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RECENT SOVIET COMPARISONS OF LABOR PRODUCTIVITY IN SOVIET AND US INDUSTRY

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CENTRAL INTELLIGENCE AGENCY

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FOREWORD

This report summarizes and evaluates three studies of comparative labor productivity in the US and the USSR recently published by Soviet economists. The findings of these studies apparently are the basis for the numerous official statements concerning relative levels and trends in labor productivity in the two countries. Because the growth of labor productivity measures economic advancement, these studies represent Soviet assessments of their progress in the "economic race" with the US.

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RECENT SOVIET COMPARISONS OF LABOR PRODUCTIVITY IN SOVIET AND US INDUSTRY*

Summary and Conclusions

During 1959-60, three international comparisons of labor productivity were published in the USSR. These were the first such studies published since the late 1930's. Appearing in the journals Sotsialisticheskiy trud and Planovoye khozyaystvo,** the comparisons purport to measure present levels of labor productivity in the USSR and the US and to assess the rate of Soviet progress in this aspect of the "economic race" with the US. The comparisons, which were made by Soviet economists A. Kats, A. Aganbegyan, and Ya. Ioffe, are being widely used as the basis for the numerous official statements on the role of labor productivity in the economic race.

In his study, Kats found that physical output per production worker in Soviet industry in 1956 was from 45 to 50 percent of that in US industry in 1954. When these ratios are moved by an index of US labor productivity, they imply a ratio of 42 to 46 percent in 1956. Kats' study is based on a sample of 28 industries*** employing about two-fifths of all production workers. Except for the limitations of his sample, Kats' study of the comparative Soviet and US industrial levels of labor productivity appears on the whole to be a careful and scholarly approach to this subject. Kats' estimate of the relative level of Soviet labor productivity, however, is somewhat above the upper limit of the measures constructed by this Office for the value of total industrial production per production worker in the two countries (21 percent when output is measured in rubles and 41 percent when measured in dollars).

Kats' study, when taken together with the comparison of Soviet and US labor productivity based on 1937 and made by the Soviet economists Ye. Vasil'yev and Kh. Koval'zon in 1939, shows average annual increases

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* The estimates and conclusions in this report represent the best judgement of this Office as of 1 October 1960.

** The journals of the State Committee on Questions of Labor and Wages under the Council of Ministers of the USSR (Gosudarstvennyy Komitet Soveta Ministrov SSSR po Voprosam Truda i Zarabotnoy Platy) and the State Planning Committee (Gosudarstvennyy Planovyy Komitet -- Gosplan), respectively.

*** Excluding most of the machinery and metalworking industries.

in Soviet industrial production of 5.4 and 5.9 percent during the period 1937-56. This rate is much lower than the 9-percent increase given by the official Soviet index of industrial production but agrees approximately with the rates shown by the Kaplan-Moorsteen Index of All Industrial Products and the industrial production index of this Office, extended backward by G. Warren Nutter's Index of All Industrial Products, including miscellaneous machinery.

According to Aganbegyan's study, labor productivity in the Soviet economy as a whole in 1957 was approximately 33 to 40 percent of that in the US. Employing the same general methodology but using somewhat different measures and adjustments, Ioffe estimated the over-all Soviet level of productivity in 1957 to have been 43 to 45 percent of that in the US. The higher over-all ratio found by Ioffe results primarily from the higher ratios estimated for transportation and agriculture.

Using their respective ratios as a base for their projections, both Aganbegyan and Ioffe attempt to forecast when the USSR will "catch up" with the US in labor productivity. Aganbegyan predicts that the USSR will reach the US level in the economy as a whole and in industry by 1972, in construction by 1967, and in rail transport by 1964. Aganbegyan further predicts that output per capita in the USSR will match that in the US by the early 1970's. Ioffe asserts that in 1971-72 the USSR will overtake the US in the level of industrial labor productivity.

Aganbegyan's and Ioffe's estimates clearly overstate the relative labor productivity of the Soviet economy as a whole in comparison with that of the US. These overstatements result from the following: the use of inflated ratios for labor productivity of individual sectors; the omission from the comparison of all economic sectors except those closely connected with production of physical products, which is in line with Marxist conceptions; and the selection of unspecified weights that are favorable to the USSR. An indication of the minimum amount of overstatement, caused by the weights alone, is given by the fact that when Aganbegyan's ratios of labor productivity in the USSR to that in the US for individual sectors (industry, construction, transportation, and agriculture) are combined by US and, alternatively, by Soviet employment weights, Soviet productivity is shown to be 26 to 41 percent of the US, instead of the 33 to 40 percent claimed by Aganbegyan. Moreover, Aganbegyan's and Ioffe's predictions of the rapid closing of the gap between the USSR and the US in labor productivity and in output per capita are exaggerations resulting from the use of the official Soviet indexes of gross value of output for projecting Soviet labor productivity. The official indexes probably overstate Soviet achievements relative to the US, which uses value-added indexes to measure changes in industrial production and labor productivity.

I. Introduction

During the 1930's, Soviet economists made a number of attempts to compare levels and trends in industrial labor productivity in the USSR with those in other countries. The most important of these attempts -- still highly regarded in the USSR 1/* -- was a study made in 1939 by Ye. Vasil'yev and Kh. Koval'zon. 2/ According to this study, the level of industrial labor productivity in the USSR relative to that in the US was 16.2 percent in 1928, 26.2 percent in 1932, and 40.5 percent in 1937.** No other studies of comparative labor productivity appeared in Soviet journals until 1959, when two major articles, one by A. Kats and the other by A. Aganbegyan, were published in the official journal of the Soviet State Committee on Questions of Labor and Wages. 4/ A third article on comparative labor productivity, written by Ya. Ioffe, appeared in the March 1960 issue of Planovoye khozyaystvo. 5/

These studies reflect the increased research effort currently being devoted to the subject of labor productivity in the USSR. Although the Soviet leadership has long emphasized the importance of increased labor productivity in the "building of socialism and communism," only recently have specific institutional arrangements been made to stimulate research on labor productivity. In general, under the new arrangements, industrial research institutes will concentrate on means for increasing labor productivity -- for example, decrease of idle time, better production flow, time-and-motion studies, and use of more advanced machines -- whereas the research institutes subordinate to Gosplan, to the State Committee on Questions of Labor and Wages, and to the Academy of Sciences (Akademiya Nauk)*** will study the economic and statistical aspects of trends and measurement of labor productivity. 6/ In the past few years these institutes have published a spate of studies on labor productivity, some of them apparently of high caliber.

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* For serially numbered source references, see Appendix C.

** These results agree generally with those obtained by several other Soviet economists of the period and with those of the US economist Walter Galenson, who found industrial labor productivity in the USSR in 1937-39 to be about 38 to 42 percent of that of the US. 3/ Galenson's figures, however, were intended to be approximate orders of magnitude rather than precise estimates.

*** The research institutes are the Scientific-Research Economic Institute (Nauchno-Issledovatel'skiy Ekonomicheskiy Institut) of Gosplan, the Scientific-Research Institute of Labor (Nauchno-Issledovatel'skiy Institut Truda) of the State Committee on Questions of Labor and Wages, and the Institute of Economics (Institut Ekonomiki) of the Academy of Sciences.

II. Recent Soviet Studies

A. Kats' Study of Comparative Labor Productivity in Industry

1. Conclusions and Methodology

The study by A. Kats compares physical output per production worker in industry as a whole and in 28 separate industrial branches in the USSR in 1956 with corresponding data for the US in 1954 and concludes that over-all industrial labor productivity in the USSR was 45 to 50 percent of that of the US.* Kats omitted from his sample most of the machinery and metalworking industries, including motor vehicles, which employ about one-third of all workers in Soviet industry. To obtain these results, Kats first calculated the relative levels of labor productivity in each of the 28 branches and then computed aggregate ratios using two sets of weights -- namely, Soviet wage bills and Soviet employment. The results, showing the effects of using alternative weights and of including or excluding coal mining, are shown in Table 1.** The comparisons for the 28 branches are shown in Appendix A.***

In general, Kats' presentation is a detailed and careful one. His methodology is similar to that used by L. Rostas in his studies of UK and US labor productivity 7/ and by Walter Galenson in his study of Soviet and US labor productivity. 8/ In making his comparison, Kats adjusted data on US production† to fit the Soviet definition of industry, which includes mining and electric power, and Soviet employment data to fit the US definition of "production workers." His adjustment of Soviet employment was made by adding to wage workers the number of apprentices and junior service personnel. Kats, however, falls short of attaining full comparability between Soviet and US data on employment because he failed to include a part of Soviet engineering-technical workers, who also should have been added to wage workers to match the US definition of "production

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* Kats also concludes that labor productivity in Soviet industry is higher than that in the UK, West Germany, and France. However, the samples used by Kats in comparing Soviet labor productivity with that in Western European countries are small and unrepresentative, and the available evidence suggests that Soviet labor productivity relative to the leading Western European countries has been systematically overstated.

** Table 1 follows on p. 5.

*** P. 17.

† The "production" figures used for the US represent "shipments" by manufacturers rather than "production," whereas Soviet data represent production.

Table 1

Comparison of Labor Productivity in Soviet Industry in 1956
with That in the US in 1954
According to Kats

US Labor Productivity in 1954 = 100

Average Annual Output per Production Worker [a]	All Industry	All Industry, Excluding Coal Mining
Weighted by wages paid	45.4	47.8
Weighted by number of workers	47.9	49.8

a. Kats used the average annual output per production worker to measure labor productivity. Labor productivity in the USSR is given in this table as a percentage of that in the US.

worker." Output per worker is expressed in physical, or "natural," terms to avoid double-counting and other difficulties encountered in making international comparisons in terms of currencies.

Kats emphasizes that his comparison, which he claims includes branches of industry accounting for 38 percent of Soviet "production workers" and 40 percent of wages paid in Soviet industry, is broader in scope than any previous comparison of labor productivity in Soviet and US industry. In interpreting his results, he discusses in considerable detail the various institutional and statistical differences which occur between the two countries and which influence the results. These differences include differences in the classifications of industries, in product mix, in the degree of self-sufficiency in particular in industries in production of small components (for example, tools, dies, and jigs), and in the length of the work year. Although Kats does not attempt to measure the effects of these institutional and statistical differences, he maintains that, on the whole, they tend to understate the level of labor productivity in the USSR relative to that in the US.

2. Evaluation

Kats' results will be evaluated in two ways in this section. First, these results will be checked for consistency with other measures of Soviet industrial growth. Taken together with the study of comparative Soviet and US labor productivity conducted by Ye. Vasil'yev and Kh. Koval'zon, Kats' data give an implicit rate of

growth in Soviet industrial production between 1937 and 1956 that may be compared with the rates of growth found by several US studies of Soviet industrial production. Second, Kats' estimates of the ratio of Soviet industrial labor productivity to that in the US will be compared with a similar ratio calculated by converting the value of total industrial production per worker in the two countries into a common currency by means of a ruble-dollar ratio weighted first by Soviet employment weights and second by US employment weights.

a. Comparison of the Increase in Soviet Industrial Production Implied by Kats' Study with the Increases Indicated by Other Measures of Soviet Industrial Production

In their 1939 study, Vasil'yev and Koval'zon found that the level of industrial labor productivity in the USSR in 1937 was 40.5 percent of that in the US in 1937. Kats estimated that the level of labor productivity in Soviet industry in 1956 was between 45 and 50 percent of that in the US in 1954. These findings, together with a measure of US industrial production adjusted to approximate the Soviet definition of industry, give an implicit index of Soviet industrial production in 1937-56. The average annual rate of increase in industrial output implied in Kats' study* is compared in Table 2** with the average annual rates indicated by the index of production of this Office extended backward with G. Warren Nutter's Index of All Industrial Products, including miscellaneous machinery; the Kaplan-Moorsteen Index of All Industrial Products; Nutter's Index of All Industrial Products, excluding miscellaneous machinery; and the official Soviet index of industrial production. The index of Soviet production implicit in the studies by Kats and by Vasil'yev and Koval'zon agrees approximately with the index of Soviet industrial production of this Office and also with the Kaplan-Moorsteen index -- that is, they have an average annual increase of 5 to 6 percent. The implicit index is

* The index of Soviet industrial production in 1937-56 implicit in the studies by Kats and by Vasil'yev and Koval'zon was estimated as follows:

(Soviet 1937 level of labor productivity as a percentage of the US 1937 level) times (Soviet 1956 level of labor productivity as a percentage of the Soviet 1937 level) times (US 1937 level of labor productivity as a percentage of the US 1954 level) equals (Soviet 1956 level of labor productivity as a percentage of the US 1954 level)

As stated alternatively for calculations:

(Soviet 1956 production as a percentage of Soviet 1937 production) equals $\frac{45 \text{ or } 50}{40.5}$ times $\frac{144}{100}$ times $\frac{169}{100}$ equals 270 or 300

** Table 2 follows on p. 7.

Table 2

Average Annual Rates of Increase in Industrial Production in the USSR According to Various Indexes a/

Percent

Index	Period of the Index	Average Annual Rate of Increase b/
Index implicit in the labor productivity studies by Kats and by Vasil'yev and Koval'zon	1937-56	5.4 c/ 5.9 c/
Extended index of production of this Office d/	1937-56	6.0
Kaplan-Moorsteen Index of All Industrial Products	1937-55	4.9
	1937-58	5.4
G. Warren Nutter's Index of All Industrial Products e/	1937-55	4.4 f/
Official Soviet index of industrial production	1937-56	9.0

a. 9/
b. Average annual rates of increase are computed at the compound interest rate between the 2 terminal years.
c. The two rates of growth result from the use of Kats' low and high estimates of 45 and 50 percent, respectively, for the 1954/56 comparison. The indexes of US production and labor productivity are based on the Soviet definition of industry (see Appendix B). If the recently revised index, from the Board of Governors of the Federal Reserve System, for US industrial production (which also uses approximately the Soviet definition of industry) is used in the calculation, the average annual rates implied by the studies by Kats and by Vasil'yev and Koval'zon are 5.5 and 6.1 percent, respectively.
d. Production index of this Office linked to G. Warren Nutter's comparable Index of All Industrial Products, including miscellaneous machinery, at 1950 (see Appendix B).
e. Excluding miscellaneous machinery.
f. The annual rate of increase is calculated for the period 1937-55 only. This index excludes most machinery products and is heavily weighted with the output of raw materials and semifinished industrial materials.

higher than Nutter's Index of All Industrial Products, excluding miscellaneous machinery, which is based largely on production of industrial materials 10/ but is much lower than the official Soviet index.

The inconsistency between the official Soviet index of industrial production and the index implicit in studies by Kats and by Vasil'yev and Koval'zon also may be shown by moving the Kats' findings concerning the relative levels of labor productivity in the USSR and the US in 1954-56 backward to 1937 (or by moving the results of Vasil'yev and Koval'zon forward to 1954-56) by means of the official Soviet indexes of industrial labor productivity in the two countries (see Table 3*). 11/ If Soviet labor productivity in 1956 was approximately 45 to 50 percent of that in the US in 1954, as Kats claims, the

* Table 3 follows on p. 8.

Table 3

Official Soviet Indexes of Labor Productivity
in Soviet and US Industry
Selected Years, 1928-56

1937 = 100

Year	USSR	US a/
1928	37.7	93
1937	100	100
1940	133	111
1950	182	137
1951	201	N.A.
1952	214	N.A.
1953	227	148
1954	242	N.A.
1955	263	163
1956	281	166

a. The origin and derivation of this index is not explained in official Soviet sources. A check of regularly published production and employment series indicates that Soviet economists may have constructed this index from data of the Board of Governors of the Federal Reserve System adjusted to the Soviet definition of industry. If this surmise is correct, the index probably represents physical product, or real output, per production worker.

Soviet level in 1937, as indicated by the relative rates of change between 1937 and 1954 in the US and between 1937 and 1956 in the USSR, shown in the official Soviet indexes, must have been about 24 to 29 percent of that in the US. Conversely, if the Vasil'yev and Koval'zon ratio of 40.5 percent in 1937 is moved forward to 1954 for the US and to 1956 for the USSR by the official Soviet indexes of labor productivity in the two countries, the Soviet level in 1956 is shown to be 70 to 77 percent of the US in 1954. Thus the official Soviet indexes of labor productivity in the two countries are sharply inconsistent with the findings of three currently reputable Soviet economists.*

* Because Soviet indexes of labor productivity are calculated from the official indexes of production, the [footnote continued on p. 9]

b. Comparison of Kats' Results with Those Obtained by Comparing the Value of Production per Worker

Although the rates of change implicit in Kats' study and that by Vasil'yev and Koval'zon are roughly consistent with the index of production of this Office, as extended, and with the Kaplan-Moorsteen Index of All Industrial Products in the USSR, Kats' estimate that labor productivity in Soviet industry in 1956 represents 45 to 50 percent of the level of the US in 1954 differs considerably from the results derived from a current comparison of the value of industrial production in the US and the USSR made by this Office. This comparison, employing ruble-dollar price ratios shows Soviet industrial production to be 24 and 47 percent of that of the US in 1956, with a geometric mean of 33 percent. 14/ A rough estimate of the ratio of labor productivity in Soviet industry to that in the US may then be obtained by multiplying the two production ratios by the ratio of US to Soviet "production workers" in 1956, as defined by Kats (approximately 88 percent). 15/ By this method, Soviet labor productivity in industry may be estimated at 21 and 41 percent of that in the US in 1956.* When Kats' estimate for the US is extended from 1954 to 1956 using an index of US labor productivity of this Office, as described in Appendix B and Tables 7 and 8,** Soviet labor productivity is shown to be 42 and 46 percent of that in the US. Thus Kats' results are somewhat above the upper limit of the measures of comparative labor when calculated in terms of value.

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indexes of labor productivity are subject to the same biases as are the indexes of production, which are gross value indexes rather than value-added indexes and therefore may exaggerate the increase in production through double-counting. 12/ This exaggeration theoretically is greatest during periods of rapid change when new industries are being established and industrial specialization is increasing, as was the case in the USSR during the 1930's. A further upward bias may result from the Soviet practice of introducing new products into the index at their relatively high initial prices. 13/

* These estimates were calculated as follows:

Soviet 1956 production as a percentage of US 1956 production	times	US 1956 production workers as a percentage of Soviet 1956 "production workers"	equals	Soviet 1956 production per "production worker" as a percentage of US 1956 production per production worker

Calculations:

(24)(88) equals 21 percent
(47)(88) equals 41 percent

** Appendix B, pp. 22 and 24, respectively, below.

The difference between Kats' results and those obtained by the method of the ruble-dollar ratio probably is accounted for primarily by the fact that Kats' study measures physical output per worker and is necessarily limited to simple, homogeneous, and mass-produced commodities that are physically comparable between the two countries. Such a comparison thus omits the numerous specialized products that are unique to, or are given greater emphasis in, the US, thereby overstating the labor productivity of the USSR. Full account is taken of such products, however, in a comparison of labor productivity made by comparing the value of total industrial production per worker in the two countries.

Other characteristics of Kats' study probably influence his comparison, but to a lesser extent. First, although Kats' employment and production data apparently were not selected deliberately to produce a desired result,* the omission of most of the machine building and metalworking industries is a serious shortcoming, and the degree and direction of distortion in Kats' findings that might result from the omission of this sector cannot be determined. Second, in making over-all international comparisons, the ratios for the various industries may be weighted by data from either country to arrive at over-all estimates -- both results being equally valid. Kats' comparison uses only Soviet (employment and payroll) data as weights. The result may have been actually to understate Soviet labor productivity slightly relative to that in the US.** Third, Kats' omission of some engineering-technical workers from the Soviet employment data as explained above*** understates Soviet employment relative to that in the US -- perhaps by 3 to 4 percent -- thereby overstating the relative level of Soviet labor productivity. Finally, because Kats uses "shipments" rather than "production" for the US and because US shipments exceeded US production in 1954, 17/ the effect of the use of data on shipments may be to overstate slightly the level of US labor productivity.

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* Arcadius Kahan of the University of Chicago recently attempted to compare Soviet and US labor productivity in 1956, using data different from those employed by Kats. He found the 1956 ratios in the various industries to be somewhat lower than the ratios reported by Kats for 1956 in the USSR and 1954 in the US. Although Kahan was unable to judge definitely the reliability of Kats' estimates, he expressed the opinion that Kats' figures might be somewhat too high. 16/

** In his comparison for the late 1930's, Galenson found that the use of US employment weights raised the Soviet level of labor productivity relative to that of the US above that obtained by using Soviet employment weights.

*** See 1, above.

B. Aganbegyan's and Ioffe's Studies of Comparative Productivity

1. Conclusions and Methodology

Unlike Kats' study, which compares only industrial labor productivity in the USSR and the US, the study by A. Aganbegyan and that by Ya. Ioffe attempt to compare levels of labor productivity in the two economies as a whole. In line with Marxist economics and Soviet statistical practice, however, both Aganbegyan and Ioffe restrict their comparisons to the "productive" sectors (industry, construction, transportation, and agriculture) and exclude service industries, government, and retail trade.*

Aganbegyan's study concludes that the over-all level of labor productivity in the USSR in 1957 was 33 to 40 percent of that in the US (see Table 4**), and Ioffe estimates the level to be somewhat higher -- that is 43 to 45 percent (see Table 5***). For the four sectors in 1957, Aganbegyan's ratios are 50 percent in industry, 59 percent in construction, 33 percent in transportation, and 20 to 25 percent in agriculture. Ioffe's ratios for the four sectors in 1958 are 49 percent in industry, 56 to 58 percent in construction, 75 percent in rail transport (used as representative of all transportation), and 33 percent in agriculture.

Both studies appear to be based on the same general methodology -- that is, the computation of ratios of physical output per worker in each of the various sectors -- and these ratios are then combined, by employment or by payroll or by value of output weights. This methodology was endorsed strongly by V. Starovskiy of the Soviet Academy of Sciences in a recent issue of Voprosy Ekonomiki. 20/ In making the various sectoral productivity estimates, Aganbegyan does not explain his sources or methodology, whereas Ioffe is quite specific on these matters. Most of the differences between the estimates made by the two authors appear to result from differences in production estimates for the various sectors and in the adjustment of data on the labor force to "insure" comparability between the Soviet and the US data.

With their computed ratios of labor productivity as bases, both Aganbegyan and Ioffe forecast when the USSR will "catch up" with the US in labor productivity. Aganbegyan notes that during the past 30 years the average annual rate of growth in Soviet labor productivity

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* Ioffe also makes an estimate for the economy as a whole, which includes wholesale trade as one of the "productive" sectors.

** Table 4 follows on p. 12.

*** Table 5 follows on p. 13.

Table 4

Comparison of Labor Productivity in the USSR with That in the US
According to Aganbegyan a/
1957

Sector	Production in the USSR as a Percentage of That in the US	Number of Workers (Million)		Number of Workers in the USSR as a Percentage of That in the US	Labor Productivity in the USSR as a Percentage of That in the US
		USSR	US		
Industry	50	19	18	105	50
Construction	67	4	3.5	111	59
Transportation	50	5	3	167	33
Agriculture	83	30 to 40 b/	6 to 10 b/	400 to 500	20 to 25
Total	62	58 to 68	32 to 37 c/	182	33 to 40 d/

a. 18/. Aganbegyan's study expressed the comparisons of production and labor productivity in the US as percentages of production and labor productivity in the USSR, with the data rounded to indicate rough orders of magnitude rather than exact percentage comparisons. To simplify comparisons with Kats' study, Aganbegyan's comparisons are presented in this table and in the text showing production and labor productivity in the USSR as percentages of production and labor productivity in the US.

b. The lower figure represents average annual employment, and the higher figure maximum (seasonal) employment. Aganbegyan adjusted the figures for the USSR to eliminate agricultural workers engaged in construction or industrial activities.

c. Aganbegyan's total.

d. This arithmetic mean is the reciprocal of Aganbegyan's estimate that US labor productivity is "2.5 to 3.0 times" that of the USSR. It cannot be calculated directly from the sector ratios as presented in this table, because such a calculation would give the harmonic mean of Aganbegyan's original sector ratios rather than the arithmetic mean. To reproduce Aganbegyan's arithmetic mean directly from his sector ratios, it is necessary to take the reciprocals of the sector ratios, as presented in this table, making a liberal allowance for Aganbegyan's method of rounding.

Table 5

Comparison of Labor Productivity in the USSR
with That in the US, According to Ioffe a/
1955-59

US = 100

Sector	1955	1956	1957	1958	1959
Industry					
Output per wage earner b/	40	42	44	45	46
Output per person employed c/	44	46	48	49	51
Construction	47	49	52	56 to 58	80
Transportation d/	63	e/	e/	75	80
Agriculture	29	e/	e/	33	e/
Total	36	38	43	44	e/
Including wholesale trade	40	42	45	47 to 48	e/

a. 19/
b. Na odnogo rabochego.
c. Na odnogo zanyatogo.
d. Rail transport only.
e. Data not reported.

has been 6 to 7 percent in industry, 7 to 8 percent in construction, 5 percent in rail transport, and 9 to 10 percent in agriculture, and he concludes that the annual growth of labor productivity for the overall economy has been 7.5 to 8.0 percent. These rates probably were derived from the official Soviet indexes of production and labor productivity. For the US, Aganbegyan claims that the average annual rate of growth in labor productivity has been about 1.5 to 2.0 percent in industry, 1.5 percent in construction, 1 percent in transportation, 1 percent in agriculture, and 1.5 percent in the "national economy" as a whole. These estimates for the US are reasonably consistent with US indexes of labor productivity published by the US Bureau of Labor Statistics. Using these rates of growth of labor productivity in the two countries together with his estimates of their relative levels of productivity in 1957, Aganbegyan concludes that the level of labor productivity in the USSR will reach that of the US in 1972 in the economy as a whole,* in 1972 in industry, in 1967 in construction, and

* For this conclusion it is assumed that labor productivity will increase 8 percent annually in the USSR.

in 1964 in rail transport.* Ioffe made a similar prediction for labor productivity in the industrial sector. Noting that, according to his calculations, Soviet labor productivity in industry will be 60 percent of that in the US by 1965, he asserts that in 1971-72 the USSR will overtake the US in industrial labor productivity.

2. Evaluation

Because Aganbegyan's and Ioffe's comparisons of labor productivity relate only to the "productive" sectors of the economy -- that is, to those sectors closely connected with production of physical goods -- their conclusions regarding the relative levels of labor productivity in the economy as a whole necessarily relate only to the "productive" sectors. In calculating over-all labor productivity ratios in the "productive" sectors, moreover, Aganbegyan and Ioffe apparently have combined the ratios for various sectors by using weights that show the USSR in the most favorable light. Although Aganbegyan and Ioffe do not explain in detail their methods of weighting, the ratios of labor productivity in the USSR to that in the US which Aganbegyan and Ioffe obtained appear to be the results of weighting in order to minimize the influence of the relatively low levels of labor productivity of Soviet agriculture and transportation. Aganbegyan appears to have weighted the ratios for the individual sectors by US employment data or to have computed an unweighted average. The use of Soviet employment data as weights for the four sectors shows the over-all level of labor productivity in the USSR to be 26 to 32 percent of that in the US, rather than the 33 to 40 percent obtained if an arithmetic average is used or the 34 to 41 percent obtained if US employment data are used. Ioffe used the comparison of labor productivity in rail transport as representative of the entire transportation sector, thereby raising substantially the estimate of the over-all Soviet level of labor productivity in comparison with the US.

Aganbegyan's and Ioffe's use of the official Soviet indexes of labor productivity in projecting their results for 1957 may be a major source of bias. As discussed above,** these indexes probably overstate the rate of increase in Soviet labor productivity, particularly for the early years. The indexes therefore are optimistic

* In addition, Aganbegyan uses his findings concerning relative levels of labor productivity in the US and the USSR to draw conclusions concerning relative levels of physical output per capita -- one of the yardsticks used by Soviet leaders to measure the relative levels of economic achievement in the two countries. He concludes that the USSR will catch up with the US in per capita output in 15 years.

** See the footnote beginning on p. 8, above.

for the Soviet present relative to the past and, when used for projections, also are optimistic for the Soviet future. This fact can be shown by comparing the levels of labor productivity in the USSR and the US in 1928-65 (see Table 6*) as estimated from the official Soviet indexes and from preliminary indexes of US and Soviet labor productivity of this Office. The relative level of labor productivity in 1955 (35 percent) is a hypothetical figure -- probably of about the right order of magnitude -- but is used in this report for purposes of illustration only.

* Table 6 follows on p. 16.

Table 6

Labor Productivity in Soviet Industry
as a Percentage of That in the US a/
Selected Years, 1928-65

Percent

Year	Based on Official Soviet Indexes	Based on Preliminary Indexes of This Office b/
1928	8.8	31.2
1933	N.A.	25.4
1937	21.7	31.1
1940	26.0	29.7
1950	28.8	29.1
1955	35.0	35.0
1956	36.7	36.2
1965	58.1	38.0

a. These estimates were calculated from the following formula:

(Soviet 1955 level of labor productivity as a percentage of the US 1955 level) times (Soviet level of labor productivity in the terminal year as a percentage of the Soviet 1955 level) times

(US 1955 level of labor productivity as a percentage of the US level in the terminal year) equals (Soviet level of labor productivity in the terminal year as a percentage of the US level in the terminal year)

The estimates for 1965 are based on projections of the average annual increase in labor productivity from 1928-56 for both countries. These rates are, for the USSR and the US, 7.44 and 2.09 percent, respectively, according to the official Soviet indexes, and 2.30 and 1.76, respectively, according to the preliminary indexes of Soviet and US labor productivity of this Office. Although the estimates given by the preliminary indexes of this Office probably are of the correct order of magnitude, they are subject to further refinement.

b. See Appendix B.

APPENDIX A

COMPARISON OF LABOR PRODUCTIVITY IN SOVIET INDUSTRY IN 1956
WITH THAT IN THE US IN 1954
BY BRANCH OF INDUSTRY a/*

Branch of Industry	Physical Output per "Production Worker"			Soviet Labor Productivity as a Percentage of US Labor Productivity
	Unit of Measure	US in 1954	USSR in 1956	
Ferrous metallurgy				
1. Iron, steel, and rolled metal	Metric tons	443.8 b/	217.8	49.1
2. Steel and rolled metal	Metric tons	316.0 b/	149.5	47.3
3. Steel	Metric tons	178.1 b/	86.8	48.7
4. Rolled metal	Metric tons	137.9	62.7	45.5
Iron ore	Metric tons	2,622	1,151	43.9
Coke	Metric tons	1,898	932	49.1
Coal	Metric tons	1,346	515	38.3
Underground mining	Metric tons	1,077 c/	434	40.3
Strip mining	Metric tons	2,791 c/	2,735	98.0
Oil refining (light oil products)	Metric tons	1,510	655	43.4

* Footnotes follow on p. 19.

Branch of Industry	Physical Output per "Production Worker"			Soviet Labor Productivity as a Percentage of US Labor Productivity
	Unit of Measure	US in 1954	USSR in 1956	
Metal-cutting machine tools	Units	1.377	1.025	74.4
Logging	Cubic meters	816	236	28.9
Saw wood	Cubic meters	377	239	63.1
Pulp, paper, and cardboard	Comparable tons of paper	59.2	24.9	42.1
Cotton fabrics	Meters	19,198	7,247	37.7
Silk fabrics	Meters	19,791	7,512	38.0
Woolen fabrics	Meters	3,166	1,429	45.1
Footwear	Pairs	2,334	1,046	44.8
Rubber footwear	Pairs	4,707	3,761	79.9
Artificial fiber	Kilograms	13,970	2,591	18.5
Synthetic rubber	Metric tons	110.5	19.4	17.6
Cement	Metric tons	1,382.3	491.4	35.5
Building bricks	Thousands	155.5	67.7	43.5
Lime and plaster	Comparable tons of lime	1,550	349.6	22.6
Meat (first grade)	Kilograms	36,483	19,419	53.2
Milk and dairy products	Metric tons	217.8	115.5	53.0
Vegetable oils	Metric tons	129.2	39.1	30.3
Margarine	Metric tons	332.58	56.95	17.1
Flour	Metric tons	414.4	251.4	60.7
Macaroni and spaghetti	Metric tons	77.9	40.4	51.9
Bread and bakery goods	Metric tons	52.5	77.3	147.4

Branch of Industry	Physical Output per "Production Worker"			Soviet Labor Productivity as a Percentage of US Labor Productivity
	Unit of Measure	US in 1954	USSR in 1956	
Candy	Metric tons	29.6	15.4	52.1
Beer	Decaliters	19,487	7,007	35.7

a. 21/. In addition, see source 22/, in which these percentages are used for further analysis of the role of electrification in the growth of labor productivity.
b. Data for 1955.
c. Data for 1953.

APPENDIX B

METHODOLOGY FOR THE CONSTRUCTION OF PRELIMINARY INDEXES OF LABOR PRODUCTIVITY IN SOVIET INDUSTRY AND US INDUSTRY

1. Soviet Labor Productivity

The preliminary index of labor productivity in Soviet industry of this Office that was used for the calculations in Table 6* was obtained by dividing an index of Soviet industrial production by an index of Soviet industrial employment. These indexes are shown in Table 7.**

a. Production Index

The index of Soviet industrial production was obtained by linking the Index of All Industrial Products (including miscellaneous machinery products), which was constructed by G. Warren Nutter for selected years, 1913-55, to the index of Soviet industrial production, which has been constructed by this Office for each of the years in 1947-59. 23/ Because Nutter's index does not cover 1951-54 or the years after 1955, the two indexes were linked at 1950 to obtain coverage for those years. Nutter's index used in this calculation is that of a number of indexes constructed by Nutter and is the most comparable to the index of this Office, with respect to industrial coverage. Both indexes measure the growth of industrial output according to the Soviet definition of industry, cover the same sectors (manufacturing, mining, and production of electric power), employ value-added weights, and therefore provide a value-added index of Soviet industrial production appropriate for comparison with indexes of US production.

b. Employment Index

The index of Soviet industrial employment presented in Table 7 is based on officially published data on employment in industry plus estimated employment in industrial cooperatives and in kolkhoz industry. It was constructed by linking at 1950 Nutter's index of industrial employment, which was computed for selected years, 1913-55, to an employment index based on recent estimates by this Office for the years 1950-56. This composite index of Soviet industrial employment includes wage workers, engineering-technical workers, white-collar

* P. 15, above.
** Table 7 follows on p. 22.

[p. 00 blank]

Table 7

Indexes of Industrial Production, Employment, and Labor Productivity in the USSR a/ Selected Years, 1913-56

1937 = 100

Year	Production b/	Employment	Labor Productivity
	Nutter's Index of All Industrial Products		
1913	38.0	47.0	80.6
1928	41.4	43.6	94.7
1933	58.5	81.7	71.8
1937	100	100	100
1940	109	107	102
1945	63		
1950	165	131	127
	Extended Indexes		
1951	188	136	138
1952	201	142	140
1953	219	148	147
1954	246	155	159
1955	277 c/	161 c/	172 c/
1956	302	169	179

a. Because of rounding of the indexes of production and employment to three significant digits, figures for labor productivity do not always equal production divided by employment.
b. Calculated with 1928 weights. Miscellaneous machinery products were included.
c. Data reported by Nutter for 1955 are as follows: production, 270; employment, 157; and labor productivity, 172.

workers, apprentices, and junior service personnel including armed and fire guards for all industry.

c. Evaluation of the Index of Labor Productivity

The levels and the directions of changes in Soviet labor productivity shown in the preliminary index of this Office seem to fit well with other studies concerning both the levels and the direction of movement. For example, Irving Siegel wrote the following in 1952:

> If it were possible to compute Soviet output per worker by the most authoritative Western procedures, a decline would probably have been recorded for the first 5-year plan (1928-32), a substantial gain for the subsequent period to 1940, a decline between 1940 and 1945, and a shaky recovery thereafter to something like the maximum prewar level by 1950. ... Given a few years of "peace," the USSR should be able to raise its industrial productivity well above the prewar level, as it reaps the benefits of previous and new investments in personnel and equipment. Attainment of parity with Great Britain and prewar Germany (already claimed in the late 1930's) and even surpassing them would not seem difficult. But the USSR could hardly catch up with the US, which has traditionally maintained a substantial productivity advantage over the leading European nations and is technologically still progressive. 25/

2. US Labor Productivity

The index of labor productivity in the US shown in Table 8* was obtained by dividing an index of US production based on the Soviet definition of "industry" by an index of US industrial employment that covers the same categories of workers as does the index of Soviet employment.

a. Production Index

The index of US industrial production was made by extending to 1956 Nutter's index of US industrial production, which he constructed for selected years. Nutter's index was extended by a composite of the

* Table 8 follows on p. 24.

Table 8

Indexes of Industrial Production, Employment, and Labor Productivity in the US a/
Selected Years, 1913-56

1937 = 100

Year	Production b/	Employment	Labor Productivity
	Indexes Based on Nutter's Index of All Industrial Products c/		
1913	51.5	81.5	63.3
1928	88.7	93.5	94.3
1933	61.3	69.9	88.0
1937	100	100	100
1940	110	102	107
1945	176		
1950	188	138	136
	Extended Indexes		
1951	202	150	135
1952	209	151	139
1953	225	157	144
1954	212	147	144
1955	235 d/	153 d/	153 d/
1956	242	156	154

a. Because of rounding of the indexes of production and employment to three significant digits, figures for labor productivity do not always equal production divided by employment.
b. Calculated from the indexes of the Board of Governors of the Federal Reserve System adjusted to correspond to Soviet industrial coverage.
c. The indexes for production and labor productivity are from Nutter's Index of All Industrial Products, and the index for employment is implicit in the other two indexes.
d. Data reported by Nutter for 1955 are as follows: production, 234; employment, 150; and labor productivity, 156.

indexes* of industrial and mineral production of the Board of Governors of the Federal Reserve System together with an index of output of electric power, the three components being combined by Nutter's weights. 26/ The Nutter index and its extension are shown in Table 8.**

b. Employment Index

The index of industrial employment was made by extending to 1956 an index of US industrial employment constructed by Nutter for selected years. The extension was made by means of an index of US employment obtained by taking an unweighted arithmetic mean of two indexes which are regularly published by the Bureau of Labor Statistics and which cover production workers in US industry and all nonagricultural employment. The index constructed from data of the Bureau of Labor Statistics corresponds closely with Nutter's index for the years covered by both indexes. The Nutter index and its extension are presented in Table 8.

* The new index of the Board of Governors of the Federal Reserve System also could be used to approximate the Soviet definition of industry. The use of this index would raise the US production index in 1956 to 252 on a 1937 base.

** P. 24, above.

APPENDIX C

SOURCE REFERENCES

Evaluations, following the classification entry and designated "Eval.," have the following significance:

Source of Information	Information
Doc. - Documentary	1 - Confirmed by other sources
A - Completely reliable	2 - Probably true
B - Usually reliable	3 - Possibly true
C - Fairly reliable	4 - Doubtful
D - Not usually reliable	5 - Probably false
E - Not reliable	6 - Cannot be judged
F - Cannot be judged	

"Documentary" refers to original documents of foreign governments and organizations; copies or translations of such documents by a staff officer; or information extracted from such documents by a staff officer, all of which may carry the field evaluation "Documentary."

Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this report. No "RR" evaluation is given when the author agrees with the evaluation on the cited document.

Except for CIA finished intelligence, all sources used in this report are evaluated RR 2 unless otherwise indicated.

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