been "solved" in part by the availability of Soviet data. In general, the industries—it is perhaps more accurate to say "commodities"—chosen for study are the most narrowly defined categories for which Soviet data on physical output can be found covering the entire Soviet period. Relying on narrow concepts of industries makes for obvious difficulties in interpreting differences in growth as between economies with differing endowments of resources. Thus the petroleum industry has shown a much more rapid development in the United States than in the Soviet Union over comparable periods, while the coal industry has not. The comparatively slower growth of coal in the United States is essentially the result of comparatively better opportunities in the petroleum industry, not of any relatively depressive factors applicable to the "fuel industry" as a whole. It would therefore be useful to examine comparative developments in the fuel industry as well as in its components and similarly in the case of other industrial groups. Analysis of this sort is planned for the study under way at the National Bureau.

It should also be pointed out that there are gross deficiencies in the definitions of industries as given in Soviet statistical materials. Often little is known about a Soviet industry beyond a broadly descriptive title—as "copper," "paper," "canned food," and so on. Under these circumstances, the choice of American counterparts is necessarily somewhat arbitrary, though we have done our best to choose what seemed to be the most similar industries.

of this sort, while containing flaws of its own, makes allowance for the important fact that most individual industries tend to grow more slowly percentagewise as they get older and larger—a phenomenon characteristic of the Soviet Union as well as the United States. An industry-by-industry comparison of percentage growth rates for concurrent periods does not make such an allowance and may produce misleading conclusions to the extent that mature American industries are being compared in growth with youthful Soviet counterparts. A simple and direct method of making the desired kind of comparison is to examine the lag of Soviet output behind American output and what has happened to the lag over time.

This is done in Tables 1 and 2, where the Soviet lag in both total and per capita output is listed for 37 industries as of three bench mark years: 1913, 1937, and 1955. Although the sample of industries has been dictated by availability of data on physical output, it does cover a fair number of so-called "basic" industrial materials and consumer "staples." Cyclical fluctuations have been smoothed out of the American output series—essentially through nine-year moving averages—so that comparisons would not be made with unusual temporary peaks in American output. On the other hand, Soviet series were not similarly smoothed because their fluctuations are fundamentally different in nature from our own cycles, and also because serious technical problems arise as a result of marked discontinuities in the series. Similarly, no adjustment has been made for gains in Soviet output resulting from territorial expansion after World War II; i.e., such gains are included in the data. Therefore, on these scores, the lags are computed favorably for the Soviet Union, at least as a general rule.

The meaning of these lags and of their changes over time is best shown through an example. In 1913, the Russian production of steel ingots within the interwar territory of the Soviet Union was roughly equal to production achieved in the United States around 1892, or 21 years earlier. Hence the lag in 1913 was 21 years. The lag had risen to 32 years in 1937, and fell somewhat from that point to a level of 29 years in 1955. Thus Soviet production of steel ingots was 8 years further behind American production in 1955 than it had been in 1913, which is to say that it has taken the Soviet Union 42 years (1913-55) to accomplish what the United States had done in 34 (1892-1926). On a per capita basis, the lag increased from 30 years in 1913 to 40 in 1937, and to 49 in 1955. Production per capita was 19 years further behind in 1955 than it had been in 1913; the same expansion in per capita output had taken place in the United States in 23 years (1883-1906), instead of in 42.

When we consider the entire group of industries, we note that in the

TABLE 1
LAG OF THE SOVIET UNION BEHIND THE UNITED STATES IN OUTPUT,
BENCH MARK DATES, 37 INDUSTRIES*

	Lag (Number of years)			Increase or Decrease (-) in Lag		
	1913	1937	1955	1913-37	1937-55	1913-55
Iron ore.....	28	36	15	8	-21	-13
Pig iron.....	30	36	39	6	3	9
Steel ingots.....	21	32	29	11	-3	8
Rolled steel.....	27	35	29	8	-6	2
Primary blister copper.....	33	50	51	17	1	18
Lead.....	94	60	52	-34	-8	-42
Zinc.....	46	43	46	-3	3	0
Electric power.....	13	21	16	8	-5	3
Coal.....	45	49	47	4	-2	2
Coke.....	31	36	30	5	-6	-1
Crude petroleum.....	14	26	34	12	8	20
Natural gas.....	32	51	52	19	1	20
Soda ash.....	22	31	24	9	-7	2
Mineral fertilizer.....	43+	27	14	-16+	-13	-29+
Synthetic dyes.....	2	15	12	13	-3	10
Caustic soda.....	17	25	24	8	-1	7
Paper.....	44	46	54	2	8	10
Sawn wood.....	61	73	62	12	-11	1
Cement.....	19	33	32	14	-1	13
Window glass.....	13	0	†	-13	§	-13+
Rails.....	42	57	54	15	-3	12
Railroad passenger cars.....	21	46	53	25	7	32
Railroad freight cars.....	33	51	69	18	18	36
Butter.....	21	38	35	17	-3	14
Vegetable oils.....	5	26	29	21	3	24
Sausages.....	24+	36	38	†	2	†
Fish catch.....	-11	4	†	15	-4+	†
Soap.....	34+	52	52	†	0	†
Sugar.....	6	17	27	11	10	21
Canned food.....	43+	45	45	†	0	†
Beer.....	42	66	73	24	7	31
Cigarettes.....	-1	11	14	12	3	15
Boots and shoes.....	23+	44	44	†	0	†
Rubber footwear.....	14+	19	†	†	-19+	-14+
Cotton fabrics.....	28	44	48	16	4	20
Silk and synthetic fabrics.....	23	44	25	21	-19	2
Woolen and worsted fabrics.....	43+	67+	69	†	†	†
Median**.....	28	36	35	11	-1	9

* U.S. output taken as centered nine-year moving average, with minor modifications. Soviet output covers interwar territory of the Soviet Union for 1913 and 1937, and postwar territory for 1955. A Soviet lead is indicated by a negative sign in columns 1-3. Where U.S. data do not go back far enough to give the full lag, the calculable lag is followed by a plus sign.

† Insufficient data to indicate whether the lag increased or decreased.

‡ Soviet output exceeds U.S. output up to the present.

§ Decrease in lag of unknown magnitude.

** Medians in the last three columns are calculated from data in those columns; i.e., they are median increases in lag, not increases in the median lags given in the first three columns. The median increases in lag are derived from data for the following numbers of industries: 1913-37, 32; 1937-55, 36; 1913-55, 31.

case of total output the median lag—that lag exceeded by half the industries and fallen short of by the other half—was 28 years in 1913, 36 in 1937, and 35 in 1955. The median lag in per capita output was 56

TABLE 2
LAG OF THE SOVIET UNION BEHIND THE UNITED STATES IN PER CAPITA OUTPUT,
BENCH MARK DATES, 37 INDUSTRIES*

	Lag (Number of years)			Increase or Decrease (-) in Lag		
	1913	1937	1955	1913-37	1937-55	1913-55
Iron ore.....	53+	52	54	†	2	†
Pig iron.....	48	52	56	4	4	8
Steel ingots.....	30	40	49	10	9	19
Rolled steel.....	24+	48+	52	†	†	†
Primary blister copper.....	53	58	66	5	8	13
Lead.....	105+	109	76	†	-33	-29+
Zinc.....	53	57	59	4	2	6
Electric power.....	14	26	25	12	-1	11
Coal.....	66	69	69	3	0	3
Coke.....	33+	49	56	†	7	†
Crude petroleum.....	27	34	41	7	7	14
Natural gas.....	32+	52	70	†	18	†
Soda ash.....	27	43	45	16	2	18
Mineral fertilizer.....	43+	40	30	-3+	-10	-13+
Synthetic dyes.....	14+	20	22	†	2	†
Caustic soda.....	19	40	35	21	-5	16
Paper.....	54+	67	71	†	4	†
Sawn wood.....	114+	102	111	-12+	9	-3+
Cement.....	30	38	47	8	9	17
Window glass.....	34+	-2	15	-36+	17	-19+
Rails.....	46+	70	85	†	15	†
Railroad passenger cars.....	27	57	69	30	12	42
Railroad freight cars.....	33+	57+	75+	†	†	†
Butter.....	30	50	58	20	8	28
Vegetable oils.....	16	40	44	24	4	28
Sausages.....	24+	48+	61	†	†	†
Fish catch.....	33+	57+	19	†	-38+	-14+
Soap.....	34+	58+	76+	†	†	†
Sugar.....	12	32	47	20	15	35
Canned food.....	43+	62	60	†	-2	†
Beer.....	43+	67+	85+	†	†	†
Cigarettes.....	0	15	19	15	4	19
Boots and shoes.....	23+	47+	65+	†	†	†
Rubber footwear.....	14+	38+	56+	†	†	†
Cotton fabrics.....	43+	67+	85+	†	†	†
Silk and synthetic fabrics.....	34	58	42	24	-16	8
Woolen and worsted fabrics.....	43+	67+	85+	†	†	†
Median †.....	§	§	56	10	4	13

For notes * and †, see Table 1.

† See note ** in Table 1. The median increases in lag are derived from data for the following numbers of industries: 1913-37, 19; 1937-55, 28; 1913-55, 21.

§ Insufficient data to calculate median.

years in 1955; equally precise calculations cannot be made for other bench mark years in the case of per capita lags, because many lags are so long they cannot be measured—American statistics on output do not go back far enough to show output per capita as small as in the Soviet Union. Changes in per capita lags can, however, be measured for 21 industries over the Soviet era as a whole, and the median of these is an increase of 13 years. Moreover, 16 of the 21 industries show an increase

in lag. In the case of total output as distinct from per capita output, the median increase in lag is 9 years, and 24 of 31 industries show an increase. Per capita lags have generally increased over recent years (1937-55) as well as over the Soviet period as a whole, but this is not true for lags in total output: in that case more industries show a decrease in lag over recent years than show an increase, the count being 20 industries to 14.²

What may we then conclude? This is obviously not the place for an exhaustive analysis, but let me indicate, with appropriate qualifications, some inferences that might be drawn. In the first place, Soviet industry seems still to be roughly three and a half decades behind us in levels of output and about five and a half decades in levels of per capita output. This is, of course, a generalization about average performance rather crudely defined; in some areas the Soviet Union is much closer to us historically, in others much further behind. Second, and with the same qualification, the development of Soviet industry is roughly equivalent to what took place in this country in the four decades bracketing the turn of this century—in per capita terms, in an even earlier period ending around the turn of the century. Third, over the Soviet era as a whole, Soviet industries have generally lost historical ground to their American counterparts—the lags have generally increased—in terms of both total and per capita output. That is, growth from the same level of output, total or per capita, has been slower in Soviet than in American industries. This tendency is, incidentally, not unique to the Soviet era; the same thing was happening over the last four decades of the Czarist period. Fourth, while Soviet industries

² The summary statistics given here reflect, of course, conditions in industries where growth has been deliberately retarded by Soviet authorities in order to promote growth in other industries. The difference in performance between the neglected and favored sectors may be indicated in part by computing summary statistics separately for industries producing consumer goods, on the one hand, and for all other industries, on the other hand. For instance, if the last 14 items in Tables 1 and 2 are taken as consumer goods, and the first 23 items as all other goods, the following results are obtained:

	Median Lag (Number of years)			Median Increase or Decrease (-) in Lags*		
	1913	1937	1955	1913-37	1937-55	1913-55
Total output						
Consumer goods.....	26	41	36	16	0	18
All other goods.....	30	36	34	8	-3	7
Per capita output						
Consumer goods.....	†	†	60	20	4	24
All other goods.....	†	52	56	6	4	11

* Derived from the following numbers of industries for 1913-37, 1937-55, and 1913-55 respectively: total output, consumer goods—8, 12, and 8; per capita output, consumer goods—5, 7, and 6; total output, all other goods—23 in each case; per capita output, all other goods—14, 21, and 15.

† Insufficient data to calculate median lag.

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 1880-1920.³ 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

³ 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.