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INDEX OF CIVILIAN INDUSTRIAL PRODUCTION IN THE USSR 1950–61

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CENTRAL INTELLIGENCE AGENCY

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FOREWORD

This report presents a summary description of the data used and the method of construction of the index of civilian industrial production in the USSR, 1950-61. More detailed information on prices, physical production, value-added weights, and their derivation is contained in a supplement that is available on request to CIA, Office of Research and Reports. This supplement contains the following appendixes:

This report covers the years 1950 through 1961 inclusive. When rates of growth for a specified period of time are given, however, the base year for the computation is the preceding year.

The following abbreviations occur frequently in this report: FRB (US Federal Reserve Board), MBMW (machine building and metalworking), and SIC (Standard Industrial Classification of the US Bureau of the Budget).

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INDEX OF CIVILIAN INDUSTRIAL PRODUCTION IN THE USSR 1950-61

Summary and Conclusions

Civilian industrial production in the USSR,* as measured by the index calculated for this report, grew at an average annual rate of 9.3 percent between 1950 and 1961. Annual rates of growth differed perceptibly among the three major sectors of civilian industrial production -- industrial materials, civilian machinery, and nondurable consumer goods -- civilian machinery being the fastest growing and nondurable consumer goods the slowest. Each of the major sectors as well as the over-all index shows a considerable reduction in the rate of growth in 1960-61. The trends of the index and its major sectors are summarized in the following tabulation of average annual rates of growth (in percentages) and in the chart, Figure 1.**

	1951	1952-55	1956-59	1960-61	1951-61
Industrial materials	13.7	9.4	9.7	5.6	9.2
Civilian machinery	0.3	12.7	12.4	9.7	10.8
Nondurable consumer goods	17.5	8.1	7.5	4.6	8.1
Total	11.7	9.8	9.8	6.4	9.3

No analysis of the determinants of Soviet industrial growth or of the causes of the recent slowdown in civilian production has been attempted in this report. Recent events, however, which probably***

* Industrial production includes manufacturing, mining, and utilities. The index is called an index of civilian industrial production because production of armaments has been excluded. However, goods such as trucks and processed foods sold to the military sector have not been excluded. Because of the way in which Soviet economic data are presented, it is not feasible to exclude these latter goods. The index in this report is therefore essentially an index of "nonarmament industrial production."

** Following p. 2. For further detail on the component indexes, see Table 1 (which follows on p. 2). For average annual rates of growth for the major sectors and their components, see Table 2 (which follows on p. 3).

*** Text continued on p. 5.

Table 1

Indexes of Civilian Industrial Production in the USSR a/
1950-61

	1955 Value-Added Weights (Percent)	1955 = 100											
		1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Industrial materials	52.3	61.4	69.8	75.3	80.8	90.1	100.0	108.9	119.8	131.8	144.9	153.8	161.7
Electric power	3.3	54.0	61.5	70.4	79.4	88.8	100.0	112.7	123.5	138.6	155.7	171.8	192.6
Coal	9.3	66.9	72.5	77.2	81.6	88.4	100.0	109.8	118.6	127.2	130.5	132.8	132.7
Petroleum products and natural gas	2.4	53.3	59.5	66.5	74.4	83.8	100.0	118.9	139.5	160.6	182.7	208.3	234.2
Ferrous metals	6.0	59.1	68.0	75.9	83.2	90.7	100.0	107.1	113.8	122.0	133.1	144.2	156.4
Nonferrous metals	4.8	51.5	60.2	70.7	78.8	88.1	100.0	106.8	112.2	117.7	129.2	142.0	154.0
Forest products	14.2	75.7	85.8	85.9	86.2	96.8	100.0	103.1	109.6	116.0	124.7	119.2	114.8
Paper products	0.8	62.2	69.7	77.1	87.1	95.7	100.0	107.8	117.2	125.1	130.7	136.5	144.6
Chemicals	4.7	53.1	62.6	70.2	78.4	87.2	100.0	111.4	126.2	142.4	161.3	176.7	191.8
Construction materials	6.8	45.3	53.9	62.4	71.5	83.4	100.0	115.7	140.5	169.4	199.5	229.5	249.6
Civilian machinery (including electronics)	22.2	61.8	62.0	64.3	75.1	86.4	100.0	118.6	137.4	148.8	159.4	172.5	191.9
Machinery, excluding electronics	19.5	66.1	65.0	66.2	76.6	87.2	100.0	118.0	135.7	143.7	151.7	162.0	175.6
Electronics	2.7	31.2	40.4	50.5	65.1	80.7	100.0	122.9	149.5	185.3	214.7	247.7	308.3
Nondurable consumer goods	25.5	62.2	73.1	78.0	85.5	93.9	100.0	108.1	115.5	124.3	133.5	139.2	146.1
Processed foods	9.3	63.0	72.0	78.9	87.0	93.2	100.0	110.7	118.6	126.5	137.2	139.5	150.8
Soft goods	16.2	61.7	73.8	77.5	84.6	94.3	100.0	106.7	113.7	123.0	131.3	139.0	143.4
Aggregate civilian industrial production	100.0	61.7	68.9	73.5	80.7	90.2	100.0	110.8	122.6	133.7	145.2	154.3	164.5

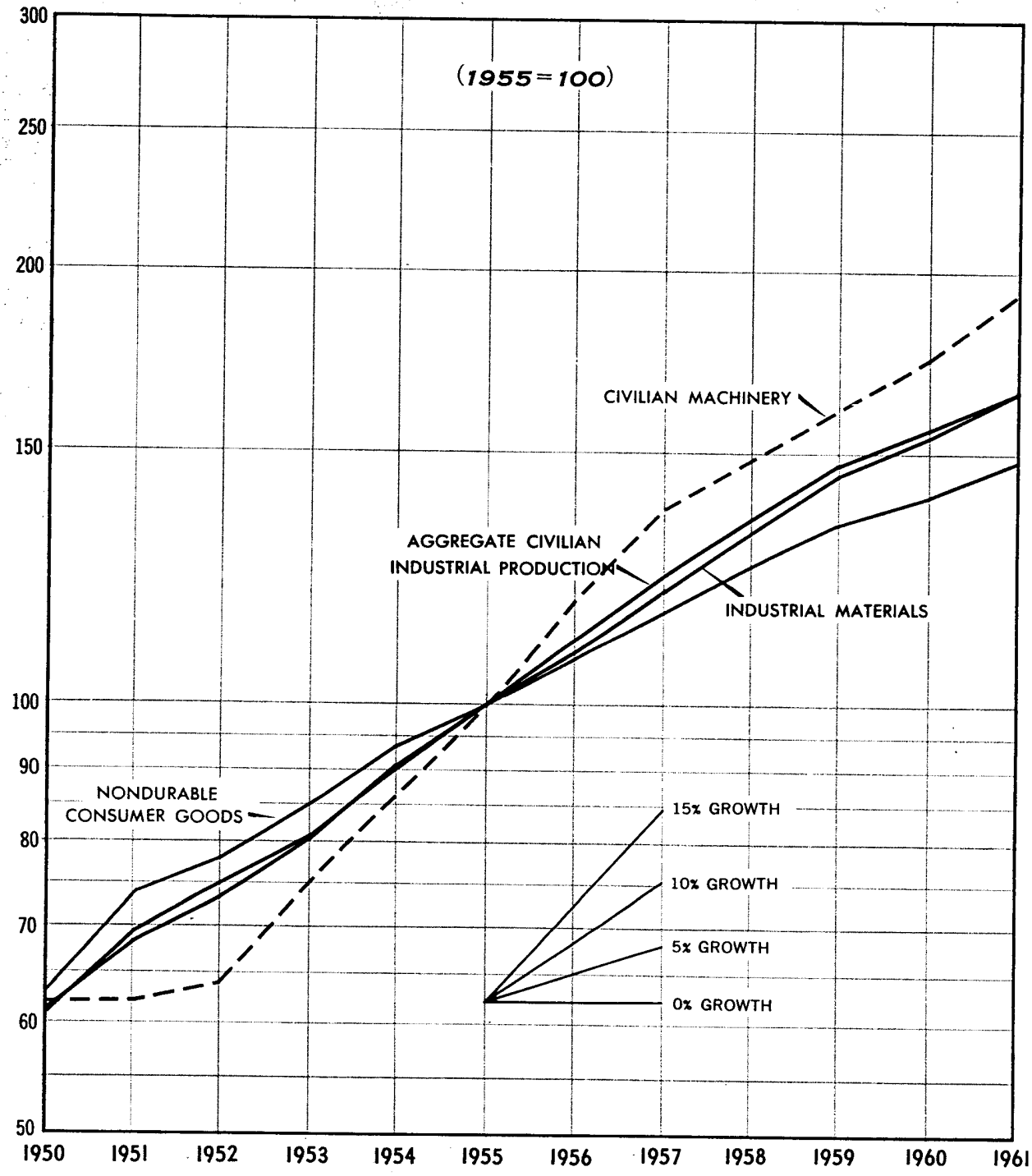
a. These indexes are based on production and prices given in Appendixes A-J of the supplementary volume.

USSR

Figure 1

CIA INDEXES OF CIVILIAN INDUSTRIAL PRODUCTION

1950-61



NOTE: These indexes are plotted using a logarithmic vertical scale, the result being that equal slopes of the lines represent equal precentage rates of growth.

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Table 2

Average Annual Rates of Growth for Civilian Industrial Production in the USSR
1951, 1952-55, 1956-59, 1960-61, and 1951-61

Percent

	1951	1952-55	1956-59	1960-61	1951-61
Industrial materials	13.7	9.4	9.7	5.6	9.2
Electric power	14.0	12.9	11.7	11.2	12.3
Coal	8.5	8.4	6.9	0.8	6.4
Petroleum and natural gas	11.6	13.9	16.3	13.2	14.4
Ferrous metals	15.0	10.1	7.4	8.4	9.2
Nonferrous metals	16.8	13.5	6.6	9.1	10.5
Forest products	13.3	3.9	5.7	-4.0	3.9
Paper products	12.0	9.4	6.9	5.2	8.0
Chemicals	17.9	12.4	12.7	9.0	12.4
Construction materials	18.9	16.7	18.8	11.8	16.8
Civilian machinery (including electronics)	0.3	12.7	12.4	9.7	10.8
Boilers	20.3	23.6	1.9	14.8	13.4
Electric power equipment	25.9	7.0	13.4	18.2	12.9
Metalcutting machine tools	-2.1	13.5	6.0	8.8	8.4
Railroad equipment	-27.0	5.3	13.1	8.2	5.1
Motor vehicles	-19.7	11.3	3.2	6.0	4.2
Tractors	-16.2	16.0	9.2	11.2	9.3
Agricultural machinery	19.2	-0.3	4.0	15.3	5.7
Construction and road work equipment	-0.6	7.4	12.9	22.6	11.2
Hoist-transport equipment	19.8	12.2	3.5	9.7	9.2
Metallurgical, fuel-refining and chemical equipment	20.7	7.5	13.6	12.1	11.7
Textile, leather, and publishing equipment	-3.8	6.3	5.9	9.1	5.7
Consumer durables (excluding radio and television sets)	31.5	23.4	10.7	6.0	16.1
Civilian shipbuilding	7.3	15.8	18.4	10.1	14.8
Civilian aircraft	-23.1	43.6	46.4	-28.4	20.4
Sanitary technical equipment	24.3	12.6	15.7	14.9	15.2
Machinery (excluding electronics)	-1.7	11.4	11.0	7.6	9.3
Electronics	29.4	25.5	21.0	19.8	23.2

Table 2

Average Annual Rates of Growth for Civilian Industrial Production in the USSR
1951, 1952-55, 1956-59, 1960-61, and 1951-61
(Continued)

Percent

	1951	1952-55	1956-59	1960-61	1951-61
Nondurable consumer goods	17.5	8.1	7.5	4.6	8.1
Processed foods	14.3	8.6	8.2	4.8	8.3
Bread and bakery products	8.0	8.8	2.1	0.2	4.7
Meat and meat products	10.2	10.1	13.9	0.4	9.7
Fish and fish products	21.8	4.6	2.9	10.6	6.5
Butter	5.7	6.9	11.7	4.1	8.0
Sugar	18.3	4.0	14.7	17.5	11.5
Canned goods	20.4	14.9	7.9	12.8	12.4
Vegetable oil	11.9	4.2	14.8	-2.6	7.3
Margarine and compound fats	14.1	16.2	3.2	2.4	8.6
Wine	21.4	18.9	12.3	8.9	14.8
Champagne	23.1	11.8	8.8	9.5	11.3
Vodka	17.4	12.2	4.1	3.0	8.0
Beer	15.1	5.2	5.9	7.2	6.7
Cigarettes	12.9	8.9	5.3	0.9	6.4
Soap	-6.0	8.9	7.8	2.0	5.8
Cheese	16.1	17.2	9.8	8.6	12.8
Macaroni	12.7	17.9	0.1	1.9	7.7
Flour	14.0	7.9	5.5	0.2	6.1
Confectionery goods	16.6	4.6	6.5	0.5	5.6
Whole milk and whole milk products	43.6	12.5	28.8	12.2	20.7
Soft goods	19.6	7.9	7.0	4.5	8.0
Cotton cloth	21.6	6.1	2.2	2.8	5.4
Silk cloth	33.0	31.0	12.4	1.4	18.4
Wool cloth	15.0	9.2	7.0	4.6	8.1
Linen cloth	9.3	-0.8	15.6	0.8	6.1
Sewn garments	14.0	13.3	7.6	7.3	10.2
Knit outerwear	25.1	9.7	5.1	6.3	8.7
Knit underwear	31.8	15.0	6.1	5.5	11.3
Hosiery	26.5	6.6	4.6	3.9	7.1
Leather footwear	17.8	3.2	9.5	6.6	7.4
Aggregate civilian industrial production	11.7	9.8	9.8	6.4	9.3

contributed in some measure to the slowdown, are as follows: (1) the reduction of the workweek from 47 hours in 1957 to 41 hours by the end of 1960 and (2) the acceleration in defense and space procurement and production during the last few years.

During the whole postwar period, Soviet industrial production has grown considerably faster than US industrial production. For the period 1951-61, when the average annual rate of growth in the USSR was 9.3 percent, the rate in the US was 3.5 percent.

In brief, in construction of the index of Soviet civilian industrial production, series for approximately 350 individual items were obtained either directly or indirectly from official Soviet data, and indexes were constructed for production in various branches of industry. These branch indexes in turn were combined in the final index by use of value-added weights* for the year 1955. Of the three major sectors of civilian industrial production, industrial materials accounted for 52.3 percent of the weight; civilian machinery, 22.2 percent; and nondurable consumer goods, 25.5 percent.

The accuracy and reliability of the calculated index are difficult to assess. An intensive effort was made to supplement the regularly announced list of products with estimates of important new products such as electronics, civilian shipbuilding, civilian aircraft, plastics, and some nonferrous metals. Nevertheless, important categories of products such as spare parts of all kinds and metal products other than machinery still are missing from the index. Possibly even more important is the question of quality. Quality is difficult to measure even with the best of data, and the tacit assumption in market economies that quality, diversity, and balance are kept in appropriate relation to quantity by consumer demand is not automatically applicable in a centrally administered economy. There is some evidence that the reliability and longevity of producer durables in the USSR may have deteriorated in the last few years.

The index presented in this report -- hereafter often referred to as the "CIA index" -- shows a greater rate of growth for 1951-55 than the index constructed by G. Warren Nutter of the National Bureau of Economic Research or that by Norman Kaplan and Richard Moorsteen of the RAND Corporation. The differences lie mainly in the civilian machinery (see

* Value-added weights are a measure of the economic activity carried out in a particular branch of industry and are calculated by subtracting from the value of the final product of the branch its purchases of raw materials and components produced in other branches, or, alternatively, as in this report, by aggregating the payments to the productive factors employed in that particular branch of industry.

Table 9*), as shown in the following tabulation of average annual rates of growth in 1951-55 (in percentages):

	CIA Index	Nutter Index	Kaplan-Moorsteen Index
Industrial materials	10.2	9.0	9.9
Civilian machinery	8.1	4.6	6.4
Consumer goods**	11.5	10.0	11.2
Total	10.2	7.9	9.6

The CIA calculations give consistently lower results than the official Soviet indexes partly perhaps because of differences in coverage and partly because of methods of computation that are believed to give an upward bias to the Soviet index. Five illustrative comparisons of average annual rates of growth for 1951-61 follow (in percentages):

	CIA Index	Official Soviet Index
Electric power	12.3	13.7
Forest products	3.9	7.4
Machinery***	10.8	15.5
Soft goods	8.0	9.1
Total industrial production***	9.3	11.5

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* P. 44, below.

** For the purpose of this comparison, consumer goods include durable consumer goods.

*** The CIA index excludes and the Soviet index includes armaments production.

I. Introduction

In recent years, there have been two major attempts to construct indexes of Soviet industrial production, the first by Norman Kaplan and Richard Moorsteen of RAND Corporation in 1960 1/* and the second by G. Warren Nutter of the National Bureau of Economic Research in 1962. 2/ Both of these indexes were constructed on the basis of Soviet production figures for individual commodities. The calculation and weighting procedures were similar to those used in constructing the Federal Reserve Board (FRB) index of industrial production for the US. (Unless otherwise stated, the term "the US index" as used in this report refers to this FRB index.)

For the postwar period, both the Kaplan-Moorsteen and the Nutter indexes suffer from reliance on the officially announced sample of physical production of commodities. Although many recently published statistical and technical handbooks and articles have greatly expanded CIA's knowledge of industrial activity in the USSR, the available sample of physical production series still is limited in number and coverage. Specifically, many industries -- such as electronics -- which are likely to be rapidly growing are omitted or are not fully reported.

The primary aim of this report is to present an index of Soviet industrial production that includes the most important product groups omitted from the officially announced sample and hence is an index that is more representative of Soviet industry and more comparable in coverage with the US index. Construction of this index with its broader coverage requires considerable use of indirect indicators of output, but it should be noted that even in the case of the US index there is widespread use of indirect indicators -- that is, direct physical production series are not available for many of the commodities included in the US index.

Accordingly, the civilian machinery sector of the Soviet index presented in this report has been supplemented by ruble estimates in constant prices of the value of production for electronics, civilian aircraft, and civilian shipping. In addition, greater commodity detail has been achieved in the machinery sector by disaggregation of some physical units of measure reported, into models (for example, different tractor models) or representative units. Subdivision of commodities, by model or representative unit, provides a means of taking partial account of quality changes and new products. The materials sector has been expanded by estimated series for nonferrous metals and plastics. As one would expect, the resulting indexes give higher rates than indexes that do not have the expanded coverage.

* For serially numbered source references, see the Appendix.

Even with these modifications the CIA index for the USSR is inferior to the US index in coverage and detail. Many groups still are in highly aggregated categories. There are fewer intermediate stages of processing represented than in the US sample, and many industries still are missing. The absence of many new products, models, and types of equipment probably results in some understatement of Soviet industrial growth.

The CIA index for the USSR, like the US index, is weighted by value added, as between industries. The weight base is 1955, which is near the middle of the 1950-61 period and close in time to the 1957 weight base of the US index.* The use of prices and weights from 1950 would have given a somewhat higher rate of growth. Soviet industry in 1950, however, still was affected strongly by recovery from war damage, and prices of that year would not be representative of the following decade. On the other hand, prices in 1959 were changed very little from 1955, and the use of a 1959 weight base probably would have changed the index only negligibly.

No attempt has been made in this report to analyze or evaluate the performance of Soviet industry. This is a task beyond the scope of the report and can be done only through the use of extensive data on inputs of capital and labor, on quality of output, and on performance in the rest of the economy. Interesting trends in Soviet industry or its components are noted and commented on briefly, but the main objective of the report is to present the index series and explain their derivation.

This report consists of seven sections and one appendix. Section II briefly describes the comprehensive FRB index of US industrial production; presents the adjustments to be made for a "comparable" FRB index that matches the coverage of the Soviet index presented in this report; and discusses the construction of the CIA index for the USSR, including problems of sample coverage, weighting, and changes in quality of product. The industrial materials sector of the CIA index is described in Section III, the civilian machinery sector in Section IV, and the nondurable consumer goods sector in Section V. In Section VI the following substantive results are presented: (1) a comparison of the CIA index with indexes in other studies -- namely, by Nutter, Kaplan-Moorsteen, and Seton -- and (2) a comparison of the CIA results with Soviet official indexes. Section VII gives a brief comparison of Soviet and US industrial growth rates since 1947.

All values that pertain to the USSR, with some minor exceptions, are expressed in 1 July 1955 rubles. Major emphasis in the report is given to the 1950-61 period, although some data for 1947-49 are included and certain long-run comparisons are made.

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* Beginning in November 1962, the index of the Federal Reserve Board (FRB) was shifted to a new comparison base, 1957-59.

II. Construction of Indexes of Industrial Production for the US and the USSR

In this section the structure of the FRB index of industrial production in the US is described in very simplified fashion to set the stage for the construction of a similar index for the USSR. Then follows a description of the methods used and the problems encountered in constructing the Soviet index.

A. Structure of the Federal Reserve Board Index for the US

The FRB index of industrial production in the US is a measure of change in the aggregate level of production in manufacturing, mining, and gas and electric utilities. A value-added weighting system is employed to combine the component parts of the index into the over-all index -- that is, changes in the production of industrial raw materials, intermediate products, and final products are weighted in proportion to the economic value added at their respective stages of production. 3/ The value-added weights used at present are drawn from the year 1957* and are distributed as follows (in percentages) 6/:

Manufacturing	86.49	
Durable		49.66
Nondurable		36.83
Mining	8.55	
Utilities	4.96	
Total	100.00	

In general, the FRB index may be expressed by the following formula:

$$\text{Index} = \frac{\Sigma \frac{q_n}{q_{57}} \; (p_{57}q_{57})}{\Sigma \, p_{57}q_{57}}$$

where

* The 1957 weights are used for the period beginning with January 1953. These weights are linked to 1947 weights for the period 1947 through 1952. 4/ As of November 1962 the FRB index was shifted to a 1957-59 comparison base, and the 1957 value-added data were adjusted to the new base. 5/ These latest revisions and modifications of the FRB indexes have not been incorporated into the present report.

q_n is the physical quantity of a given product produced in any given period,*

q_{57} is the physical quantity of the product produced in 1957,

p_{57} is the value-added component of price in the year 1957, and

$p_{57}q_{57}$ is the value-added weight for 1957 expressed as a proportion of 100 percent.

The formula above reduces to a Laspeyres index, as follows:

$$\text{Index} = \frac{\Sigma\, p_{57} q_n}{\Sigma\, p_{57} q_{57}}$$

In practice, however, construction of the FRB index is considerably more complicated than the preceding discussion implies and involves considerable estimating and adjusting of data. Data on physical production often are not available, and dollar values of sale must be used, entailing not only adjustments for changes in inventories but also adjustments for changes in prices. In other instances, changes in physical output are estimated on the basis of changes in man-hours used in producing the product, the data being adjusted for estimated changes in output per man-hour. 7/

A vast amount of data is collected on a current basis from trade associations and other government bureaus to ascertain monthly fluctuations in output of the products and product groups included in the index. The revision of weights and the expansion and refinement of coverage, which are periodic long-run tasks, rest heavily on information collected by the US Bureau of the Census in its Census of Manufactures for 1939, 1947, 1954, and 1958,** plus annual supplements in the Annual Survey of Manufactures.

The Federal Reserve Board publishes, in addition to the over-all index of industrial production, numerous subordinate indexes for various sectors of industry. In the construction of these sector indexes, industrial establishments are grouped by primary product according to the

* The FRB index is basically a monthly indicator, and, for many purposes, physical volume data for each month are expressed as relatives to the comparison base period.

** The final data for the 1958 Census of Manufactures recently have been released (1962), but the results have not yet been incorporated as a new benchmark in the FRB index.

Standard Industrial Classification (SIC) system of the US government.* Thus the primary and secondary production of an establishment are not distinguished in arriving at the total value of production in the industry. For example, military production in electronics, instruments, and other machinery products is not isolated, and comparison of the nonmilitary components of some US machinery categories with the USSR is difficult.

B. Description of the Index for the USSR

1. Product Coverage

The index for the USSR calculated in this report is based on a sample consisting primarily of final products of three major sectors: industrial materials, civilian machinery, and nondurable consumer goods. Production at an earlier stage normally is not counted if data for a later stage of production are available. In contrast the FRB index for the US includes a profusion of intermediate stages weighted by value added.

Armaments per se are excluded. Production series for all other industries, however, insofar as possible, are comprehensive and include production for both military and civilian use. Thus, for example, production for all uses of electronics, motor vehicles, and tractors is included in the index. Military purchases of merchant ships and transport aircraft are excluded because of lack of data.

The index for the USSR in this report is based on a sample of approximately 350 products. This sample is not a random sample, being made up of those important items for which data exist or for which estimates can be reasonably made. The various product series have been classified first into minor industry categories patterned after the Soviet classification, by branch of industry. 9/ These more narrowly defined groups have been combined into three sector indexes: industrial materials, civilian machinery, and nondurable consumer goods.** Consumer durables are placed in the civilian machinery sector rather than in the consumer goods sector.

The classification system is based on a commodity structure. Each series represents total production of a commodity wherever produced. Even though some ferrous metals are produced by machine building enterprises, all are classified under ferrous metals. Many consumer durables are produced as secondary products of various machinery industries. These consumer durables are separated out and grouped together in a special category within the civilian machinery sector.

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* The revised FRB industries follow the 1957 SIC scheme. 8/

** For the composition of the three major sectors, see Table 2, p. 3, above.

The Soviet sample is much smaller than the 1,400 series in the annual FRB index for the US* and even more so than the 6,000 series in the 1954 Census of Manufactures benchmark indexes. 10/ A great part of the inferiority of the Soviet sample, however, is loss of detail rather than loss of coverage. The US series are disaggregated, both by stage of production and by detailed product classes. In the Soviet index the entire integrated iron and steel industry is represented by one series of rolled products, whereas in the US each stage is included along with a detailed breakdown of final steel products. As another example, tons of synthetic rubber represent both rubber and rubber products (for example, tires) in the Soviet index.

The list of production data announced by the USSR is seriously deficient in coverage. Important industries that are missing are nonferrous metals, many new chemicals industries, industrial electronics, civilian shipbuilding, and aircraft. Even though announced physical production data may be missing, estimates based on a variety of partial sources and indirect indicators can be made for these industries and are included in the index presented in this report.

To ascertain the degree of coverage of all industrial production represented by the Soviet sample, value added would need to be known for each commodity or industry represented by a commodity. Unfortunately, this information is not known. As an approximate check on coverage, however, the US breakdown of value added, by industry, may be used, and the portion of US value added that would be represented by the items in the Soviet sample may be ascertained. These steps have been carried out at the 4-digit level of industry classification.** Those 4-digit industries in the FRB index that are represented in the Soviet sample are identified. These industries can be aggregated to form an index of US production comparable in coverage to the Soviet sample.*** This comparable FRB index accounts for 68 percent of the value-added weight of the comprehensive FRB index. When the comparable index is divided into the three major divisions of the Soviet index, the comparable index is found to cover 72 percent of the comprehensive FRB index in industrial materials, 88 percent in

* The 1953 FRB revision of the US index provided 1,400 annual series, and approximately the same number were included in the 1959 revision.

** For the listing of SIC categories of the FRB index that are in and out of the Soviet sample, see Appendix K of the supplementary volume. The greater the number of digits in the classification numbers, the finer the breakdown of commodities.

*** The comparable items were selected by CIA, and the FRB calculated an industrial production index based on the smaller sample and using 1957 value-added weights.

nondurable consumer goods, and 68 percent for civilian machinery.* Miscellaneous series amounting to about 8 percent of the FRB index were not classified in the three divisions mentioned above. These have no counterparts in the Soviet sample.

In general, it can be argued that the Soviet sample covers Soviet industry more completely than these percentages in the FRB comparable sample would indicate. First, the percentages are the value-added coverage of four-digit levels, whereas in the Soviet index a commodity may represent activity at its own and earlier stages of production. Second, the missing industries in general probably are less important in Soviet industry than in US industry. For example, drugs and medicines, toiletries, manufactured cereal and feeds, bottled soft drinks, printing and publishing, and furniture and fixtures are among those missing from the sample. On the other hand, some of the missing categories obviously are large and important. Two in particular should be noted: (a) fabricated metal products other than machinery and (b) spare parts of all kinds. In both these cases, fragmentary evidence suggests that production has grown faster during the postwar period than industry as a whole. More detailed consideration of industries that are missing from the sample is given in the sections on the major industrial sectors.

2. Weighting System

a. Gross Price Weights of the Product Series

The physical production series are aggregated, by industry, using as weights the average enterprise wholesale prices of 1 July 1955 except for consumer goods, where retail prices with some adjustment for distribution charges and turnover taxes have been employed. These indexes of gross value for individual industries and major sectors are aggregated into major sectors and the major sectors into all industry by 1955 value-added weights. The final index may be regarded as essentially a Laspeyres index with 1955 value-added weights, on the assumption that the use of price weights at the lower levels of aggregation gave approximately the same results as value-added weights would have given.

Except for consumer goods the 1955 prices used as weights were derived from the Ministry of Finance pricebook and the Coal Industry pricebook. 11/ They usually are enterprise prices F.O.B. (free on board) factory or depot of seller. For construction materials,

* Although ordnance and accessories have been excluded, the comparable FRB indexes include other categories of military production.

lumber, and coal, which were priced on a zonal basis in accordance with regional production patterns, weighted averages of zonal prices were derived for this report. Wholesale prices for lumber products and some construction materials have been adjusted to exclude transportation charges. Within some groups such as chemicals and construction materials where one or a few products represent larger categories, prices are weighted average prices for several grades, types, or specifications.

For most machinery categories a representative model price or a median price from several models of a type of equipment was selected as the price weight. The use of representative price data instead of comprehensive price data for machinery introduced a small element of error. The widespread practice of standardization of machines, however, tended to minimize the error. There was some departure from these procedures for turbines and generators, where production was available both in number of units and in total capacity in kilowatts. Average size was computed by dividing total capacity by the number of machines produced, and prices for the average sizes were derived from prices of given models that bracketed the average sizes. 12/ In several categories of mounted equipment for construction and road work the price is a net price derived by deducting the value of the tractor mount from the wholesale price. For example, the D-271 bulldozer, which is selected as the representative model for that category, is mounted on an S-80 tractor. To avoid double counting within the civilian sector of machinery (because all tractors are counted under the tractor category), the value of the bulldozer minus the tractor mount was used.

For nondurable consumer goods (soft goods and processed foods), individual product price weights are average 1955 retail prices inclusive of turnover taxes but adjusted for distribution charges.* Some bias is introduced in that retail prices tend to be the average for the year 1955 and not dated as of 1 July. Because turnover taxes, which comprise the largest share of budget revenues, function as sales taxes, 13/ they should be excluded from factor cost weights. However, turnover tax rates for most commodities are not known.** The inclusion of turnover taxes may introduce some misweighting as between foods and soft goods but does not distort the weight of consumer goods as a whole, which is a value-added weight derived exclusive of turnover tax. For electric power, petroleum,

* For details, see Appendix J of the supplementary volume.

** In light industry, turnover taxes in 1956 as a percent of retail prices comprised on the average 30 to 60 percent for cloth, approximately 50 percent for knit goods, and 20 percent for leather. In the food industry, with some exceptions, turnover taxes ranged from 20 to 85 percent of retail prices. 14/

and most consumer durables, which also bear a turnover tax, the estimated turnover tax per unit has been deducted from the price weights.

The aggregation of production series into industries in the Soviet index differs procedurally from that of the FRB index for the US. In the former, final products (as much as possible) of each industry are weighted by gross prices, and intermediate products are omitted from the index. The final products, weighted by price, are taken to be representative of themselves and earlier stages of production. In the FRB index, intermediate stages are included among the production series, weighted by value added. If data permitted, this procedure should have been followed in the index for the USSR. In the absence of detailed value-added data, the method of price times final product was adopted. Although the latter procedure is less precise, there is no clear apparent bias upward or downward. Some items are overweighted and some underweighted because varying degrees of materials purchased (for example, fuels and power) may be from outside the particular industry and because varying quantities of intermediate stages may be sold outside the industry. One would expect errors of this kind to be largely offsetting.

In the Soviet price system, wholesale prices very inadequately correspond to factor cost because all capital charges and land rent are not systematically included in cost. 15/ Nevertheless, it is difficult to see that these prices would impart a general bias to the industry indexes, although the random errors involved reduce the accuracy of the individual industry indexes.

b. Value-Added Weights

In this report, the 1955 value-added weights employed for aggregation both at branch of industry and at the aggregate level consist of wages and salaries and capital consumption allowances.* Ideally, charges for rent, interest, and profit should be included, but these concepts are not recognized in Soviet theory or practice, at least in the sense that they are used in the West, and hence no data are available. The omission of these parts of value added is believed to have no appreciable effect on the relative weights assigned to various industries in this report. 16/

The three sectors, industrial materials, civilian machinery, and nondurable consumer goods, are estimated to compose 52.3 percent, 22.2 percent, and 25.5 percent, respectively, of the total 1955 value-added weights (see Table 1**). Because armaments

* For derivation of value-added weights, see Appendix L of the supplementary volume.
** P. 2, above.

per se are excluded from the index, the value-added weight of all production of machinery has been reduced to reflect only civilian products plus all electronics. The final value of civilian output is estimated to be approximately one-half of the final value of the Soviet category "machine building and metalworking," and its value added is assumed to be the same proportion of the value added of this category. To this value added in civilian output is added two-thirds of the estimated value added in electronics, which is the estimated military portion of electronics output. The 16 branches of nonelectronic civilian machinery carry 87.7 percent of the value-added weight of the civilian machinery sector, and electronics carries 12.3 percent of this total weight.

3. Weight Base

In this report, 1955 wholesale prices in effect serve as base year weights for individual products. Between 1949 and 1955, radical changes occurred in Soviet industrial prices. By 1955, however, the large subsidies paid to various industries had been mostly eliminated, and prices had become established in a stable pattern that reflected settled postwar relationships among the various factors of production. Since 1955, no appreciable changes have occurred in wholesale prices, and, in any case, 1955 prices are by far the most readily available.

4. Complexity

The postwar period in both Soviet and US industry has been characterized by rapid introduction of new products that are highly complex; that require increased processing at different stages of production; and that give rise to new problems of inventories, incentive wages, management control, and measurement of output. The FRB index in its latest revised form has gone to considerable lengths to reflect this increasing complexity of production. 17/ In general, the index for the USSR in this report appears less adequate in this respect. The FRB index has the advantage of a numerically larger sample representing greater detail of product and many intermediate stages of production. The periodic censuses of manufacturing and mining permit regular revisions to expand the sample by the inclusion of new products. Finally, where product details appear to be insufficient, the FRB index uses value of output (adjusted for estimated changes in price), thus insuring automatic and continuous inclusion of new types of products.

In this report, production data have been disaggregated into more specific types and models wherever possible. Thus the railroad equipment and tractors series consist of individual models. A fair amount of detail on agricultural machinery, by type, exists and

is included in the sample. For most kinds of machinery, however, this kind of breakdown could not be accomplished. In electric power equipment a partial reflection of increased size and complexity is achieved by the use of kilowatts of capacity as the unit of measure. In most other kinds of machines the series consists of numbers of machines of an aggregative category such as the number of spinning machines, of lathes, or of coal-cutting machines. Metallurgical equipment and petroleum refining equipment are measured in tons, thus reflecting the increasing size of units but not the increasing quality or complexity. On the other hand, the estimates of electronic equipment, aircraft, and shipping are estimates in constant rubles and should reflect fully the new products and increasing complexity. In the case of industrial materials and consumer goods the sample series for the USSR are much more aggregative than in the US sample and therefore reflect new products much more poorly. In this instance, the index for the USSR is concluded to be more likely to err on the side of understatement on account of the inadequate reflection of the increased complexity of the product mix.

5. Problem of Quality

The problem of quality in the measurement of production in the USSR assumes an acute importance not just because of the lack of detailed data (on specifications, for example) but also because purchasers' preferences in an administered economy do not have the direct and tangible effect on product mix that one takes for granted in a market economy.

There are three recognizable aspects of quality that bear on the significance of a production index: (a) quality of individual products, (b) the diversity (variety) of the product mix, and (c) the balance of supply and demand for individual products.

Quality of individual products is used in this report to mean not only attractiveness of consumer goods but also durability and longevity of all kinds of goods, including capital goods. Diversity or variety of product refers to the choice between a few standardized all-purpose models or types and many specialized and differentiated models or types. The tendency of Soviet industry to favor fewer standardized models (as in machine tools) is notorious. A few years ago, Soviet planners decided to widen drastically the range of agricultural equipment and to bring out many new models of specialized tractors or harvesting machines. Partly as a result of this, output of agricultural equipment dropped drastically in 1958 and, by 1961, had not recovered to the level of 1957. (See Table 3.*)

* P. 26, below.

Failure to balance supply and demand for individual products has been a specialty of planned economies, especially for consumer goods. A recent example in the USSR in the producer goods category has been the failure of production of tires to meet demand in the last 3 or 4 years. According to Soviet statements the shortages of tires have immobilized part of the truck fleet at times. Clearly, production of fewer trucks and more tires would have been a tangible improvement in product mix but might have left the industrial production index unchanged.

These aspects of quality affect the welfare of consumers as directly as quantities do. In addition, they affect the cost or resource requirements of production. It is the latter question that is of concern for this report. Questions are raised on the extent to which a quantity index reflects the production potential of the industrial establishment in question* and whether it is fair to assume that quality trends are the same in an index of Soviet industrial production as in an index for a Western market economy with which it may be compared. In a market economy the preferences of purchasers of both consumer goods and producer goods guide production not only as to relative quantities of goods (balance) but also as to quality and number of models and types (diversity). The mix of quality and quantity is the mix that purchasers desire. In the Soviet economy, purchasers' preferences appear to be directly influential in only one general area -- military production.

It has been tacitly assumed by some observers that quality of production in the USSR, though admittedly bad, has become no worse in the postwar period and may have improved and that consequently a quantity index might be suspect on grounds of coverage and representativeness of sample but probably not on grounds of quality.

In the light of recent events a judgment concerning quality perhaps should be suspended until further evidence is accumulated. Military production apparently has been expanding recently in the USSR and putting considerable pressure on the civilian sector. How much this may have affected quality, diversity, and balance in the civilian sector is uncertain.

Evidence on production of spare parts for machinery and equipment highlights the problem of reliability and longevity. Fragmentary evidence on spare parts for motor vehicles, tractors, and agricultural machinery indicates that production of parts through 1960 increased faster than production of complete units of equipment and faster than the stocks of equipment. In 1959 and 1960 these spare parts were about three-fifths of the value of output of complete units.

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* For a discussion of these and related problems, see source 18/.

In the US the corresponding ratio is about one-fourth. Yet, at the same time, the Soviet press is filled with complaints about the shortage of spare parts.*

6. Probable Biases of Calculated Indexes

The calculated indexes for the USSR correspond generally in product coverage and methodology with the comparable FRB index. Although some items may be overweighted and some underweighted, errors related to employment of gross price weights instead of value-added weights at the commodity level are largely offsetting and do not seriously understate growth for the 1950-61 period. Neither is there likely to be any significant bias imparted to the indexes from the particular value-added weights employed for purposes of aggregation. The net effect of using wages and salaries and capital consumption allowances instead of full value-added weights seems to be negligible.

The supplementary ruble estimates for electronics, aircraft, and shipbuilding may have a considerable range of error -- that is, relative to estimates derived from reported physical production, they are more likely to err on the side of overstatement. Inadequate reflection of complexity and new products, however, may impart some downward bias to the index for the USSR especially in machinery categories.

On the whole, the industrial production indexes presented in this report can be argued to have relatively small quantitative biases and to err if at all probably on the downward side. On possible bias resulting from quality problems, the argument of the preceding section suggests that the reader keep an open mind.

III. Industrial Materials

Nine industrial branches -- electric power, coal, petroleum products and natural gas, ferrous metals, nonferrous metals, forest products, paper products, chemicals, and construction materials -- constitute the industrial materials sector of the index. Indexes for the whole sector and for the nine branches are given in Table 1,** and average annual rates of growth within the sector are given in Table 2.*** A majority of the series are derived from announced data, which have been supplemented by estimates for certain nonferrous metals and chemicals.

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* Information on the 1963 plan and the 1962 achieved production of spare parts for these categories indicates a decrease in the rate of growth. 19/ For more details on production of spare parts, see Appendix C of the supplementary volume.

** P. 2, above.

*** P. 3, above.

The rates of growth for the sector as a whole roughly parallel the pattern for the index as a whole, which is not unexpected, for this sector accounts for 52.3 percent of the 1955 value-added weight. Considerable variation exists in the rates of growth of the nine branches, as described in the sections that follow.

A. Electric Power

The USSR reports gross production of electric power inclusive of power generated by stations for their own use. For comparability with the US index, net production of electric power excluding station use is calculated and used in the CIA index. Until the 1959 revision of the FRB index, electric power production was not included in the US measure of industrial output.* Consumption of electric power by industry (excluding construction) accounted for approximately 67 percent of total electric power generated in 1955 in the USSR, 21/ whereas, in the US, only 44 percent represented consumption by industry. Soviet production of electric power increased by a rate of 12.9 percent a year during 1952-55, 11.5 percent during 1956-61, and 12.3 percent during all of 1951-61. Long-range goals for electrification of the Soviet economy under the Twenty Year Plan (1961-80) stress continued rapid rates of growth.**

B. Coal

By 1958 the USSR attained first place in world output of coal. In standard fuel units,*** however, the US production and the Soviet production were approximately the same in that year 23/ because the high share of lignite, 30 percent, reduced substantially the average heat value of Soviet coals. The Soviet coal industry accounted for 9.3 percent of aggregate 1955 value-added weights, whereas the US industry (FRB comprehensive) accounted for 1.3 percent of US 1957 value-added weights.

Between 1955 and 1959, coal declined from 64 to 54 percent of the primary energy resources available in the USSR.† 24/ Production

* Pursuant to a recommendation in 1950 by the UN Statistical Commission that production of electricity and gas be included in indexes of industrial activity, the FRB developed these physical volume indexes in 1956 but did not combine them with manufacturing and mining indexes until 1959. 20/

** It might be noted again that the branch-of-industry concept used in this report is the broader one of primary product wherever produced. Only two-thirds to three-fourths of electric power output would be included under the establishment concept of branch of industry.

*** Adjusted for heat value at the rate of 7,000 kilocalories per kilogram. 22/

† Hydroelectric and atomic energy, fuelwood, peat, oil shale, crude oil, and natural gas are included in this comparison.

of coal grew at an average annual rate of 8.4 and 4.8 percent during 1952-55 and 1956-61, respectively, and 6.4 percent during 1951-61. A reduction in the rate of growth was scheduled for the Seven Year Plan period, mainly reflecting the shift in the structure of the primary energy balance toward expanded production of oil and gas. 25/

C. Petroleum Products and Natural Gas

An attempt was made to match on the Soviet side the following petroleum products categories employed in the FRB industrial production index: automotive gasoline, distillate fuel oils, residual fuel oils, aviation fuel, kerosene, lubricants, and some synthetic products. 26/ Aggregate Soviet production of petroleum products was based on the estimates of refined products derived from nongas products and refinery gas; of associated natural gas; and of crude oil consumed, added to storage, or included in net exports.* Natural gas from gas wells was added for an aggregate estimate of the oil and natural gas industry. The share of crude oil and natural gas in the Soviet fuel balance has increased considerably since 1955. Its share is planned to be almost one-half by 1965 compared with one-third in 1959. 27/ These products grew annually by 13.9 percent and 15.2 percent during the 1952-55 and 1956-61 periods, respectively, and 14.4 percent during 1951-61. In percent of total value added the petroleum products and gas categories accounted for 2.4 percent of the Soviet weights in 1955.

Turnover taxes levied on petroleum products have been sizable, totaling 10.4 billion rubles in 1955 and had increased to 23.4 billion rubles by 1959. 28/ Wholesale release prices for refined products were adjusted for turnover taxes, transportation charges, and the operating costs of the product distribution system.**

D. Ferrous Metals

The index for ferrous metals is the physical index of production of rolled steel announced by the Soviet government. Initially, a sample of rolled products as reported in the ECE Steel Committee's Quarterly Bulletin of Steel Statistics*** was selected as representative of the final output of steel. Changes in definitions and specifications of

* Because the calculated index is for value of final product, crude oil will be that output not elsewhere shown.

** Turnover taxes on petroleum products accounted for about 40 percent of the release prices. 29/

*** Rolled products were reported in the following categories: rails and rail accessories, heavy sections, light sections, wire rod, pipe and tube, strip, plate, and sheet. 30/

items of the various categories, however, made it impossible to construct for the 1950-61 period a consistent series that reflected the shifting composition of steel products. Production of rolled steel declined from an annual rate of 10.1 percent a year during 1952-55 to 7.7 percent during 1956-61. During 1951-61 this branch averaged a 9.2 percent rate of growth.

E. Nonferrous Metals

As a producer and consumer of nonferrous metals and minerals, the USSR ranks second to the US. The basic nonferrous products -- aluminum, lead, copper, zinc, tin, and magnesium -- have been included in the Soviet sample. The USSR is believed to possess a full range of rare metals and other nonferrous materials that have important industrial applications. 31/ The rate of growth of the sample of above noted primary nonferrous commodities declined from 13.5 percent annually for 1952-55 to 7.5 percent for the 1956-61 period. It was 10.5 percent during 1951-61. The metals sector (ferrous and nonferrous) accounted for 10.8 percent of aggregate value-added weights.

F. Forest Products

At present the USSR uses more timber than any other country in the world. By 1958 the USSR had become approximately equal to the US in production of industrial logs and lumber. 32/ In that year, logging, wood processing, and paper industries employed 14 percent of the Soviet industrial labor force. 33/ Forest products are represented in this report by production series for lumber; for fuelwood removed from government forests; and for industrial wood, exclusive of sawlogs used in production of lumber. With the rapid development of the petroleum and natural gas industry, the relative importance of fuelwood has declined. 34/ Thus the inclusion of fuelwood in the series has a dampening effect on the forest products index. In 1955, sawlogs processed in the form of lumber accounted for 55 percent of production of industrial wood (logs). The remainder of industrial wood was used primarily as pit props, crossties, construction timbers, pulpwood, plywood, veneer logs, and chemical wood. 35/

The lack of data on processed wood products such as furniture, containers,* plywood, and veneer** necessitates the use of materials inputs as an indicator of output activity in the forest product sector. The absence of these final products from the index probably results in

* The bulk of wooden containers is made from boxboards, which are included in the lumber series.

** A portion of the value of production of plywood and veneers is expressed as plywood and veneer logs included in the industrial log series.

an understatement of the growth of this sector. On the other hand, only a small percentage of industrial wood is used in the final products. 36/ The calculated indexes for forest products were the slowest growing item in the materials sample, increasing by 3.9 percent and 2.3 percent a year during 1952-55 and 1956-61, respectively, and averaging 3.9 percent during 1951-61. This branch accounted for 14.2 percent of total value-added weights.

G. Paper Products

Sixteen series on paper and paperboard products available from the industry handbooks represent this branch, which is assigned 0.8 percent of the total value-added weights. Production of paper, cardboard, and cellulose has been a lagging branch of industry, dropping from an average rate of growth of 9.4 percent during 1952-55 to an average of 6.3 percent during 1956-61.

H. Chemicals*

Although the 24 items in the sample of chemicals were from published sources, information is generally limited for this industry. Because a number of the industrial chemicals are used in further processing of other chemicals, the sample with both final and intermediate products has an undetermined degree of double counting. Intrabranch consumption accounted for 25 to 30 percent of the official measure of gross industrial production of the combined chemicals and rubber industry in 1959.** 40/ The synthetic rubber series is assumed to be an appropriate proxy for tires. In 1959, truck tires constituted 75 percent of the reported production of tires,*** and the tire industry consumed 67 and 76 percent of synthetic rubber output in 1950 and 1955, respectively. 41/

The calculated indexes for this branch, which accounted for 4.7 percent of value-added weights, increased by 12.4 percent annually during 1952-55 and declined slightly to 11.5 percent for the 1956-61 period.

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* The Soviet chemicals industry does not include soap and vegetable and animal oils, as does the US classification. 37/ Both coke chemicals and petrochemicals may be included partly in other branches of industry or hidden partly in other areas of the chemical industry itself.

** Ammonia and nitric acid are consumed largely in production of nitrogen fertilizers. Approximately 86 percent of synthetic rubber was produced from ethyl alcohol. 38/ The coal tar crudes are used as solvents and intermediates. Sulfuric acid, the most important industrial acid, is used in the manufacture of inorganic and organic acids, synthetic drugs, and technical gases and in preparing soluble phosphates. 39/

*** Reported production excludes aircraft and bicycle tires.

I. Construction Materials

Twenty-three construction materials products correspond approximately to the product groups of the Federal Reserve Board's stone, clay, and glass category. In accordance with US classification practices six items* are treated as metal products and are transferred to the machinery sector. Intrasector duplication is considerable, necessitating several double-counting adjustments. Thus cement inputs into precast concrete, asbestos cement shingle, asbestos cement pipe, and wall materials have been removed. Gypsum inputs into cement and dry gypsum plaster board were excluded. Rock products (stone, sand, and gravel), which are inputs into cement, precast concrete, lime, and wall materials also have been adjusted for double counting. 42/

The construction materials index carries 6.8 percent of the value-added weight and grew at 16.7 percent a year and 16.5 percent during the 1952-55 and 1956-61 periods, respectively. These rates of growth would be higher than an index representing all construction materials as inputs into the construction sector. Such an index would include two important slowly growing items, steel and lumber, which would reduce the rate of growth. 43/ These two products are covered in the ferrous metals and forest products categories of the CIA index.**

J. Evaluation of the Aggregate Materials Index

The materials sample accounts for 52.3 percent of value-added weight for civilian industry. The calculated materials indexes may be biased slightly downward because of the failure to measure fully the improvement of physical product. Within the chemicals industry, some items have experienced rapid and significant quality changes during 1950-61. A possible understatement of growth in ferrous metals may result from the failure to reflect shifts in the product mix. Forest products are represented by three categories, which hardly reflect product diversity. Because forest products carry more than one-fourth of the materials sector weights, the shortcomings in the quantity and price data have a more serious impact on the aggregative index than either chemicals or ferrous metals.

Some assurance of reliability of these estimates can be based on the following considerations: (1) physical quantity indexes of leading commodities and the value-added indexes for the various branches correspond closely during 1951-61, (2) reasonably accurate

* Heating boilers, heating radiators, sewer pipe and fittings, enameled bath tubs, enameled bath water heaters, and corrugated pipe.
** A small amount of construction steel (reinforcing steel) is included in precast reinforced concrete and thus is double-counted.

value-added weights could be established for aggregating production of the various branches within the materials sector, and (3) the generally low degree of fabrication to be found in the materials sector precluded a significant amount of double counting. If the differences in coverage for each industry are taken into account, the materials industries indexes are fairly reliable indicators of growth. With the exception of petroleum the material branches experienced some decline in rates of growth in 1956-61 compared with the preceding 4 years, 1952-55. If the 1956-61 period is divided into 1956-59 and 1960-61 segments, the retardation is seen to be concentrated in the latter 2 years. The weighted materials index grew by 9.2 percent during 1951-61, increasing by 9.4 percent, 9.7 percent, and 5.6 percent in 1952-55, 1956-59, and 1960-61, respectively.

IV. Civilian Machinery

In the civilian machinery sector the methodological pitfalls and the scarcity of data are more formidable obstacles to construction of reliable indexes than they are in either the industrial materials sector or the nondurable consumer goods sector. Additional series that have been estimated in order to supplement the machinery series announced by the Soviet government have a much greater effect on the over-all industrial index than the additional series for the other major sectors. The value of output of the sample of machinery products by 16 major subdivisions is shown in Table 3.* This section provides a general discussion of the product coverage of the sample of machinery products and an evaluation of its representativeness.

A. Product Coverage of the Sample

Civilian machinery items are defined by industry of origin and do not precisely reflect exclusive civilian end use.** The series for trucks and electronics, for example, include production for military as well as civilian use. Under the Soviet industrial classification schema it is as difficult to disentangle civilian and military production in some branches as it is in the US.

The civilian machinery index has been constructed primarily from physical production series published in statistical handbooks and technical journals. The sample of announced production series, however, has been supplemented in two ways. First, estimates based on

* Table 3 follows on p. 26. For a description of civilian machinery categories, see Appendix C of the supplementary volume.

** Wherever possible, the civilian components of important branches such as aircraft and shipbuilding have been isolated from total production of these branches of industry.

Table 3

Value and Indexes of Civilian Machinery Production in the USSR
1950-61

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
	Million 1 July 1955 Rubles											
Boilers	70.4	84.7	118.2	149.8	158.2	197.8	200.6	197.0	204.9	213.7	244.8	281.5
Electric power equipment	955.4	1,202.6	1,250.1	1,645.7	1,646.3	1,575.0	1,770.1	1,897.0	2,178.0	2,601.8	3,068.9	3,635.8
Metal cutting machine tools	2,113.1	2,068.1	2,082.5	2,440.3	2,725.3	3,428.7	3,918.2	3,684.4	4,023.4	4,333.9	4,735.9	5,125.7
Railroad equipment	2,868.2	2,095.1	1,714.2	2,037.8	2,185.9	2,577.2	2,798.9	2,937.1	3,659.3	4,223.9	4,546.0	4,946.3
Motor vehicles	3,768.9	3,026.2	3,211.6	3,689.6	4,216.8	4,638.9	4,869.3	5,183.2	5,357.9	5,263.5	5,585.0	5,918.3
Tractors	1,933.2	1,619.1	1,773.0	2,007.3	2,426.7	2,929.1	3,580.3	3,977.3	4,245.0	4,160.5	4,653.4	5,144.4
Agricultural machinery	2,297.3	2,738.6	2,203.4	1,983.8	2,251.5	2,708.5	4,280.2	6,328.5	4,267.2	3,173.1	3,324.4	4,219.1
Construction and road work equipment	646.6	642.9	643.6	686.0	774.1	854.1	996.8	1,221.2	1,343.8	1,389.7	1,657.9	2,088.0
Hoist-transport equipment	271.8	325.8	350.6	445.8	482.8	515.3	494.0	582.6	687.7	591.7	623.3	712.7
Metallurgical, fuel-refining, and chemical equipment	1,312.4	1,584.2	1,993.4	2,368.1	2,259.2	2,112.4	2,240.4	2,475.1	2,742.1	3,515.9	4,229.6	4,420.8
Textile, leather, and publishing equipment	266.8	256.7	274.9	298.9	346.6	327.9	328.2	359.0	341.8	412.7	448.5	491.3
Consumer durables (excluding radio and television sets), turnover tax adjusted	1,424.6	1,873.8	2,173.6	2,645.1	3,521.9	4,346.4	4,931.6	5,423.2	6,022.1	6,519.5	6,843.0	7,325.2
Civilian shipbuilding (excluding inland)	632.8	679.1	727.9	837.7	966.2	1,219.0	1,685.5	1,655.0	1,899.4	2,391.5	2,595.7	2,900.6
Civilian aircraft (excluding electronics)	260.0	200.0	160.0	380.0	680.0	850.0	1,300.0	2,500.0	3,600.0	3,900.0	2,900.0	2,000.0
Sanitary technical equipment	373.9	464.6	539.3	604.4	665.1	746.4	845.3	975.1	1,129.0	1,336.7	1,562.6	1,766.2
Machinery (excluding electronics) a/	19,195.6	18,861.4	19,216.2	22,220.2	25,306.4	29,026.9	34,239.3	39,395.8	41,701.5	44,028.1	47,019.2	50,975.9
	1955 = 100											
Index	66.1	65.0	66.2	76.6	87.2	100.0	118.0	135.7	143.7	151.7	162.0	175.6
	Million 1 July 1955 Rubles											
Electronics	3,400.0	4,400.0	5,500.0	7,100.0	8,800.0	10,900.0	13,400.0	16,300.0	20,200.0	23,400.0	27,000.0	33,600.0
	1955 = 100											
Index	31.2	40.4	50.5	65.1	80.7	100.0	122.9	149.5	185.3	214.7	247.7	308.3
Weighted civilian machinery index b/	61.8	62.0	64.3	75.1	86.4	100.0	118.6	137.4	148.8	159.4	172.5	191.9

a. Because of rounding, components may not add to the totals shown.
b. Machinery, excluding electronics, carries 87.7 percent of the civilian machinery weight; electronics, 12.3 percent.

indirect indicators for electronics, civilian aircraft, and civilian shipbuilding have been constructed, and, second, disaggregation of physical output series into various models or types as a means of taking partial account of quality changes has been undertaken.* Railroad equipment, tractors, agricultural equipment, and construction equipment have been treated in this manner.

The major industrial groups represented in the civilian sector of machinery vary widely as to coverage of commodities. In the case of metalcutting machine tools, motor vehicles, tractors, and agricultural equipment, coverage is essentially complete. On the other hand, the samples of products in electric power equipment and equipment for light industry represent less than one-half of the output in those categories. Whereas tractors and agricultural equipment have a fairly extensive count by models for most years, metallurgical, petroleum refining, and chemical equipment have no specific product detail available. The expanded sample of items in the civilian machinery sector consists of 16 major subdivisions (as shown in Table 3**) representing Soviet branch-of-industry categories for machine building.

Because of their impact on the civilian sector machinery indexes, the following supplemental series are discussed in greater detail: electronics, civilian shipbuilding, and civilian aircraft. All three of these series are ruble estimates of total production.

B. Expanded Civilian Machinery Sample

1. Electronics

The electronics industry*** is defined broadly as those enterprises producing equipment in which electron tubes and semiconductors are the essential components. This definition embraces radio and television sets; broadcasting equipment; commercial telephone and telegraph equipment; industrial electronic equipment, including computers and data-handling equipment; automation equipment; scientific and industrial test and measuring equipment; and, finally, the highly diversified sphere of military electronic equipment. Although military

* For a report on an attempt of the Federal Reserve Board to treat quality changes for selected commodities by subdivision of items, see source 44/.

** P. 26, above.

*** The electronics category is not specifically isolated as a branch of industry in either the US or the Soviet economies. According to the most recent data, products classified in this category may be scattered in the electrotechnical, radiotechnical, and instruments branches of Soviet machine building.

electronics is by far the most important sector of this branch of industry, two categories of civilian electronics (radio and television sets and computers) have been accorded special priority at various times.

Since 1950 the volume of production of the Soviet electronics industry has increased more rapidly than any other major industry. The gross value of output in 1955 was reported by the USSR to have been 340 percent of 1950. 45/ The index used here is simply the over-all production (for both civilian and military uses) of electronic tubes and semiconductors. The justification for the use of tubes and semiconductors as an indicator of the growth of output of the industry is that the number of these components is a reasonably good indicator in the US. The ratio of value of tubes and semiconductors to value of final output of electronics has been fairly stable in the US in the postwar period, even in times of changing product mix such as the Korean War. In addition, the average price per unit of components has not changed much in the US.

The index of tubes and semiconductors grew to 323 in 1955 (1950 = 100) compared with the Soviet claim of 340 percent for gross value of the industry. Two other series also provide evidence of rapid growth in this industry. Civilian television sets and radios grew to an index of 441 in 1955, and computers to an index of 740.

Soviet data provide a basis for estimating the value of electron tubes and semiconductors for 1956. 46/ The value of output and hence the value-added weight for the electronics sector are derived from the US ratios of value of components to value of output and value added.* The employment of a US relationship probably understates the Soviet value of electronics final product. This understatement occurs because civilian radios and television sets, with small tubes, constitute a much larger part of total production of electronics in the US than in the USSR, where the military demand for increasingly complex components has been the dominant and most rapidly growing part.

2. Civilian Shipbuilding

Because of the long production cycles in the shipbuilding industry, the appropriate measure of amount of production is the value of work done, including the value of repair activities.** The basic

* For details, see Appendix C of the supplementary volume.

** The US annual index is based on the "work done" for large vessels estimated from keel laying and completion and tonnage data, on the number of small vessels completed, and on employment in repair activities.

data, however, are expressed as a series of "completions" of new civilian ships. This series, in turn, is based on observations of ships at sea.* Since 1955, when the USSR embarked on a program of increased domestic production of vessels for its maritime fleet, the changes in the value of output of the Soviet merchant vessels** have been sizable (see Table 3***). The variable completion cycles, however, are not an accurate reflection of construction activity, and on this account the completed vessels series has been smoothed by a 2-year moving average. Shipbuilding data have been adjusted to be inclusive of repair and to represent work performed.

3. Civilian Aircraft

Estimated expenditures for procurement of nonmilitary Soviet aircraft, excluding electronic equipment, rose from 0.26 billion in 1950 to 3.90 billion rubles in 1959† (see Table 3***). Since 1954 the USSR has given very high priority to development and production of modern transport aircraft. 49/ It is likely, however, that, in the USSR as in the US, production of military aircraft accounts for the major part of output of the aircraft industry.†† There may be a considerable margin of error in the production estimates derived for production of civilian aircraft. Although CIA has not completely identified the product mix, estimates of the total piston and high-performance (jet and turboprop) units can be ascertained from inventories of aircraft for four benchmark positions (early, two midrange, and late years). Before 1955, two-engine piston aircraft were used almost exclusively, and following 1956 the civilian airline (Aeroflot) was largely reequipped with jet and turboprop aircraft (mostly four-engine aircraft).†††

* The observations give the sizes of ships and the dates of appearance, from which the dates of completion can be deduced. This information has been collected by the US Maritime Commission. 47/

** The maritime fleet includes all classes of vessels assigned to the maritime fleet such as cargo vessels, tankers, tugs, schooners, lighters, barges, passenger cutters, and miscellaneous auxiliary types. Categories included under merchant vessels are the maritime fleet and fishing vessels. 48/

*** P. 26, above.

† Because of the leadtime between input of materials and completion of the aircraft, measurement of output should not be based on completed units. The FRB index now employs a deflated value of work done in the aircraft industry.

†† In the 1959 revision of the FRB index, military aircraft accounted for 78 percent of the weight of the aircraft and parts industry. 50/

††† For details, see Appendix C of the supplementary volume.

Production data derived from benchmark inventories are supplemented by other estimates calculated from average daily rates of utilization of aircraft in Aeroflot and from flight schedules. Although the estimated average rate of production for the second half of the 1950-61 period correlates well with passenger and freight kilometers flown, the incompleteness of the data tends toward a conservative estimate. Helicopters, which have appeared in considerable numbers in the USSR, are missing from the index. Furthermore, it is likely that new models of aircraft, which have been discussed in Soviet publications but have not been reported in the Aeroflot inventory, are already in production. Their omission understates production in 1960 and 1961 by an unknown amount.

C. Major Gaps in Coverages and the Imputed Growth of Missing Categories

Ideally the index of industrial production should include not only machinery but also equipment that appears in the US index as fabricated metal products and in the Soviet official index as metalworking. This category includes, among other things, structural shapes, fencing, nails, screws, nuts and bolts, hand tools, metal drums, cans, and other containers. This category accounts for 5 percent of value added in the US index and perhaps 3 percent in the Soviet index. In the absence of data this category is not represented in the calculated index in this report.

A second major omission is spare parts of all kinds of except electronics, shipbuilding, and aircraft, for which the ruble estimates implicitly include some production of spare parts. The USSR has published a ruble value series of spare parts for tractors, agricultural machinery, and automotive equipment.* This series increases from 1.0 billion rubles in 1950 to more than 5.0 billion in 1957 and to 9.3 billion in 1959. It rises considerably faster than all industry or even machine building and is a substantial fraction of the value of the latter.** The decline in the rates of growth for this category after 1960 underscores the complaints in the press about the shortage of parts.*** Not enough is known, however, about the coverage and

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* Data in the input-output table in the 1960 statistical handbook specified that spare parts were included in the value of output of these branches.

** In the US, according to the 1958 Census of Manufactures, parts and attachments accounted for about 34 percent of the value of shipment of tractors, about 38 percent of the value of shipment of railroad equipment and about 19 percent of the value of shipment of other farm machinery.

*** The plan for 1963 of 11.92 billion rubles is 10 percent above output of spare parts in 1962 for tractors, agricultural machinery, and automobiles. 51/

construction of the series for much confidence to be placed in it. There is reason to believe that production of spare parts has risen rapidly and that its omission from the index results in some understatement.*

Within machinery proper the most important missing categories are pumps and compressors, medical equipment, food-processing equipment, metal forming (pressing, stamping, and forging) equipment, nonelectronic measuring instruments, and miscellaneous electrical equipment (for example, switch gear).

The assignment of weights to various parts of the sample has the effect of imputing rates of growth to products missing from the sample. The question is, what rates of growth to impute to (1) missing machinery products and (2) fabricated metals. In the calculated machinery index a separate value-added weight is estimated for the electronics industry. The remaining value added for production of civilian machinery is applied to the nonelectric sample of machinery products. This procedure is equivalent to assuming that the missing products grow at the rate of machinery excluding electronics rather than at the faster rate of machinery including electronics.

The weight of civilian machinery includes value added in metal working. Thus fabricated metal products also are implicitly assumed to grow at the same rate as civilian machinery (excluding electronics) rather than at the slower rate of all industry. The Soviet official index for metalworking for 1955 above 1950 was 209 compared with 185 for industry as a whole and 243 for machinery alone.

Repair work usually is not considered as manufacturing activity in the US,** but the Soviet definition of production of machinery has included repair on industrial and construction equipment, railroad equipment, ships, motor vehicles, tractors, and agricultural machinery. Soviet data indicate that the repair category of the machinery sector*** amounted

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* In a recent statement the annual volume of production of all spare parts was estimated to be from 50 billion to 60 billion rubles. 52/

** A revision in the scope of manufacturing was made in the 1957 edition of the SIC, in which machine shops solely engaged in repair work were transferred from the service trades to manufacturing. 53/

*** Capital repair of equipment also is performed outside the machinery sector in repair technical stations (RTS's), kolkhoz shops, repair enterprises of industrial cooperatives, and specialized repair enterprises. 54/ More of the capital repair of enterprise own equipment formerly done by enterprises and included in its gross industrial production may have been shifted to specialized repair plants. The most recent branch of industry classification no longer includes district railroad repair shops and blacksmith shops under repair of machinery.

to approximately 6 to 7 percent of gross industrial production of machinery in 1959.* Repair work is represented in the CIA sample only through ship repair, which, because it involves the same kind of activity as new production, should be treated as production.

D. Comparison of the Civilian Machinery Index with Soviet Investment in Machinery and Equipment

This section presents a comparison of the index calculated for civilian machinery (excluding consumer durables) with the announced Soviet investment index for machinery and equipment. The general scope of the two series is approximately the same, but there still are significant differences in statistical method. The series for investment in machinery and equipment includes some imported equipment and some reparations for the early years, although the largest share is new domestically produced machinery (see Table 4**). Tools and implements delivered to purchasers are recorded in transfer prices (inclusive of transportation charges). Uninstalled equipment would be counted in the production index but not in the investment index. Finally, investment lags behind production by an unknown timespan.

The investment index is compared in Table 5*** and in the chart, Figure 2,† with the index calculated for production of civilian machinery exclusive of consumer durables. Because the investment index is comprehensive and reflects new products more fully, it should perhaps rise faster than the production index, which is based on a sample. Also, if the change in the amount of uninstalled equipment is significant, the

* Based on data from the interindustry tables presented in the 1960 economic handbook and adjusted to include only the specialized repair activity of the machine building and metalworking (MBMW) sector. As defined in 1959, repair work in the MBMW category would include specialized enterprises for repair of metalcutting machines and pressing-forging equipment, specialized enterprises for repair of industry and construction equipment, and specialized enterprises for repair of railroad rolling stock and communications equipment. Inclusion of repair workers in the weight for the machinery sector may overstate the weight for this sector. An acceptable estimate is approximately a million repair workers in the machinery sector in 1955. 55/ A Soviet author has estimated 1.2 million for 1958. This figure includes not only workers engaged in repair directly at MBMW plants but also workers at state industrial enterprises specializing in repair of equipment. 56/ In CIA adjustments to exclude military hardware from the machinery weight, some repair workers are removed also.

** Table 4 follows on p. 33.

*** Table 5 follows on p. 34.

† Following p. 34.

Figure 2

USSR

INDEXES OF PRODUCTION OF CIVILIAN MACHINERY AND INVESTMENT IN MACHINERY AND EQUIPMENT

1950-61

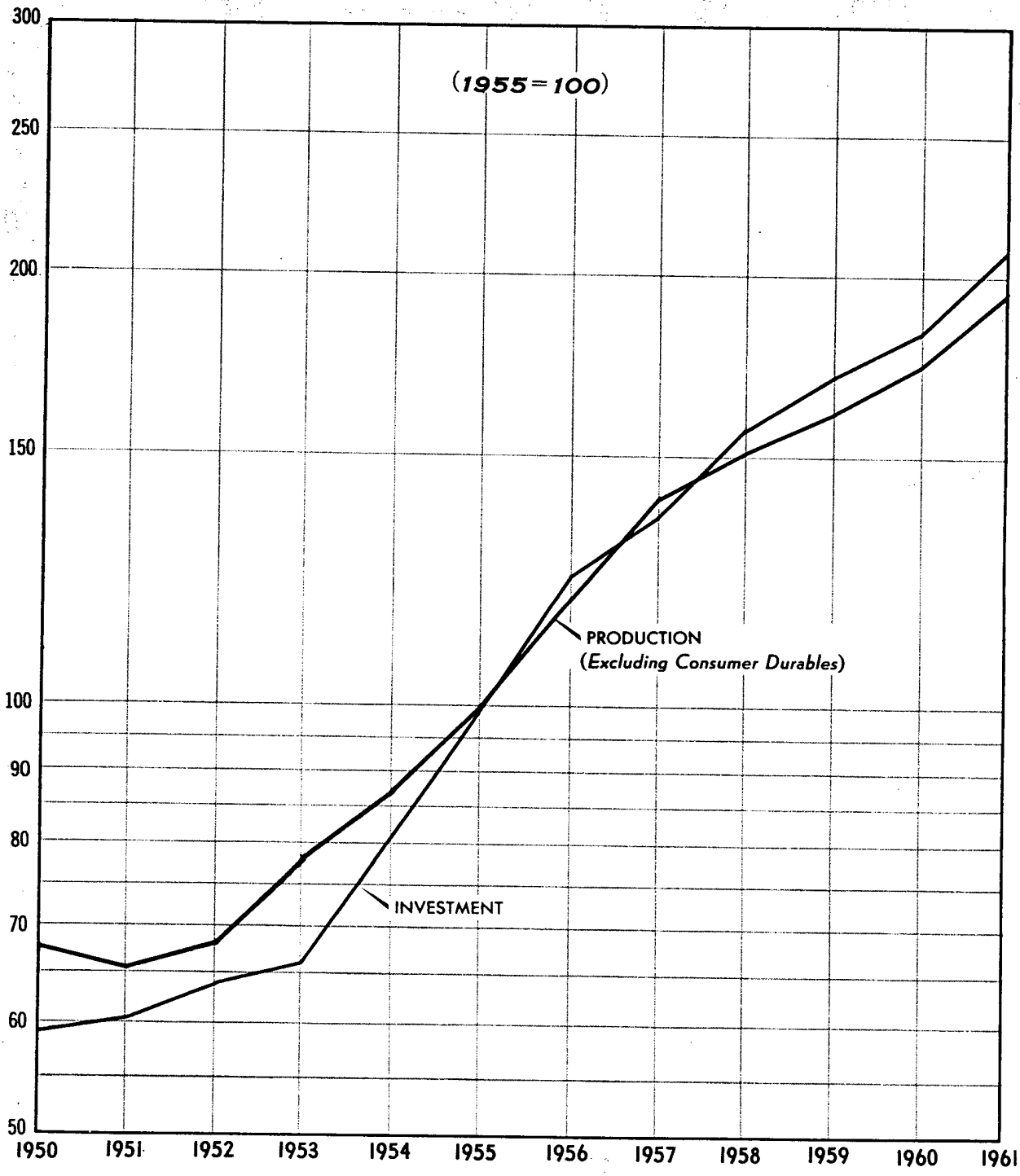

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Table 4

Value and Index of Investment for Machinery and Equipment in the USSR
1950-61

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
	Billion 1955 Rubles											
State plan and decentralized a/	31.2	31.4	33.2	34.3	41.7	49.9	62.8	70.2	77.1	83.4	93.1	104.8
Kolkhoz capital investment b/	1.4	1.8	1.7	2.2	2.9	4.7	4.7	4.2	8.9	9.7	6.7	6.9
Total	32.6	33.2	34.9	36.5	44.6	54.6	67.5	74.4	86.0	93.1	99.8	111.7
	1955 = 100											
Index	59.7	60.8	63.9	66.8	81.7	100.0	123.6	136.3	157.5	170.5	182.8	204.6

a. For 1950-60, USSR, Tsentral'noye Statisticheskoye Upravleniye, Kapital'noye stroitel'stvo v SSSR statisticheskiy sbornik (Capital Construction in the USSR: a Statistical Handbook), p. 44; for 1961, Narodnoye khozyaystvo SSSR v 1961 godu (National Economy of the USSR in 1961), p. 538-39.

b. The series for kolkhoz investment in machinery is a residual. Investment of construction-installation work plus 10 percent of total investment as an estimate of capital work other than construction and equipment procurement are subtracted from total kolkhoz investment. The data for 1950-60 are from Kapital'noye stroitel'stvo v SSSR: statisticheskiy sbornik, pp. 155 and 164. Investment in machinery in 1961 is estimated to have decreased at the same rate as investment as a whole. The rate of change is from Narodnoye khozyaystvo SSSR v 1961 godu, p. 541.

Table 5

Indexes of Investment in Machinery and Equipment and Production of Civilian Machinery in the USSR 1950-61

1955 = 100

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Investment for machinery and equipment a/	59.7	60.8	63.9	66.8	81.7	100.0	123.6	136.3	157.5	170.5	182.8	204.6
Production of civilian machinery												
Excluding consumer durables, radios, and television sets	67.9	66.2	67.8	78.7	87.7	100.0	119.6	140.2	150.7	160.8	174.3	195.0
Excluding consumer durables and all electronics	72.0	68.8	69.1	79.3	88.3	100.0	118.7	137.6	144.6	152.0	162.8	176.9

a. See Table 4, p. 33, above.

discrepancy between the production and the investment series is greater.* Uninstalled equipment amounted to 13 billion rubles at the beginning of 1955 and had reached 17 billion rubles at the beginning of 1961. 57/ Given differences between the two series, neither can be regarded as a test of the other. However, the divergence between the two may at least suggest the order of magnitude of uncertainty as to the accuracy of the calculated index (see the chart, Figure 2**).

V. Nondurable Consumer Goods

In the calculation of the index series for nondurable consumer goods, processed foods carried 36.5 percent of the 1955 value-added weight and soft goods 63.5 percent. Production of nondurable consumer goods increased by an average of 8.1 percent annually in 1952-55 (see Table 2***) and 6.5 percent annually in 1956-61. The index for this sector is not comparable in coverage with the Soviet Group B index, which includes consumer durables as well as food and light industrial products.†

All of the series presented in this sector are based on data from the statistical handbooks and various technical publications. Description of the items, details of sample coverage, price weights, and evaluation of results are treated in the following sections.

A. Processed Foods

The CIA sample coverage for processed foods is fairly comprehensive, with 19 of the most important categories represented, as follows: meat, fish, sugar, canned goods, confections, butter, vegetable oil, macaroni, bread products, margarine, wine, beer, vodka, champagne, flour, soap, cigarettes, cheese, and milk (see Table 6††). Among those not

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* Equipment arriving on a construction site and paid for is not included in capital investment if it requires any installation and assembly work. While such equipment is being held in storage, its cost is charged to working capital as uninstalled equipment. When it is removed from storage for installation, it becomes part of capital investment.

** Following p. 34, above.

*** P. 3, above.

† Consumer durables in the CIA index are in the machinery sector.

†† Table 6 follows on p. 36. In a 1960 classification of the branches of the food industry, the relative weights in terms of gross industrial production were as follows: meat, 17.5 percent; fish, 7.2 percent; bread baking, confectionery, and macaroni, 20.9 percent; flour and grain, 10.0 percent; sugar, 4.5 percent; milk (including dairy products and cheese), 12.1 percent; fruit and vegetable canning, 3.3 percent; distilled alcoholic beverages, 3.3 percent; tobacco, 1.2 percent; vegetable oils, 8.5 percent; and other, 11.5 percent. 58/

Table 6

Value and Index of Production of Processed Foods in the USSR a/
1950-61

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
	Million 1955 Rubles											
Bread and bakery products												
Refined flour	18,540.4	21,713.3	24,886.1	28,058.9	31,231.8	34,404.6	36,988.3	36,588.6	39,656.2	41,575.0	41,659.2	42,290.4
Coarse flour	11,224.4	10,436.5	10,599.1	9,558.8	10,372.0	10,666.4	8,923.7	8,127.4	7,817.6	7,458.6	7,150.2	6,939.9
Meat and meat products	17,836.7	19,658.5	22,563.8	25,481.0	28,279.1	28,945.9	30,577.2	35,792.4	38,804.9	48,747.3	50,866.7	49,164.0
Fish and fish products	11,665.0	14,207.5	13,678.6	13,943.1	15,733.0	16,994.1	17,451.7	17,034.8	18,295.8	19,089.1	22,221.4	23,370.7
Butter	8,743.1	9,237.5	9,653.8	9,940.0	10,122.2	12,047.7	14,493.7	16,523.3	17,147.8	18,761.1	19,177.5	20,322.4
Sugar, granulated	15,420.2	17,935.1	17,331.8	18,436.3	11,240.2	18,020.0	23,338.5	24,961.2	31,001.9	35,445.3	37,628.8	54,247.0
Sugar, lump	7,279.2	8,919.9	10,560.5	13,000.8	13,239.6	13,343.4	16,520.9	15,970.6	18,338.1	18,909.3	19,885.4	20,830.3
Canned goods (400-gram can equivalents)	6,754.0	8,131.2	9,081.6	10,375.2	12,060.4	14,154.8	15,844.4	16,693.6	17,921.2	19,197.2	21,388.4	24,420.0
Vegetable oil, net	12,388.3	13,866.4	14,711.1	16,840.3	18,388.9	16,347.6	22,225.0	24,917.4	21,609.1	28,401.6	23,351.2	26,941.0
Margarine and compound fats	2,659.8	3,033.8	3,768.0	4,682.3	5,430.4	5,527.3	6,053.8	6,220.0	5,471.9	6,261.6	5,970.6	6,566.3
Wine	4,018.0	4,879.0	6,314.0	7,749.0	9,184.0	9,758.0	11,767.0	12,054.0	13,489.0	15,498.0	17,220.0	18,368.0
Champagne	341.9	420.8	420.8	394.5	526.0	657.5	710.1	815.3	867.9	920.5	1,052.0	1,104.6
Vodka and vodka products	26,627.2	31,248.8	35,870.4	40,449.6	45,028.8	49,565.6	52,109.6	59,444.8	61,649.6	58,215.2	58,554.4	61,776.8
Beer	5,872.9	6,757.4	7,251.4	8,216.7	8,450.2	8,293.0	8,113.4	8,822.8	8,939.6	10,412.3	11,216.0	11,974.8
Cigarettes	7,093.2	8,006.0	8,964.3	10,387.4	11,759.6	11,237.9	11,527.1	12,201.8	13,148.7	13,800.8	13,880.2	14,050.3
Soap	3,933.1	3,696.9	3,783.7	4,232.0	5,142.9	5,191.1	6,102.1	6,463.6	6,579.3	7,008.3	7,104.7	7,292.7
Cheese	1,780.9	2,067.4	2,430.1	2,843.6	3,228.0	3,899.0	4,461.2	4,787.6	5,440.5	5,676.3	6,238.4	6,695.4
Macaroni	1,699.3	1,915.6	2,382.9	2,857.9	3,282.7	3,699.8	3,329.0	3,695.9	3,668.9	3,715.2	3,889.0	3,858.1
Flour, net	32,028.7	36,528.6	39,705.0	41,557.9	46,322.5	49,498.9	51,087.1	54,792.9	59,028.1	61,410.4	57,704.6	61,675.1
Confectionery goods	18,196.7	21,220.4	23,566.0	25,838.2	26,699.5	25,453.4	28,990.2	28,861.9	30,712.7	32,746.8	31,958.8	33,095.0
Whole milk and whole milk products (in whole milk equivalents)	3,177.8	4,564.4	4,807.2	5,281.5	5,990.1	7,307.0	11,338.6	14,505.2	16,876.7	20,093.6	23,168.2	25,274.6
Total	217,280.8	248,444.9	272,330.1	300,125.1	321,711.9	345,013.3	381,952.7	409,275.2	436,465.7	473,343.4	481,285.7	520,257.3
	1955 = 100											
Index	63.0	72.0	78.9	87.0	93.2	100.0	110.7	118.6	126.5	137.2	139.5	150.8

a. Because of rounding, components may not add to the totals shown.

included are tea, malt, starch and molasses, nonalcoholic beverages, yeast, vitamins, and bottling of natural waters.

The category processed foods, as designated by the Soviet branch-of-industry classification, 59/ is comparable to the SIC categories of combined foods, beverages, and tobacco manufactures for the FRB industrial production index.* In the US the Soviet sample of food items accounts for 86 percent of the 1957 value-added weights in the comprehensive FRB categories -- foods, beverages, and tobacco. In the calculated indexes the Soviet definition of the foods industry is followed because it is most consistent with employment used in the 1955 value-added weights. This industry carried 9.3 percent of the 1955 value-added weights.

The processed foods indexes include only industrial processing -- that is, they generally exclude production by households and collective farms.** The industrial physical production series involve considerable intrasector duplication. For example, in 1959, approximately 40 to 45 percent of meat was used for sausage products and canned goods; 60 to 65 percent of vegetable oil went to margarine; and 20 to 25 percent of sugar was consumed in industrial preparations. 61/ The following adjustments have been made to eliminate some of this double counting within the foods sector: flour used in industrial baking, confections, and macaroni is deducted from the flour series; meat and fish in canned goods are deducted from other meat and fish; vegetable oil is reduced by the oil inputs into margarine; and granulated sugar (sakhar-pesok) is net of inputs into lump sugar.***

* Several commodities (soap, vitamins, alcohol, perfumes, and cosmetics), which are classed under the Soviet foods branch, are treated as chemicals in the US. Because more than one-half of the output of ethyl alcohol is used in production of synthetic rubber, plastics, synthetic fibers, lacquers, and other technical uses, 60/ these are counted by CIA as intermediate products in the chemicals sector. Some alcohol is indirectly included in the foods branches as materials inputs into vodkas and alcoholic beverages.

** The sugar and margarine series embrace total production. The butter, vegetable oil, and grape wine series exclude household production only. The meat and cheese series exclude both household and collective farm output. The bread and bakery series exclude household, collective farm, and industrial cooperative production. The scope of the remaining series is not defined.

*** No adjustment has been made for industrial consumption of sugar in other branches of the food industry. One-third of all sugar is estimated to be consumed here, 62/ with more than 50 percent of this sum going to confections, approximately 20 percent to fruit canning, 7 percent to bread products, and 6 percent to nonalcoholic beverages.

B. Soft Goods

The soft goods category or light industry in the Soviet industrial classification includes the following product groups: textiles, leather articles, knit goods, sewn goods, fur, haberdasheries, glassware, and china-earthenware.* 63/ One writer states that one-sixth of all industrial workers are employed in light industry, one and one-half times more than in food and three and one-half times more than in ferrous metallurgy. 64/

The CIA calculated index includes no series representative of fur, leather articles (other than shoes), haberdasheries, glassware, and chinaware. The sample covers the major categories of textiles, garments, and shoes (see Table 7**). The soft goods sector is assigned 16.2 percent of 1955 total value-added weights.

1. Textile Industry (Fabrics)

Within the soft goods sector the largest component is the textile industry, employing 1.3 million workers. The four products used in computing the CIA index are the four basic fabrics produced in the industry -- cotton, wool, linen, and silk (including rayon). The absence of detailed information on the mix within each category of fabric may lead to some understatement in the growth of output of textiles. Output of most expensive high-quality fabrics has been increasing relative to cheaper types. 65/

2. Garments

The calculated index for garments includes sewn garments, knitted wear, and hosiery. The indexes for knitted wear, in two categories (inner wear and outerwear), and hosiery are constructed from the reported number of pieces times the average price per piece. The sewn goods index, however, is the Soviet announced gross value index. For the calculated index the sewn goods gross value index is weighted by a base year net value.

The sewn goods industry,*** with approximately 600,000 workers and a volume of gross production (including the cost of basic

* In addition, some repair and renovation of knitted wear, sewn goods, and shoes are included.

** Table 7 follows on p. 39.

*** Sewn goods articles include the following types from cloth: men's, women's, and children's clothes; uniforms; special clothes; hats; bed clothes; and technical sewn articles. Articles from natural and synthetic leathers and from natural and synthetic furs, sporting goods, and some haberdashery items are excluded. 66/

Table 7

Value and Indexes of Production of Soft Goods in the USSR a/
1950-61

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
	Million 1955 Rubles											
Fabrics												
Cotton	29,755.8	36,173.1	38,492.8	40,671.7	43,197.4	45,820.7	43,056.5	44,389.8	46,698.7	50,026.6	52,443.9	52,834.2
Silk	3,874.3	5,153.6	6,579.0	11,403.6	14,766.2	15,168.2	22,003.1	23,867.2	25,219.5	24,232.6	24,671.2	24,927.1
Wool	16,729.2	19,243.0	20,803.2	22,710.2	26,437.4	27,390.9	29,384.5	31,031.4	33,371.8	35,972.2	38,052.5	39,352.7
Linen	3,248.5	3,551.8	2,869.3	3,235.8	3,223.2	3,438.1	4,461.9	4,904.3	5,561.6	6,130.4	6,522.2	6,231.5
Total fabrics	53,607.8	64,121.5	68,744.3	78,021.3	87,624.2	91,817.9	98,906.0	104,192.7	110,851.6	116,361.8	121,689.8	123,345.5
	1955 = 100											
Index	58.4	69.8	74.9	85.0	95.4	100.0	107.7	113.5	120.7	126.7	132.5	134.3
	Million 1955 Rubles											
Garments												
Sewn garments	4,585.0	5,227.0	5,869.0	6,556.0	7,794.0	8,620.0	9,491.0	9,583.0	10,500.0	11,554.0	12,517.0	13,296.0
Knit outerwear	2,060.2	2,576.3	2,777.5	2,886.8	3,302.4	3,726.6	3,735.4	3,945.3	4,251.5	4,544.6	4,881.4	5,135.1
Knit underwear	3,862.3	5,092.3	6,032.2	7,054.3	8,399.9	8,898.1	8,949.5	9,622.3	10,254.0	11,263.2	12,128.7	12,524.1
Hosiery	3,275.8	4,142.8	4,053.4	4,240.5	4,676.4	5,351.3	5,566.2	5,853.8	6,151.8	6,417.9	6,681.2	6,933.5
Total garments	13,783.3	17,038.4	18,732.1	20,737.6	24,172.7	26,596.0	27,742.1	29,004.4	31,157.3	33,779.7	36,208.3	37,888.7
	1955 = 100											
Index	51.8	64.1	70.4	78.0	90.9	100.0	104.3	109.1	117.2	127.0	136.1	142.5
	Million 1955 Rubles											
Leather footwear	32,047.6	37,762.5	37,415.2	37,588.8	40,288.4	42,814.3	45,308.7	50,092.2	56,264.9	61,553.5	66,194.9	69,968.0
	1955 = 100											
Index	74.9	88.2	87.4	87.8	94.1	100.0	105.8	117.0	131.4	143.8	154.6	163.4
	Million 1955 Rubles											
Total soft goods	99,438.7	118,922.3	124,891.6	136,347.7	152,085.3	161,228.3	171,956.8	183,289.3	198,273.8	211,695.1	224,093.1	231,202.2
	1955 = 100											
Index	61.7	73.8	77.5	84.6	94.3	100.0	106.7	113.7	123.0	131.3	139.0	143.4

a. Because of rounding, components may not add to the totals shown.

materials) in 1958 of 70.7 billion rubles, accounted for the second largest share of light industry. 67/ Beginning in 1957 the USSR employed a net value rather than a gross production index in order to evaluate more accurately enterprise performance in the sewn goods industry.* The net index (stoimost' obrabotki) represented gross production minus the cost of raw materials. An exception to the net valuation was materials for industrial use, such as canvas and belting, which continued to be valued inclusive of the full cost of materials. 69/ The deductions are based on the norms of the cost of processing approved by the former Minister of Light Industry on 25 October 1956 and on the norms approved by other departments as of 1 July 1955. 70/

In 1958 the USSR reported that the value of gross and net production for the sewn goods industry was 70.7 billion and 10.5 billion rubles, respectively. 71/ CIA has accepted the latter figure and has estimated production for other years by moving the 1958 net figure according to the official gross production index for this branch. This methodology may contribute to an upward bias in the index. Until 1957, enterprises, in order to fulfill plans measured in gross value terms, substituted expensive materials, thereby inflating the value of final products. Furthermore, the gross production index for sewn garments included, among other things, the cost of repair of garments and some intermediate products.

3. Leather Footwear

Leather footwear was incorporated into the index according to the official Soviet announcement of the number of pairs produced.

4. Evaluation of Soft Goods Indexes

Light industry is roughly comparable to the combined FRB category of textile, apparel, and leather products. Comparison of the CIA sample for the USSR with US data yields a high coverage ratio. However, the lack of detailed product mix reduces the validity of such a comparison. The calculated indexes for soft goods grew by 7.9 percent and 6.2 percent for the 1952-55 and 1956-61 periods, respectively. Some of the difference may be due to the fact that the Central Statistical Administration includes internal plant turnover (goods to be further processed by the plant) in industrial gross production of the textile industry. 72/

C. Adjusted 1955 Prices

In calculating the index of nondurable consumer goods, physical production series are weighted by average 1955 retail prices including turnover taxes but with some adjustment for distribution charges. Retail

* Including production of the sewing industry as well as enterprises with special sewing shops turning out the basic articles. 68/

prices of goods of industrial origin comprise wholesale prices of industrial enterprises, turnover taxes, and trade margins.* Trade margins (natsenki and torgovlyye skidki) have been removed, so that the adjusted per unit values are net of these items.** To the extent that turnover tax rates vary among the different products, these weights will deviate from ideal factor cost weights.

In the case of food prices, average prices for the categories in the index were estimated from a limited sample of observed prices for individual food items.

D. Alternative Food Indexes

An alternative weighting procedure for an index of processed foods is to use retail sales in the base year. Retail and cooperative sales of food products in 1955 were adjusted for the distribution charges, and sales were estimated for other years by moving the 1955 data by the physical output indexes of the selected commodities. The index derived from this procedure grew by 8.5 percent and 6.6 percent for 1952-55 and 1956-61, respectively, compared with the 8.6 percent and 7.1 percent, respectively, for the indexes weighted by average 1955 retail prices. For a comparison of these two calculated indexes and the official Soviet index, see Table 8.***

VI. Comparison with Other Indexes of Soviet Industrial Production

The preceding sections have treated in considerable detail problems of sample coverage, appropriate weights, reduction of double counting, and qualitative changes in the CIA indexes. In this section the indexes are compared with other measures of Soviet industrial production by Western scholars and with the Soviet official index of gross industrial production. Two comprehensive indexes of Soviet industrial growth for the plan period have been constructed recently -- one by G. Warren Nutter of the National Bureau of Economic Research and one by Norman Kaplan and Richard Moorsteen of the RAND Corporation. Nutter's index relates to a terminal year of 1955, and the Kaplan-Moorsteen index relates to a terminal year of 1958. Although both studies are based on Soviet production figures and are in substantial agreement for civilian industrial production for the prewar period, there are doubts about the representativeness of the sample of products for the postwar period.

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* The shares of enterprise wholesale prices, turnover taxes, and the two trade margins in the total value of state retail sales in recent years have been estimated, respectively, at 50, 40, and 10 percent, but their relative importance in the prices of individual goods differs markedly. 73/

** For details of adjusted prices, see Appendix J of the supplementary volume.

*** Table 8 follows on p. 42.

Table 8

Comparison of Indexes of Production of Processed Foods in the USSR
1950-61

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Index based on 1955 retail sales a/												
1950 = 100	100	113	124	136	145	156	171	183	194	207	213	230
1955 = 100	64	72	79	87	93	100	109	117	124	133	136	147
Index based on the value of the final product b/												
1950 = 100	100	114	125	138	148	159	176	189	200	217	222	240
1955 = 100	63	72	79	87	93	100	111	119	126	137	140	151
Official Soviet index c/												
1950 = 100	100	114	124	138	152	160	176	192	204	224	234	250
1955 = 100	62	71	78	86	95	100	110	120	128	140	146	156

a. Retail sales in 1955 adjusted for distribution charges and moved by physical volume indexes of selected commodities. For details, see Appendix D of the supplementary volume.
b. Production of selected commodities adjusted for intrabranch double counting and valued at 1955 retail prices, adjusted for distribution charges.
c. Value of gross industrial production.

A. CIA, Nutter, and Kaplan-Moorsteen Indexes

A comparison between the CIA, Nutter, and Kaplan-Moorsteen indexes, by sector of industry, for the period 1951-55 is shown in Table 9.*

For purposes of comparison, Nutter's index of all civilian products inclusive of miscellaneous machinery for the 1951-55 period has been selected. 74/ This index grew by 46 percent during this period compared with an increase of 62 percent for the comparable CIA index. In both studies, data are aggregated into sector and over-all indexes by 1955 weights. The CIA items are classified in accordance with Nutter's industrial groups -- that is, consumer durables including radios and television sets are included in consumer goods instead of in the machinery sector, paper products are combined with chemicals, and forest products are combined with construction materials.

The rates of growth of the CIA indexes exceed the rates for the Nutter indexes for most industries. The widest divergence, however, is in machinery. In Nutter's index the coverage for civilian machinery products consists of 35 products of agricultural machinery and transportation equipment and miscellaneous machinery. 75/ The miscellaneous machinery items are boilers, turbines, generators, mining equipment, machine tools, textile equipment, roadbuilding equipment, hoist-transport equipment, and other equipment that one would expect to find in any measure of production of machinery. 76/ When these are aggregated with the agricultural machinery and transportation equipment, the Nutter machinery index increases by only 25 percent from 1950 to 1955. The CIA index of civilian machinery, which includes electronics, civilian aircraft, and shipbuilding data and excludes consumer durables, increases by 47 percent (see Table 9*).

Some of the divergence between the Nutter and CIA indexes is attributable to a significant difference in weights for the major sectors. Nutter's weight for machinery is 29.1 percent, whereas the CIA weight for machinery excluding electronics is 19.5 percent. Nutter does not reduce the machinery weight to exclude arms production and applies this large weight to his very slowly moving machinery index.

The Kaplan-Moorsteen civilian industrial indexes of various product categories are aggregated by 1950 wage bill weights. 77/ In spite of its broader coverage, the CIA index grows only a little faster than the Kaplan-Moorsteen index for the 1951-55 period. The industrial materials and consumer goods sectors, which account for approximately 80 percent of the weight in both indexes, do not diverge significantly. The Kaplan-Moorsteen machinery sector grew by 36 percent**

* Table 9 follows on p. 44.

** Text continued on p. 46.

Table 9

Three Indexes of Civilian Industrial Production in the USSR
1955

1950 = 100

	CIA	Nutter	Kaplan-Moorsteen
Industrial materials	162.8	154	160.1
Ferrous metals a/	169.2	170	167.9
Nonferrous metals b/	194.0	187	
Fuel and electricity	161.6	158	
Electric power	185.2		186.6
Fuel	156.0		167.2
Chemicals (including paper)	183.8	144	
Chemicals c/	188.4		165.3
Paper	160.7		
Construction materials (including wood)	151.9	150	
Construction materials	220.3		190.4
Forest products	132.0		
Lumber, wood, and paper d/	133.4		139.1
Civilian machinery (excluding consumer durables and including added industries)	147.3		
Civilian machinery (excluding electronics, aircraft, and ships)	134.0	125	136.2
Transport equipment e/	108.7	106	118.2 f/
Agricultural machinery g/	133.3	128	122.6 f/
Miscellaneous machinery h/	162.3	154	169.3 f/
Added industries			
Electronics i/	295.4		
Civilian aircraft	326.9		
Civilian shipbuilding	192.6		

Table 9

Three Indexes of Civilian Industrial Production in the USSR
1955
(Continued)

1950 = 100

	CIA	Nutter	Kaplan-Moorsteen
Consumer goods	172.3	161	170.3
Food and allied products	158.8	154	156.7
Nonfoods	179.4		178.9
Textile and allied products	162.1	154	
Consumer durables (including radio and television sets) j/	344.8	283	
Total civilian industrial production	162.2	146	158.1

a. Rolled steel products only are included in the CIA index. Both Nutter and Kaplan-Moorsteen include iron ore, pig iron, steel ingots and castings, and rolled products.
b. Aluminum is included in the CIA index but not in the Nutter index.
c. Plastics and synthetic fibers are included in the CIA index but not in the other two indexes. Nutter's sample of chemicals is considerably smaller than in the other two indexes.
d. For the CIA index, lumber, wood, and paper, which are part of the preceding category, are shown again in order to match the different classification of the Kaplan-Moorsteen index.
e. Including automotive and railroad equipment.
f. The disaggregation of the Kaplan-Moorsteen machinery index is taken from Moorsteen, Richard, Prices and Production of Machinery in the Soviet Union, 1928-58, Cambridge, 1962, pp. 312-313, 382-391.
g. Including tractors and agricultural equipment.
h. Metallurgical, chemical, and petroleum refining equipment are omitted from the Nutter index.
i. Excluding civilian radios and television sets in all indexes. Both Nutter and Kaplan-Moorsteen include a few electronic items in miscellaneous machinery -- chiefly telephones and switchboards.
j. Nutter omits television sets, a very important and fast-growing product in the consumer durables category.

compared with the CIA civilian machinery increase of 47 percent. Kaplan and Moorsteen suggested that their machinery indexes may have understated actual increases in output after 1950 because of their failure to reflect proliferation of new models. 78/

From 1955 to 1958 the two over-all civilian indexes diverge further. The average annual rate of growth for the Kaplan-Moorsteen index is 8.6 percent compared with the 10.2 percent annually for the CIA index (see Table 10*). Because of the usual index number effect, one would expect the prices for early year employed in the Kaplan-Moorsteen study to result in a somewhat faster growth than prices for the later year. However, the broader coverage of faster growing items in the CIA index more than offsets the influence of the price effect.

B. CIA and Other Western Indexes

An entirely different approach to measurement of Soviet industrial activity has been proposed by Francis Seton. Soviet industrial growth was estimated from a regression relation between fuel (in calories), steel, electric power, and over-all industry. The regression equation was based on the relationship between these variables and the official rates of growth in manufacturing in 12 Western countries. A best estimate of Soviet growth in manufacturing and the confidence limits within which the true rate of growth could be expected to lie is calculated. 79/ Seton's estimates represent total industrial activity inclusive of military production. For comparisons of the CIA, Seton, and Kaplan-Moorsteen indexes, see Table 10.*

C. CIA and Official Soviet Indexes

The average annual rates of growth of the calculated CIA indexes are lower than the official rates throughout the 1951-61 period. A comparison of CIA indexes and the official Soviet index for 1960, the latest year of complete data, is shown in Table 11** and, for all years, in the charts, Figures 3 and 4.*** When the official branch-of-industry indexes are aggregated by CIA weights, appreciable differences in the results do not appear in the industrial materials and nondurable consumer goods sectors.† The difference in shape between the official machinery index and the CIA civilian index is due in part to the

* Table 10 follows on p. 47. Other indexes of Soviet industrial production are those by Donald Hodgman 80/ and by Demitri Shimkin and Frederick Leedy. 81/

** Table 11 follows on p. 48.

*** Following p. 46.

† For official Soviet indexes, by branch of industry, see Appendix M of the supplementary volume.

Table 10

Comparison of CIA and Other Indexes of Industrial Production in the USSR
1950-59

1950 = 100

	CIA	Seton a/	Kaplan-Moorsteen
1950	100.0	100.0	100.0
1951	111.7	113.2	111.5
1952	119.1	125.6	118.9
1953	130.8	138.5	130.3
1954	146.2	151.0	143.6
1955	162.1	167.0	158.1
1956	179.6	183.2	171.7
1957	198.7	196.9	188.4
1958	216.7	213.3	202.3
1959	235.3	236.5	

a. Midpoint between the upper tolerance limits of Seton's method 1 and the lower tolerance limits of his method 2. The later method substitutes consumption of electric power in industry for total electricity input.

divergent trend in military products, which are included in the official index. To a lesser extent this is true of total industry also (see Table 12*). Aside from the known difference in coverage -- for example, military items -- the official index differs from the CIA aggregate indexes in (1) comprehensive coverage including not only new products but also qualitative changes; (2) double counting through the use of gross price weights at all stages of production; and (3) inclusion of items -- for example, repair -- which normally are not counted as output, and inclusion of inventories, mainly unfinished production.

The deficiencies of our sample coverage have been discussed in Section II. Some of the difference between the official and CIA indexes might be attributed to the use of late year weights (1955) throughout for the latter indexes. The official indexes were calculated in 1952 prices until the 1 July 1955 price regulation became effective at the beginning of 1956. It appears that the official index in 1955 prices was merely linked to the earlier official index in 1952 prices. In**

* Table 12 follows on p. 50.
** Text continued on p. 51.

Table 11

Comparison of CIA and Official Soviet Indexes of Industrial Production in the USSR, by Branch of Industry 1960

	1955 = 100		
	CIA Index of Civilian Production	Official Soviet Index	Official Soviet Index as a Percent of the CIA Index
Industrial materials	153.8	164.9 a/	107.2
Electric power	171.8	185.7 b/	108.1
Fuel	148.3 c/	150.0 d/	101.1
Coal	132.8		
Petroleum products and natural gas	208.3		
Ferrous metals	144.2 e/	152.8 f/	106.0
Nonferrous metals	142.0	151.3 g/	106.5
Forest products	119.2	144.5 h/	121.2
Paper products	136.5	141.9	104.0
Construction materials	229.5	235.7	102.7
Chemicals	176.7	179.3 i/	101.5
Machinery			
Civilian machinery	172.5 j/	194.5 k/	112.8
Nondurable consumer goods	139.2	142.2 l/	102.2
Processed foods	139.5	146.2	104.8
Soft goods	139.0	139.9 m/	100.6
Total industry	154.3	165.7 n/ 164.0 o/	107.4 106.3

a. Official branch indexes weighted by CIA 1955 value-added weights (see Table 1, p. 2, above).
b. Gross industrial production for all electric and thermal power production.
c. Weighted index of coal and petroleum and natural gas products.

Table 11

Comparison of CIA and Official Soviet Indexes
of Industrial Production in the USSR
1960
(Continued)

d. Gross industrial production of the fuel industry, which includes coal, petroleum, peat, shale, and natural gas.
e. Based on rolled steel products.
f. Including ore extraction as well as all processing stages of ferrous metallurgy.
g. Including ore extraction. The 1960 figure was estimated on the basis of Seven Year Plan goals.
h. Logging and woodworking industry.
i. Including rubber-asbestos industry.
j. Including consumer durables and electronics.
k. Machine building and metalworking including military machinery.
l. Official branch indexes for light and food industries weighted by CIA 1955 value-added weights.
m. Light industry including cotton, wool, silk, knit goods, leather, fur, and shoes.
n. Official indexes for food and light industry, machine building and metalworking, and industrial materials weighted by CIA 1955 value-added weights.
o. Official gross value index for all industry.

USSR

Figure 3

CIA INDEXES AND OFFICIAL SOVIET INDEXES OF INDUSTRIAL PRODUCTION, BY SECTOR, 1950-61

(1955=100)

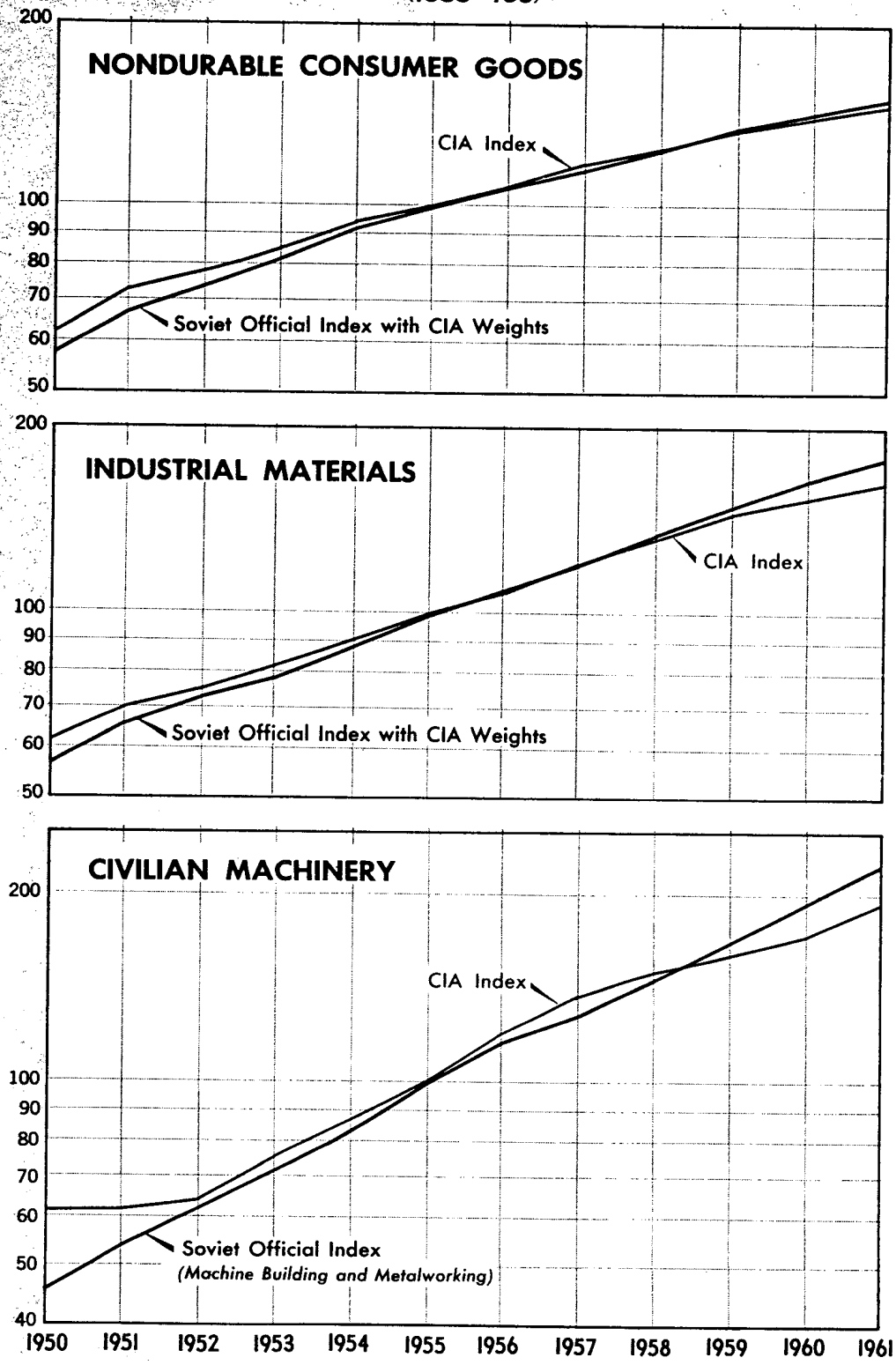

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Figure 4

USSR

CIA INDEXES AND OFFICIAL SOVIET INDEXES OF AGGREGATE INDUSTRIAL PRODUCTION

1950-61

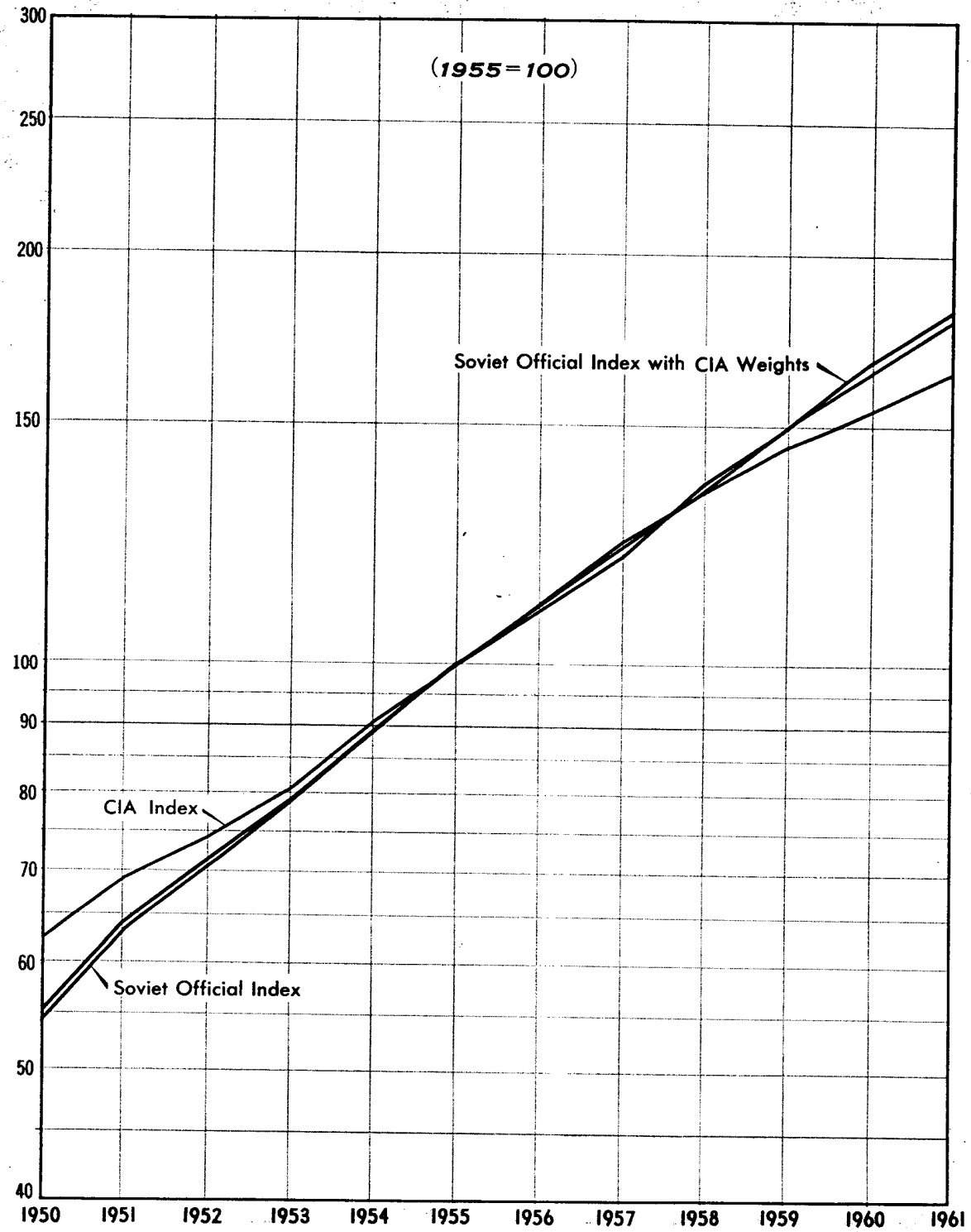

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Table 12

Comparison of CIA and Official Soviet Indexes of Industrial Production in the USSR
1950-61

1955 = 100

	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
Industrial materials												
CIA index	61	70	75	81	90	100	109	120	132	145	154	162
Official Soviet index	57	66	73	79	89	100	108	120	135	150	165	179
Machinery												
CIA index	62	62	64	75	86	100	119	137	149	159	172	192
Official Soviet index a/	46	54	62	72	84	100	114	129	147	169	194	223
Nondurable consumer goods												
CIA index	62	73	78	85	94	100	108	116	124	134	139	146
Official Soviet index b/	58	68	74	82	93	100	108	115	124	135	142	150
Total industry												
CIA index	62	69	74	81	90	100	111	123	134	145	154	164
Official Soviet index	54	63	70	79	89	100	111	122	134	150	164	179
Official Soviet index c/	55	64	71	79	89	100	110	121	135	150	166	181

a. Machine building and metalworking including military machinery.
b. Official indexes for food and light industry weighted by CIA 1955 value-added weights.
c. Weighted by CIA 1955 value-added weights.

addition, the official index is suspected of having incorporated into it the high temporary prices established for new products.*

The influence of different weight bases, if any, appears to be confined to weights within major industries rather than between them. As a test, the official branch of industry indexes were aggregated by CIA value-added weights. The over-all index calculated in this manner does not deviate significantly from the official index (see Table 12** and the charts, Figures 3 and 4***).

The official index of gross industrial production (valovaya produktsiya promyshlennosti) includes (1) value of final product and semifabricates released to the outside; (2) net change in unfinished production for branches of machine building with long cycles of production†; (3) changes in the stock of semifabricates produced for enterprise own use; (4) value of special models, equipment, and appliances produced for own use; and (5) any other work of an industrial nature. 84/ Because each enterprise's activity as defined above is weighted into the gross industrial production at full value, the magnitude of the nonfinal product component of the output of enterprises and the extent of double counting in the aggregation are the areas of uncertainty.††

A recent Soviet study††† showed net product indexes calculated by norms of cost of processing,‡ with higher rates than gross indexes. One would expect the net indexes to exceed the gross indexes where the requirements for materials inputs are decreasing relative to output of final product. The net measures were below the gross for ferrous metals,

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* Production of new products in the machine building sector accounts for approximately 30 percent of annual production. 82/

** P. 50, above.

*** Following p. 46, above.

† Through 1961, all machine building and repair enterprises and those turning out metal construction items were permitted to include the full cost of changes in unfinished production in gross industrial production. Beginning in 1962 a new decree allowed inclusion of unfinished production only for those products whose production cycle was more than 2 months. The change perhaps was related to the fact that different enterprises not fulfilling the plan for output of final goods were able to fulfill the goal for industrial production in general. 83/

†† The official chemicals indexes include all products that are final to an enterprise as well as the internal plant turnover, which usually is excluded from gross industrial production. 85/

††† Under the auspices of the Central Statistical Administration, Gosplan, and Gosekonomsovet. 86/

‡ Apparently based on the factor cost concept.

fuel, and light industry. For MBMW, chemicals, wood and paper, construction materials, food, and over-all industry, the net indexes showed a higher rate of growth than the gross. Without further information these results cannot be evaluated.

VII. Comparison of US and Soviet Industrial Growth and Structure

A. Comparative Growth

As measured by the calculated CIA index for 1947-61, Soviet civilian industrial production in 1961 was 494, if 1947 is taken as 100 -- an average annual rate of growth of 12.1 percent. Also during 1948-61, US industrial production as measured by the FRB index grew by 67 percent -- an average annual rate of growth of 3.7 percent (see Table 13* and the chart, Figure 5**). For the period 1951-61 the average annual increases were 9.3 percent for the USSR and 3.5 percent for the US.

To compare industrial production by major sector and by individual industry in the US and the USSR, a US index comparable in coverage to the index for the USSR was calculated for the period 1947 to 1959. The comparable sample matches as nearly as possible the sample of commodities on which the Soviet industrial production index is based and accounts for 68 percent of the 1957 value-added weights in the FRB index. The US commodities have been distributed into subindustry and major group categories to match the Soviet classification. The comprehensive FRB index for the US was first divided into four sectors -- industrial materials, machinery, consumer goods, and goods not included in the comparison accounting for 39.57, 34.80, 17.96 and 7.67 percent, respectively, of 1957 value-added weights. The items not appearing in the Soviet sample were eliminated. The Soviet sample coverage for industrial materials was 72 percent, compared with the comprehensive FRB; for machinery 68 percent; and for consumer goods 88 percent. Because of the difficulties of accurately disaggregating major subgroups of the US metalworking industries and of estimating their direct weights, the degree of sample coverage may be somewhat lower for machinery.*** Table 13* shows that the comprehensive FRB index and the comparable sample index are nearly identical in their description of movements in US industrial production. The latter index employs 1957 (late year) prices throughout rather than the linkage of early and late prices that the FRB followed in calculating its comprehensive index.

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* Table 13 follows on p. 53. For a description of the extension of the calculated USSR index from 1950 back to 1947 by a smaller sample of products, see Appendix N of the supplementary volume.

** Following p. 52.

*** Some SIC categories such as special industry and general heavy industry machinery could not be precisely disaggregated.

Figure 5

US AND USSR

INDEXES OF INDUSTRIAL PRODUCTION

1947-61

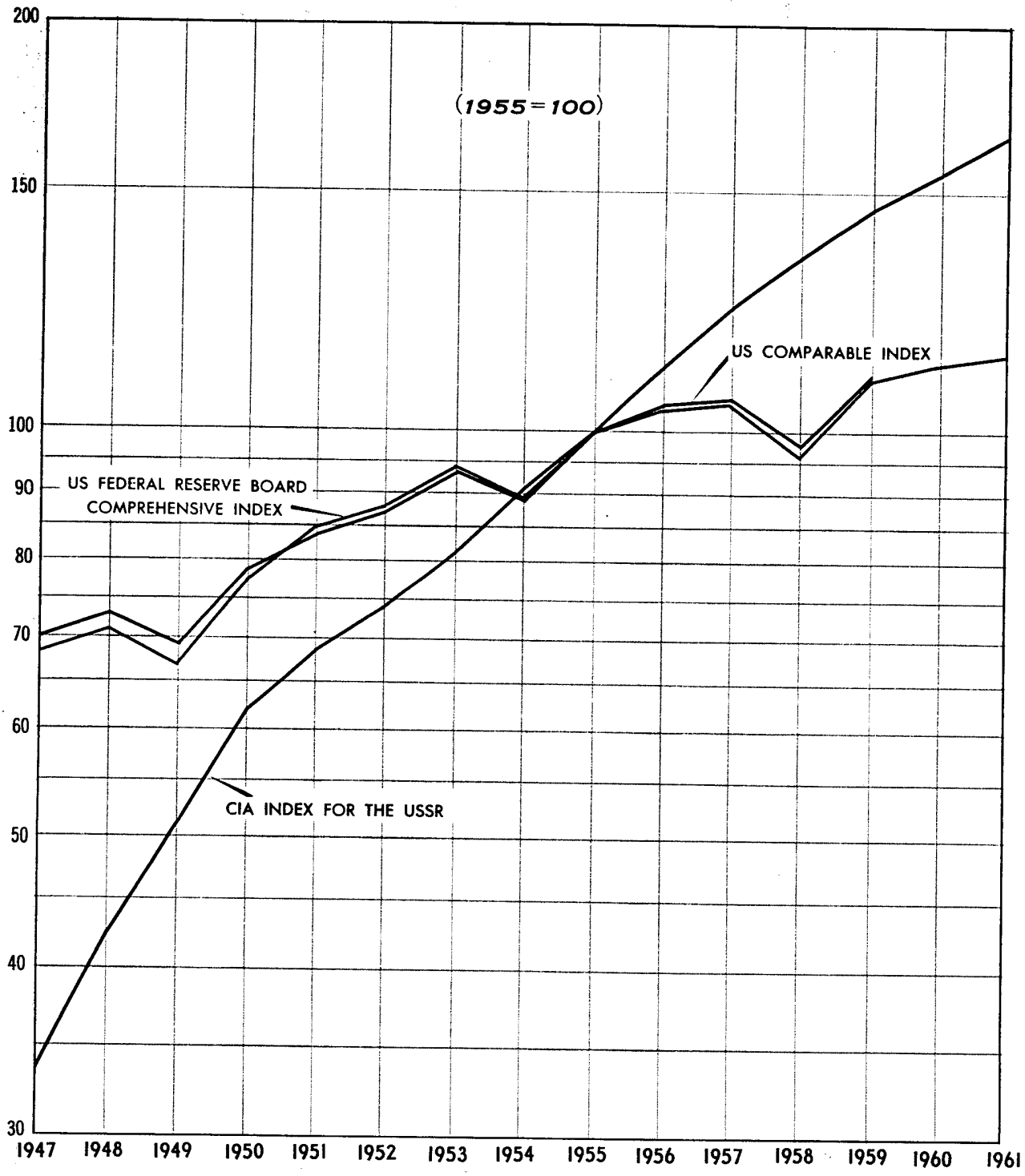

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Table 13

Comparison of Indexes of Industrial Production in the US and the USSR
1947-61

1955 = 100

	Industrial Materials		Metal Fabricating [a]		Nondurable Consumer Goods		Industrial Production		
	US [b]	USSR	US [b]	USSR	US [b]	USSR	US Comparable Index	US Federal Reserve Board Comprehensive	USSR
1947	68.1	37.2	60.1	21.4	86.1	35.5	69.8	68.0	33.3
1948	72.0	45.9	64.1	31.5	86.6	45.1	72.9	70.8	42.5
1949	66.1	53.7	60.3	43.3	85.3	53.2	68.8	67.0	51.3
1950	77.6	61.4	69.1	61.8	90.7	62.2	78.0	77.5	61.7
1951	84.5	69.8	77.6	62.0	91.0	73.1	83.8	84.2	68.9
1952	83.8	75.3	85.2	64.3	93.3	78.0	86.7	87.3	73.5
1953	89.5	80.8	96.9	75.1	94.5	85.5	93.4	94.5	80.7
1954	87.0	90.1	87.3	86.4	93.9	93.9	88.9	88.8	90.2
1955	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1956	104.4	108.9	102.9	118.6	103.7	108.1	103.8	103.4	110.8
1957	104.6	119.8	106.2	137.4	103.4	115.5	104.9	104.2	122.6
1958	99.6	131.8	90.4	148.8	104.3	124.3	97.7	97.0	133.7
1959	111.2	144.9	105.6	159.4	114.2	133.5	110.1	109.3	145.2
1960		153.8		172.5		139.2		112.5	154.3
1961		161.7		191.9		146.1		113.7	164.5

a. Metal fabricating includes machinery and other metal products. In the USSR index, only machinery is represented.
b. US comparable sample index.

Comparative trends in the three major sectors (industrial materials, machinery, and nondurable consumer goods) also are shown in Table 13.* Throughout the postwar period each of these sectors in the USSR has grown faster than in the US.

Rates of growth for the individual branches of industry, as measured by the USSR calculated indexes and the US comparable coverage indexes, are compared in Table 14.** The relative rates of growth for 1951-59 indicate that with the exception of production of electric power and chemicals the Soviet industries grew at a pace at least twice as fast as the US.

B. Comparative Structure

Comparing the 1957 value-added weights of the US and the 1955 value-added weights of the USSR the various sectors and branches of industry account for the percentages shown in Table 15.***

The important difference is in coverage of machinery, where production of military hardware is excluded and an adjustment has been made for inclusion of aggregate electronics on the Soviet side but where data have not been treated so precisely for the US. US ordnance and accessories (including Navy shipyards) have been excluded, but military aircraft and production of atomic energy are included. There is a striking variation in the composition of the materials sector for the two countries. For the USSR, forest products and coal account for 45 percent of the value-added weight in industrial materials, and for the US the chemicals and petroleum industries account for 46 percent of the value-added weights in the industrial materials sector.

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* P. 53, above.
** Table 14 follows on p. 55.
*** Table 15 follows on p. 56.

Table 14

Average Annual Rates of Growth of Industrial Production in the US and the USSR 1951-59

Percent

	US [a]	USSR
Industrial materials	4.1	10.0
Electric power	9.1	12.5
Coal	-3.4	7.7
Petroleum products and natural gas	3.3	14.7
Ferrous metals	-0.5	9.4
Nonferrous metals	4.5	10.8
Forest products	0.1	5.7
Paper products	4.1	8.6
Construction materials	4.7	17.9
Chemicals	7.0	13.1
Civilian machinery	4.8 [b]	11.1
Nondurable consumer goods	2.6	8.9
Processed foods	2.5	9.0
Soft goods	2.6	8.8
Total industry		
Comparable coverage	3.9	10.0
US Federal Reserve Board comprehensive	3.9	

a. Average annual rates of growth of US individual sectors are derived from the indexes of comparable coverage. The comparable groups account for 67.8 percent of the comprehensive index. See Table 13, p. 53, above.

b. Including military aircraft and other noncivilian goods.

Table 15

Comparison of Value-Added Weights for Industrial Production in the US and the USSR

Percent

	"Comparable" US 1957 Weights	Soviet 1955 Weights
Industrial materials	41.9	52.3
Electric power	5.5	3.3
Coal	1.9	9.3
Petroleum products and natural gas	10.0	2.4
Ferrous metals	4.3	6.0
Nonferrous metals	0.8	4.8
Forest products	1.7	14.2
Paper products	4.6	0.8
Construction materials	3.9	6.8
Chemicals	9.2	4.7
Machinery	34.7	22.2
Machinery, excluding electronics		19.5
Electronics		2.7
Nondurable consumer goods	23.4	25.5
Processed foods		9.3
Soft goods		16.2
Total of represented industries	100.0	100.0

APPENDIX

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