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APPENDIXES

NOTE: In these appendixes the sources are cited by an italicized numbering code followed by the page number. The sources are arranged by that code in the bibliography at the end of the book. In the case of articles, citations are given by an italicized number identifying the periodical or newspaper, followed by the year, issue, and page number.

APPENDIX A

Technical Notes

Technical Note 1 (Chapter 2): Indicators of the Quality of Cotton Fabrics

FINENESS OF YARN

Cotton yarn is classified by "yarn number," which indicates the length of yarn that weighs a specified amount. Hence the finer the yarn, the higher the yarn number. In the Soviet Union, a metric yarn number is used, specifying the number of meters of yarn weighing one gram. In the United States and the United Kingdom, the yarn number used specifies the number of hanks (each 840 yards long) that weigh a pound. The American or British count is multiplied by 1.6933 in order to translate it into an equivalent Soviet count. According to various Soviet sources, the average yarn number has run as follows in the Soviet Union:

1910	47.1	1939	41.5
1913	52	1940	38.9
1928	48	1946	32.7
1930	47.5	1950	38.5
1931	45.5	1951	39.0
1932	41.6	1952	39.1
1933	39.9	1953	39.2
1934	39.6	1954	39.3
1935	40.9	1955	39.5
1936	43.4		
1937	40.6		

SOURCE: 1910: *96*, 137; 1913, 1939: *331*, 1939, No. 5, 2; 1928: *370*, 1929, No. 12, 36; 1930–1931, 1935–1936: *363*, 1938, No. 1, 77; 1932–1934: *222*, 198; 1937: *339*, 1940, No. 11–12, 14; 1940: *394*, 1947, No. 4; 1946: *394*, 1952, No. 11, 2; 1950–1955: *180*, 338. Alternative data are given as follows: 40 for 1935 in *363*, 1937, No. 2, 67; 39.3 for 1937 in *363*, 1940, No. 7, 59; 32.8 for 1946 in *394*, 1947, No. 4.

Average yarn numbers for the United States and the United Kingdom can be derived from frequency distributions of classes of yarn numbers by weight.[1] For the United States, the average yarn number in metric units was around 39 in 1939 and 37 in 1947; for the United Kingdom,

[1] See, e.g., *609*, 1947, II, 161, 303; *600*, 159; and *648*, 137.

around 51 in 1937 and 48 in 1947. Rostas gives slightly lower figures for both countries for 1937,[2] but his average numbers do not seem to be consistent with the mentioned frequency distributions, at least when yarns made from waste are excluded.

CLOSENESS OF WEAVE

Closeness of weave may be measured by "thread count," which is the number of threads (strands of yarn) contained in both the warp and the woof of a specified area of fabric. An average thread count may be derived by multiplying the average yarn number by the average density of the fabric. For instance, the average yarn number for Russian fabrics was 52 meters per gram in 1913, and the average density was about 174 grams per square meter; hence there were about 9,048 threads (each a meter long) per square meter, or about 90.5 per square centimeter, or about 230 per square inch.

According to various Soviet sources, the average density of cotton fabrics was as follows:

	Grams per Linear Meter	*Grams per Square Meter*
1913	120.3	174
1927/28	107.4	156
1930	100.2	145
1931	103.3	150
1932	106.6	154
1933	107.1	155
1934	114.0	165
1940	121.9	177
1946	135.5	196
1950	123	178
1951	123	178
1952	123	178
1953	125	181
1954	126	183
1955	127	184

SOURCE: 1913: *567*, Part 1, series 1208.6, col. 1, and series 1205.1, col. 4; 1927/28: *323*, 1929, No. 7–8, 34; 1930–1934: *215*, 206; 1940, 1946: *394*, 1947, No. 4, 7; 1950–1955: *180*, 338. To convert from linear to square meters, average width of fabrics taken as 69 cm (see *410*, 1956, No. 7, 43, and *394*, 1950, No. 7, 9).

[2] *648*, 131.

These data, taken along with those in the preceding section giving average yarn numbers, imply the following thread counts (number of threads per square centimeter):

1913	90.5	1933	62.0	1951	67.6
1928	74.9	1934	66.0	1952	69.6
1930	69.6	1940	69.0	1953	71.0
1931	69.0	1946	64.7	1954	71.9
1932	64.7	1950	68.5	1955	72.7

Average thread counts can be similarly estimated for the United States and the United Kingdom. There are, however, substantial differences in estimates based on alternative measures of the weight of fabrics. Thus, for 1939 the average density of American fabric is about 154 grams per square meter on the basis of the recorded weight of broad woven goods, and about 171 grams per square meter on the basis of the weight of cotton yarns produced; for 1947, the average density is about 181 and 164, respectively.[3] Similarly, for 1937 the average density of British cloth is about 135 grams per square meter on the basis of the weight of yarn consumed, and about 196 on the basis of the weight of yarn produced; for 1947 the average density is about 174 and 242, respectively[4] (data for 1947 converted to square measure on the basis of the average width of cloth in 1937, which may be derived from data in Rostas).[5]

Using these data and the average yarn numbers for the preceding section, we may derive the following estimates of average thread counts for the United States and the United Kingdom (number of threads per square centimeter):

United States		*United Kingdom*	
1939	60 to 67	1937	69 to 100
1947	61 to 67	1947	84 to 116

OTHER CHARACTERISTICS OF QUALITY

The number of constructions of cotton cloth fell from 1,300 in the pre-revolutionary period to 260 in 1929/30, rising to 498 in 1949.[6] In an investigation of 183 enterprises conducted in 1955, it was found that 494

[3] *609*, 1947, II, 161 ff.
[4] *600*, 159 f.
[5] *648*, 130.
[6] *323*, 1929, No. 9, 18, and 1930, No. 3; and *265*, II, 79 ff.

constructions of gray goods were being produced, that 70 of these accounted for 77 per cent and 4 (*mitkal'*, *biaz*, sateen, and gauze) for 54 per cent of total production. It was also found that 68 counts of yarn were produced, that fewer than 300 tons were produced for each of 20 counts and fewer than 50 tons for each of an additional 8 counts, and that 95 per cent of total production was accounted for by 15 counts.[7]

In the United States about 4,000 constructions of gray goods have been produced from time to time and about 2,500 regularly.[8] There are

TABLE A-1

FREQUENCY DISTRIBUTIONS OF GROWTH RATES FOR FIXED AND TOTAL SAMPLES OF SOVIET INDUSTRIES, 1913–1955 AND 1928–1955

AVERAGE ANNUAL GROWTH RATE[a] (PER CENT)	NUMBER OF INDUSTRIES					
	Fixed Sample			*Total Sample*		
	Consumer Goods	All Others	Total	Consumer Goods	All Others	Total
			1913–1955			
−1 to 1	4	1	5	4	3	7
1 to 3	11	3	14	12	4	16
3 to 5	6	8	14	9	14	23
5 to 7	2	14	16	4	16	20
7 to 9	4	3	7	4	7	11
9 to 11		3	3		4	4
11 to 13		5	5	1	6	7
13 to 15		3	3		4	4
15 to 17	1	2	3	1	2	3
17 to 19					1	1
Totals	28	42	70	35	61	96
			1928–1955			
−3 to −1	1		1	1		1
−1 to 1					3	3
1 to 3	7	1	8	7	4	11
3 to 5	9	3	12	12	4	16
5 to 7	4	6	10	7	9	16
7 to 9		8	8		16	16
9 to 11	1	10	11	2	12	14
11 to 13	4	2	6	5	5	10
13 to 15	1	3	4	1	9	10
15 to 17		2	2	1	2	3
17 to 19		3	3		4	4
19 to 21		3	3		6	6
21 and over	1		1	1	6	7
Totals	28	31	69	37	80	117

[a] Calculated from output in terminal years by the compound interest formula.

[7] *394*, 1956, No. 1, 6 ff.
[8] *599*, 487–548.

about 150 counts of yarn, 30 to 40 accounting for 95 per cent of output in terms of weight.[9]

Technical Note 2 (Chapter 4): The Fixed Sample of Seventy Soviet Industries

In Table A-1, the frequency distributions of growth rates over the periods 1913–1955 and 1928–1955 are compared for the fixed sample of industries used in our analysis of growth trends (see Table 8) and for the total sample of industries with the necessary data in Appendix B. The distributions for the fixed and total samples are similar in structure. The major concentrations of industries (modes) tend to occur at lower class intervals for the total than for the fixed sample, but the median growth rates are almost the same. Thus, for 1913–1955, the median growth rates are 5.3 and 5.2 per cent for the fixed and total samples, respectively; for 1928–1955, 8.0 and 8.8 per cent. In brief, the fixed sample seems to be an adequate representation, for the purposes of our analysis, of the total sample at our disposal.

Estimated 1928 value added for sixty-seven of the seventy industries is given in Table A-2. In general, value added applies only to the most advanced stage of fabrication for each relevant item reported separately in Soviet statistics. In the following cases, value added has been estimated for all stages of fabrication within the bounds of industry: soda ash, caustic soda, sulfuric acid, motor vehicle tires, cement, construction gypsum, construction lime, rails, window glass, and rubber footwear. The value added for these sixty-seven industries, estimated in this way, amounts to 73 per cent of the total value added for Soviet industry (excluding repair shops) in 1927/28 (see Table A-43).

Growth trends for the seventy industries are pictured in Chart A-1.

Technical Note 3 (Chapters 5–7): NBER Indexes of Soviet Industrial Production

GENERAL DESCRIPTION OF METHODS OF CONSTRUCTION

The production indexes constructed in this study are described in some detail in Chapter 5, and these notes are intended merely to fill in minor technical details. The products included in the different indexes are given in Tables D-10 and D-11; the weights, in Tables D-8 and D-9.

In the case of industrial materials and finished civilian products, the production index is constructed for each year by multiplying the output of each product by its unit value (net of the cost of nonindustrial materials

[9] *614*, 18, and *609*, 1939, 1947, and 1954.

TABLE A-2

ESTIMATED VALUE ADDED FOR FIXED SAMPLE OF SOVIET INDUSTRIES, 1928[a]
(million rubles)

Code		Value Added	Code		Value Added
101	Pig iron	77.4	1101	Steam boilers	4.8
102	Rolled steel	73.7	1103	Steam turbines	0.6
103	Steel ingots	135.7	1105	Diesel engines	3.9
704	Iron ore	27.6	1110	Power transformers	4.0
202	Copper	16.5	1210	Machine tools	2.7
203	Lead	0.9	1214	Looms	1.7
204	Zinc	0.9	1501	Flour	511.5
301	Electric power	274.4	1502	Macaroni	20.8
303.1	Coke	28.0	1503	Butter	61.0
305	Crude petroleum	272.9	1504	Vegetable oil	71.9
306	Natural gas	14.4	1506	Meat	120.7
308	Peat	31.1	1507	Fish catch	194.2
310	Coal	295.5	1508	Soap	44.8
401	Soda ash[b]	15.9	1509	Salt	11.7
402	Caustic soda[b]	7.1	1510	Raw sugar consumption	210.8
404	Sulfuric acid[b]	21.5	1511	Starch and syrup	9.2
405	Mineral fertilizer	2.8	1513	Canned food	12.2
410	Red lead	1.7	1514	Beer	52.2
412	Synthetic dyes	10.7	1515	Cigarettes	61.2
416	Paper	58.0	1516	Low-grade tobacco	14.3
418	Motor vehicle tires[b]	7.1	1517	Matches	20.6
501	Red bricks	64.4	1518	Vodka	74.9
506	Cement[b]	61.0	601	Crude alcohol	34.0
507	Construction gypsum[b]	2.6	1601	Boots and shoes	401.0
508	Construction lime[b]	8.1	1602	Rubber footwear[b]	112.5
509	Industrial timber hauled	577.0	1604	Cotton fabrics	909.5
510	Lumber	136.2	1607	Linen fabrics	102.3
513	Roll roofing	4.4	1609.1	Pure silk fabrics[c]	13.3
516	Asbestos shingles	3.6	1609.2	Rayon and mixed fabrics[c]	29.6
518	Rails[b]	4.4	1611	Woolen and worsted fabrics	217.1
519	Window glass[a]	90.6	1614	Felt footwear	81.2
904	Steam locomotives	17.9	1701	Bicycles	0.9
905	RR freight cars	24.6	1707	Household sewing machines	4.5
906	RR passenger cars	3.6			
				Total, 67 industries	5,787.8

NOTE: Unless otherwise noted, value added is taken from Table D-9, prorated within groups wherever necessary by value of output computed from data in Tables B-2 and D-8.

[a] Includes 67 of the 70 industries. Clocks and watches, roofing tiles, and sausages are not included for lack of data.

[b] Output in Table B–2 times unit value in Table D–8.

[c] Value added for silk and rayon fabrics prorated by value of output. Outputs from Table B–2; unit value of pure silk fabrics taken as 5 rubles per meter from 1913 prices (2 rubles, as given in *375*, 1933, No. 2) and 1927/28 price index for silk products (251 on 1913 = 100, from *315*, 1928, September, 23 f); unit value of rayon and mixed fabrics from price of cotton fabrics and price ratio of rayon yarn to cotton yarn.

CHART A-1
Physical Output Trends of Fixed Sample of Seventy Soviet Industries

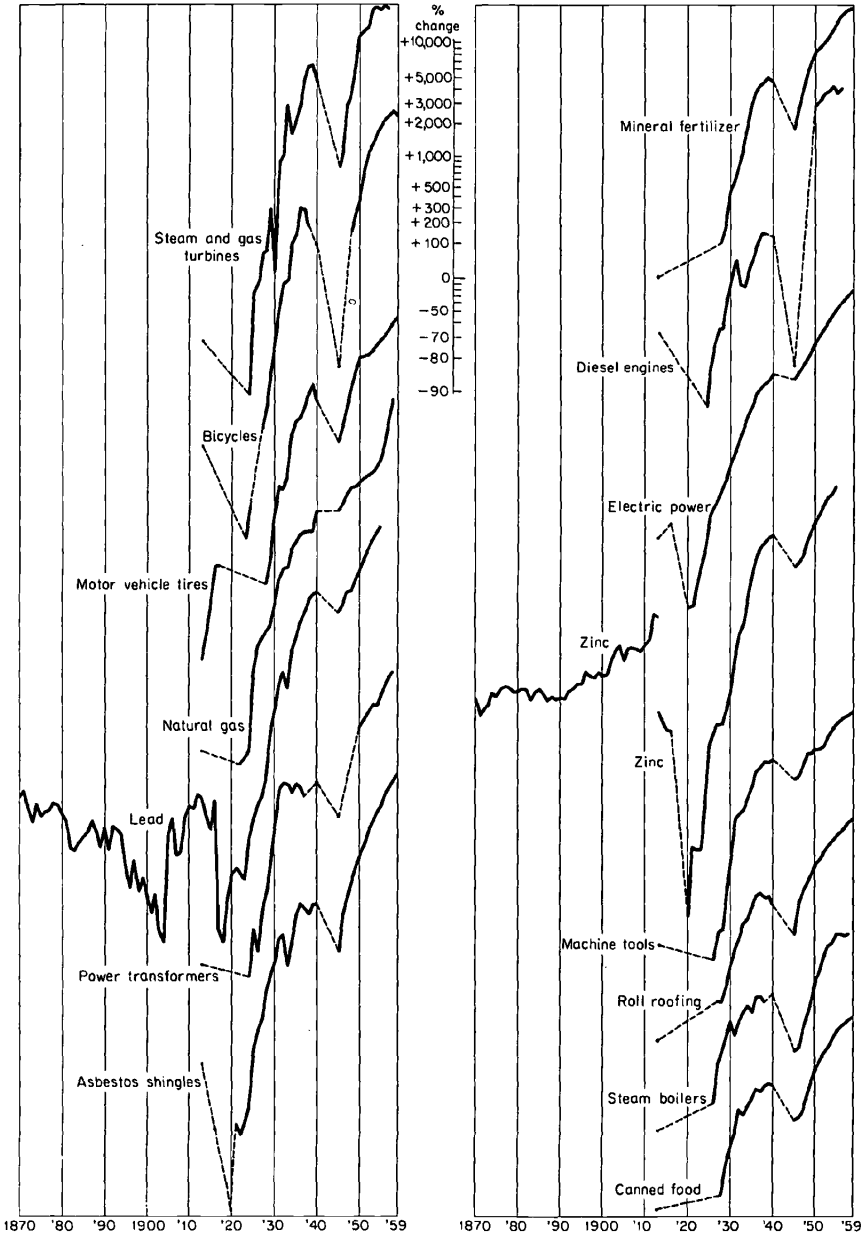


CHART A-1 (continued)

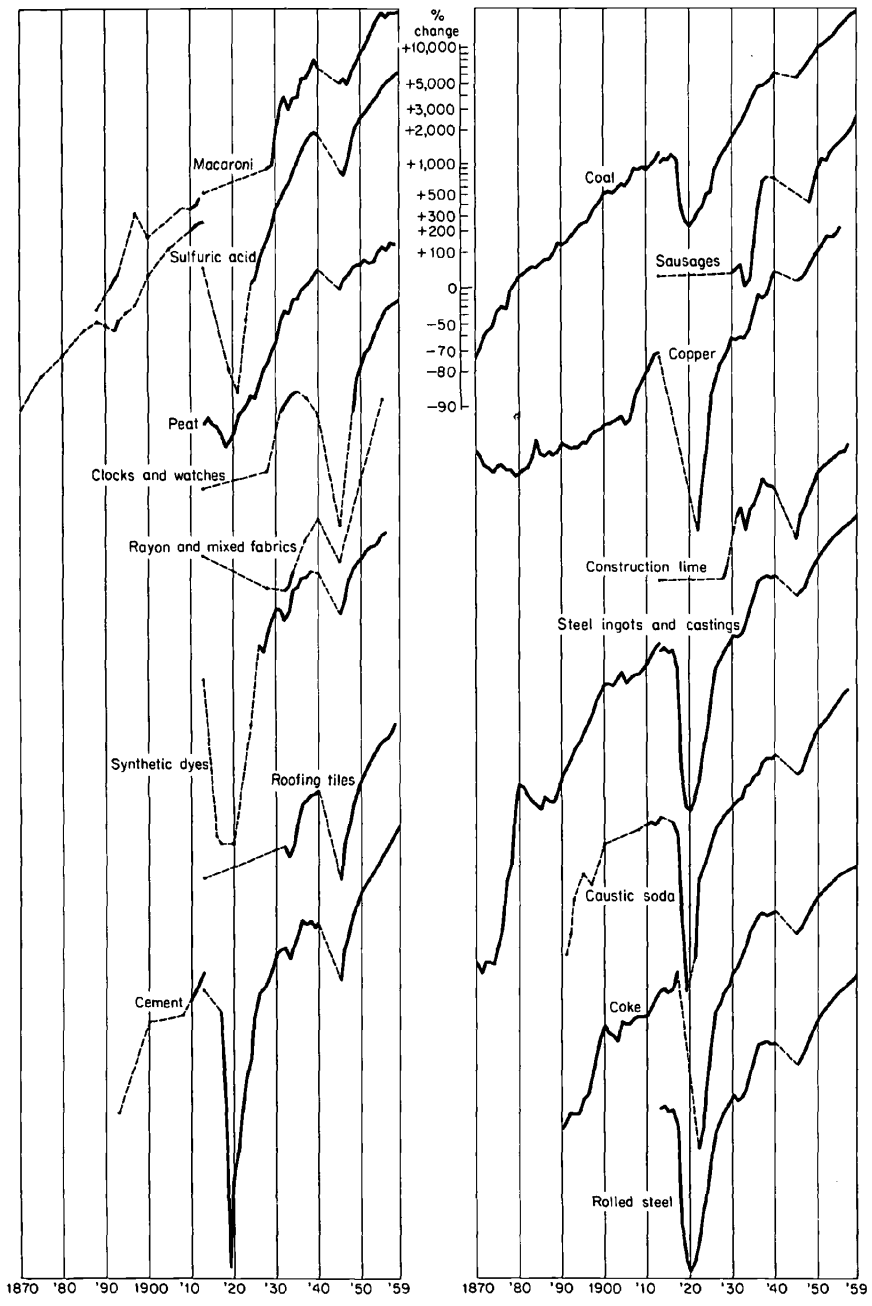


CHART A-I (continued)

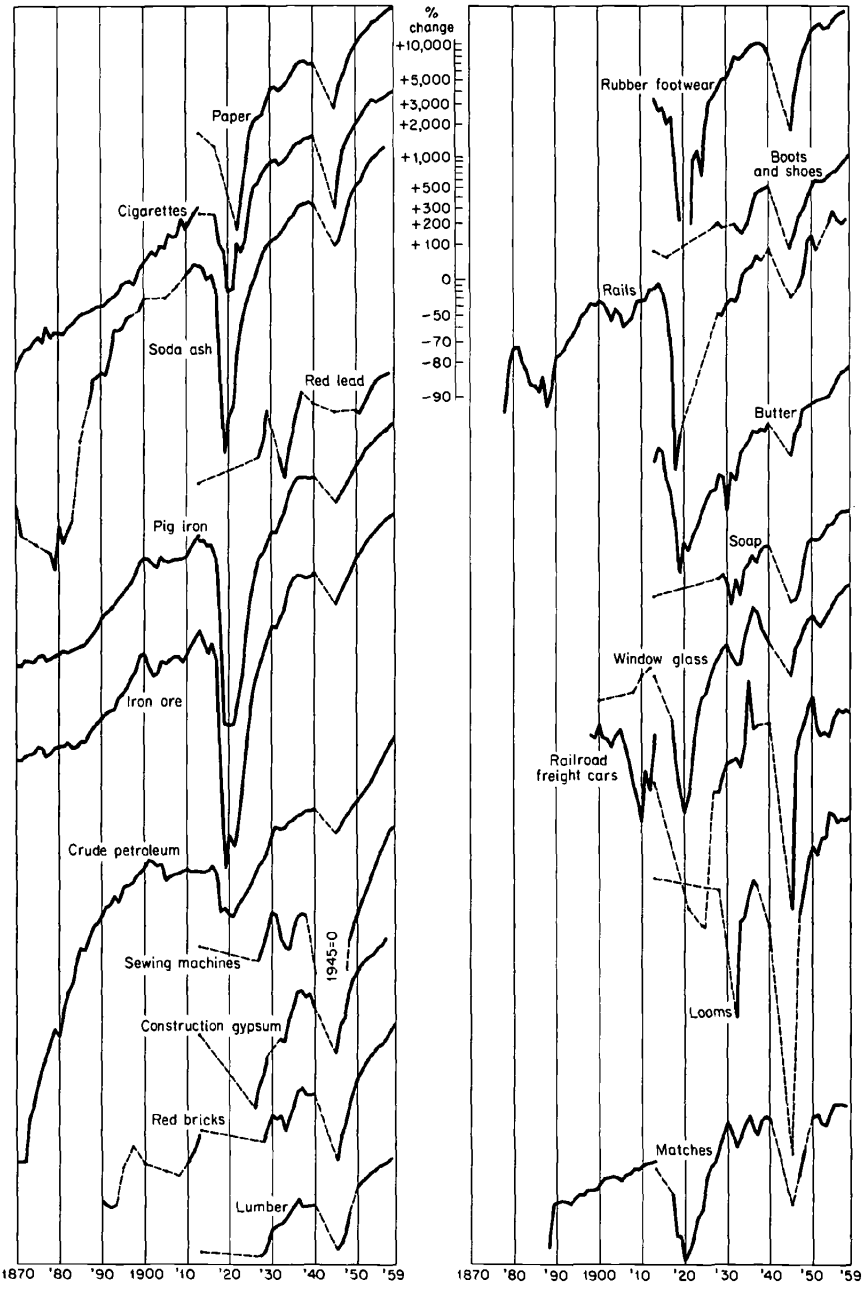
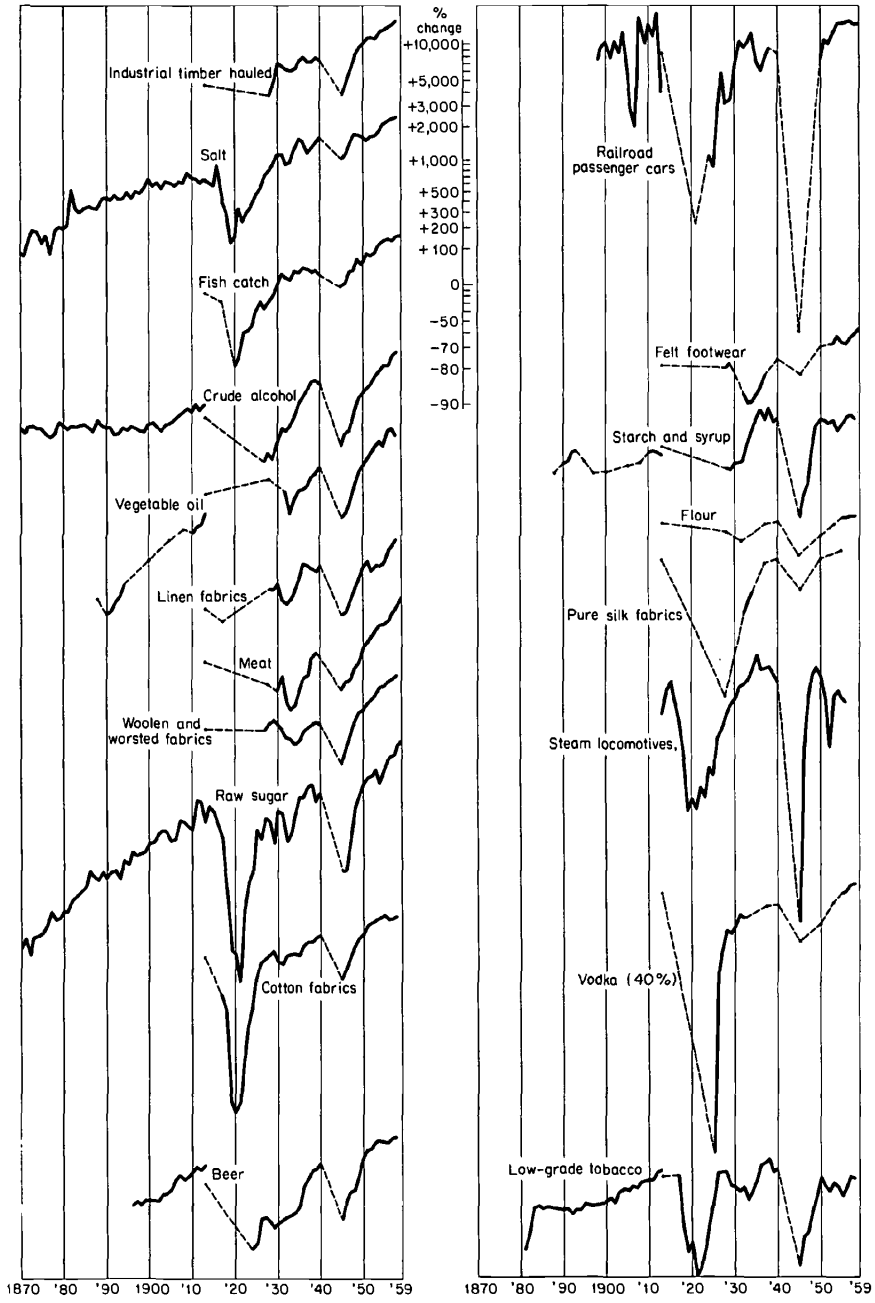


CHART A-I (concluded)



Dash line connects nonconsecutive years.
Source: Tables B-1 and B-2. It should be noted that some data are indirectly estimated.

consumed) and by summing the resulting values. The sum for any one year is simply aggregate production in that year valued in the prices (net unit values) of the weight-base year. These aggregate values in constant prices are given in tables in Appendix D. For any one index (as industrial materials, 1928 weights), the aggregate values in constant prices may be converted into index numbers by dividing all values by the value for a chosen base year (as 1913). For example, the index numbers in columns 1–3 and 5–6 of Table 16 are derived from aggregate values in constant prices in Tables D-1 and D-2.

The indexes for all civilian products are constructed in a more complicated manner, with two stages of weighting. To be specific, we may illustrate by the index with 1928 weights. As basic weights we have used value-added data for 1927/28 (for brevity, expressed as 1928) as derived from Soviet censuses and annual surveys of industry for 1926/27, 1927/28, and 1928/29 (see Table C-2 and D-9). Wherever value added is available for individual products, outputs are weighted by value added per unit of output in 1928, in the manner already described. In many cases these value-added data are available only for groups of products, and it is therefore necessary to construct subindexes for these groups (in the form of index numbers with 1928 as unity) on the basis of other weights. The weights used are generally estimates of value added per unit of output in 1928, at least to the extent of excluding the estimated cost of nonindustrial materials consumed in the process of fabrication. The subindexes are incorporated into the over-all index and its components by weighting each (expressed in ratio form) by the value added attributable to it. The indexes, in the form of aggregate values in 1928 prices, are given in Table D-3.

For example, value added is available for the product group consisting of pig iron, rolled steel, and steel ingots and castings, but not for each product separately. An index is constructed for this product group by weighting outputs of each component product by its estimated value added per unit in 1928. As an example, value added for a ton of steel ingots and castings is estimated as the value of a ton of ingots and castings minus the value of a ton of pig iron. The resulting index is translated into index numbers with a 1928 comparison base. Put in ratio form, the index numbers read 1.000 for 1928, 1.498 for 1932, 4.135 for 1937, and so on. This amounts to setting 1928 combined output for the group as the unit of production. The index numbers are, therefore, multiplied by the 1928 value added for the group (286.8 million rubles) to find the aggregate values for the group in 1928 prices.

The index for all civilian products with 1955 weights is constructed in the same manner, except that in this case the basic weights are employment rather than value-added data. This index and its components are given only in the form of index numbers (see Table D-4), since aggregate production expressed in terms of constant employment factors has little economic significance.

ESTIMATES OF MISSING OUTPUT DATA

The output series in Appendix B contain a number of estimates and adjustments made to fill in important gaps in Soviet statistics. In general we have made estimates only where the linkage to known data is reasonably simple and direct. We wish to call attention here to some special estimates that were made to fill in minor gaps in incomplete series so that they might be incorporated into our indexes.

It has not been unusual for Soviet statistical sources to cease publishing output data for a product whose output is rather steadily declining. Thus, for horse-drawn agricultural implements, whose output tended to reach a peak in the late 1920's and early 1930's, output series generally end in the 1930's. Since these implements accounted for most of the production of agricultural equipment in those years, an index excluding them would seriously exaggerate growth of production in this area. We have, therefore, extended these series through the benchmark years, with the general assumption that output reached the zero level by 1940 and later years (for the estimates, see Table B-2). Since these implements are probably still produced in small quantities, our estimates tend to cause some understatement of the growth of production of agricultural equipment between 1937 and 1955.

A similar estimate was made for the output of roofing iron. In 1940, the last year for which output was published, the output of roofing iron was about a quarter of its 1913 level. We have assumed that output fell to zero in 1945 and later benchmark years.

In the case of six series (narrow-gauge railroad cars, street and subway cars, horse-drawn cultivators, combined plows and drills, knitted goods, and hosiery), output for one or more missing benchmark years has been interpolated or extrapolated on the basis of production indexes for related products. These estimates affect indexes for both finished and all civilian products, and they were made differently in each case. In the indexes for finished products, it was assumed that each machinery series moved the same percentagewise over the gap to be filled as the index for all covered machinery items; and that each consumer good moved the same

unit values minus estimated unit costs of nonindustrial materials consumed in the process of fabrication. There is double counting to the extent that some covered products are used in fabricating others, as in the case of coal being used in fabricating steel ingots. It is, of course, more important for industrial materials than for finished products.

INTERPOLATING INDEXES

Our basic production indexes were calculated for benchmark years only (1913, 1928, 1932, 1937, 1940, 1945, 1950, and 1955). Intervening years were covered by special interpolating indexes, with the product coverage varying from year to year but in each case as large as possible.

For industrial materials, annual interpolations were made for the period 1913–1955 (except 1940–1945) in the case of the indexes with 1928 and 1955 weights, and for 1913–1928 in the case of the index with 1913 weights. Interpolations were made in three steps: (1) link relatives were constructed for each adjoining pair of years on the basis of maximum possible product coverage; (2) the links were chained together to span a period terminated by benchmark years (e.g., 1927/28–1932, 1932–1937, etc.); and (3) the interpolating index was adjusted to the corresponding benchmark index by distributing the percentage difference over the intervening years. For ease of computation the difference was distributed linearly; test calculations indicated that logarithmic distribution would not have significantly changed the results. For 1913–1928 an extra step was added because of small product coverage for early years. An index number for 1921/22 was first interpolated between 1913 and 1928 on the basis of twenty-eight products (twenty-four products for the index with 1913 weights), and annual interpolations were then made over 1913–1921/22 and 1921/22–1927/28. The product coverage for adjoining pairs of years is given in Table A-3.

For all civilian products, annual interpolations were made for the period 1928–1955 (except 1940–1945). Each subindex for a product group, as given in Table D-3, was separately interpolated in the manner described above. The number of products covered in adjoining pairs of years are given in Tables A-3 through A-4, except for products assumed to have no output in the relevant years. Coverage for interpolated and benchmark years diverges most in the cases of agricultural equipment, food and allied products, textiles and allied products, and consumer durables. The divergence is significant but less marked for construction materials and transportation equipment in the case of 1955 weights. Elsewhere it is insignificant or nonexistent. In the case of miscellaneous

percentagewise as the index for all covered consumer goods. For example, the output of street and subway cars for 1945 was filled in by assuming that it increased by the same percentage from 1940 as the output of all other machinery. In the indexes for all products, the interpolations were made by the product group to which the interpolated series belonged. For example, the 1945 output of street and subway cars was interpolated by the index for covered transportation equipment. Different methods were used in the two types of indexes because the weighting systems—or, put another way, the scopes of productive activity covered—differ in the two cases.

For the illustrative indexes calculated for miscellaneous machinery, estimates of the nature outlined were made for eighteen items with incomplete output series (see Table 28). Interpolations and extrapolations were based on all covered machinery in the case of indexes for finished civilian products, and on all covered miscellaneous machinery in the case of the indexes for all civilian products.

The outlined interpolations and extrapolations were actually made implicitly, by the device of chaining together link indexes for the relevant product groups, each link bridging successive benchmark years and having maximum possible product coverage. Since the estimative procedures differed with the production index involved, implied interpolations and extrapolations for individual products have not been entered into the series in Table B-2.

FRACTION OF INDUSTRIAL ACTIVITY COVERED

For 1927/28, it is possible to make direct estimates of the fraction of value added by industry that is covered by the products in our indexes with 1928 weights. Excluding repair shops, value added by industry in 1927/28 was 7,894 million rubles (see Table A-43). Value added accounted for by covered products in our indexes was 5,879 million rubles for all civilian products excluding miscellaneous machinery (see Table D-3), 5,557 million rubles for industrial materials (see Table D-1), and 4,505 million rubles for finished civilian products excluding miscellaneous machinery (see Table D-2). Hence the fractions of total value added accounted for by covered products in 1927/28 are as follows: 74 per cent for all civilian products, 70 per cent for industrial materials, and 57 per cent for finished civilian products.

It should be understood that the figures referred to as "value added" for industrial materials and finished products are only approximations including an unknown amount of double counting. Unit weights are

TABLE A-3

PRODUCT COVERAGE OF INTERPOLATING PRODUCTION INDEXES FOR INDUSTRIAL MATERIALS AND ALL CIVILIAN PRODUCTS, 1913–1955

PAIR OF YEARS	NUMBER OF PRODUCTS IN INDEX[a]		
	Industrial Materials[b]	*All Civilian Products*[c]	
		1928 Weights	1955 Weights
1913–1914	14		
1914–1915	14		
1915–1916	14		
1916–1917	13		
1917–1918	18		
1918–1919	18		
1919–1920	18		
1920–1921	22[d]		
1921–1921/22	22[d]		
1921/22–1922/23	27[e]		
1922/23–1923/24	30[f]		
1923/24–1924/25	31[g]		
1924/25–1925/26	31[g]		
1925/26–1926/27	31[g]		
1926/27–1927/28	31[g]		
1927/28–1928/29	49	81	86
1928/29–1929/30	43	82	86
1929/30–1931	43	85	91
1931–1932	43	86	94
1932–1933	53	95	107
1933–1934	53	95	107
1934–1935	53	95	107
1935–1936	53	95	108
1936–1937	53	95	108
1937–1938	43	76	74
1938–1939	41	62	68
1939–1940	42	62	68
1945–1946	42	64	67
1946–1947	41	63	67
1947–1948	41	63	67
1948–1949	42	68	73
1949–1950	42	70	75
1950–1951	46	80	96
1951–1952	46	80	95
1952–1953	46	80	95
1953–1954	46	80	95
1954–1955	47	80	95

[a] Excludes products whose output was, or was assumed to be, zero in the specified pair of years.

[b] Coverage in benchmark index is 54 products in the cases of 1928 and 1955 weights and 49 products in the case of 1913 weights.

[c] Coverage in benchmark index (excluding miscellaneous machinery) is 101 products in the case of 1928 weights and 119 products in the case of 1955 weights. Those products with output assumed to be zero after 1937 (1945 for roofing iron) are 10 in the case of 1928 weights and 11 in the case of 1955 weights.

[d] 20 in the case of 1913 weights.

[e] 23 in the case of 1913 weights.

[f] 25 in the case of 1913 weights.

[g] 26 in the case of 1913 weights.

TABLE A-4

PRODUCT COVERAGE OF INTERPOLATING PRODUCTION INDEXES FOR ALL CIVILIAN PRODUCTS BY INDUSTRIAL GROUP, 1927/28–1955

	NUMBER OF PRODUCTS[a]																			
	Ferrous Metals		*Nonferrous Metals*		*Fuel and Electricity*		*Chemicals*		*Construction Materials*		*Transportation Equipment*		*Agricultural Machinery*		*Food and Allied Products*		*Textiles and Allied Products*		*Consumer Durables*	
PAIR OF YEARS	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
1927/28–1928/29	5	5	3	3	8	9	12	11	14	17	5	6	10	12	16	16	5	4	3	3
1928/29–1929/30	5	5	3	3	8	9	11	10	13	15	5	6	11	13	16	16	5	4	5	5
1929/30–1931	5	5	3	3	8	9	11	10	13	15	6	7	12	16	16	16	5	4	6	6
1931–1932	5	5	3	3	8	9	12	11	13	15	6	7	12	18	16	16	5	4	6	6
1932–1933	5	5	3	3	8	9	13	12	14	17	6	7	14	19	16	17	9	10	7	8
1933–1934	5	5	3	3	8	9	13	12	14	17	6	7	14	19	16	17	9	10	7	8
1934–1935	5	5	3	3	8	9	13	12	14	17	6	7	14	19	16	17	9	10	7	8
1935–1936	5	5	3	3	8	9	13	12	14	17	6	7	14	20	16	17	9	10	7	8
1936–1937	5	5	3	3	8	9	13	12	14	17	6	7	14	20	16	17	9	10	7	8
1937–1938	5	5	3	3	8	9	11	11	12	12	5	5	11	5	8	9	7	9	6	6
1938–1939	5	5	3	3	8	9	11	11	12	12	5	5	3	5	8	9	7	9	b	b
1939–1940	5	5	3	3	8	9	11	11	12	12	5	5	3	6	8	9	7	9	b	b
1945–1946	5	5	3	3	8	8	12	11	12	11	5	5	4	5	10	12	5	7	c	c
1946–1947	5	5	3	3	8	8	12	11	11	11	5	5	4	5	10	12	5	7	c	c
1947–1948	5	5	3	3	8	8	12	11	11	11	5	5	4	5	10	12	5	7	c	c
1948–1949	5	5	3	3	8	8	12	11	11	11	5	5	4	5	10	12	5	7	5	6
1949–1950	5	5	3	3	8	8	12	11	11	11	5	5	4	5	10	12	5	7	7	8
1950–1951	5	5	3	3	8	8	13	12	13	16	6	7	8	16	12	14	5	7	7	8
1951–1952	5	5	3	3	8	8	13	12	13	15	6	7	8	16	12	14	5	7	7	8
1952–1953	5	5	3	3	8	8	13	12	13	15	6	7	8	16	12	14	5	7	7	8
1953–1954	5	5	3	3	8	8	13	12	13	15	6	7	8	16	12	14	5	7	7	8
1954–1955	5	5	3	3	8	8	13	12	13	15	6	7	8	16	12	14	5	7	7	8

[a] Columns marked A refer to index with 1928 weights; B, to index with 1955 weights. Excludes products whose output was, or was assumed to be, zero in the specified pair of years. Coverage in benchmark indexes is as follows: ferrous metals, 5 and 5; nonferrous metals, 3 and 3; fuel and electricity, 8 and 9; chemicals, 13 and 12; construction materials, 14 and 17; transportation equipment, 6 and 8; agricultural machinery, 17 and 27; food and allied products 19 and 20; textiles and allied products, 9 and 10; consumer durables, 7 and 8. Output was assumed to be zero for the following products: construction materials, 1 and 1 (after 1945); agricultural machinery, 9 and 10 (after 1937).

[b] No data available for 1939. Index for 1939 interpolated logarithmically between 1938 and 1940.

[c] No data available for 1946 and 1947. Index for 1946 and 1947 interpolated logarithmically between 1945 and 1948.

machinery, coverage varies so widely from year to year that no effort was made to construct interpolating indexes.

Data for fiscal years (as 1927/28) were not adjusted to a calendar year basis, on the ground that adjustment would be essentially arbitrary. Except where precision is required, fiscal years are generally referred to in the text as calendar years. Since the fiscal year began on October 1, the ending year is used; thus, 1927/28 is generally referred to as 1928.

EXTENSION OF PRODUCTION INDEXES THROUGH 1958

As in the case of years covered by the interpolating indexes, output data are not available for years after 1955 for all products in our benchmark

TABLE A-5

PRODUCT COVERAGE OF PRODUCTION INDEXES FOR INDUSTRIAL MATERIALS AND ALL CIVILIAN PRODUCTS, BY INDUSTRIAL GROUP, 1955–1958

	Number of Products[a]		
	1955–1956	1956–1957	1957–1958
Industrial materials[b]			
Same products, each pair of years	50	49	46
Same products, all years	41	41	41
All civilian products[c]	100	100	95
Ferrous metals	5	5	5
Nonferrous metals	0	0	0
Fuel and electricity	9	9	9
Chemicals	12	12	10
Construction materials	16	16	14
Transportation equipment	7	7	7
Agricultural machinery	15	15	15
Food and allied products	20	20	20
Textiles and allied products	8	8	8
Consumer durables	8	8	7

[a] Refers to indexes with 1955 weights only. Excludes products whose output was, or was assumed to be, zero in the specified pair of years.

[b] Extrapolating index is based on 54 products (coverage of the benchmark index), with output assumed to remain the same as in the preceding year for those products whose output has not been published (4 in 1956, 5 in 1957, and 8 in 1958). See text.

[c] Extrapolating index is based on 100 products, with output in 1958 assumed to be the same as in 1957 for the 5 products whose 1958 output has not been published. Coverage of the benchmark index is 108 products, excluding those with output assumed to be zero. See Table A-4 for coverage of benchmark indexes for industrial groups.

indexes (see Table A-5). This raises a special problem since the indexes covering the latter years—based solely on 1955 weights—cannot be adjusted to benchmark data, as was done in the case of interpolating

indexes. We have tried to meet this problem by making a few adjustments to compensate in part for the missing data.

Data are missing for all three years after 1955 in the case of eight products covered by our benchmark index for all civilian products: copper, zinc, lead, street and subway cars, machines for planting seedlings, cotton pickers, hard leather, and soft leather. In addition, data are missing for 1958 in the case of five other products: soda ash, caustic soda, construction gypsum, construction lime, and phonographs. One may suppose that the primary reason why these data were not published is that growth in output was in some sense abnormally low. Nothing was done to compensate for the data missing for all three years, since it is difficult to know what to do. In the case of those products missing only for 1958, it was assumed that output was the same in that year as in 1957.

The publication record is more uneven in the case of industrial materials. Of the fifty-four products in our benchmark index, four are not reported for 1956, five for 1957, and eight for 1958. Moreover, the list varies from year to year: data are missing for at least one year in the case of thirteen different products. If our index were to be based only on the forty-one products with data available for every year, it would probably exaggerate growth for the sample of fifty-four products, since we may again presume that the missing data represent below average growth. Hence we have followed the expedient of using all fifty-four products and assuming that missing output was equal to output in the preceding year for which it has been published.

Differences in the results of alternative procedures are illustrated in the following table, comparing the index for industrial materials constructed as described with alternative indexes based on maximum product coverage for adjoining pairs of years (Table A-5) and on the same forty-one products for all years:

	Production as % of Preceding Year		
	1956	1957	1958
Constant coverage, 54 products	107.1	107.1	107.2
Variable product coverage	107.4	107.4	107.6
Constant coverage, 41 products	107.8	107.6	108.0

The procedure we have followed results, as expected, in a somewhat lower growth for each year. Whether the lower growth is closer to the truth is another matter, and one that cannot be settled definitively with the data available.

SPECIAL INDEXES WITH 1928 WEIGHTS

In order to illustrate the difference in results of using alternative weighting systems, three special production indexes were constructed with the following 1928 weights: (a) imputed value added, (b) direct (covered) employment, and (c) imputed employment. The special indexes are given in Table 20 and the uses made of them are discussed in the surrounding text. We shall discuss here the derivation of weights and the methods of constructing the special indexes.

Imputed value-added weights were assigned to the same product categories as direct value-added weights (see Table D-9), the imputed weights being total value added as taken from Table C-2 without an adjustment for product coverage. Rails and roofing iron were not included with construction materials in the special index and hence were not assigned imputed weights. For product categories covered by value-added data but not by output series, value added has been imputed to more inclusive industrial groups as follows: value added for artificial gas to fuel; for pharmaceutical chemicals to chemicals; for china, extraction of minerals, and miscellaneous wood products to construction materials; for primary processing of mixed fibers, hemp and jute, knitted goods, garment industry, and fur products to textiles and allied products. Value added for metal products, printing, and unspecified miscellaneous products was not allocated to specific industrial groups and hence was implicitly imputed to all other industry as a whole.

A second type of adjustment was made. The value added for electricity given in Table C-2 applies only to electricity produced within the jurisdiction of the Commissariat of Electric Power Stations, and the value of this production amounted to only about 45 per cent of the value of total production. Value added for electricity has therefore been raised in accord with this ratio, or by 152 million rubles. Since this amount represents value added for electricity produced within other industrial categories, it should be subtracted from value added for other categories to avoid double weighting. In the absence of more specific information, the amount to be subtracted has been prorated among the other categories on the basis of value added.

Value-added weights, both direct and imputed, are summarized for major industrial categories in Table A-6.

Direct and imputed employment weights—based on Table C-1—were derived and applied in the same manner as their value-added counterparts, with a few minor exceptions. For example, employment

TABLE A-6

IMPUTED AND DIRECT VALUE-ADDED WEIGHTS: SOVIET UNION, INDUSTRIAL GROUPS, 1928

	Million Rubles		*Per Cent*	
	Imputed[a]	Direct	Imputed[a]	Direct
Ferrous metals	314.8	321.2	4.3	5.4
Nonferrous metals	51.2	18.2[b]	0.7	0.3
Fuel	744.8	651.9[c]	10.3	11.0
Electricity	274.4[d]	274.4[d]	3.8	4.6
Chemicals[e]	317.2	168.5[f]	4.4	2.8
Construction materials	1,150.4	935.8[g]	15.8	15.8
Transportation equipment	89.3	60.8[h]	1.2	1.0
Agricultural machinery[i]	81.9	83.6	1.1	1.4
Miscellaneous machinery	248.1[j]	45.4[k]	3.4	0.8
Food and allied products	1,740.6	1,580.7[l]	24.0	26.7
Textiles and allied products	2,198.7	1,774.9[m]	30.3	30.0
Consumer durables	47.2[j]	8.6[n]	0.7	0.1
Total	7,260.8	5,924.0	100.0	99.9
Unallocated[o]	632.7			
Total incl. unallocated[p]	7,893.5			

Details may not agree with totals because of rounding.

SOURCE: Tables C-2 and D-9.

[a] To compensate for the upward adjustment for electricity, value added for each other industry group has been multiplied by 0.9801. See text.

[b] Excludes unspecified products not covered by our series (34.0 million rubles) as estimated through coverage adjustment (see Table D-9, notes).

[c] Excludes petroleum refining (105.5 million rubles) and artificial gas (2.4 million rubles).

[d] Adjusted upward to cover electricity produced outside Commissariat of Electric Power Stations (152.0 million rubles) as estimated through coverage adjustment.

[e] Includes rubber and paper products.

[f] Excludes pharmaceutical chemicals (19.1 million rubles) and unspecified products not covered by our series (136.0 million rubles) as estimated through coverage adjustment.

[g] Excludes china (33.7 million rubles), extraction of minerals (57.6 million rubles), miscellaneous wood products (159.4 million rubles), and unspecified products not covered by our series (19.8 million rubles) as estimated through coverage adjustment. Includes rails (4.4 million rubles) and roofing iron (28.1 million rubles).

[h] Excludes shipbuilding (30.2 million rubles).

[i] Includes tractors.

[j] Value added for electrical and industrial machinery prorated by computed value of output (see Table D-9).

[k] Excludes metal products not elsewhere covered (398.2 million rubles), and unspecified machinery not covered by our series (247.4 million rubles) as estimated through coverage adjustment.

[l] Excludes unspecified products not covered by our series (195.0 million rubles) as estimated through coverage adjustment.

[m] Excludes primary processing of mixed fibers (13.9 million rubles), hemp and jute (39.9 million rubles), knitted wear (89.4 million rubles), apparel (309.8 million rubles), and unspecified products not covered by our series (15.4 million rubles) as estimated through coverage adjustment.

[n] Excludes unspecified products not covered by our series (39.4 million rubles) as estimated through coverage adjustment.

[o] Includes metal products, printing and publishing, and unspecified miscellaneous products not elsewhere covered.

[p] Excludes railroad repair shops.

data were not available for roofing iron and rails (therefore not included in construction materials) and for felt footwear (therefore not included in textiles and allied products). In addition, imputed employment for the electricity industry was not adjusted to take account of production outside the Commissariat of Electric Power Stations, as was done in the case of imputed value added, because the employment weight factors for 1928 were designed to parallel those for 1955, where no such adjustment was possible. The employment weights for 1928 are summarized for major industrial categories in Table A-7.

To bring the 1928 imputed employment weights into even closer conformity with the 1955 counterparts, an alternative set of weights was computed for machinery and equipment categories, combined employment for machinery, equipment, and metal products being prorated on the basis of computed value of products. These alternative weights are as follows (persons engaged in thousand full-time equivalents):

Transportation equipment	208
Agricultural equipment	338
Miscellaneous machinery	170
Consumer durables	33

These weights were used in constructing the "second variant" of the special index with 1928 imputed employment weights.

MACHINERY AND MILITARY PRODUCTION

As already discussed at length in Chapter 5, index number problems are particularly acute in the area of machinery and allied products. These difficulties are compounded in the case of military items by the absence of detailed Soviet statistics. We present here some alternative production indexes for machinery and military items.

Alternative indexes for civilian machinery and equipment are given in Table A-8 for three different product coverages, in each case calculated by four weighting systems. The component indexes are those given in Table D-4 for transportation equipment, agricultural equipment, miscellaneous machinery, and consumer durables. Each of the indexes is constructed with direct gross-value weights. They are alternatively combined together by direct or imputed value-added or gross-value weights, as indicated in Table A-8.

Of these alternative indexes, those with imputed weights generally rise more rapidly between 1927/28 and 1955 than their counterparts with

TABLE A-7

IMPUTED AND DIRECT EMPLOYMENT WEIGHTS: SOVIET UNION, INDUSTRIAL GROUPS, 1928

	PERSONS ENGAGED			
	Thousand Full-Time Equivalents		*Per Cent*	
	Imputed	Direct	Imputed	Direct
Ferrous metals	245	245	5.0	6.7
Nonferrous metals	36	12[a]	0.7	0.3
Fuel	399	391[b]	8.1	10.8
Electricity	28	63[c]	0.6	1.7
Chemicals[d]	149	70[e]	3.0	1.9
Construction materials	924	626[f]	18.8	17.2
Transportation equipment	110[g]	68[h]	2.2	1.9
Agricultural machinery	62[g]	62	1.3	1.7
Miscellaneous machinery	184[g]	33[i]	3.7	0.9
Food and allied products	820	744[j]	16.7	20.5
Textiles and allied products	1,919	1,315[k]	39.1	36.2
Consumer durables	35[g]	6[l]	0.7	0.2
Total	4,912	3,635	100.0	100.0
Unallocated[m]	467			
Total incl. unallocated[n]	5,379			

Details may not agree with totals because of rounding.

SOURCE: Tables C-1 and D-9.

[a] Excludes unspecified products not covered by our series (24 thous.) as estimated through coverage adjustment (see Table D-9, notes).

[b] Excludes petroleum refining (8 thous.).

[c] Adjusted upward to cover electricity produced outside Ministry of Electric Power Stations (35 thous.) as estimated through coverage adjustment.

[d] Includes rubber and paper products.

[e] Excludes pharmaceutical chemicals and paints and varnishes (34 thous.) and unspecified products not covered by our series (45 thous.) as estimated through coverage adjustment.

[f] Excludes miscellaneous wood products (280 thous.) and unspecified products not covered by our series (18 thous.) as estimated through coverage adjustment.

[g] Total for machine building (391 thous.) prorated by large-scale employment. Additional adjustments as follows: (1) employment for tractors (3 thous.) prorated from land transportation equipment by value of output and transferred to agricultural equipment, and (2) employment for electrical and industrial machinery prorated to miscellaneous machinery and consumer durables by computed value of output (see Table D-9, notes).

[h] Excludes shipbuilding (42 thous.).

[i] Excludes unspecified machinery not covered by our series (151 thous.) as estimated through coverage adjustment.

[j] Excludes unspecified products not covered by our series (76 thous.) as estimated through coverage adjustment.

[k] Excludes primary processing of mixed fibers (4 thous.), hemp and jute (59 thous.), knitted goods (104 thous.), and apparel (437 thous.).

[l] Excludes unspecified products not covered by our series (29 thous.) as estimated through coverage adjustment.

[m] Includes metal products, printing and publishing, and unspecified miscellaneous products not elsewhere included.

[n] Excludes railroad repair shops.

TABLE A-8

PRODUCTION INDEXES FOR MACHINERY AND EQUIPMENT BASED ON 1928 WEIGHTS, WITH VARYING COVERAGE AND METHOD OF CONSTRUCTION: SOVIET UNION, SELECTED YEARS, 1913–1955[a]
(1927/28 = 100)

	1913	1927/28	1937	1940	1945	1950	1955
All civilian machinery and equipment							
Direct value-added weights	66.7	100.0	1,121	852.8	356.4	2,384	3,348
Imputed value-added weights	64.8	100.0	1,179	950.5	371.6	2,648	4,724
Direct gross-value weights	64.9	100.0	1,063	806.5	335.3	2,272	3,208
Imputed gross-value weights	66.6	100.0	1,217	971.6	402.6	2,991	4,616
All civilian machinery and equipment excluding consumer durables							
Direct value-added weights	66.9	100.0	1,067	827.7	362.4	2,316	3,021
Imputed value-added weights	65.0	100.0	1,051	898.7	410.9	2,901	4,063
Direct gross-value weights	65.0	100.0	1,007	779.6	340.3	2,199	2,878
Imputed gross-value weights	67.0	100.0	1,104	926.9	421.2	2,899	4,004
Transportation and agricultural equipment							
Direct value-added weights[b]	70.2	100.0	1,139	826.5	350.9	2,025	2,438
Imputed value-added weights	77.3	100.0	1,358	996.2	428.0	2,409	2,885
Direct gross-value weights	65.1	100.0	946.2	750.1	345.7	2,119	2,518
Imputed gross-value weights	79.1	100.0	1,411	1,038	446.8	2,503	2,748

SOURCE: Tables A-6, C-2, D-3, and D-9.

[a] Weights used are as follows (million 1927/28 rubles):

	Value Added		*Gross Value of Output*	
	Direct	Imputed	Direct	Imputed
Transportation equipment	60.8	89.1	109.4	220.8
Agricultural equipment	83.6	81.9	175.4	184.1
Miscellaneous machinery	45.4	248.1	86.4	469.1
Consumer durables	8.6	47.2	16.6	90.0

[b] This index is used in our basic index for all industrial products.

direct weights; those with value-added weights, more rapidly than their counterparts with gross-value weights. This relation does not hold over all relevant spans of years, however. In our basic index for all civilian products with 1928 weights, the index for transportation and agricultural equipment based on direct value-added weights is used to represent the machinery and equipment sector (except for consumer durables, which has a separate index). This index rises less rapidly in general than other indexes that might have been chosen. They were not chosen because of the ambiguity of data for heterogeneous categories of machinery.

As to production of military products, the best that can be done is to make informed guesses, based ultimately on official data on military expenditures drawn from published Soviet budgets. From budgetary and related official data, we have first estimated the earmarked expenditures on currently produced military products (Table A-9), and then deflated these figures by price indexes to derive estimated production indexes (Table A-10). The earmarked expenditures probably do not cover atomic energy—treated as "medium machinery" in Soviet statistics —and undoubtedly omit some civilian-type equipment put to military use, just as American statistics on military production do. It would be foolish to pretend that the resulting indexes do more than set rough limits to trends in output. Their main virtue is that they are better than nothing.

For years through 1941 Plan, expenditures on military products may be derived from a reasonably firm base of evidence. The two major sources of ambiguity are, first, lack of evidence on product coverage and, second, the problem of translating some data from "1926/27" rubles to current rubles. As to product coverage, we may infer from the 1941 Plan that production under the commissariats of defense industries was classified wholly under machinery and equipment. Gross production in "1926/27" rubles was planned for 1941 to be 31.9 billion under the defense commissariats and 19.5 billion under the civilian machinery commissariats, for a total of 51.4 billion. Gross production for all machine building and metalworking was planned to be 61.0 billion, or 9.6 billion more.[10] The residual corresponds very closely with the 1940 gross production of metal products and repair shops, the remaining categories within machine building and metalworking (see Table F-1). While this seems to tell us where the production of military products was classified, it does not, of course, tell us what kinds of products were included. We are faced with such questions as whether explosives and ammunition

[10] *490*, 181.

TABLE A-9

SOVIET BUDGETED MILITARY EXPENDITURES, WITH ESTIMATES BY CATEGORY, 1927/28–1955
(billion rubles)

					Alternative Estimates	
	Total (1)	Military Products[a] (2)	Pay and Subsistence (3)	All Other[b] (4)	Military Products (2a)	All Other (4a)
1927/28	0.76					
1928/29	0.88					
1929/30	1.1					
1931	1.3	0.15	0.70	0.44		
1932	1.3	(0.15)				
1933	1.4	(0.17)				
1934	5.0					
1935	8.2					
1936	14.9					
1937	17.5	10.7	4.0	(2.8)		
1938	23.2	14.6				
1939	39.2	21.4				
1940	56.7	(31.0)	12.3	(13.4)		
1941 Plan	70.9	40.3				
1945	128.2	(44.6)	44.9	(38.5)		
1946	72.6	(6.8)				
1947	66.4	(5.1)				
1948	66.3	(4.9)	32.0	(29.4)	(4.9)	(29.4)
1949	79.2	(13.2)	31.1	(34.9)	(4.9)	(43.2)
1950	82.8	(16.8)	29.1	(36.9)	(8.5)	(45.2)
1951	93.9	(27.9)	29.0	(37.0)	(18.6)	(45.3)
1952	108.6	(42.6)	29.4	(36.6)	(34.3)	(44.9)
1953	105.0	(39.0)	28.8	(37.2)	(30.7)	(45.5)
1954	101.8	(35.7)	28.8	(37.2)	(28.4)	(45.5)
1955	108.1	(42.1)	29.5	(36.5)	(33.8)	(44.8)

NOTE: Figures in parentheses are indirect estimates or residuals.

[a] Earmarked expenditures. Excludes, among other likely things, expenditures on atomic energy and related products.

[b] Probably includes military construction at least through 1931. Construction work appeared elsewhere in the national budget from at least 1937 onward.

SOURCE TO TABLE A-9

Column 1

1927/28–1932: *420.*
1933: *464*, 410.
1934–1941 Plan: *479*, 233.
1945–1947: *431*, 67.
1948: *499*, 49.
1949–1955: *491*, 177.

Column 2

1931: *420.* Breakdown of defense expenditures is given as follows:

	Million Current Rubles
Total	1,288
Effectives	697
Transport	207
Buildings	233
War material	153

1932, 1933: Taken as same ratio (0.119) of total expenditures as in 1931.

1937: Estimated gross production in "1926/27" rubles (8.5 billion) multiplied by 1.26 to adjust to current prices, the ratio in the 1941 Plan (see the 1941 Plan below). Gross production in "1926/27" rubles (8.5 billion) derived from 1938 value (see 1938) and statement (*320*, 1959, No. 1, 20 f) that gross production of commissariats of defense industries increased by 36.4% from 1937 to 1938.

1938: Gross production of commissariats of defense industries in "1926/27" rubles (11.6 billion from *501*, 115) multiplied by 1.26 (see 1937).

1939: Estimated gross production in "1926/27" rubles multiplied by 1.26 (see 1937). Gross production in "1926/27" rubles derived from 1938 value (see 1938) and statement (*320*, 1959, No. 1, 21) that gross production of commissariats of defense industries increased by 46.5% from 1938 to 1939. The resulting figure for 1939 (17.0 billion rubles) is almost the same as the planned figure (16.9 billion as given in *501*, 115).

1940: Taken as same ratio (0.546) of total expenditure as in 1939.

1941 Plan: Value of marketed output (*72*, 9). Gross value of output (a slightly different concept, as noted in *467*, 6 f) is given in same source as 31.9 billion rubles in "1926/27" prices.

1945: Residual, official gross production of machinery and equipment (52.8 billion rubles in "1926/27" prices, assumed also to be current prices, as given in Table F-1) minus estimated gross production of civilian items (8.2 billion current rubles as derived in the text).

1946: Derived as follows (billion "1926/27" rubles, assumed to be current rubles also):

	1945	1946
Gross production of industry	128.0	106.9
Civilian products	83.4	100.1
Military products	44.6	6.8

Gross production is taken from Table F-1. For 1945, civilian products are taken as residual; for 1946, they are taken as 120% of 1945, on the basis of *364*, 1/21/47, as cited in *495*, 25.

1947: Planned expenditures (67.0 billion rubles) were stated by the Minister of Finance (*403*, 3/12/47, 7) to represent a reduction of 24% in real terms below expenditures in 1946, despite increases in food prices and salary rates for military personnel. Actual expenditures, lower than planned, therefore represent a reduction of about 25% in real terms. We assume that there was no change in the price of military products and that the 25% reduction in real terms applied here as well as to other items. Our computations imply an average price (and wage-rate) rise of about 24% for items other than military products.

1948: Planned expenditures (66.1 billion rubles) were stated (*403*, 1948, 157) to represent a reduction of 2.5 billion rubles below expenditures in 1947, in "comparable data." We take this to imply a reduction by about 4% in real terms, which would also apply

to actual expenditures since they differed little from planned expenditures. We assume again that there was no price change in military products and that the percentage reduction applied there as well as to other items. Our computations imply an average price (and wage-rate) rise of about 4% for items other than military products.

1949: The official statement accompanying the budget (*403*, 1949, 200) suggests that a significant part of the increase over 1948 was caused by a rise in wholesale prices and railroad tariffs. In the absence of any indications of possible increases in real expenditures, we assume that real expenditures on military products remained the same as in 1948 and inflate for the price increase (169%) by the price index for basic industrial products (excluding petroleum), *432*, 322.

1950–1955: Residual, total (col. 1) minus sum of pay and subsistence and all other expenditures (cols. 3 and 4). The latter sum is assumed to remain constant at its 1949 value (66.0 billion rubles).

Column 3

1931: *420.*

1937: *426*, 18.

1940, 1945: *429*, 136 f. 1945 assumed same as 1944.

1948–1955: *491*, 4.

Column 4

1931: *420.*

1937, 1940, 1945, 1948–1949: Residual, total (col. 1) minus sum of military products (col. 2) and pay and subsistence (col. 3).

1950–1955: Sum of pay and subsistence (col. 3) and all other expenditures (col. 4) is assumed to remain constant at the 1949 value (66.0 billion rubles), all other expenditures being taken as residual, sum minus pay and subsistence.

Column 2a

1948: Same as col. 2.

1949: Both real expenditures and the price level for military products are assumed to remain the same as in 1948. See text.

1950–1955: Residual, total (col. 1) minus sum of pay and subsistence (col. 3) and other expenditures (col. 4a). That sum is assumed to remain constant at its 1949 value (74.3 billion rubles).

Column 4a

1948–1949: Residual, total (col. 1) minus sum of military products (col. 2a) and pay and subsistence (col. 3).

1950–1955: Sum of pay and subsistence (col. 3) and all other expenditures (col. 4a) is assumed to remain constant at the 1949 value (74.3 billion rubles), all other expenditures being taken as residual, sum minus pay and subsistence.

were included, to say nothing of civilian-type products put to military use.[11]

If we assume that the same relation between current and "1926/27" prices held in 1940 as in the 1941 Plan, we may estimate civilian and military gross production of machinery and equipment as follows (billion rubles):

[11] Jasny argues (*501*, 101) that the production of the defense commissariats included even such items as occupational clothing, but he cites no evidence to support his view. As we shall discuss more fully in technical note 8 below, conventional military products seem to have been included in machine building and Group "A" until the shift from "1926/27" to "1952" prices, at which time they were apparently transferred to metal products and Group "B."

TABLE A-10

ESTIMATED VALUE, PRICE, AND DEFLATED VALUE INDEXES, SOVIET MILITARY PRODUCTS
(1937 = 100)

	Value of Output, Current Prices		*Price Index*		*Deflated Value of Output*	
	Estimate A[a]	Estimate B[b]	Estimate A[c]	Estimate B[d]	Estimate A[e]	Estimate B[f]
1933[g]	2	2	57		4	
1937	100	100	100	100	100	100
1938	136	136	103		132	
1939	200	200	115		174	
1940	290	290	132	117	220	248
1941 Plan	377	377	137		275	
1945	414	414	66	58	627	714
1946	61	61	66	58	92	105
1947	46	46	66	58	70	79
1948	44	44	66	58	67	76
1949	119	44	178	58	67	76
1950	152	78	147	58	103	134
1951	256	172	146	58	175	297
1952	393	319	140	58	281	550
1953	360	285	140	58	257	491
1954	329	264	140	58	235	455
1955	389	314	135	58	288	541

[a] From Table A-9, col. 2.

[b] From Table A-9, col. 2a.

[c] Linked index. 1933–1941, index for basic industrial products except petroleum, *432*, 322 f; 1941–1945, prices of military goods taken as falling by 50% from evidence in *499*, 51–55; 1945–1955, index for basic industrial products except petroleum, *432*, 322, and *576*, 13.

[d] Linked index. 1937–1940, index for civilian machinery, *500*, 15; 1940–1945, same as estimate A (see note *c*); 1945–1955, assumed no change in prices of military items.

[e] Value A deflated by price index A.

[f] Value B deflated by price index B.

[g] 1933 is used instead of 1932 because price indexes for years before 1933 are unusually unreliable, in view of widespread rationing.

	1940		*1941 Plan*	
	"1926/27" Prices	Current Prices	"1926/27" Prices	Current Prices
Civilian items	15.7	17.3	19.5	21.5
Military items	24.6	31.0	31.9	40.3
Total	40.3	48.3	51.4	61.8

The data for the 1941 Plan are taken directly from an official source.[12] For 1940 data in "1926/27" prices, we have the total from official sources (Table F-1); we derive military production as the estimated value in current prices deflated by the price index implicit in the 1941 Plan data; and we take civilian production as the residual. For current prices, the 1940 total is built as the sum of civilian production in "1926/27" prices inflated by the price index implicit in the 1941 Plan data, plus estimated military production (from Table A-9). It is apparent that there is room for error in these calculations.

The 1940 estimate of civilian gross production in current prices is consistent with the values derived from our production indexes with 1928 weights as inflated by available price indexes. If the 1928 gross value of 964 million rubles for machinery and equipment (Table C-2) is extrapolated to 1940 by the indexes in Table A-8, the resulting values in 1928 prices range from 7.2 through 10.0 billion rubles. Inflated by a price index for basic industrial products,[13] the values in 1940 prices range from 16.6 through 23.1 billion rubles; inflated by a price index for civilian machinery,[14] from 12.6 through 17.5 billion. Hence our estimate of 17.3 billion rubles lies toward the bottom of the first range and toward the top of the second. Since it is not clear which price deflator is to be preferred either in principle or in practice, it is not possible to choose one or the other value as the "correct" one.[15]

Direct evidence on the breakdown between military and civilian production ends with the 1941 Plan, and estimates for the postwar years must be made by tenuous roundabout procedures. Inflating our indexes in the manner described above, we derive 1945 civilian production in current rubles as lying within the ranges 8.0 through 10.7 billion rubles and 6.2 through 8.4 billion rubles. Guided by the results for 1940, we choose 8.2 billion rubles as the "best estimate." Supposing the distinction between "1926/27" and current prices had all but vanished by that time, we subtract this figure from 52.8 billion rubles, official gross production of all machine building (Table F-1), to derive an estimate of 44.6 billion rubles for military items. Various bits and pieces of evidence as described in the notes to Table A-9 allow us to extend the estimate for military items through 1948, but the problem of how to treat the price reforms in the next two years seems to make it advisable to carry forth two distinct estimates for later years.

[12] *72*, 9–11. The figures in "1926/27" rubles are gross value of output; those in current rubles, value of marketed output, a slightly different concept. See *467*, 6 f.

[13] *432*, 322. Index excluding petroleum.

[14] *500*, 15.

[15] See the discussion below on deflating expenditures on military products.

In the one case, it is assumed that the output of military items remained constant in 1949 while their prices rose by the average for basic industrial products; in the second case, that neither the output nor the prices of military items changed. A third possibility—that prices of military items rose by more than the average for basic industrial products—is not explored for lack of any basis for a reasonable guess, though it is not clear that this possibility should be ruled out. For succeeding years, expenditures on military products are treated as a residual on the assumption that all other budgeted military expenditures remained constant in the aggregate. Very recent evidence, given in the annex to this technical note, indicates that this assumption is probably unwarranted: other military expenditures were probably lower than we show for 1948 and higher for 1955. The implications of this are discussed in the annex referred to.

The next step is to deflate these estimates of expenditure, and here we face once again the question of the proper price deflator. As a matter of principle, it might be thought that the appropriate deflator would be a price index for machinery, but this may not be so for two reasons. In the first place, prices of military products were arbitrarily set during the war, being cut in half between 1941 and 1943, a period of general inflation. Nothing is known of pricing of military products in the postwar period, though a continued effort to keep prices relatively so low would have required persistent and large subsidies to military industries in the face of a very sharp decline in total subsidies to industry.[16] One is led to conclude that it is highly improbable that prices of military products moved very differently in the postwar period from the general trend.

In the second place, even if prices of military products have moved along with prices of civilian machinery, this does not mean that a conventional price index for machinery is the appropriate deflator for data on expenditures. We face the dual problem of "new" products and the tendency of Soviet managers to evaluate them—even when they are really new—at inflated original cost of production (see the discussion of the official Soviet index of gross production in Chapter 5). It is impossible to know whether these factors are as important for military products as for other types of machinery and equipment, and there is no strong presumption either way.

In the light of these difficulties and the added fact that an extensive price index for machinery has not been published up to the time of this

[16] *491*, 143 ff. See also *538*, 259 ff.

writing,[17] we have followed two alternative deflating procedures. First, we have assumed that the price level for military products moved the same as the level for basic industrial products, except between 1941 and 1945, when the former is taken to have fallen by half (see column 3 of Table A-10). This index is used to deflate expenditures on military products estimated under similar assumptions, with the resulting production index shown as estimate A in column 5. Second, we have assumed that the price level for military products moved the same as the level for civilian machinery through 1940, fell by half by 1945, and remained constant thereafter (see column 4). This estimate almost certainly understates the relevant price index by a significant amount. It is used to deflate expenditures estimated under similar assumptions, giving the index shown as estimate B in column 6.

Which production index is more reliable? That cannot be finally answered. In our opinion, estimate A is based on more reasonable assumptions and we accordingly adopt it. But so many roundabout procedures are involved that errors of large magnitude are possible (on which, see the annex to this technical note).

INDEXES ADJUSTED TO COVER MILITARY PRODUCTION

Estimate A may be used to make rough corrections in our production indexes for their failure to cover military products. The relevant adjusted indexes are compared in Table A-11 with their unadjusted counterparts.

In the case of machinery and equipment, the moving-weight index for transportation and agricultural equipment is combined with the index for military products by using 1937 official gross production to weight the two sectors. The index with military products shows a faster growth over the entire Soviet period than its counterpart without military products. Moreover, as one would expect, the former shows a substantial growth between 1937 and 1945 while the latter shows a substantial decline.

In the case of the index for all industry, the adjusted index for machinery and equipment as described above is substituted for the index for transportation and agricultural equipment. It is combined with the remaining component indexes on the basis of the system of moving weights described earlier in this technical note. The index including military products shows a smaller decline over 1937–1945 and a somewhat larger rise over 1913–1955 than its counterpart without military products, again as would be expected.

[17] The problems do not all arise from matters of principle. A price index for machinery is no more reliable than a counterpart production index, and for the same reasons.

TABLE A-11

MOVING-WEIGHT INDEXES OF SOVIET INDUSTRIAL PRODUCTION ADJUSTED TO COVER ESTIMATED MILITARY PRODUCTION
(1913 = 100)

	Machinery and Equipment		*All Products*	
	Civilian (1)	Total (2)	Civilian (3)	Total (4)
1913	100	100	100	100
1928	143	143	102	102
1933	654	693	152	153
1937	1,624	2,597	268	285
1938	1,626	2,910	275	298
1939	1,517	3,209	282	311
1940	1,140	3,280	274	318
1945	265	6,363	123	264
1946	563	1,458	160	180
1947	883	1,564	207	219
1948	1,425	2,076	271	276
1949	2,069	2,721	340	343
1950	2,637	3,639	397	393
1951	2,248	3,950	426	448
1952	2,106	4,839	439	488
1953	2,312	4,811	473	516
1954	2,631	4,916	528	563
1955	2,994	5,795	577	620
1956	3,466		625	
1957	4,086		686	
1958	3,881		715	

NOTE: All indexes exclude miscellaneous machinery.

SOURCE: Column 1: Table 53.

2: Combined indexes for civilian component (col. 1) and military component (estimate A in Table A-10) weighted by 1937 official gross production (14.2 and 8.5 billion "1926/27" rubles, respectively, as given in Table F-1). The civilian component is slightly overweighted since the weight covers consumer durables, not included in the index. If estimate B had been used for the military component, this index would have differed as follows: 1940, 3,552; 1945, 7,209; 1950, 3,940; and 1955, 8,256.

3: Table 53.

4: Combined indexes for civilian products except machinery and equipment (derived from Tables D-3 and D-4) and for total machinery and equipment (col. 2), appropriately weighted by 1928 value added and 1955 employment. If estimate B had been used for the military component, the index would have differed as follows: 1940, 323; 1945, 252; 1950, 401; and 1955, 666.

ANNEX: MILITARY DATA PUBLISHED IN 1960

In a speech given in January 15, 1960, Nikita Khrushchev revealed for the first time the strength of Soviet armed forces in recent years, together with a hint on current levels of military expenditures in support of troops. This information suggests that the estimates of the latter expenditures in Table A-9 (pay and subsistence plus all other expenditures) are too high for around 1948 and too low for around 1955, since they are based on an assumed constant strength of 4 million (see the cited source) while the actual strength rose from 2.9 to 5.8 million (see Table A-12).

TABLE A-12

SIZE OF SOVIET ARMED FORCES, SELECTED YEARS, 1927–1959
(thousands)

1927	586	1937	1,433	1955	5,763
1931	562	1939	3,000	1956	5,123
1933	600	1941	4,207	1957	3,923
1935	940	1945	11,365	1958	3,623
1936	1,300	1948	2,874	1959	3,623

NOTE: Whether these figures refer to annual averages or strengths as of a specific date is generally not known. Internal security forces are apparently excluded.

SOURCE:

1927, 1937, 1941, 1945, 1948, 1955, and 1959:	Speech of N. Khrushchev on January 15, 1960, as reported in *451*, XII, 2, 9.
1931:	*420*.
1933 and 1935:	Speech of Marshal Tukhachevsky in *228*, 222.
1936:	Marshal Tukhachevsky as quoted in *532*, 1/16/36.
1939:	Telegram of Ambassador Schulenburg to German Foreign Office as reproduced in *530*, 91.
1956:	Strength in 1955 minus reported reduction of 640 thousand (*451*, VII, 45, 26).
1957 and 1958:	Strength in 1956 minus reported reductions of 1,200 and 300 thousand (*451*, X, 1, 3).

In his speech, Khrushchev states that "the proposal to reduce the Soviet Armed Forces [from 3.6 down to 2.4 million] that the government has submitted to the Supreme Soviet for consideration will yield an annual saving of approximately 16,000,000,000 to 17,000,000,000 rubles" (*451*, XII, 2, 13). It is not at all clear what kinds of expenditures are counted within these expected savings. If they are taken as applying solely to the support of troops excluding the production of armaments, and if it is assumed that the savings were calculated on a simple *pro rata* basis, total expenditures in support of troops would be indicated as around 50 billion rubles in 1959, or 13,900 rubles per member of the armed

forces. Applying the latter to the strength of the armed forces in 1955 would give an expenditure of 80 billion rubles in support of troops, or 14 billion rubles more than the estimate in Table A-9. Expenditures on military products would be reduced accordingly, or by about a third—from 42 down to 28 billion rubles.

If, as seems unlikely, expenditures on military products were also to be reduced in proportion to the troop cut, the 1955 estimate in Table A-9 for such expenditures would remain substantially correct. Most likely, the correct figure is significantly less than our estimate but not a third less. A reasonable guess might be that our estimate should be reduced by about a fifth. Aside from the fact that we could not do so at such a late point, we thought it unnecessary to revise our index of military production because the upward bias for conventional military products is counterbalanced by the downward bias resulting from the exclusion of atomic energy.

Technical Note 4 (Chapter 5): Hodgman and Hodgman-NBER Indexes of Soviet Industrial Production

GENERAL DESCRIPTION OF THE HODGMAN INDEX

The Hodgman index has been fully described elsewhere,[18] and we shall not try to do so again. We propose to give only a brief outline of its coverage and method of construction, in sufficient detail to clarify how it differs from our own indexes.

The Hodgman index covers industrial production in so-called large-scale enterprises. For several reasons advanced elsewhere in this book (see Chapter 7), the fraction of total industrial production accounted for by so-called large-scale enterprises rose from less than 70 per cent in 1928 to more than 90 per cent in 1933, and probably to an even higher percentage in succeeding years. Hodgman describes his output series as covering large-scale production, but this is generally the case only for the period 1928–1931, when the share of such production was steadily expanding. For years after 1931, output data published in Soviet sources and used by Hodgman apply with very few exceptions to total production, both small- and large-scale. Hence a substantial part of the growth shown by some of Hodgman's output series, particularly in consumer goods, reflects an accounting in later years of output not covered earlier.

The scope of the productive activity covered by the Hodgman index corresponds with the Soviet definition of industry, except that logging is not directly represented by output data. In the adjusted version of the

[18] See *490* and *558*, 128–142.

index, logging is implicitly included by assigning its weight to other sectors, in a manner to be described below. That is to say, Hodgman makes the implicit assumption that productive activity in logging grew at the same rate as activity in the other covered sectors to which its weight was assigned.[19] For 1928–1937, the index covers 137 products in all, which (according to our definitions of broad categories) may be broken down into thirty intermediate industrial products, forty items of agricultural and transportation equipment, thirty items of miscellaneous machinery, and thirty-seven items of consumer goods (see Table A-13). For 1937–1951, the coverage diminishes to twenty-two products in all because of the paucity of data available on this period when Hodgman did his work.

The basic weights used are wage bills (including payroll taxes) for large-scale industry in 1934. Where such data are available only for a group of products, weighting within the group is based on several types of statistics, typically physical data on employment or labor cost. In the case of machinery, most internal weighting is based on unit values drawn from various censuses of manufactures for the United States.

Imputed weights are used, as opposed to direct or earned weights. The imputation is made in two stages. In the first stage, the full weight of a product group (as chemicals) is assigned to the output series representing that group, whether they fully cover it or not. In the second stage, the full weight of all product groups not considered to be represented by output series is divided between covered machinery, on the one hand, and all other covered products, on the other hand. The resulting indexes are referred to as unadjusted and adjusted, respectively. The percentage weights used in each are shown in Table A-14, where they are given for the major product groups in our indexes.

In using imputed weights, one assumes that the industries not covered by output data showed the same percentage growth as the covered industries to which weights are imputed. This assumption is questionable in the Soviet case, for it seems reasonable to presume that those industries most poorly covered by published output data have generally grown more slowly than related industries covered by output data. This is simply to say that Soviet authorities have not been backward in advertising success, except in areas directly concerned with military production. Assuming unknown growth to be the same as published growth is likely,

[19] This procedure of introducing logging by imputing its weight elsewhere is rather curious, since Hodgman states that he did not include an output series for logging in his index "because calculation of an appropriate net value-added weight was considered too risky" (*490*, 57).

in our opinion, to lead to an exaggeration of over-all growth. On this ground, the Hodgman index is open to criticism, particularly the adjusted version, which we shall now examine in more detail.

The adjustment is based on 1934 employment of production workers (large-scale industry) in the covered and uncovered sectors of industry. The covered sector—i.e., those industrial groups represented by output series—accounts for 4.1 million workers, the uncovered for 3.3 million.[20] Hodgman divides the uncovered sector into two parts: uncovered machinery and metalworking (1.3 million workers) and other uncovered industrial groups (2.0 million workers). Employment in all machinery and metalworking industries is 3.088 times employment in the covered portion; for all other industries as a group, the corresponding factor is 1.589.[21] Hodgman therefore multiplies the weight for each of the covered machinery groups in his index by 3.088, and the weight for every other covered industrial group by 1.589. Put another way, this amounts to increasing the percentage weights for machinery categories by 64 per cent, and reducing those for every other industrial group by 15 per cent (see Table A-14).

The inflation of weights for machinery is a questionable procedure, since standard production indexes for the United States, where many more data are available, seldom cover even as large a segment of machinery and metalworking industries as is included in the unadjusted Hodgman index (see the discussion in Chapter 5). Moreover, repair shops account for almost half the expanded coverage (0.6 million workers), and these are almost never counted in industrial production in other countries. Metal products account for almost another quarter (0.3 million workers), and their production grew much more slowly than the production of machinery and probably no faster than the production of industry as a whole (see Table F-1). Finally it seems improbable that the production of ships and various unspecified items of miscellaneous machinery—the other uncovered machinery and metalworking categories—grew as rapidly as the production of machinery reported on in detail.

Outside the machinery and metalworking area, the most important uncovered items, in terms of weight accounted for, fall in the area of construction materials and consumer goods. Logging alone accounts for almost a million workers, or half the employment, in uncovered non-metalworking industries. The procedure of adjustment followed by Hodgman assumes that production of each of the uncovered items grew

[20] *490*, 56.
[21] *490*, 73.

at the same percentage rate as his index for all covered nonmetalworking items. However, his index is 237 per cent of 1928 for covered food and allied products and 229 per cent for covered textiles and retail products (see Table A-15), percentages that are much lower than the corresponding one (308 per cent) for all covered nonmetalworking items,[22] and it seems beyond reasonable doubt that the rate for the uncovered consumer good industries—the most important of which is the garment industry ("needle trades" in Soviet terminology)—would also be lower. In the case of logging, Hodgman's data on large-scale output (in terms of timber removed from forests) show production in 1937 as only 211 per cent of 1929;[23] our own data on total haulage of industrial timber (Table B-2) show production as only 141 per cent. These percentages are also much lower than the corresponding one (269 per cent) for all covered nonmetalworking industries.[24]

In summary, it seems that Hodgman's coverage adjustment (a) does not accord with the practices generally followed in constructing industrial production indexes and (b) probably causes his adjusted index to rise significantly more rapidly than it would if it were constructed with the same product coverage under a system of direct weights, were the necessary data available.[25]

For the period 1937–1951, Hodgman makes a second upward adjustment in his index to offset undercoverage of military production. The adjustment is complicated, involving many assumptions, and it seems best to refer to the original for a full description.[26] The procedure rests on the basic presumption that Hodgman's index correctly measures the production of machinery (excluding armaments) over the period from 1937 to the 1941 Plan, and that the "inflationary bias" in the Soviet measures of gross production of both machinery and armaments over the same period is fully reflected in the percentage divergence of the Soviet index for machinery (excluding armaments) from Hodgman's index for the same category. Hodgman uses this measure of "inflationary bias" to deflate rough estimates of armament production, and then combines the deflated estimates with his index for machinery excluding armaments. He describes the procedure as "painfully rough and ready,"[27] and Seton states that "the resulting inflation of the general index by 13

[22] *490*, 72.
[23] *490*, 58.
[24] *490*, 72.
[25] Seton seems to reach an opposite conclusion, for he argues that the Hodgman index, even as adjusted, probably understates Soviet industrial growth (see *558*, 140).
[26] *490*, 83 ff.
[27] *490*, 88.

per cent for all years after 1937 can only be accepted as an act of faith."[28] Our own comments on problems in measuring military production are given elsewhere (see technical note 3, this Appendix, and Chapters 5 and 7).

COMPUTATION OF THE HODGMAN-NBER INDEX

Our synthetic index was constructed by using Hodgman's weights and our output series, the latter reflecting total as opposed to large-scale production. With a few modifications, we used the same product coverage as Hodgman, except for machinery. The following products were substituted for those used by Hodgman: bituminous coal, anthracite, and lignite, combined by 1928 weights, were substituted for all coal in tons; motor vehicle tires and rubber footwear, combined by 1928 weights, for crude rubber consumption; vegetable oil excluding consumption in oleomargarine for vegetable oil; candy for confectionery; and flour for bread. The following seven products were omitted either because they are not included in our output series or because their output is not adequately measured by existing data: crude petroleum consumed in refining (weight given to crude petroleum); copper ore (weight to nonferrous metals); plastic pulp and iodine (weight to chemicals); cottonized fiber (weight to cotton fabrics); and knit underwear and outerwear (weight to hosiery).

In general, we used Hodgman's weights in full detail. In the case of some product groups, we weighted internally with 1928 prices instead of using Hodgman's internal weights. Those cases are: pig iron, rolled steel, and steel ingots and castings; copper, lead, and zinc; soda ash, phosphoric fertilizer, sulfuric acid, and synthetic dyes; and lumber and plywood. We also used our moving-weight indexes for agricultural equipment, transportation equipment, miscellaneous machinery, and consumer durables. For an explanation of how these indexes are constructed, see Chapter 5. The basic weights used were those for the unadjusted Hodgman index (see Table A-14). The resulting Hodgman-NBER indexes are presented in Table A-15.

COMPARISON OF HODGMAN, HODGMAN-NBER, AND NBER INDEXES

The product coverages of the Hodgman and NBER indexes are summarized in Table A-13. The coverages are seen to be similar, particularly as between the Hodgman index and the NBER index with 1928 weights. There are, however, some important differences in coverage of machinery not revealed by these summary figures. The larger number of machinery

[28] *558*, 132.

items in the Hodgman index actually reflects greater detail in product breakdown, not broader scope of activity. For example, the Hodgman index includes nine types of machine tools, while the NBER index includes only one series for aggregate machine tools. All in all, there are in the Hodgman index twenty-six items of machinery that are represented

TABLE A-13

PRODUCT COVERAGE OF HODGMAN AND NBER INDEXES OF SOVIET INDUSTRIAL PRODUCTION

	Number of Products[a]				
	Total	Intermediate Industrial Products	Agricultural and Transportation Equipment	Miscellaneous Machinery	Consumer Goods
Hodgman index[b]	137	30	40	30	37
NBER indexes[c]					
1928 weights	130	43	23	29	35
1955 weights	165	46	35	46	38

[a] For the scope of industrial categories, see Table D-10.

[b] Coverage counted from output series in *490*, 205 ff. Applies only to period 1928–1937; for later years, index is based on 22 products (*490*, 194 ff). See text of this technical note for further qualifications.

[c] From Table D-10.

in the NBER index by only seven output series. In this sense, then, the coverage of the Hodgman index is overstated in Table A-13 by nineteen products. It should also be remembered that the coverage shown there applies to the period 1928–1937; for all later years, the total coverage is only twenty-two products.

The Hodgman-NBER index has a slightly different product coverage from those shown. For all years, it covers twenty-nine intermediate industrial products and thirty-four items of consumer goods. The coverage for machinery varies over the periods, since moving-weight indexes were used for each category: through 1937, the coverage is that for the NBER indexes with 1928 weights; from 1937 through 1940, that for NBER indexes with both 1928 and 1955 weights; and from 1940 through 1950, that for NBER indexes with 1955 weights. Hence, total coverage varies from 115 to 144 products.

The weighting systems are put on a comparable basis in Table A-14, which shows for each index the percentage distribution among product groups of the weighted aggregate for 1934. We note that there are marked differences between the implicit 1934 weight structures for the two NBER

TABLE A-14

PERCENTAGE DISTRIBUTION OF 1934 WEIGHTED AGGREGATES FOR NBER AND HODGMAN PRODUCTION INDEXES AMONG INDUSTRIAL GROUPS[a]
(per cent)

	NBER Indexes		*Hodgman Indexes*	
	1928 Weights[b]	1955 Weights[c]	Unadjusted[d]	Adjusted[e]
Ferrous metals	7.6	3.9[f]	10.8	9.1
Nonferrous metals	0.5	0.3[f]	1.9	1.6
Fuel	15.3	6.5	14.6	12.3
Electricity	10.7	0.6	2.6	2.2
Chemicals	3.9	4.7	7.7	6.5
Construction materials	15.3	22.0	8.5	7.2
Transportation equipment	5.7	13.5	4.5	7.3
Agricultural machinery	2.7	9.7	3.8	6.2
Miscellaneous machinery	2.8	4.8	9.7	16.0
Food and allied products	20.0	14.3	15.5	13.1
Textiles and allied products	14.7	18.4	19.2	16.2
Consumer durables	0.7	1.4	1.4[g]	2.2[g]
Total	100.0	100.0	100.0	100.0

Details and sums may not agree because of rounding.

[a] For product coverage of industrial groups, see Table D-10.

[b] Calculated from Table D-3. Value for miscellaneous machinery interpolated logarithmically as 303 million rubles.

[c] Calculated from Tables D-4, D-8, and (for electricity only) B-2. For each group, weight for 1955 multiplied by index number for 1934 (1955 = 100), the resulting figure expressed as a percentage of sum of figures for all groups. Index number for miscellaneous machinery interpolated logarithmically as 15.79.

[d] *490*, 215 ff.

[e] *490*, 73 and 215 ff. For each group, unadjusted weight multiplied by coverage adjustment ratio, the resulting figure expressed as a percentage of the sum of figures for all groups. Adjustment ratios are 3.088 for transportation equipment, agricultural equipment, miscellaneous machinery, and consumer durables; 1.589 for all other groups.

[f] 1955 weight for combined ferrous and nonferrous metals (5.7 per cent) apportioned to each group on the basis of computed 1955 aggregate value (31,090 million rubles for ferrous metals and 5,385 million rubles for nonferrous metals). The latter are computed from output in Table B-2 and unit values in Table D-8.

[g] Covers electric light bulbs and articles for home and general use.

indexes, on the one hand, and the actual 1934 structures for the Hodgman indexes, on the other hand. The smallest discrepancies occur for consumer goods; elsewhere, discrepancies are significantly large without a transparent pattern. Such discrepancies reflect in part changes in relative unit costs of production (as measured by the weight factors) from one weight-base year to another,[29] and in part differences in degree of imputation. Electricity is a good example of differences attributable in

[29] It may be doubted that 1934 is a good choice as weight base, since the pricing system was deteriorating seriously at this time. See, e.g., *538*, 258,

large part to imputation: in the NBER index with 1928 weights, the weight covers all producers of electricity; in the Hodgman indexes, and probably in the NBER index with 1955 weights, the weight covers only electric power stations. Machinery categories—particularly miscellaneous machinery—provide other good examples.

A comparison of various indexes, broken down by product groups, is given in Table A-15. For the aggregate, the unadjusted Hodgman index rises more rapidly than the Hodgman-NBER index; the latter, more rapidly than either of the NBER indexes. Using the NBER index with 1928 weights as a basis for comparison, we find that the Hodgman index exceeds it by 29 per cent in 1937 and by 20 per cent in 1950, while the Hodgman-NBER index exceeds it by only 7 and 4 per cent, respectively. Hence the more rapid growth shown by the Hodgman index relative to the NBER index with 1928 weights may be attributed primarily to differences in scope of output series (large-scale as opposed to total production) and only secondarily to differences in weighting structures. Using the NBER index with 1955 weights for comparison, we find that the Hodgman index exceeds it by 47 per cent in 1937 and by 53 per cent in 1950, while the Hodgman-NBER index exceeds it by 22 and 33 per cent. In this case, differences in scope of output series and in weighting structures seem to be about equally important in accounting for the divergence.

For the aggregate excluding miscellaneous machinery, the divergences between the Hodgman-NBER index, on the one hand, and the NBER indexes, on the other, are smaller. The Hodgman-NBER index exceeds the NBER index with 1928 weights by 2 per cent in 1937 and falls short by 3 per cent in 1950; it exceeds the NBER index with 1955 weights by 20 and 29 per cent. Similar comparisons with the Hodgman index have not been made, because a tedious recalculation of the Hodgman machinery index would have been required in order to eliminate the miscellaneous category.

For industrial groups, the Hodgman indexes generally rise more rapidly than the Hodgman-NBER indexes. A slower rise is shown only for machinery and equipment, which is attributable to the fact that machinery groups are internally weighted by Soviet factors in the Hodgman-NBER index and by U.S. factors in the Hodgman index. Machinery aside, the greatest percentage divergences between Hodgman and Hodgman-NBER indexes as of 1937 are for textiles, chemicals, food, and construction materials. Except in the case of chemicals, these divergences are attributable almost wholly to differences in scope of output series, since these are

TABLE A-15

HODGMAN, HODGMAN-NBER, AND NBER PRODUCTION INDEXES FOR INDUSTRIAL GROUPS: SOVIET UNION, SELECTED YEARS, 1927/28–1950[a]
(1927/28 = 100)

	1927/28	1932	1934	1937	1940	1950
Aggregate						
Hodgman (unadjusted)	100.0	162.5	213.2	342.2	351.1	527.0
Hodgman-NBER	100.0	150.3	194.1	283.4	304.7	457.6
NBER, 1928 weights	100.0	143.6	181.9	265.7	286.3	438.9
NBER, 1955 weights	100.0	140.6	167.3	232.6	226.9	343.4
Aggregate excl. misc. machinery						
Hodgman (unadjusted)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Hodgman-NBER	100.0	138.1	180.3	267.3	288.5	405.8
NBER, 1928 weights	100.0	140.3	178.1	261.3	282.1	417.3
NBER, 1955 weights	100.0	136.0	161.0	223.2	216.8	314.0
Ferrous metals						
Hodgman	100.0	150.7	252.3	406.1	n.a.	n.a.
Hodgman-NBER	100.0	155.8	263.2	418.8	431.8	616.8
NBER, 1928 weights	100.0	153.2	254.8	416.4	428.6	617.6
NBER, 1955 weights	100.0	156.9	262.1	418.2	430.0	612.2
Nonferrous metals						
Hodgman	100.0	195.2	322.5	732.9	n.a.	n.a.
Hodgman-NBER	100.0	205.3	311.9	683.0	1,027.4	1,536.6
NBER, 1928 weights	100.0	197.3	274.7	583.5	869.2	1,300.5
NBER, 1955 weights	100.0	219.7	295.1	626.0	937.0	1,426.8
Electricity						
Hodgman	100.0	270.6	420.2	726.9	n.a.	n.a.
Hodgman-NBER	100.0	270.4	419.6	722.4	964.3	1,821.0
NBER, 1928 weights	100.0	270.4	419.6	722.4	964.3	1,821.0
NBER, 1955 weights	100.0	270.4	419.6	722.4	964.3	1,821.0
Fuel						
Hodgman	100.0	196.8	268.8	356.9	n.a.	n.a.
Hodgman-NBER	100.0	194.3	267.4	354.2	446.9	620.5
NBER, 1928 weights	100.0	191.5	249.5	347.2	401.1	560.3
NBER, 1955 weights	100.0	191.0	266.7	357.3	446.9	642.4
Chemicals						
Hodgman	100.0	190.5	284.3	529.6	n.a.	n.a.
Hodgman-NBER	100.0	179.6	256.4	409.3	427.1	647.7
NBER, 1928 weights	100.0	184.8	251.6	391.0	400.5	589.9
NBER, 1955 weights	100.0	181.7	223.0	334.7	322.9	561.3
Construction materials						
Hodgman	100.0	183.3	222.7	309.4	n.a.	n.a.
Hodgman-NBER	100.0	152.4	184.4	257.2	229.0	329.4
NBER, 1928 weights	100.0	162.4	175.9	220.3	214.8	306.5
NBER, 1955 weights	100.0	164.2	176.3	219.7	217.2	302.9

TABLE A-15 (concluded)

	1927/28	1932	1934	1937	1940	1950
Machinery, equip., and consumer durables (incl. misc. mach.)						
Hodgman	100.0	257.8	363.6	625.5	n.a.	n.a.
Hodgman-NBER	100.0	421.3	621.8	920.1	745.1	1,919.9
NBER, 1928 weights	100.0	367.5	650.7	1,121.3	852.8	3,236.9
NBER, 1955 weights	100.0	214.3	314.1	440.0	327.9	784.0
Machinery, equip., and consumer durables (excl. misc. mach.)						
Hodgman	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Hodgman-NBER	100.0	289.2	582.2	992.1	641.7	1,641.1
NBER, 1928 weights	100.0	307.0	645.8	1,204.9	859.1	2,129.7
NBER, 1955 weights	100.0	189.0	284.1	394.0	266.7	620.0
Food and allied products						
Hodgman	100.0	125.0	162.4	237.4	n.a.	n.a.
Hodgman-NBER	100.0	114.0	137.1	186.0	200.2	239.8
NBER, 1928 weights	100.0	112.9	136.6	181.4	192.9	217.2
NBER, 1955 weights	100.0	119.4	136.4	168.7	167.0	180.0
Textiles and allied products						
Hodgman	100.0	135.8	133.7	229.3	n.a.	n.a.
Hodgman-NBER	100.0	102.3	102.3	145.1	179.2	185.0
NBER, 1928 weights	100.0	92.6	89.4	133.8	154.3	165.4
NBER, 1955 weights	100.0	93.0	87.0	137.9	160.7	164.1

[a] For product coverage of industrial groups, see Table D-10. NBER indexes are calculated from Tables D-3, D-4, D-8, and (for electricity only) B-2. Hodgman indexes are calculated from data in *490*, 173, 215 ff., 226, 233, and 236 ff. Hodgman-NBER indexes are calculated from Hodgman's weights and NBER output series (Table B-2), as described in text.

areas with important small-scale production in 1928. In the case of chemicals, the divergence results from differences in product coverage and in internal weighting.

The only Hodgman-NBER index that rises more slowly than our NBER index with 1928 weights is the one for machinery, the reason being that the NBER index has 1928 weights while the Hodgman-NBER index has moving weights. None of the Hodgman-NBER indexes rise more slowly than the NBER indexes with 1955 weights.

ANNEX: KAPLAN-MOORSTEEN INDEX OF SOVIET INDUSTRIAL PRODUCTION

An important Western index of Soviet industrial production, constructed by Norman Kaplan and Richard Moorsteen of the RAND Corporation, was published in mid-1960,[30] becoming available to us too late for the careful examination it deserves. Details on the machinery segment, scheduled for later publication, have, in fact, not yet been made available. Therefore, the analysis undertaken here is necessarily, if regretfully, superficial.

[30] *504* and *504a*.

The index is of the "comprehensive" type, covering civilian products. Weighting within industrial groups is based on 1950 Soviet prices; among groups, on estimated 1950 Soviet wage bills. It will be recalled that our indexes with comparable coverage have 1928 and 1955 weight bases and that the one with 1955 weights uses employment rather than wage bill to weight industrial groups. In addition, Kaplan and Moorsteen use gross unit values for internal weighting, while we use estimated unit value added wherever possible; their internal weights for consumer goods apply to the retail level including turnover tax, while ours apply to the wholesale level excluding most of the turnover tax; their output series are taken directly from Soviet sources, while some of ours have been adjusted to expand incomplete coverage in earlier years; their classification of industrial groups is somewhat different from ours; and their machinery index is apparently based on a finer breakdown of products than ours and covers "miscellaneous" items, while our basic indexes do not.

These differences make it difficult to choose counterparts from their and our indexes for comparison, but we attempt to do so in Table A-16. Aside from the points already mentioned, it is well to note some specific differences in product coverage. For example, nonferrous metals are covered in our indexes but not in theirs; cigarettes, low-grade tobacco, soap, and starch are included in our "foods and allied products" but in their "consumer non-foods"; and so on. In two cases—chemicals and wood construction materials—we have replaced our basic indexes with the special ones calculated for study of labor productivity. The reason for this is that paper products are classified with chemicals in our basic indexes but with wood materials in the Kaplan-Moorsteen and our special indexes. The main drawback of using our special indexes is that they are based on moving weights.

Bearing these considerations in mind, we may note that the Kaplan-Moorsteen index for all civilian products falls between our counterparts, as would be predicted from the fact that their weight base is also intermediate. They feel, however, that their index differs much more from ours with 1955 weights than should be expected from the closeness of the weight bases,[31] and there are undoubtedly several other reasons to explain the difference. At the same time, the probable effect of the weight bases would be very hard to predict in this case because the Soviet price structure underwent a radical change in 1950 imposed in an effort to correct the serious errors of the equally radical reform of 1949. The resulting price structure, established as it was by emergency

[31] *504a*, 79.

TABLE A-16

KAPLAN-MOORSTEEN AND NBER PRODUCTION INDEXES FOR INDUSTRIAL GROUPS: SOVIET UNION, SELECTED YEARS, 1927/28–1958
(1927/28 = 100)

	1927/28	1932	1937	1940	1945	1950	1955	1958
Aggregate								
Kaplan-Moorsteen	100	154	249	263	135	369	583	746
NBER incl. misc. machinery								
1928 weights	100	144	266	286	165	439	713	
1955 weights	100	141	233	227	103	343	502	
NBER excl. misc. machinery								
1928 weights	100	140	262	282	163	417	681	
1955 weights	100	136	223	216	97	314	457	567
Ferrous metals								
Kaplan-Moorsteen	100	156	421	433	276	637	1,069	1,291
NBER, 1928 weights	100	153	416	429	270	618	1,046	
NBER, 1955 weights	100	157	418	430	269	612	1,039	1,254
Fuel and electricity								
Kaplan-Moorsteen[a]	100	187	298	357	270	502	848	1,221
NBER, 1928 weights	100	215	444	568	473	934	1,634	
NBER, 1955 weights	100	196	377	477	383	709	1,120	1,494
Chemicals[b]								
Kaplan-Moorsteen	100	258	762	819	368	1,449	2,395	3,105
NBER, moving weights	100		451	450		814	1,132	
Wood construction materials[b]								
Kaplan-Moorsteen	100	198	254	274	148	348	485	564
NBER, moving weights	100		209	215		296	417	
Mineral construction materials								
Kaplan-Moorsteen	100	200	385	335	138	532	1,013	1,386
NBER moving weights	100		283	241		368	696	
Civilian machinery and equipment								
Kaplan-Moorsteen	100	287	602	505	200	1,471	2,004	2,721
NBER incl. misc. machinery								
1928 weights	100	364	1,067	828	362	2,316	3,021	
1955 weights	100	212	436	326	102	779	974	
NBER excl. misc. machinery								
1928 weights	100	299	1,139	826	351	2,025	2,437	
1955 weights	100	185	386	262	61	607	689	893
Food and allied products								
Kaplan-Moorsteen	100	105	157	164	74	150	235	282
NBER, 1928 weights	100	113	181	193	86	217	331	
NBER, 1955 weights	100	118	169	167	88	180	277	323
Textiles, allied products, and consumer durables								
Kaplan-Moorsteen	100	114	171	197	74	216	386	468
NBER, 1928 weights	100	94	144	160	63	183	347	
NBER, 1955 weights	100	96	145	164	62	177	294	388

SOURCE: *504a*, Table 22; this study, Tables D-3, D-4, and A-24.

[a] Separate indexes for fuel and electricity combined by wage-bill weights in *504a*, Table 7.

[b] Paper products included with wood materials, not with chemicals.

measures, was substantially modified over the succeeding five years, and it would therefore not be surprising if production indexes alike in other respects turned out quite differently when based on 1950 and 1955 prices.

In any case, the Kaplan-Moorsteen index rises considerably slower than ours in the case of fuel and electricity; considerably faster in the cases of mineral construction materials and chemicals. The full explanation for these discrepancies would undoubtedly involve all the factors already mentioned, since casual inspection does not suggest a simple reason for the differences. For wood construction materials, the faster growth of the Kaplan-Moorsteen index may result from their weighting timber, lumber, and plywood by gross prices—we used unit value added—and from their using an output series for timber that understates total output in 1928 by about a third, according to our estimates. For the two categories of consumer goods, the differences between their indexes and ours are less pronounced and run in both directions, the explanation for divergences probably lying mainly in the types of weights and output series used. Opinions will vary on whether the counterpart machinery indexes behave as might be expected from the differences in the weight bases—our two indexes with comparable coverage bracket their index. However that may be, further investigation must await publication of the details underlying their index.

Technical Note 5 (Chapter 5): Indexes of Soviet Industrial Prices

Price indexes are a natural by-product of work on production indexes using weights from different years, and we present here such indexes for a few key years and the data on which they are based (Tables A-17 and A-18). The basic prices are supposed to represent only the value per unit attributable to productive activity within the boundaries of industry, derived in general by subtracting the estimated cost of nonindustrial materials consumed in industrial processing. Though these prices are referred to as value added per unit, this is not strictly correct since some double counting of industrial value added is involved (see the discussion in Chapter 5).

Prices generally refer to the wholesale or factory level and exclude excise taxes for 1928. A portion of levied turnover taxes remains in 1955 prices, primarily for consumer goods. In general, we eliminated a fraction equal to the ratio of the cost of materials to the combined cost of materials and labor—in most cases between 80 and 90 per cent.

Our 1928 price indexes for industrial materials on the 1913 base are very close to the official Soviet price indexes for industrial products as a

TABLE A-17

INDEXES OF SOVIET INDUSTRIAL PRICES, 1913, 1928, AND 1955
(per cent)

	1928 as % of 1913		*1955 as % of 1928*	
	1913 Output Weights	1928 Output Weights	1928 Output Weights	1955 Output Weights
Industrial materials	205.6	198.0	546.0	478.0
Intermediate products	183.0	175.7	494.8	472.0
Metals	175.3	175.8	443.1	466.0
Fuel and electricity	157.6	148.0	530.3	497.9
Chemicals	174.0	159.2	468.8	434.7
Construction materials	268.6	269.6	480.6	458.0
Consumer goods	229.6	224.1	594.1	494.6
Food and allied products	189.9	186.9	727.3	833.6
Textiles and allied products	294.1	271.1	383.9	260.2
Finished industrial products			581.8	370.1
Construction materials			495.9	458.1
Machinery and equipment			990.7	198.9
Transportation equipment			774.4	163.3
Agricultural equipment			1,670.6	372.0
Miscellaneous machinery			295.9	208.8
Consumer goods			576.6	459.4
Food and allied products			804.7	695.6
Textiles and allied products			331.6	255.3
Consumer durables			1,310.8	357.5

SOURCE: Table A-18. Prices exclude most of the applicable turnover taxes (see Chapter 5).

whole. For wholesale prices, the latter are 188 for 1927/28 and 1928/29; for retail prices, 198 for 1927/28 and 203 for 1928/29.[32]

Our indexes relating 1928 and 1955 may be compared with the Bergson-Turgeon-Bernaut indexes for basic industrial products with 1937 output weights.[33] Since prices remained the same, with very few exceptions, from January 1952 to July 1955, the appropriate indexes for comparison would be averages for 1952 and 1956. The relevant Bergson-Turgeon-Bernaut indexes are as follows (1928 = 100):

	1952	*1956*
Ferrous and nonferrous metals	411	392
Fuel and power	633	573
Chemicals and related products	373	339
Basic industrial products, incl. petroleum	524	489
Basic industrial products, excl. petroleum	525	498

[32] *498,* 784.
[33] *432* and *576.*

TABLE A-18

BASIC DATA FOR INDEXES OF SOVIET INDUSTRIAL PRICES (million rubles)

A. VALUE ADDED FOR INDUSTRIAL MATERIALS IN CONSTANT PRICES

	49 products[a]				54 products[b]			
	1913 Value Added		*1928 Value Added*		*1928 Value Added*		*1955 Value Added*	
	1913 Prices	1928 Prices	1913 Prices	1928 Prices	1928 Prices	1955 Prices	1928 Prices	1955 Prices
All materials	2,687.6	5,525.3	2,779.1	5,502.8	5,557.0	30,342.7	30,448.2	145,535.9
Intermediate products	1,385.2	2,535.3	1,499.0	2,633.9	2,688.1	13,299.3	22,376.2	105,612.5
Metals	298.8	523.9	298.9	525.4	525.4	2,327.8	6,013.1	28,020.2
Fuel and electricity	721.4	1,136.7	796.0	1,178.0	1,216.5	6,451.1	8,445.0	42,047.7
Chemicals	111.8	194.5	144.0	229.2	229.2	1,074.5	3,103.8	13,492.6
Construction materials	253.2	680.2	260.1	701.3	717.0	3,445.9	4,814.3	22,052.0
Consumer goods	1,302.4	2,990.0	1,280.1	2,868.9	2,868.9	17,043.4[c]	8,072.0	39,923.4[c]
Food and allied products	806.6	1,532.0	714.3	1,335.0	1,335.0	11,155.3[c]	3,431.1	27,850.0[c]
Textiles and allied products	495.8	1,458.0	565.8	1,533.9	1,533.9	5,888.1[c]	4,640.9	12,073.4[c]

B. VALUE ADDED FOR 70 FINISHED INDUSTRIAL PRODUCTS IN CONSTANT PRICES[d]

	1928 Value Added		*1955 Value Added*	
	1928 Prices	1955 Prices	1928 Prices	1955 Prices
All products	4,369.8	25,424.5	25,749.7	95,287.6
Construction materials	787.9	3,906.8	4,814.1	22,052.0
Machinery and equipment	208.8	2,068.5	8,809.9	17,524.9
Transportation equipment	105.8	819.3	5,322.9	8,694.2
Agricultural equipment	68.7	1,147.7	949.3	3,531.3
Miscellaneous machinery	34.3	101.5	2,537.7	5,299.4
Consumer goods	3,373.1	19,449.2[c]	12,125.7	55,710.7[c]
Food and allied products	1,712.5	13,780.8[c]	5,214.9	36,274.6[c]
Textiles and allied products	1,644.0	5,450.8[c]	5,155.5	13,160.2[c]
Consumer durables	16.6	217.6[c]	1,755.3	6,275.9[c]

NOTE: All unit values are taken from Table D-8; all outputs from Table B-2.

[a] Products in Table D-10 covered by all production indexes of industrial materials with Soviet weights.

[b] Products in Table D-10 covered by production indexes of industrial materials with 1928 and 1955 Soviet weights. The 1955 unit value for fish catch is taken as 3,300 rubles (see note b to Table D-8).

[c] Prices exclude most turnover taxes (see Chapter 5).

[d] Products in Table D-10 covered by both production indexes for finished industrial products. For the 1955 unit value for fish catch, see note b above.

Their indexes for all basic industrial products are seen, when averaged, to lie between ours for all industrial materials with 1928 and 1955 output weights, a result to be expected since their indexes have 1937 weights. Their indexes for product groups do not conform so well to ours for apparent counterparts, as would perhaps also be expected because of inevitable differences in product coverage, judgments on relevant prices, and so on. Their indexes for metals and chemicals are lower than ours and the ones for fuel and power higher. In the latter case, the explanation lies in part in the treatment of turnover taxes, which are included in full in the prices of petroleum products within their index. If those taxes are removed from the 1937 price and it is assumed that they did not change as a percentage of price in later years, the Bergson-Turgeon-Bernaut indexes for fuel and power would be 402 for 1952 and 363 for 1956, both of which are lower than our indexes.

Technical Note 6 (Chapter 6): Indexes of Industrial Production in Prerevolutionary Russia

None of our discussion of industrial development in prerevolutionary Russia should be taken as definitive, since we have not undertaken an exhaustive study of this period. We have constructed a production index for industrial materials with 1913 weights, but it has many shortcomings and weaknesses, some inherent in the relatively poor statistical record for the period.

The products covered by our index are listed in Table D-11 and the weights are given in Table D-8. Since output data for the prerevolutionary period are essentially the by-product of the factory inspection and tax collection systems, they apply only to large-scale, or factory, production. Output in this sector grew significantly more rapidly than in small-scale enterprises and in hand trades, where the bulk of industrial production took place. Hence an index based on the available data will exaggerate the rate of industrial growth. To a lesser degree, the same is true for indexes covering similar periods of development in Western countries, as the nineteenth century in the United States. We should also note that this exaggeration of growth is not as serious as the exaggeration for the early Soviet period if large-scale production is used to represent total production. In the latter case, the large-scale sector absorbed the small-scale sector within the span of five years (see Chapter 7). During the late nineteenth century the small-scale sector was not being absorbed; it was merely growing more slowly than the large-scale sector.[34]

[34] The development of small-scale industry is discussed in a study by Adam Kaufman, "Small-Scale Industry in the Soviet Union" (in press).

The small product coverage is perhaps a more serious shortcoming of the prerevolutionary index. Only fourteen products have output data spanning the entire period 1860–1913; nineteen have data spanning the period 1888–1913; and twenty-six—the largest number—have data spanning 1900–1913. In 1913 these twenty-six products accounted for an estimated value added of 2,042 million rubles (Table D-5), while the industrial materials in our index for the Soviet period with 1913 prices accounted for 3,176 million rubles, when adjusted to cover Tsarist territory (Table D-1). Value added in all industry was around 4,400 million if adjusted to Tsarist territory on the basis of data for industrial materials (Table A-43 and D-1). Hence the products covered in our prerevolutionary index accounted in 1913 for about 64 per cent of the value added by industrial materials in our index for the Soviet period and about 46 per cent of the value added of all industry.

For comparative purposes, we show in Table A-19 four indexes of prerevolutionary industrial production (for benchmark years) constructed by other scholars. These indexes differ from ours primarily in weighting systems; product coverage is similar in all indexes shown. In the Kondratiev index as originally constructed, output relatives for each product are weighted by the simple average of attributed percentages of horsepower and employment, and the relatives thus weighted are averaged geometrically.[35] This index covers the period 1885–1913. It has been revised by Raymond Goldsmith to extend it back through 1860 and to transform it to an arithmetically averaged index, in accord with present Western practice. Both versions are shown in Table A-19.

The other two indexes shown there have been constructed by Raymond Goldsmith and Israel Borenstein, using estimated value added in 1887, 1900, and 1908 to weight three separate links that are chained together.[36] Hence these represent efforts to construct moving-weight indexes based on value-added weights. The index has two versions, one using direct weights and the other imputed weights.

It is interesting that the original Kondratiev index most closely parallels ours. Both indexes rise more rapidly over the period shown than any of the other three. Since the primary difference among the indexes is the weighting system, it is somewhat puzzling to find our index with late-year weights rising more rapidly than those with moving weights including earlier weight bases. Perhaps the explanation lies in the Tsarist policy of granting more and more tariff protection to industries

[35] See *311*, 1926, No. 2, 17–21, and *289*, II, issue 1, 79–95.
[36] See *473*, 51 ff.

TABLE A-19

KONDRATIEV, BORENSTEIN-GOLDSMITH, AND INDUSTRIAL MATERIALS INDEXES OF INDUSTRIAL PRODUCTION: TSARIST RUSSIA, BENCHMARK YEARS, 1860–1913 (1913 = 100)

	Kondratiev Index		*Borenstein-Goldsmith Index*		*Industrial Materials Index*
	Original[a]	Revised[b]	Direct Weights[c]	Imputed Weights[d]	1913 Weights[e]
1860	5.0	9.0	10.1	8.8	5.7
1865	4.0	7.1	9.2	7.5	4.3
1870	6.6	10.8	13.1	10.9	6.4
1875	10.6	14.6	15.7	14.0	9.9
1880	15.4	19.0	20.8	18.4	13.4
1885	20.6	23.2	25.4	23.7	19.2
1888	22.6	24.9	27.9	26.2	22.8
1890	27.3	28.5	33.2	32.0	24.9
1895	39.4	40.0	45.7	44.4	39.1
1900	61.1	59.5	63.6	63.1	59.4
1905	62.0	60.8	62.6	61.3	60.5
1910	83.9	83.7	87.8	86.4	78.2
1913	100.0	100.0	100.0	100.0	100.0

NOTE: Indexes cover current Tsarist territory excluding Finland.

SOURCE: Except industrial materials, *473*, 60 f. Comparison base shifted from 1900. For description of weighting systems, see text.

[a] Geometric average of weighted output relatives. Extended by Israel Borenstein and Raymond Goldsmith from 1885 through 1860, using Kondratiev's weights and component products.

[b] Arithmetic average of weighted output relatives. Extended as described in note *a* above.

[c] Each product weighted by its value added (see *473*, 52 ff).

[d] Each product weighted by value added of the product group it is taken to represent; weight of unrepresented manufacturing groups imputed to manufacturing as a whole (see *473*).

[e] Products in Table D-11 weighted by net unit values for 1913 in Table D-8. For weighted aggregates, see Table D-5.

that were growing rapidly in this period. It is even more puzzling to find our index corresponding more closely with Kondratiev's geometrically weighted index than with the same one arithmetically weighted. No obvious explanation is at hand for this.

Technical Note 7 (Chapter 6): Basic Data on Soviet Labor Productivity

The Soviet Union has not yet published a comprehensive set of statistics on industrial employment, wage rates, or hours of work. In this area as in many others, we are forced to reconstruct our own series from such information as has been made available. The reconstructed data are presented in Tables A-20 through A-24.

The basic series is for persons engaged (expressed in full-time equivalents) in enterprises counted statistically within the category of industry.

TABLE A-20

PERSONS ENGAGED IN SOVIET INDUSTRY: INDUSTRIAL GROUPS, BENCHMARK YEARS
(thousand full-time equivalents)

	1913	1928	1933	1937	1940	1950	1955
Ferrous and nonferrous metals	425	281	573	626	603	998	1,121
Fuel and electricity	335	427	822	864	991	1,489	1,809
Fuel	315	399	725	739	857	1,260	1,514
Electricity	20	28	97	125	134	229	295
Chemicals	70	100	279	351	415	442	629
Construction materials[a]	1,304	989	2,318	2,280	2,665	3,601	4,051
Wood materials[a]	1,073	768	1,798	1,929	2,210	2,799	2,891
Mineral materials	231	221	520	351	455	802	1,160
Machinery and allied products	602	663	1,233	3,262	3,550	4,572	5,792
Civilian mach. and equip.[b]	303	391	811	1,831[c,d]	1,249[c,d]	1,884[c]	2,597[c]
Metal products[e]	299	272	422	1,431[c,d]	2,301[c,d]	2,688[c]	3,195[c]
Food and allied products	1,072	803	1,094	1,478	1,554	1,637	1,790
Textiles and allied products[f]	1,847	1,919	2,000	2,568	2,733	2,602	3,343
Total of above	5,655	5,184	8,319	11,429	12,511	15,341	18,535
Unallocated[g]	162	195	334	814	589	638	826
Total excl. repair shops	5,817	5,379	8,653	12,243	13,100	15,979	19,361
Repair shops	86	86	1,573[h]	283[c]	294[c]	387[c]	305[c]
Grand total	5,903	5,465	10,226	12,526	13,394	16,366	19,666

SOURCE: Table C-1.

[a] Includes paper and matches.

[b] Includes consumer durables.

[c] Sum of machinery and allied products and repair shops apportioned to components by official gross production as estimated in Table F-1. For 1940, repair shops and metal products are apportioned by their 1937 breakdown. For 1937 and 1940, machinery and equipment was adjusted to exclude estimated employment in military production (see note d below).

[d] Conventional military products were apparently included under machinery and equipment up to 1950 and under metal products for 1950 and after (see Appendix F). Using estimated official gross production (Table F-1) to apportion persons engaged in machinery and equipment between civilian and military components, we derive the following (thousands of persons engaged):

	1937	*1940*
Machinery and equipment	2,925	3,202
Civilian	1,831	1,249
Military	1,094	1,953

Employment in the military component may be treated as insignificant for years before 1937. In accord with this estimated breakdown, we have transferred the military component for 1937 and 1940 from machinery and equipment to metal products.

[e] Includes military products. See note d above.

[f] Includes furniture for 1937 and later years.

[g] Includes printing and publishing and unspecified miscellaneous industries.

[h] Includes 1,302 thousand in the "others" category of machine building and metal products (Table C-1).

TABLE A-21

AVERAGE DAILY HOURS WORKED BY ADULT PRODUCTION WORKERS IN SOVIET LARGE-SCALE INDUSTRY, BENCHMARK YEARS[a]
(number of hours)

	1913	1928[b]	1933[c]	1936	1940	1950	1956	1959[d]
All large-scale industry	9.9	7.81	6.99	7.03	8.5[e]	8.5[e]	7.96	7.70
Electric power	8.7						7.98	7.14
Coal	10.1	7.32	6.90				7.94	7.03
Petroleum	8.5						7.98	7.94
Ferrous metallurgy	10.1	7.88	6.99				7.98	7.05
Machine building and metal products	9.7	7.91	7.00				7.97	7.81
Chemicals	9.6						7.74	6.91
Paper	10.0						7.97	7.90
Textiles	9.6						7.98	7.96
Cotton	9.39[f]	7.84	7.00					
Leather	10.0						7.99	7.98
Shoes	9.9						8.00	7.98
Food	10.8						8.00	7.99

SOURCE: 1913, 1956, and 1959, *141*, 665; 1928, *222*, 529; 1933, *241*, 192; 1936, *465*, 55.

[a] For all years except 1940 and 1950, actual hours including overtime, according to source. For 1940 and 1950, standard hours roughly adjusted for overtime.

[b] As of March.

[c] As of September 1.

[d] As of the beginning of the year.

[e] Standard eight-hour day (established by the directive of June 28, 1940) with a rough adjustment for overtime. The prevalence of overtime is indicated in *465*, 55.

[f] *222*, 529.

TABLE A-22

AVERAGE ANNUAL DAYS WORKED BY PRODUCTION WORKERS IN SOVIET LARGE-SCALE INDUSTRY, BENCHMARK YEARS
(number of days)

	1913	1928	1932	1937	1940	1950	1955	1956
Days worked	257.4	263.0	257.2	260.3	269.8	276.3	273.3	272.1
Days not worked	107.6	103.0	108.8	104.7	96.2	88.7	91.7	93.9
Holidays	88.6	62.3	67.1	66.8	64.0	55.5	55.5	56.9
Paid vacations	[a]	14.2	15.1	13.7	13.0	14.9	16.0	16.0
Sick leave	5.2	15.3	14.2	17.6	13.9	13.4	13.7	14.6
Authorized absence	2.8	3.6	5.2	4.2	3.6	4.0	5.6	5.4
Other absence[b]	11.0	7.6	7.2	2.4	1.7	0.9	0.9	1.0

SOURCE: 1913, *257*, 477 ff; other years, *408*, 1957, No. 2, 91.

[a] Apparently included in holidays.

[b] For example, absence due to mechanical failures.

TABLE A-23

ESTIMATED ANNUAL HOURS WORKED BY PERSONS ENGAGED IN SOVIET INDUSTRY, BENCHMARK YEARS

	Average Annual Hours Worked[a]	Annual Hours Worked (millions)[b]
1913	2,548	14,822
1928	2,054	11,048
1933	1,798[c]	15,558
1937	1,830[d]	22,405
1940	2,293	30,038
1950	2,349	37,535
1955	2,175[e]	42,110

[a] For production workers in large-scale industry. Average daily hours (Table A-21) times average annual days (Table A-22).

[b] Average annual hours for production workers in large-scale industry (preceding column) times full-time equivalent persons engaged in all industry excluding repair shops (Table A-20). Full-time equivalence is measured in our estimates in terms of the average work-year, in days or weeks, of workers and employees in large-scale industry (see Table C-1). Since daily hours were probably lower for large- than for small-scale and for production workers than for other persons engaged, the annual hours estimated here probably understate the actual figures. There is no basis for determining whether there is a trend in relative understatement, either up or down.

[c] Average daily hours in 1933 times average annual days in 1932.

[d] Average daily hours in 1936 times average annual days in 1937.

[e] Average daily hours in 1956 times average annual days in 1955. Since daily hours fell in 1956 (see *529*), average annual hours are understated here to an unknown degree.

TABLE A-24

INDEXES OF EMPLOYMENT AND OUTPUT BY INDUSTRIAL GROUP: SOVIET UNION, BENCHMARK YEARS (1913 = 100)

	1913	1928	1933	1937	1940	1950	1955
Ferrous and nonferrous metals							
Output	100	88.1	156.7	374.6	399.7	574.1	987.9
Persons engaged	100	66.1	134.8	147.3	141.9	234.8	263.8
Fuel and electricity							
Output	100	150.3	366.9	667.1	847.9	1,261.7	1,993.1
Persons engaged	100	127.5	245.4	257.9	295.8	444.5	540.0
Fuel							
Output	100	128.0	266.9	418.2	519.4	746.6	1,145.5
Persons engaged	100	126.7	230.2	234.6	272.1	400.0	480.6
Electricity							
Output	100	257.4	841.0	1,859.8	2,483.8	4,690.3	8,751.9
Persons engaged	100	140.0	485.0	625.0	670.0	1,145.0	1,475.0
Chemicals							
Output	100	144.0	304.3	649.4	647.5	1,173.4	1,630.7
Persons engaged	100	142.9	398.6	501.4	592.9	631.4	898.6

TABLE A-24 (concluded)

	1913	1928	1933	1937	1940	1950	1955
Construction materials[a]							
Output	100	89.9	144.3	202.3	198.7	280.0	424.5
Persons engaged	100	75.8	177.8	174.8	204.4	276.1	345.2
Wood materials[a]							
Output	100	86.7	147.6	181.3	186.2	256.2	361.4
Persons engaged	100	71.6	167.6	179.8	206.0	260.9	269.4
Mineral materials							
Output	100	104.0	129.4	294.8	250.3	382.6	723.7
Persons engaged	100	95.7	225.1	151.9	197.0	347.2	502.2
Machinery and allied products[b]							
Output[c]	100	120.8	406.7	1,411.8	1,754.6	1,984.1	3,248.1
Persons engaged	100	108.9	407.8	515.3	558.7	720.8	886.2
Civilian machinery and equipment[d]							
Output	100	143.4	666.4	1,727.7	1,200.8	2,791.5	3,472.2
Persons engaged	100	129.0	267.7	604.3	412.2	621.8	857.1
Metal products[e]							
Persons engaged	100	91.0	141.1	112.7	116.4	899.0	1,068.6
Food and allied products							
Output	100	84.2	93.0	152.7	156.5	168.7	259.7
Persons engaged	100	74.9	102.1	137.9	145.0	152.7	167.0
Textiles and allied products[f]							
Output	100	113.0	102.0	151.2	175.2	178.8	274.5
Persons engaged	100	103.9	108.3	139.0	148.0	140.9	181.0
All industrial products[g]							
Output[h]							
Civilian products	100	102.4	152.3	267.5	273.9	396.8	576.9
All products	100	102.4	152.9	284.5	318.3	392.9	619.5
Persons engaged	100	92.5	148.8	210.5	225.2	274.7	332.8
Man-hours	100	74.5	105.0	151.2	202.7	253.2	284.1

SOURCE: Tables A-20, A-23, and 52 (revised for coverage, as noted below). All output indexes are based on moving weights.

[a] Includes paper and matches.

[b] Includes consumer durables and military products.

[c] Special index combining component indexes for civilian machinery and equipment (this table), military products (estimate A in Table A-10), and metal products. The latter is represented by the index for all civilian products over 1913–1937 and 1945–1955 and by the index for industrial materials over 1937–1945 (both as given in Table 16). This seems to be reasonable in view of the fact that the official Soviet indexes for all industry and for metal products move in a parallel fashion (see Table F-2). Component indexes are weighted together by 1937 official gross production in billion "1926/27" rubles as follows (Table F-1): 14.2 for civilian machinery and equipment, 8.5 for military products, and 2.6 for metal products.

[d] Includes consumer durables but excludes miscellaneous machinery.

[e] Includes military products.

[f] For 1937 and later years, furniture is included for persons engaged but not for output. This latter omission is not likely to be significant.

[g] Excludes repair shops.

[h] Excludes miscellaneous machinery.

Derivation of these figures for major industrial categories is explained in Table C-1. Persons engaged include workers, employees, and self-employed and supervisory personnel. Full time is measured by the average work-year in large-scale industry, expressed in days or weeks. For 1937 and later years, the aggregate of persons engaged has been calculated as the sum of workers, employees, members of industrial producer cooperatives, and workers in industrial enterprises attached to collective farms. Such an aggregate does not include some categories of employees—as "overhead" personnel—normally counted as persons engaged.[37] Members of so-called "industrial collective farms" are also not included. For the same span of years, the aggregate has been distributed among industrial groups on the basis of the percentage distribution of production workers, the only such distribution available. Production workers are wage earners directly engaged in manufacturing or extractive activities, and the ratio of production workers to all persons engaged will vary from one industrial sector to another, as is shown by the statistics for 1933 and 1935 given in the general note to Table C-1. On the basis of the latter statistics, we would conclude that the use of production workers to break down the aggregate probably leads to a significant relative understatement of persons engaged in producing electricity, machinery and equipment, and possibly mineral construction materials, and to a relative overstatement in the cases of other industrial categories. The degree of error cannot be estimated.

After our estimates had been constructed and used in analysis, Barney K. Schwalberg computed another set of data for the Foreign Manpower Research Office of the U.S. Bureau of the Census.[38] The latter data are based on a broader range of source materials than was available at the time our estimates were made and seem to be more reliably constructed than ours. If so, they indicate a significant and growing understatement in our data for 1937 and later years, as is shown by the following comparison:

Thousands of Persons Engaged

	Schwalberg	NBER	(2) ÷ (1)
	(1)	(2)	(3)
1933	10,144	10,226	1.008
1937	13,887	12,526	0.902
1950	18,309	16,366	0.894
1955	22,000	19,666	0.848

[37] For a careful description of Soviet labor statistics and the categories of industrial labor, see *551.*

[38] See *551.*

TABLE A-25

ECONOMIC AID AND REPARATION PAYMENTS TO THE SOVIET UNION, 1946–1953
(million dollars)

	Reparation Dollars ("1938 dollars")	Current Dollars
Lend-Lease and UNRRA	333	450
East Germany	6,195	15,488
Hungary	205	512
Rumania	493	986
Poland	1,231	2,462
Finland	438	866
Italy	100	200
Manchuria	100	200
Total	9,095	21,164

SOURCE:

Lend-Lease and UNRRA: Materials in Lend-Lease pipeline at end of war: $250 million; UNRRA aid: $200 million (*554*, 597). We assume these are in 1945 dollars; they have been deflated to 1938 dollars by BLS wholesale price index (*649*, 1956, 320).

East Germany: *590*, 15, where cited as estimates by Leon Herman. From an official Soviet statement (*364*, 5/16/50), collections through 1950 were 3,650 million "1938 dollars," with 210 million to be collected annually (continued through 1953). Implied total from official statement: 4,280 million "1938 dollars," or 2,000 million less than our figure. See also *531*.

Hungary: *590*, 15, gives 160 million "1938 dollars" and 400 million current dollars. We have added Soviet requisitions of so-called Hungarian debts to Germany amounting to 45 million "1938 dollars" (*437*, 111, and *565*, 172). The latter translated into current dollars by conversion factor of 2.5 implied by reparations data.

Rumania: In "1938 dollars," *565*, 172 and 175. Translated into current dollars by conversion factor of 2 (see text). *590*, 15, gives smaller estimates, apparently excluding so-called restitutions: 226 million "1938 dollars" and 570 million current dollars.

Poland: Estimate consists of two parts: (a) reparations for industrial plant and equipment acquired by Poland in territories taken from Germany and (b) benefits from special prices accorded to the Soviet Union for Polish coal. Reparations were to be a quarter of acquired plant and equipment (*565*, 29), which Molotov presumably valued at 6 billion "1938 dollars" (according to *524*, 158). An official Polish source (*549a*, 8/24/45) gives the figure 500 million "1938 dollars." Our estimate (875 million "1938 dollars") is a simple average of these two. Translated into 1,750 million current dollars by conversion factor of 2 (see text).

Polish coal was apparently sold to the Soviet Union at an eighth to a tenth of the world price over the period 1946–1953 (*437*, 152, and *522*, I, 219). Average world price was about $12 a ton over 1946–1949 (*437*, 152) and about $18 over 1950–1953 (*580*, 1953, 231). About 6.5 million tons were delivered each year over the entire period (*522*, I, 219). We therefore estimate benefits of 712 million current dollars. Translated into 356 million "1938 dollars" by conversion factor of 2 (see text). For a higher estimate, see *457*, 464.

Finland: *421*, *509*, and *521*. Estimated from following components: (a) reparations of 227 million "1938 dollars" or 445 million current dollars (*421*, 336); (b) transport services of 7 million current dollars, translated into 3.5 million "1938 dollars" by conversion factor of 2 (see text); (c) transferred German assets valued at 7 million "1938 dollars," translated into 14 million current dollars by conversion factor of 2; and (d) assets in territory ceded by Finland to Soviet Union valued at 400 million current dollars, translated into 200 million "1938 dollars" by conversion factor of 2.

Italy: In "1938 dollars," *571*, "Treaty of Peace with Italy," Article 24. Primarily Italian assets in Balkan countries. Translated into current dollars by conversion factor of 2 (see text).

Manchuria: In "1938 dollars," official Soviet statement as quoted in *554*, 106. Translated into current dollars by conversion factor of 2 (see text). Mr. Edwin Pauley, U.S. Representative to the Reparations Commission, estimated reparations at 2 billion 1938 dollars (quoted in *554*), or 20 times the official Soviet figure that we have used.

Both sets of figures as given here include repair shops in all years and exclude private artisans in 1933. We have not substituted Schwalberg's figures for ours because that would have required massive recalculations at too late a date. The apparent trend in understatement in our figures should be kept in mind in interpreting our findings on labor productivity.

Soviet statistics on hours of work are limited to production workers in large-scale industry. Moreover, average annual hours must be computed from separate data on average daily hours and average annual days worked, the latter not being available in an industrial breakdown. Total annual hours worked by persons engaged in industry are calculated by applying these average annual hours to all persons engaged. Average daily hours are probably lower for production workers than for other persons engaged, and for large-scale industry than for small-scale industry. Average annual days worked are not likely to differ significantly among these categories, since full-time employment has generally been defined in terms of average annual days or weeks for wage earners in large-scale industry. As a result of the probable differences in daily hours, average annual hours for production workers in large-scale industry, calculated in the manner described, probably understate those for all persons engaged in total industry. Hence, our figures for total annual hours worked are understated. There is no solid evidence to determine whether the relative understatement is larger for some years than for others. Although small-scale industry was relatively more important in earlier than in more recent years, the effects of this trend on average daily hours may have been offset by the growing relative importance of "nonproduction" workers and employees.

It should be noted that the coverage of the industrial categories used for persons engaged differs in some cases from the coverage of similar categories for which our basic production indexes have been computed. Those differences are indicated in Table A-20 and A-24, and the affected production indexes in the latter table have been adjusted accordingly. In addition, a special production index has been constructed for machinery and allied products, as explained in that table.

Technical Note 8 (Chapter 7): Economic Aid and Reparations Received by the Soviet Union After World War II

The data given in Table A-25 include the postwar economic aid from the Allies (primarily the United States) and the direct reparations collected from enemy countries, generally as reported by the Soviet

Union. They do not include Soviet proceeds from so-called joint companies established in European satellite countries, discriminatory trading prices (except for Polish coal), transit privileges, levies for support of occupation troops and administration, the forced labor of prisoners of war and internees, and other indirect exactions. They also do not include the value of machinery and equipment in occupied territories dismantled by Soviet occupation forces before the end of the war (on the dismantling policy in Eastern Europe, see *565*, 184).

Reparations to the Soviet Union were presumably calculated in terms of 1938 "world prices," raised by 10 to 15 per cent and translated into U.S. dollars on the basis of the 1938 gold content of the dollar; but there is no doubt that prices were discounted substantially in favor of the Soviet Union. For example, in 1946 the value of Hungary's reparations deliveries in current dollars (calculated at the official exchange rate) was about four times the value in "1938 dollars" (*549a*, 8/24/45, 170), whereas in 1946 the BLS wholesale price index for the United States was only 1.5 times its 1938 level (*649*, 1956, 320). This suggests that, at least in the case of Hungary, the reparations in "1938 dollars" may be less than 40 per cent of their value in actual 1938 dollars.

Mr. Lauri Kivinen, former chairman of the Finnish Delegation for Reparations Industries, comments on the "1938 dollars" as follows (*509*, 13):

> Indeed, in talking of the dollars in which the war reparations were calculated Finns used the name "war reparation dollars," thus wishing to illustrate the fact that they had nothing in common with the monetary unit of the United States. Each item of the agreement had its own "war reparation dollar rate," expressed in Finnish marks, depending on the price fixed in the autumn of 1944. An "exchange ratio" of one "war reparation dollar = 5,000 Finnmarks was no rarity (the official exchange rate of the U.S. dollar in 1945–48 was $1.00 = 136 Finnmarks, and in 1949–52 it was $1.00 = 231 Finnmarks).

A careful and thorough study of Finnish reparations gives them in "1938 dollars" as $226.5 million[39] and in current dollars as $444.7 million (*421*, 336), the latter being the sum of payments in current U.S. prices over the period 1946–1952.[40] These data imply a ratio of about

[39] The same source points out that, if commodities had been priced in accord with the reparations agreement, the value would have been $269.3 million in adjusted "1938 dollars" (*421*, 330).

[40] In 1952 U.S. prices, the value would be $546 million (*421*, 336); in 1955 U.S. prices, $826 million (*510*, 14, and *649*, 1956, 962).

two postwar dollars to one "1938 dollar." The evidence already cited here suggests that this conversion factor is too low for other countries with less control over reparations programs. For lack of more definitive estimates, we have, however, used this conversion factor whenever estimates of reparations were lacking for specific countries in either "1938 dollars" or current dollars. In converting from "1938 dollars," current dollars are probably understated by using this factor; in converting from current dollars, "1938 dollars" are probably overstated, though not sufficiently to offset their understatement of actual 1938 dollars.

The estimates in Table A-25 have been pieced together from fragmentary information and are obviously only crude approximations to the values they seem to measure. There can be little doubt that the net effect is understatement in terms of both 1938 U.S. and current U.S. prices. In the absence of more detailed and accurate statistics, there is no way of determining the degree of understatement.

Technical Note 9 (Chapter 8): Basic Data for Comparisons Between the United States and the Soviet Union

We discuss here some characteristics of the basic data underlying various comparisons made in the text between U.S. and Soviet industry. This note is divided into four sections, dealing with data on (1) individual industries; (2) production of energy; (3) ruble-dollar price ratios; and (4) aggregative output, employment, and value added.

DATA ON INDIVIDUAL INDUSTRIES

In Chapter 8 and its annex, U.S. and Soviet growth trends are analyzed for two samples of industries, a basic sample consisting of forty-seven industries long established in both economies and a supplementary sample consisting of thirteen industries relatively new in the Soviet Union. Physical output for these counterparts is presented graphically in Charts A-2 and A-3, which are based on Tables B-1, B-2, and E-1.

A detailed breakdown of estimated value added for the basic sample is given in Table A-26, covering 1913, 1928, and 1955 for both countries. For each year and each country, value added is estimated in both rubles and dollars, the dollar values applying to U.S. prices of an adjoining year. Synthetic dyes and sausages, though included in the basic sample, are not covered in this table because necessary data could not be reconstructed for all years. The estimates of value added are used in weighting frequency distributions of growth rates and in calculating

CHART A-2

Physical Output Trends of Basic Sample of Forty-Seven Industries: Soviet Union and United States

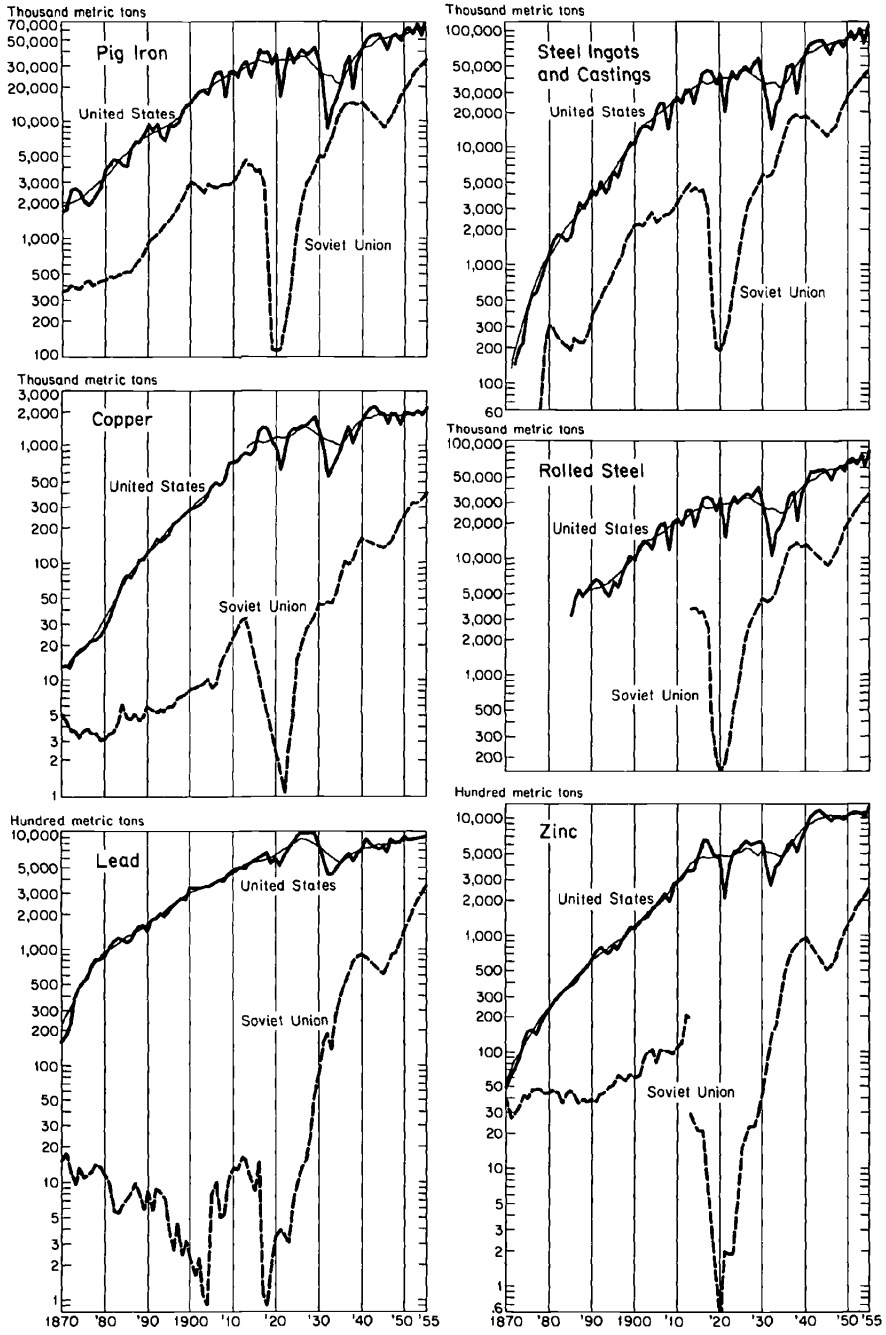


CHART A-2 (continued)

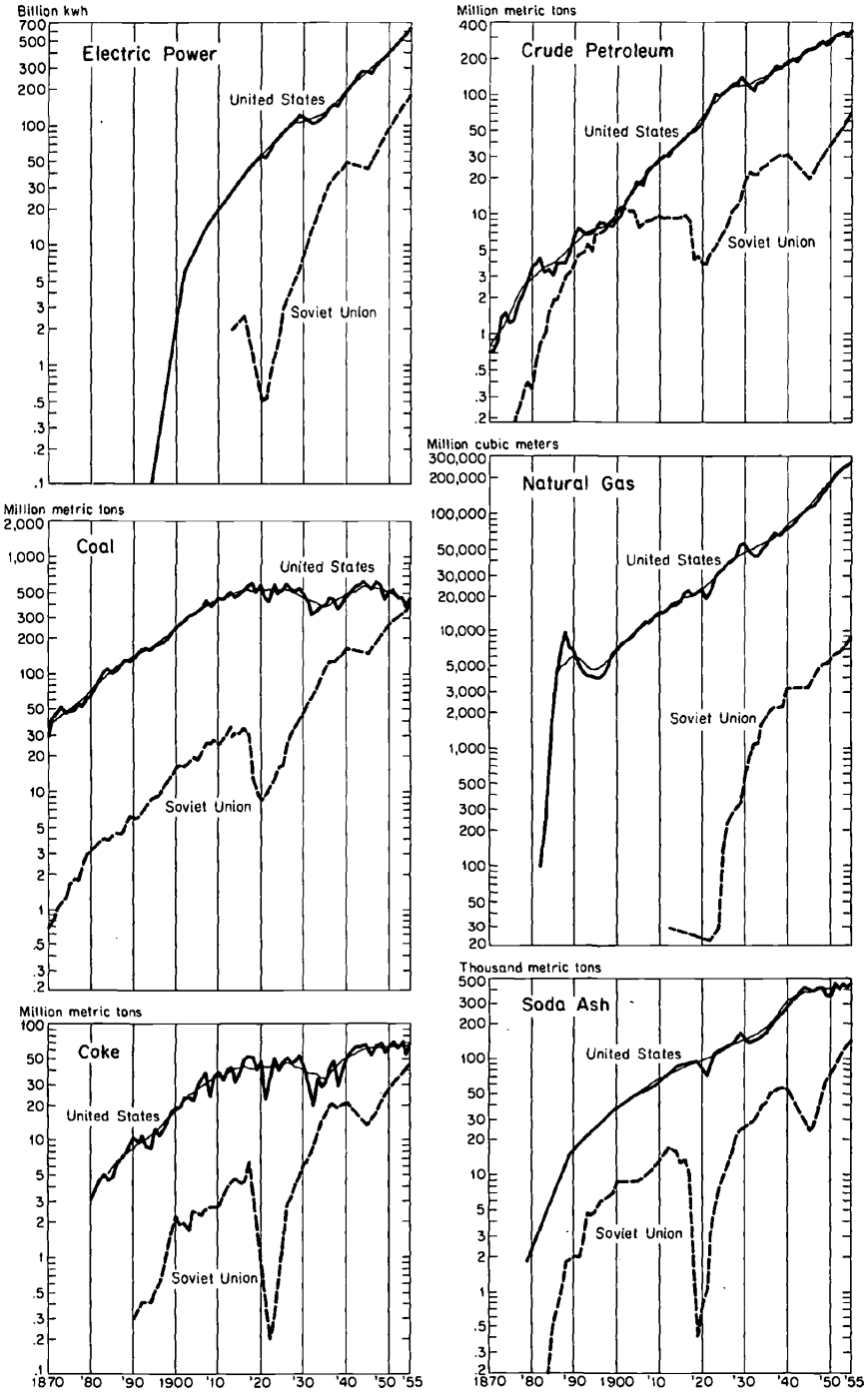


CHART A-2 (continued)

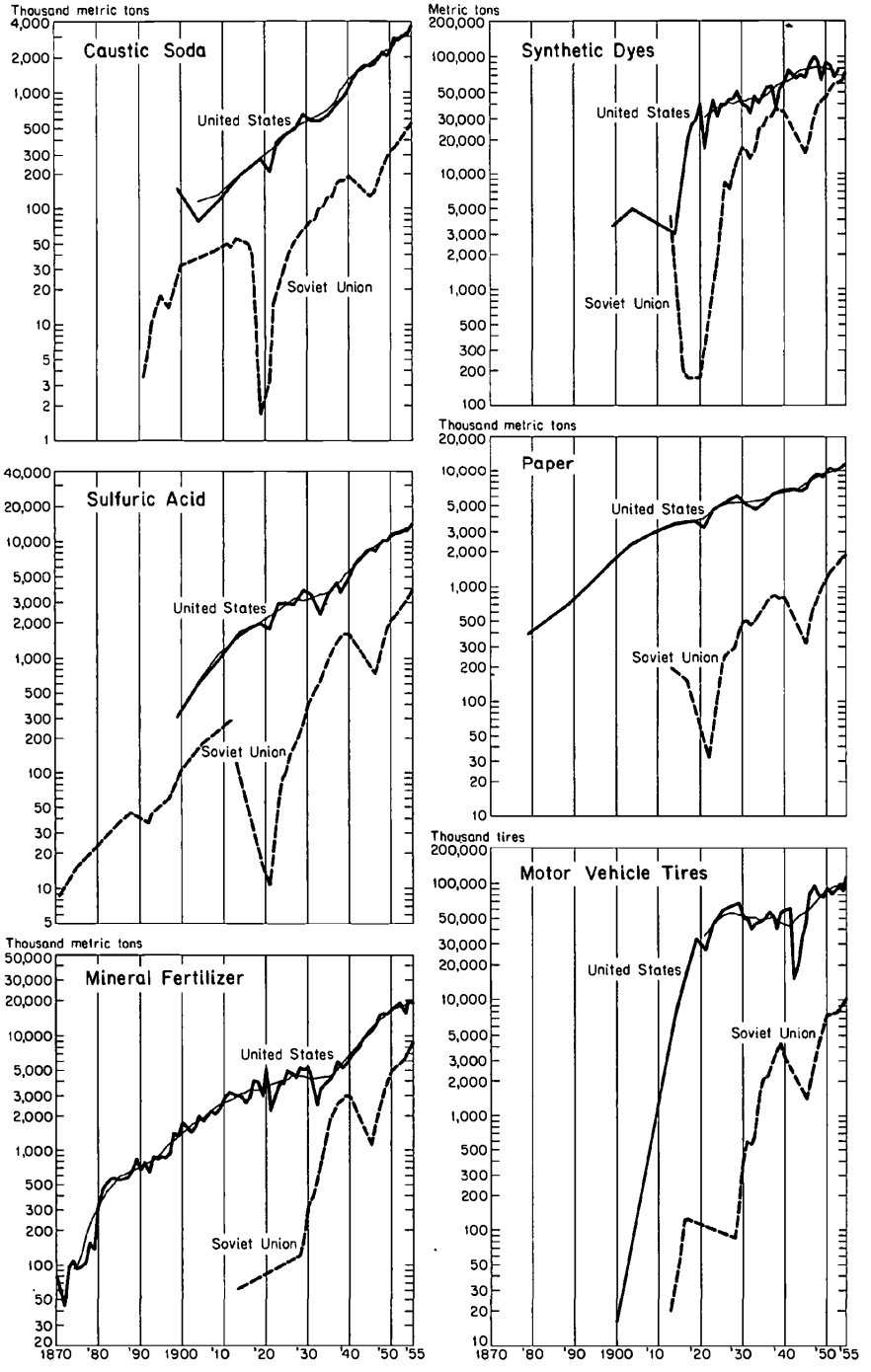


CHART A-2 (continued)

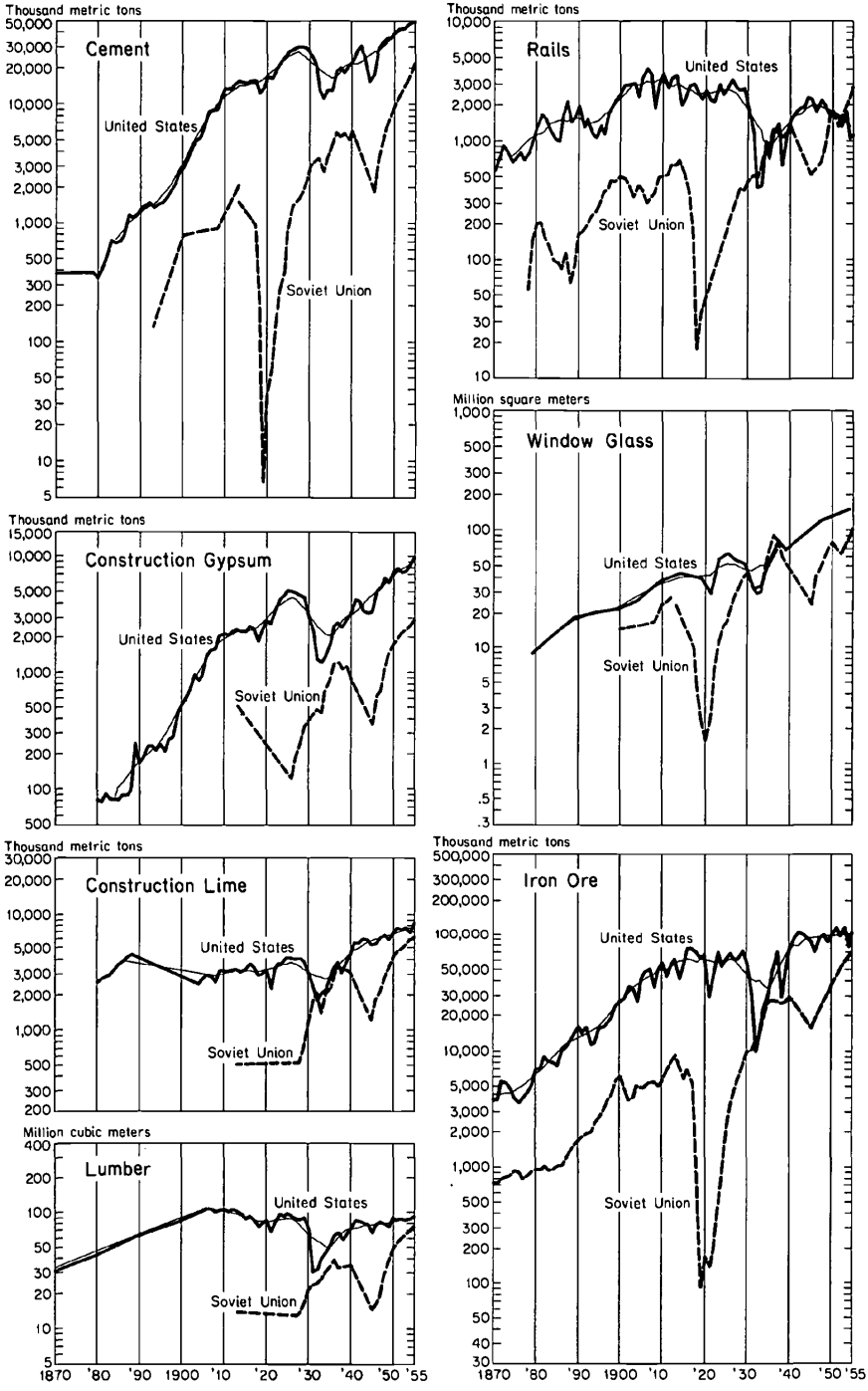


CHART A-2 (continued)

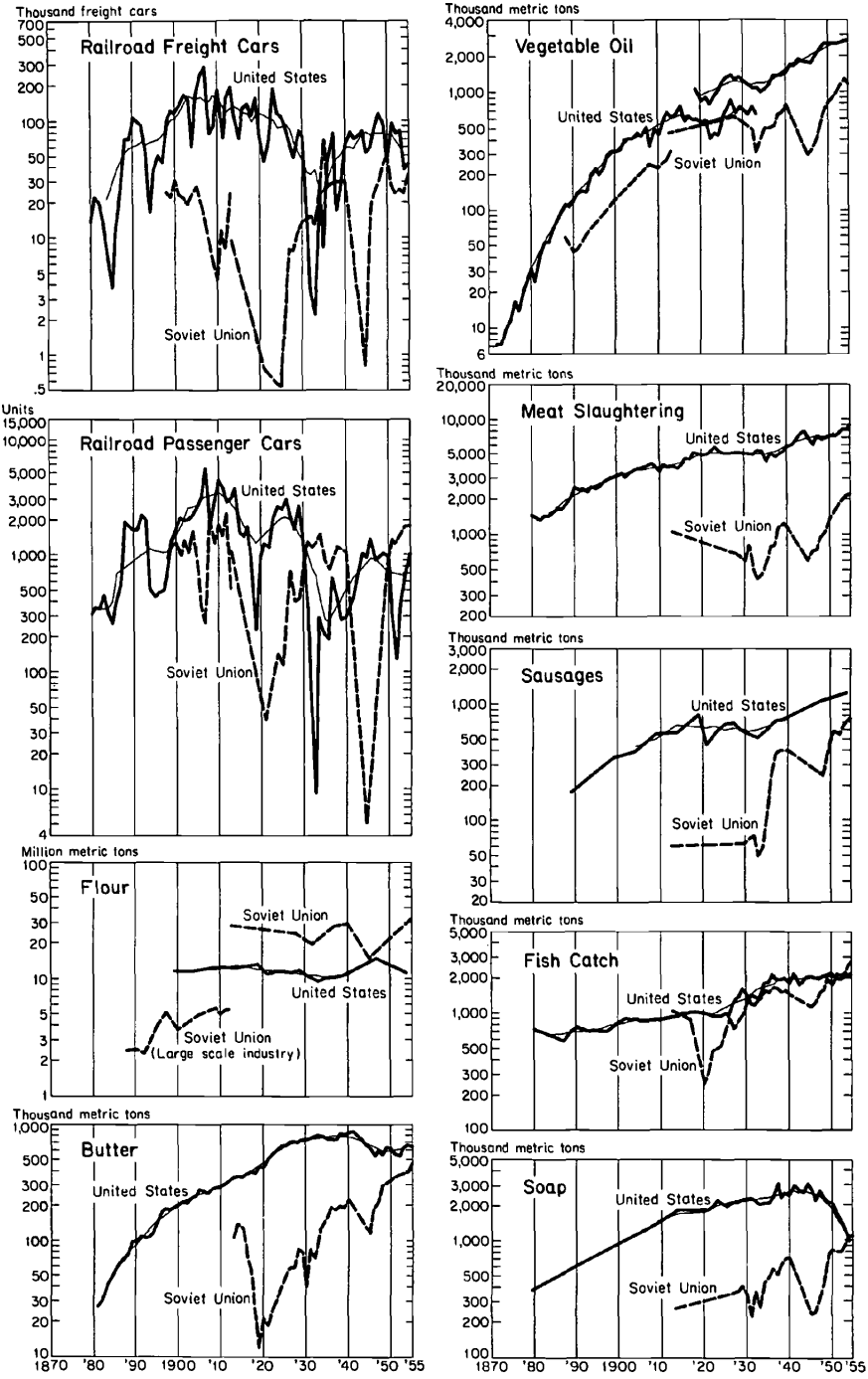


CHART A-2 (continued)

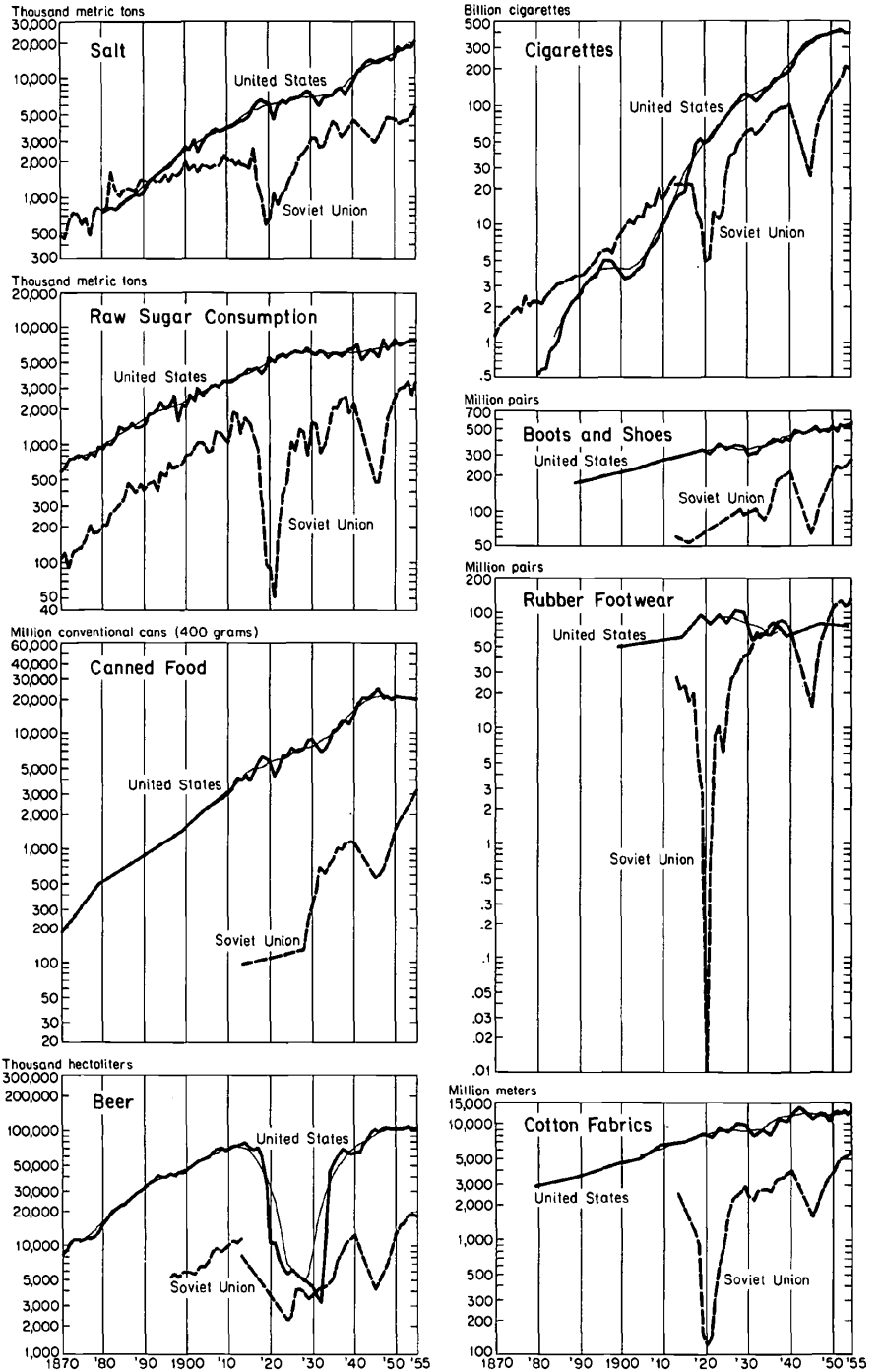
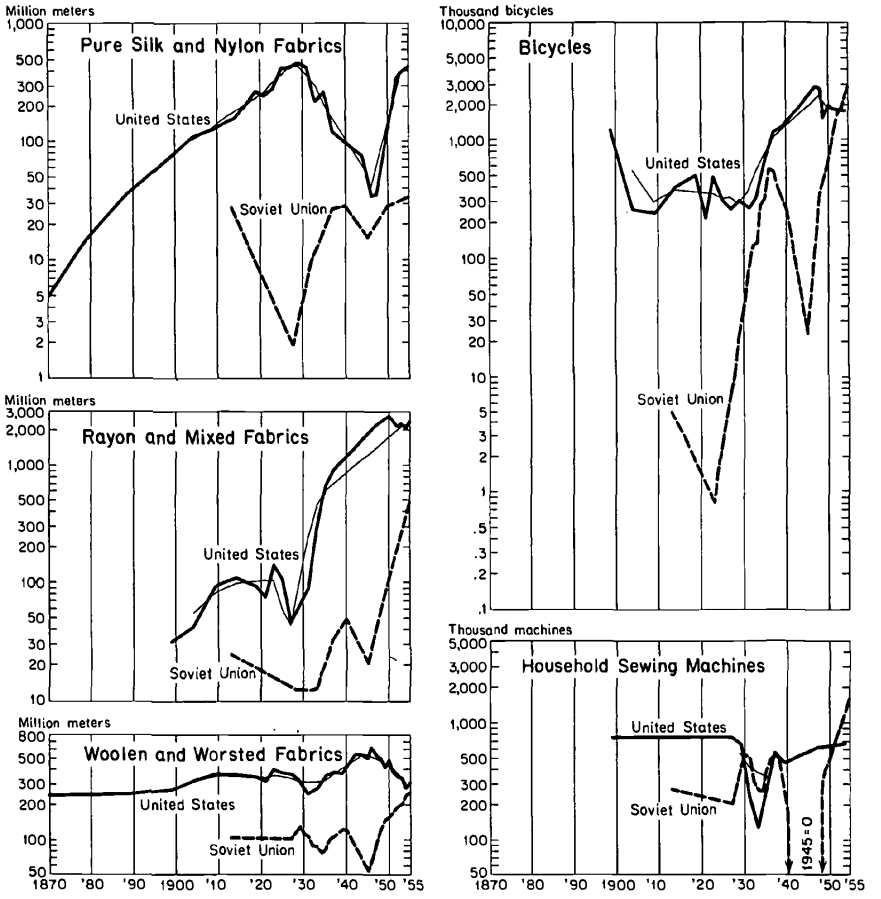


CHART A-2 (concluded)



Source: Tables B-1, B-2, and E-1.
Ratio scales.
Thin line represents nine-year moving average for the U.S.

TABL

ESTIMATED VALUE ADDED CALCULATED IN RUBLES AND DOLLARS FOR BASIC SAMPLE OF FORTY-FIVE INDUSTRIES:[a]

CODE		SOVIET UNION					
		1913 Value Added		*1928 Value Added*		*1955 Value Added*	
		1913 Rubles (1)	1914 Dollars (2)	1928 Rubles (3)	1929 Dollars (4)	1955 Rubles[b] (5)	1954 Dollars (6)
	Total, 45 industries	2,534	1,144	5,033[c]	1,990[c]	129,739	16,928
	Intermediate industrial products	945.2	326.5	1,965	639.1	87,705	11,188
	Metals	190.7	88.4	332.6	140.5	21,741	3,253
704	Iron ore	171.6	12.8	286.8	27.6	1,670	395.7
101	Pig iron		9.4		14.5	2,599	393.0
103	Steel ingots and castings		58.1		108.4	14,441	2,272
102	Rolled steel						
202	Copper	18.4	7.8	16.5	4.9	1,242	111.2
203	Lead	0.20	0.07	0.87	0.20	1,348	43.2
204	Zinc	0.48	0.18	0.87	0.29	441.4	38.3
	Fuel and electricity	495.4	103.7	885.2	221.8	44,552	4,267
301	Electric power	89.8	36.9	274.4	79.0	13,316	1,505
302–4	Coal	182.5	27.8	295.5	50.5	23,298	1,009
303.1	Coke	26.4	3.4	28.0	7.7	3,314	228.7
305	Crude petroleum	195.5	35.5	272.9	82.8	3,681	1,508
306	Natural gas	1.2	0.11	14.4	1.8	943.0	16.7
	Chemicals	84.8	23.7	179.6	66.5	11,269	828.5
401	Soda ash	11.3	2.2	15.9	7.5	395.2	52.3
402	Caustic soda	6.5	1.4	7.1	1.7	464.8	13.2
404	Sulfuric acid	6.4	3.2	17.6	4.3	556.6	93.4
405	Mineral fertilizer	3.0	0.93	5.6	17.6	1,931	86.7
416	Paper	56.6	14.4	126.3	34.7	3,539	426.1
418	Motor vehicle tires	1.0	1.6	7.1	0.73	4,382	156.8
	Construction materials	174.3	110.7	567.1	210.3	10,143	2,839
506	Cement	27.8	8.2	61.0	16.1	2,608	366.2
507	Construction gypsum	3.5	0.82	2.6	0.28	287.0	9.6

(continued)

GENERAL NOTE: Unless otherwise noted, each estimate is intended to represent value added at all stages of fabrication within the bounds of industry, as defined in this study, through the final stage represented by the product specified in the stub. Also unless otherwise noted, value of output or value added means unit value or unit value added (Table D-8) times output (Table B-2 or E-1, as appropriate). Estimates in the table made solely by this procedure are not further explained in the special notes below, except for column 3.

In the notes for columns 8, 10, and 12, items identified as census data are taken from official U.S. censuses of mines and quarries, manufactures, or electric utilities, as appropriate.

[a] The basic sample contains forty-seven industries, but synthetic dyes and sausages are not included here because of difficulties in estimating value added for all years.

[b] Prices exclude most of the applicable turnover taxes (see Chapter 5).

[c] The dollar figure excludes beer while the ruble figure does not. Ruble figures excluding beer are: 4,981, 2,988, and 1,300 for the Soviet Union; and 46,973, 11,430, and 4,274 for the United States.

[d] Reliable data are not available for beer in this year, because of prohibition.

26

UNITED STATES AND SOVIET UNION, 1913, 1928, AND 1955
(millions)

UNITED STATES					
1913 Value Added		*1928 Value Added*		*1955 Value Added*	
1913 Rubles (7)	1914 Dollars (8)	1928 Rubles (9)	1929 Dollars (10)	1955 Rubles[b] (11)	1954 Dollars (12)
16,115	5,496	47,039[c]	12,565[c]	397,139	41,524
11,655	3,774	35,378	8,931	317,784	32,490
1,911	856.0	5,301	2,056	54,548	7,668
	87.4	284.5	149.9	2,466	584.3
1,281	70.5	3,532	144.2	5,503	832.0
	436.2		1,335	33,875	5,329
506.9	216.1	887.1	266.0	6,877	615.6
64.5	23.3	362.5	83.1	3,632	116.3
58.5	22.5	235.1	77.9	2,195	190.5
6,991	1,372	17,577	4,017	165,314	15,755
1,283	526.6	5,914	1,702	66,216	5,526
4,065	619.9	6,314	1,080	48,396	2,095
251.9	32.4	319.3	88.1	5,184	357.8
724.1	131.6	2,912	883.4	17,783	7,286
666.7	61.3	2,118	263.9	27,735	490.3
1,529	778.4	8,731	1,481	82,255	5,247
56.5	10.8	106.1	49.7	1,224	162.0
20.1	4.2	69.9	16.6	2,921	82.9
81.4	40.1	287.6	71.0	2,095	351.7
145.6	45.0	233.7	73.6	5,539	248.8
962.6	245.3	2,572	705.8	22,216	2,675
263.2	433.0	5,462	564.7	48,260	1,727
1,224	767.5	3,768	1,376	15,668	3,820
289.9	85.8	1,003	264.7	5,954	836.0
15.9	3.7	51.2	5.6	959.2	32.2

(continued)

SOURCE TO TABLE A-26

Column 1

Iron ore, pig iron, steel ingots and castings, and rolled steel: Value of output of steel ingots and castings plus value added by rolled steel, the sum (358.0 million rubles) times 1927/28 ratio (0.4792) of value added for all component products (Table D-9) to same kind of sum. 1913 unit value added for rolled steel (27.5 rubles per m. ton) is taken to be the same fraction (0.4119) of unit value for steel ingots and castings as in 1927/28.

Electric power: Value of output times 1927/28 ratio (0.6385) of value added to value of output, as both are given in Table C-2. Unit value (0.0725 rubles) taken as average of cost per kwh in Moscow (0.067 rubles) and Leningrad (0.0781 rubles), arbitrarily raised by 10 per cent to reflect distributional costs. Basic data from *38*.

Coal: Value of output times 1927/28 ratio for coal and coke (0.8003) of value added to value of output, as both are given in Table C-2.

Coke: Value added in coke ovens. Unit value added (6.0 rubles per m. ton) is taken to be the same fraction (0.7755) of unit value for bituminous coal as in 1927/28.

Copper, lead, and zinc: Value of output (33.5, 0.36, and 0.88 million rubles) times 1927/28 ratio (0.5506) of value added (col. 3) to value of output.

TABLE A-

CODE		SOVIET UNION					
		1913 Value Added		*1928 Value Added*		*1955 Value Added*	
		1913 Rubles (1)	1914 Dollars (2)	1928 Rubles (3)	1929 Dollars (4)	1955 Rubles[b] (5)	1954 Dollars (6)
508	Construction lime	4.0	2.2	8.1	4.6	620.5	80.4
510	Lumber	112.0	83.3	400.4	159.8	5,821	2,187
518	Rails	3.8	4.7	4.4	6.5	207.5	107.6
519	Window glass	23.2	11.5	90.6	23.0	598.8	88.2
Transportation equipment		16.5	10.4	28.2	10.5	970.1	255.0
905	Railroad freight cars	7.2	4.4	24.6	8.2	720.3	121.1
906	Railroad passenger cars	9.3	6.0	3.6	2.3	249.8	133.9
Consumer goods		1,572	806.6	3,040[c]	1,341[c]	41,063	5,485
Food and allied products		805.2	631.7	1,352[c]	971.6[c]	28,051	3,775
1501	Flour	365.4	341.6	511.5	438.8	5,696	756.4
1503	Butter	17.8	8.2	61.0	11.8	902.9	80.1
1504	Vegetable oil	37.9	11.6	71.9	42.5	1,869	136.0
1506	Meat slaughtering	62.9	34.0	120.7	36.3	934.9	178.6
1507	Fish catch	134.4	116.7	194.2	227.1	9,032	889.6
1508	Soap	11.2	5.7	44.8	20.8	464.3	859.6
1509	Salt	10.0	4.5	11.7	8.2	1,140	32.1
1510	Raw sugar consumption	112.3	43.0	210.8	45.7	2,821	172.7
1513	Canned food	3.1	2.6	12.2	6.3	1,608	149.9
1514	Beer	34.7	27.2	52.2	[d]	1,404	187.1
1515	Cigarettes	15.5	36.6	61.2	134.1	2,180	332.6
Textiles and allied products		763.4	168.8	1,683	357.7	11,580	1,473
1601	Boots and shoes	269.4	40.3	401.0	127.6	2,937	516.6
1602	Rubber footwear	65.9	13.9	112.5	24.2	607.1	190.0
1604	Cotton fabrics	309.8	58.2	909.5	122.2	4,842	455.8
1609.1	Pure silk and nylon fabrics	35.4	18.6	13.3	8.5	1,209	78.8
1609.2	Rayon fabrics			29.6			
1611	Woolen and worsted fabrics	82.9	37.8	217.1	75.2	1,985	232.1
Consumer durables		3.7	6.1	5.4	11.5	1,432	236.7
1701	Bicycles	0.32	0.04	0.91	0.22	864.9	57.9
1707	Sewing machines	3.4	6.1	4.5	11.3	566.6	178.8

Crude petroleum: Value of output (239.1 million rubles) times 1927/28 ratio (0.8176) of value added to value of output.

Natural gas: Unit value added (0.0426 rubles per m^3) is taken to be the same fraction (0.0020) of value added per m. ton of crude petroleum as in 1955.

Caustic soda: Value added at last stage of fabrication. Unit value added (118 rubles per m. ton) is taken to be difference between unit values of caustic soda and soda ash. Former (189 rubles per m. ton) is taken to be same fraction (2.6712) of latter as in 1927/28.

Sulfuric acid: Value of output not used in fertilizer.

Rails: Value added in rolling rails.

Railroad freight and passenger cars: Value of output (12.6 and 16.1 million rubles) times 1927/28 ratio (0.5737) of value added (col. 3) to value of output. 1913 price taken from *28*; for passenger cars, average of class II and class III.

Soap: Value of output (33.3 million rubles) times 1927/28 ratio (0.3363) of value added (col. 3) to value of output. 1913 price taken from *28*; assumed to apply to 80% fatty acid content.

(concluded)

UNITED STATES					
1913 Value Added		*1928 Value Added*		*1955 Value Added*	
1913 Rubles (7)	1914 Dollars (8)	1928 Rubles (9)	1929 Dollars (10)	1955 Rubles[b] (11)	1954 Dollars (12)
25.6	14.1	62.3	35.0	837.3	108.5
830.2	617.6	2,481	990.3	7,105	2,669
21.3	26.2	30.3	44.5	80.2	41.6
40.6	20.1	140.4	35.6	731.8	132.5
167.7	103.3	164.3	59.8	1,019	222.3
141.5	86.4	148.6	49.6	880.2	148.0
26.2	16.9	15.7	10.2	138.6	74.3
4,291	1,618	11,496[c]	3,575[c]	78,337	8,812
1,544	997.2	4,340[c]	2,074[c]	51,525	5,800
156.6	146.4	247.2	212.1	1,869	248.2
59.6	27.6	517.8	100.0	1,223	108.5
89.5	27.4	143.9	85.1	4,410	320.8
225.9	122.0	913.7	275.1	3,833	732.1
123.6	107.3	323.2	378.0	7,177	706.9
76.3	39.1	272.0	126.0	275.9	510.8
22.3	10.1	36.7	25.8	4,120	115.9
316.9	121.3	983.7	213.1	6,352	388.8
131.4	109.6	701.1	362.9	9,675	902.2
329.8	259.0	65.9	[d]	8,050	1,073
11.6	27.4	134.9	295.7	4,540	692.7
2,715	601.6	7,122	1,467	26,059	2,901
1,280	191.4	1,417	450.9	6,174	1,086
141.7	29.9	316.1	68.1	341.9	107.0
827.9	155.6	3,328	447.1	10,602	998.1
181.1	95.0	1,430	282.2	6,486	442.8
284.2	129.7	630.9	218.5	2,455	287.0
33.0	19.7	34.5	34.3	752.5	110.7
23.5	2.7	23.2	5.7	509.8	34.1
9.5	17.0	11.3	28.6	242.7	76.6

Boots and shoes: Value of output. Price per pair taken as average for men's boots (6.50 rubles), women's shoes (3.00 rubles), and men's civilian shoes (3.98 rubles); from *28.*

Rubber footwear: Value of output. Price from *28.*

Bicycles: Value of output (0.63 million rubles) times 1927/28 ratio (0.5170) of value added (col. 3) to value of output. 1913 price from *28.*

Sewing machines: Value added. Unit value added derived as 1927/28 unit value added (from col. 2 and Table B-2) times price ratio for bicycles (0.7858), 1913 to 1927/28.

Column 2: Col. 8 times 1913 ratio of Soviet to U.S. output. Ratio for steel ingots and castings is used for combined iron and steel products.

Column 3

All items except those noted below: Value added taken from Table D-9, prorated within groups wherever necessary by value of output.

Soda ash, mineral fertilizer, paper, motor vehicle tires, cement, construction gypsum,

construction lime, lumber, window glass, and rubber footwear: Values computed from Tables B-2 and D-8.

Caustic soda: Value added in last stage of fabrication computed from Tables B-2 and D-8. Unit value added is taken as difference between unit values of caustic soda and soda ash.

Rails: Value added in rolling rails computed from Tables B-2 and D-8.

Column 4: Col. 10 times 1928 ratio of Soviet to U.S. output. Ratio for steel ingots and castings is used for combined ingots and rolled products.

Column 5

Iron ore: Value of output (2,098 million rubles) times 1954 U.S. ratio (0.7962) of census value added to census value of shipments.

Pig iron: Value of output (11,488 million rubles) times 1954 U.S. ratio (0.2262) of census value added to census value of shipments for blast furnaces.

Steel ingots and castings and rolled steel: Value of output of steel ingots and castings (22,635 million rubles) times 1954 U.S. ratio (0.6380) of census value added for steel works and rolling mills to computed value of output of steel ingots and castings ($6,301 million).

Copper, lead, and zinc: Value of output (2,243, 2,367, and 774.9 million rubles) times 1927/28 ratio (0.5506) of value added to value of output (see col. 1 notes).

Electric power: Value of output (23,321 million rubles) minus cost of fuel and materials. Latter estimated from computed total cost (15,965 million rubles) and percentage distribution of costs by type (*180*, 170).

Coal: Value of output (29,111 million rubles) times 1927/28 ratio for coal and coke (0.8003) of value added to value of output (see col. 1 notes).

Caustic soda: Value added in last stage of fabrication. Unit value added is taken as difference between unit values of soda ash and caustic soda.

Sulfuric acid: Value of output not used in fertilizers.

Rails: Value added in rolling rails.

Railroad freight and passenger cars: Value of output (1,256 and 435.4 million rubles) times 1927/28 ratio (0.5737) of value added (col. 2) to value of output.

Fish catch: Unit value taken as 3,300 rubles (see note b to Table D-8).

Soap: Value of output (1,381 million rubles) times 1927/28 ratio (0.3363) of value added (col. 3) to value of output.

Bicycles: Value of output (1,673 million rubles) times 1927/28 ratio (0.5170) of value added (col. 3) to value of output.

Sewing machines: Value of output (1,096 million rubles) times 1927/28 ratio (0.5170) of value added (col. 3) to value of output.

Column 6: Col. 12 times 1955 ratio of Soviet to U.S. output. Ratio for steel ingots and castings is used for combined ingots and rolled products.

Column 7: Col. 1 times 1913 ratio of U.S. to Soviet output. Ratio for steel ingots and castings is used for combined iron and steel products.

Column 8

Iron ore: 1914 value of shipments ($71.9 million, *626*) times 1919 ratio (0.8129) of census value added to census value of products, times ratio of 1913 to 1914 output.

Pig iron: 1914 census value added for blast-furnace products ($53.1 million) times ratio of 1913 to 1914 output.

Steel ingots and castings and rolled steel: 1914 census value added for steel-mill products ($327.8 million) times ratio of 1913 to 1914 output of steel ingots and castings.

Copper: Value of output times 1919 ratio (0.8613) of census value added in ore mining and primary smelting to census value of products in primary smelting.

Lead and zinc: Value of output times 1919 ratio (0.5571) of census value added for combined lead and zinc mining and primary smelting to census value of products in primary smelting.

Electric power: Value of output times 1912 ratio for commercial central electric stations (0.7313) of census value added to census gross income. 1913 output interpolated

logarithmically between 1912 and 1917. Value added taken as gross income minus purchased fuel, power, supplies, and materials.

Coal: Value of output times 1919 ratio (0.8290) of census value added to census value of products.

Coke: 1914 census value added ($24.2 million) times ratio of 1913 to 1914 output. Census value added for entire coke industry (not including gas-house coke) prorated by census value of products.

Petroleum and natural gas: Value of output times 1919 ratio for petroleum natural gas, and natural gasoline (0.6637) of census value added to census value of products.

Soda ash: 1914 value of output.

Caustic soda: 1914 output times difference between 1914 unit values of caustic soda and soda ash (*618*).

Mineral fertilizer: 1914 census value added ($45.2 million) times ratio of 1913 to 1914 output.

Paper, motor vehicle tires, and window glass: 1914 value of output.

Rails: Output times difference between 1914 unit value of rails and steel ingots (*618*).

Railroad freight and passenger cars: 1914 census value added ($45.8 and $20.9 million) times ratio of 1913 to 1914 output. Census value added for combined cars prorated by detailed census value of products for steam-railroad cars.

Flour: 1914 value added.

Soap, boots and shoes, and rubber footwear: 1914 census value added.

Cotton, silk and synthetic, and woolen and worsted fabrics: 1914 value added.

Bicycles: 1914 census value added for bicycles and motorcycles prorated by census value of products.

Sewing machines: 1914 census value added.

Column 9: Col. 3 times 1928 ratio of U.S. to Soviet output. Ratio for steel ingots and castings used for combined ingots and rolled products.

Column 10

Iron ore: 1929 value added ($176.0 million) times ratio of 1928 to 1929 output.

Pig iron: 1929 value added for blast-furnace products ($161.1 million) times ratio of 1928 to 1929 output.

Steel ingots and castings and rolled steel: 1929 value added for steel-mill products ($1,462 million) times ratio of 1928 to 1929 output of steel ingots and castings.

Copper, lead, and zinc: 1929 census value added for ore mining and smelting and refining ($298.3, $82.8, and $77.9 million) times ratio of 1928 to 1929 output. Census value added in secondary smelting and refining prorated by detailed census value of products for secondary ingots and pigs.

Electric power: Value of output times 1927 ratio for commercial central electric stations (0.7701) of census value added to census gross income. Value added taken as gross income minus purchased fuel, power, supplies, and materials.

Coal: 1929 census value added ($1,141 million) times ratio of 1928 to 1929 output.

Coke: 1929 census value added ($134.8 million) times ratio of 1928 to 1929 output. Census value added for entire coke industry (not including gas-house coke) prorated by census value of products.

Petroleum and natural gas: Value of output times 1939 ratio for petroleum, natural gas, and natural gasoline (0.7790) of census value added to census value of shipments.

Soda ash: 1929 value of output.

Caustic soda: 1929 output times difference between 1929 unit values of caustic soda and soda ash (*618*).

Mineral fertilizer: 1929 value added ($72.7 million) times ratio of 1928 to 1929 output.

Paper, motor vehicle tires, and window glass: 1929 value of output.

Rails: Output times difference between 1929 unit values of rails and steel ingots (*618*).

Railroad freight and passenger cars: 1929 census value added ($88.8 and $15.5 million) times ratio of 1928 to 1929 output. Census value added for combined cars prorated by detailed census value of products for steam-railroad cars.

Flour: 1929 value added.

Soap: 1929 census value added ($129.8 million) times ratio of 1928 to 1929 output.
Boots and shoes and rubber footwear: 1929 census value added.
Cotton, silk and synthetic, and woolen and worsted fabrics: 1929 value added.
Bicycles: 1929 census value added for bicycles and motorcycles prorated by census value of products.
Sewing machines: 1929 census value added.

Column 11: Col. 5 times 1955 ratio of U.S. to Soviet output. Ratio for steel ingots and castings is used for combined ingots and rolled products.

Column 12
Iron ore: 1954 value added ($435.7 million) times ratio of 1955 to 1954 output.
Pig iron: 1954 value added for blast furnaces ($620.2 million) times ratio of 1955 to 1954 output.
Steel ingots and castings and rolled steel: 1954 value added for steel works and rolling mills ($4,020 million) times ratio of 1955 to 1954 output of steel ingots and castings.
Copper: 1954 census value added for ore mining and smelting and refining ($548.7 million) times ratio of 1955 to 1954 output. Census value added for secondary smelting and refining prorated by detailed census costs of metals consumed.
Lead and zinc: 1954 census value added for ore mining and smelting and refining ($114.5 and $160.3 million) times ratio of 1955 to 1954 output. Census value added for combined lead and zinc ore mining prorated by value of each in terms of recoverable content of ores (*638*). Census value added for secondary smelting and refining prorated by detailed census costs of metals consumed.
Electric power: 1954 value added ($4,816 million, see Table A-42) times ratio of 1955 to 1954 output.)
Coke: 1954 census value added ($357.8 million) times ratio of 1955 to 1954 output. Census value added for all coke-oven products prorated by census value of products.
Crude petroleum and natural gas: 1954 census value added ($6,789 and $459.0 million) times ratio of 1955 to 1954 output. Census value added in oil- and gas-field contract services divided between petroleum and natural gas by relative census value added.
Caustic soda: Output times difference between 1954 unit values of caustic soda and soda ash. Former is taken as census value of total shipments divided by census quantity of total shipments.
Mineral fertilizer: 1954 census value added times ratio of 1955 to 1954 output.
Rails: Output times difference between 1954 unit values of rails and carbon steel ingots. Both unit values are taken as value of total shipments divided by quantity of total shipments.
Railroad freight and passenger cars: 1954 census value added ($135.4 and $44.2 million) times ratio of 1955 to 1954 output. Census value added for railroad and street cars prorated by census value of shipments.
Soap: 1954 census value added.
Boots and shoes: 1954 census value added for footwear (except rubber) and house slippers ($985.8 million) times ratio of 1955 to 1954 output.
Rubber footwear: 1954 census value added.
Bicycles: 1954 census value added for bicycles and motorcycles prorated by census value of shipments.
Sewing machines: 1954 census value added.

ruble-dollar ratios.

The basic sample of industries accounted for the following percentages of value added for all industry (Tables A-26, A-42, and A-43):

	1913	*1928*	*1955*
Soviet Union	67	63	50
United States	45	37	28

CHART A-3
Physical Output Trends of Fifteen New Soviet Industries: Soviet Union and United States

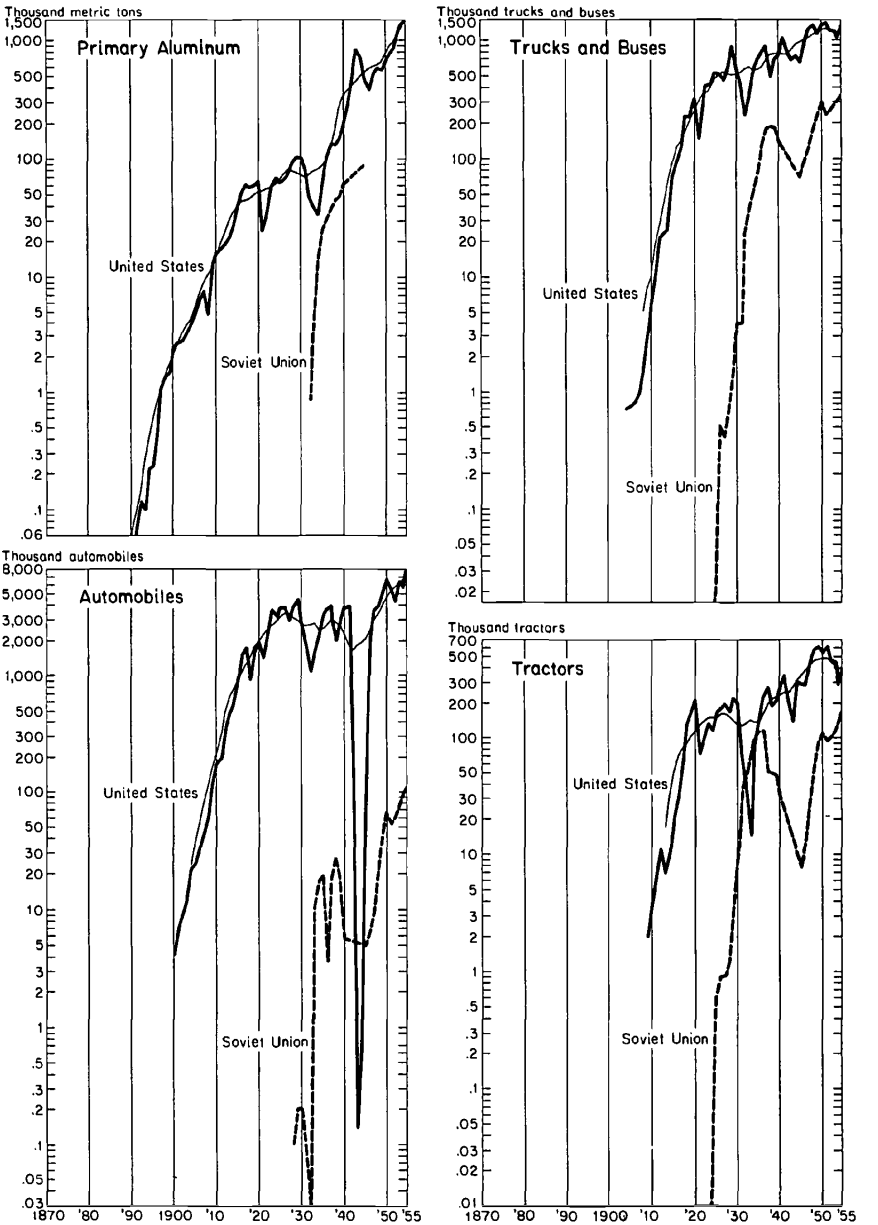


CHART A-3 (continued)

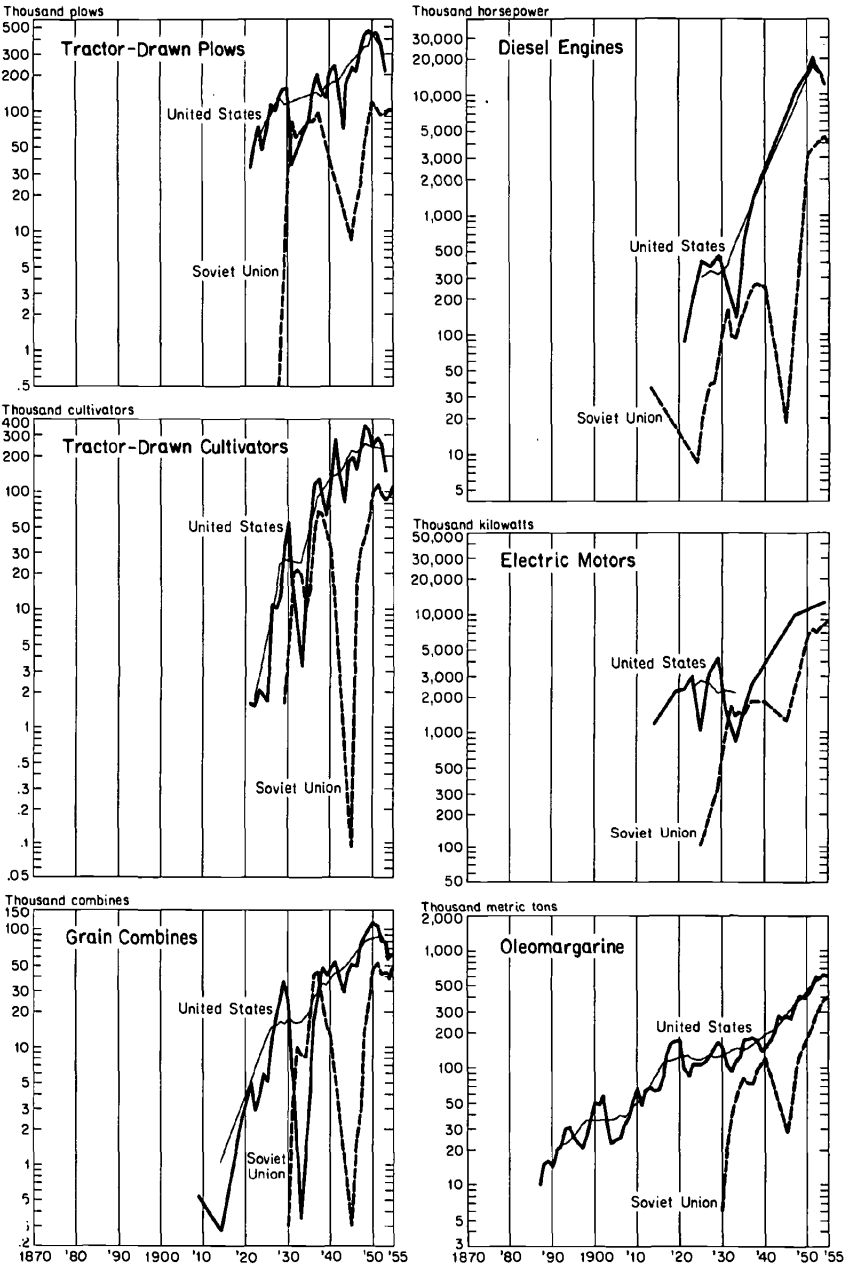
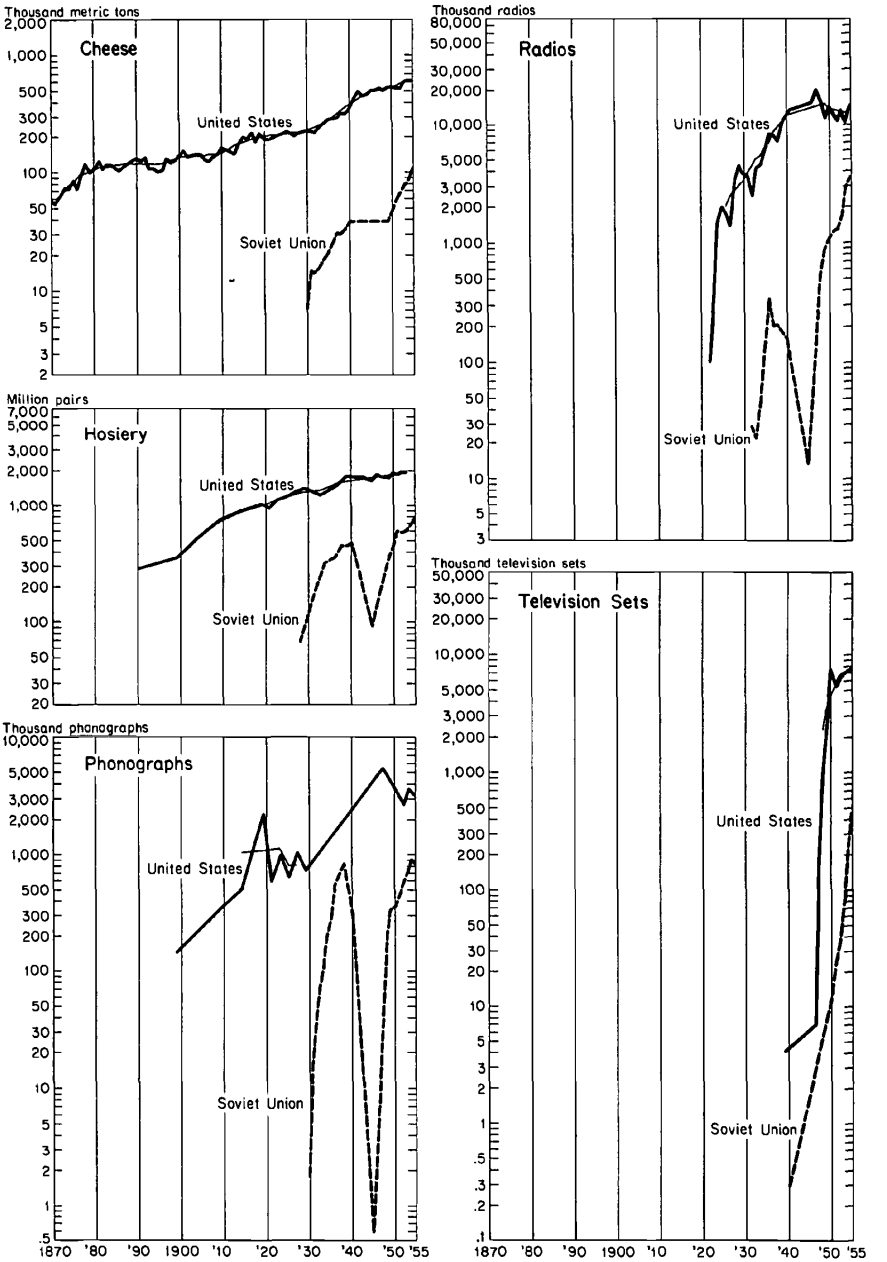


CHART A-3 (concluded)



Source: Tables B-1, B-2, and E-1.
Ratio scales.
Thin line represents nine-year moving average for the U.S.

PRODUCTION OF ENERGY

Basic data on production of energy are given in the Tables A-27 and A-28, which are self-explanatory, and Chart A-4. It might have been preferable, for the purposes of our analysis, to have used consumption rather than production in the two countries, but sufficient data were not available on net imports of fuel into the Soviet Union for many of the years involved. Between 1913 and 1938, the Soviet Union shifted from being a net importer of fuel to being a net exporter, so that growth in production overstates growth in consumption. In the postwar period, the Soviet Union probably once again became a net importer, so that growth in production probably understates growth in consumption over some of these years. For the United States, the long-run trend has been for net imports to become increasingly large relative to production in terms of thermal content. Net imports were negligible before 1910 and had risen to around 3 per cent of production in 1955. Hence growth of production understates growth in consumption over that period, but only slightly.

We constructed our own estimates of coal in thermal units instead of using data published in recent Soviet sources, because the latter cannot be reconciled with other data on physical output and thermal content as given in earlier as well as more recent sources. Thus we find the total thermal content of coal for 1913 given as 641.6 billion b.t.u. (161.7 billion calories) on page 133 of *Promyshlennost' SSSR* (*180*), while the thermal content of Donbas coal alone is implied as 696.4 billion b.t.u. (175.5 billion calories) by its output of 25.3 million metric tons (given on page 142 of the same source) and its thermal content of 6,860 calories per ton (given in standard Soviet sources, such as the book by Savinskii cited in Table A-28).

The short table below compares the b.t.u. content per metric ton of coal as we have calculated it with the content implied by data in *Promyshlennost' SSSR* (*180*, 133 and 140) (million b.t.u.):

	Our Data (1)	*Promyshlennost'* (2)	*Ratio* (2)/(1)
1913	26.5	22.0	0.83
1940	24.8	23.5	0.95
1945	22.6	21.4	0.95
1950	23.2	21.9	0.94
1955	23.4	22.1	0.94

The official Soviet figures are lower than ours for all years in which comparisons can be made, but the ratio of the official figure to ours is

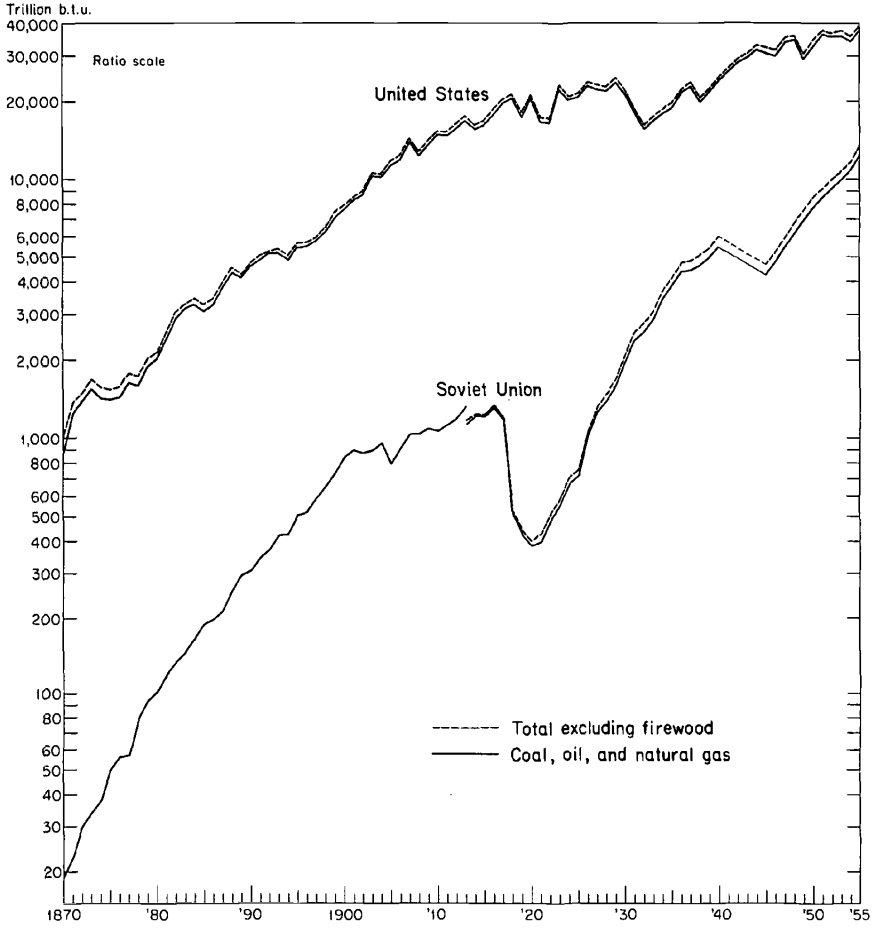
TABLE A-27

PRODUCTION OF ENERGY IN THE UNITED STATES, 1860–1955
(trillion b.t.u.)

	Coal, Petroleum, and Natural Gas (1)	Total Excluding Firewood (2)	Total (3)		Coal, Petroleum, and Natural Gas (1)	Total Excluding Firewood (2)	Total (3)
1860	379	480		1908	12,295	12,771	
1861	436	539		1909	13,587	14,100	
1862	468	575		1910	14,836	15,375	
1863	564	674		1911	14,763	15,328	
1864	620	732		1912	15,833	16,418	
1865	628	744	3,585	1913	16,927	17,536	
1866	769	887		1914	15,559	16,195	
1867	811	931		1915	16,163	16,822	18,594
1868	869	993		1916	17,944	18,625	
1869	873	1,001		1917	19,787	20,487	
1870	884	1,012		1918	20,529	21,230	
1871	1,243	1,374		1919	17,441	18,159	
1872	1,365	1,498		1920	20,602	21,340	
1873	1,545	1,679		1921	16,646	17,266	
1874	1,421	1,558		1922	16,506	17,149	
1875	1,404	1,543	4,492	1923	22,494	23,179	
1876	1,431	1,572		1924	20,274	20,922	
1877	1,642	1,783		1925	20,903	21,571	23,020
1878	1,590	1,733		1926	23,049	23,777	
1879	1,876	2,019		1927	22,379	23,155	
1880	2,002	2,146		1928	21,949	22,803	
1881	2,385	2,531		1929	23,796	24,612	
1882	2,865	3,012		1930	21,308	22,060	
1883	3,145	3,294		1931	18,275	18,943	
1884	3,285	3,434		1932	15,607	16,320	
1885	3,091	3,242	5,975	1933	16,924	17,635	
1886	3,279	3,432		1934	18,038	18,736	
1887	3,812	3,967		1935	18,921	19,727	21,086
1888	4,386	4,542		1936	21,598	22,410	
1889	4,135	4,292		1937	22,997	23,868	
1890	4,619	4,780		1938	19,814	20,680	
1891	4,888	5,052		1939	21,653	22,491	
1892	5,121	5,289		1940	24,089	24,969	
1893	5,176	5,350		1941	26,060	26,994	
1894	4,873	5,055		1942	28,124	29,260	
1895	5,467	5,657	7,937	1943	29,407	30,711	
1896	5,491	5,692		1944	31,572	32,916	
1897	5,715	5,928		1945	30,681	32,123	33,340
1898	6,228	6,456		1946	29,916	31,322	
1899	7,171	7,409		1947	33,672	35,098	
1900	7,643	7,893		1948	34,409	35,890	
1901	8,316	8,580		1949	29,067	30,606	
1902	8,685	8,974		1950	32,849	34,422	
1903	10,205	10,526		1951	36,047	37,606	
1904	10,171	10,525		1952	35,249	36,830	
1905	11,386	11,772	13,550	1953	35,554	37,076	
1906	11,946	12,360		1954	33,916	35,365	
1907	13,917	14,358		1955	37,453	38,900	

Notes on page 374.

CHART A-4
Physical Output Trends of Energy: Soviet Union and United States



Source: Tables A-27 and A-28.

Notes to Table A-27

Column 1

1860–1898: Data taken from *626*, 142 ff. Converted into b.t.u. at heat unit values given in *649*, 1958, 528.

1899–1951: *613*, 22 and 62 f. Total mineral fuels (G 163a) minus imports of petroleum (G 169a).

1952–1955: *649*, 1958, 528.

Column 2

1860–1898: Col. 1 plus water power. Water power extrapolated from 1899 (see below) by series on water power in *643*, 378.

1899–1951: *613*, 22 and 62 f. Grand total energy (G 160a) minus imports of petroleum (G 169a).

1952–1955: *649*, 1958, 528.

Column 3

All years: Col. 2 plus firewood. Average annual consumption of firewood for decades (*641*, 26) centered and converted into b.t.u. at standard heat unit value as in col. 1 above.

TABLE A-28

PRODUCTION OF ENERGY IN RUSSIA AND THE SOVIET UNION, 1860–1955
(trillion b.t.u.)

	Coal and Petroleum[a] (1)		Coal and Petroleum[a] (1)		Coal, Petroleum, and Natural Gas[b] (1)	Total Excluding Firewood[b] (2)	Total[b] (3)
1860	8	1900	840	1913	1,138	1,160	1,684
1861	10	1901	897	1914	1,209	1,234	
1862	9	1902	876	1915	1,205	1,227	
1863	10	1903	886	1916	1,306	1,327	
1864	11	1904	952	1917	1,174	1,192	
1865	10	1905	795	1918	510	524	
1866	12	1906	900	1919	424	440	
1867	12	1907	1,032	1920	382	400	
1868	13	1908	1,033	1921	399	425	
1869	17	1909	1,079	1922	481	508	
1870	19	1910	1,056	1923	542	573	
1871	23	1911	1,117	1924	666	702	
1872	30	1912	1,193	1925	715	750	
1873	34	1913	1,321	1926	1,009	1,054	
1874	38			1927	1,256	1,323	
1875	50			1928	1,392	1,468	1,882
1876	56			1929	1,592	1,689	
1877	57			1930	1,986	2,099	
1878	80			1931	2,386	2,554	
1879	93			1932	2,548	2,753	3,319
1880	101			1933	2,849	3,049	
1881	119			1934	3,423	3,700	
1882	133			1935	3,853	4,157	
1883	145			1936	4,372	4,730	
1884	163			1937	4,434	4,812	5,435
1885	189			1938	4,621	5,044	
1886	197			1939	4,931	5,384	
1887	214			1940	5,480	5,995	6,839
1888	257						
1889	295			1945	4,286	4,656	5,353
1890	309			1946	4,749	5,188	
1891	345			1947	5,406	5,905	
1892	370			1948	6,146	6,724	
1893	421			1949	6,970	7,596	
1894	427			1950	7,784	8,468	9,196
1895	509			1951	8,470	9,171	
1896	518			1952	9,130	9,811	
1897	585			1953	9,831	10,585	
1898	657			1954	10,751	11,569	
1899	726			1955	12,316	13,357	13,996

[a] Tsarist territory excluding Finland.

[b] Current Soviet territory (for prerevolutionary years, interwar territory).

NOTES TO TABLE A-28

For each fuel, output as given in Tables B-1 and B-2 multiplied by b.t.u. content. Content is given for benchmark years in the table below; for intervening years, content was interpolated (except in the case of hydroelectric power for years after 1937, for which content was derived from *180*, 181); for 1860–1913, content for 1913 was used. Gaps caused by missing output data were interpolated on the basis of computed output in b.t.u.'s.

Notes continue on page 376.

significantly lower for 1913 than for other years. Since our figures have all been derived by a consistent procedure, we can only conclude that the cited Soviet source significantly understates the thermal content of coal in 1913. This conclusion is supported by the fact that a technical Soviet source on the economics of the fuel industry published in 1957 gives data implying a thermal content of 26.4 million b.t.u. per metric ton of coal in 1913, a figure virtually identical with ours.[41]

Firewood presents a rather different problem. Data on Soviet output for the interwar years vary enormously from one source to another. The variation may be attributed in part to differences in coverage, but that cannot be the entire explanation. Here, again, there seems to be little doubt that output for early years has been significantly understated in recent statistical abstracts, due allowance being given for possible legitimate differences in coverage, never adequately described. Thus, on page 249 of *Promyshlennost' SSSR*,[42] output is given as 33.4 and 25.7 million cubic meters for 1913 and 1928, respectively. These figures are only about 10 per cent of total consumption of firewood (including peasant use) given in other sources, some published much earlier.[43] They are

[41] *7*, 12.
[42] See also *114*, 57.
[43] *173*, 17, and *363*, 1929, No. 5, 327 ff.

Notes to Table A-28 (continued)

B.T.U. CONTENTS PER UNIT OF SOVIET FUELS,[a] BENCHMARK YEARS
(million b.t.u.)

Fuel	Unit	1913	1928	1932	1937	1940	1945	1950	1955
Coal	m. ton	26.488	25.857	25.712	25.113	24.795	22.640	23.153	23.357
Anthracite	m. ton	27.06	27.06	27.06	27.06	27.06	27.06	27.06	27.06
Bituminous	m. ton	26.90	26.83	26.77	26.70	26.54	26.20	26.27	26.35
Lignite	m. ton	15.83	15.40	15.16	15.20	15.30	15.18	15.18	15.36
Crude petroleum	m. ton	39.68	39.68	39.68	39.68	39.68	39.68	39.68	39.68
Natural gas[b]	thous. m^3	40.906	40.906	40.906	40.906	40.906	40.906	40.906	40.906
Peat	m. ton	12.499	12.499	12.499	12.499	12.499	12.499	12.499	12.499
Oil shale	m. ton	9.067	9.067	9.067	9.067	9.067	9.067	9.067	9.067
Hydroelectric power	thous. kwh	29.443	22.776	21.138	17.332	16.582	15.999	15.055	13.305
Firewood	m^3	5.241	5.241	5.241	5.241	5.241	5.241	5.241	5.241

[a] B.t.u. contents of equivalent fuels in the United States are (same units as table): anthracite, 27.998; bituminous coal, 28.880; petroleum, 41.71; natural gas, 37.947; and firewood, 5.36. For source, see Table A-27.

[b] 1 kg. of natural gas equals 1.1 m^3 (see series 306, Table B-2).

SOURCE: Caloric content of each fuel (given in *195*, 281) multiplied by no. of b.t.u. per calorie (3.968). In the case of coal, derived from regional breakdown of output (*272*, 42 ff) by using coefficients of thermal content of different kinds of coal in different regions (given in *195*, 281). In the case of hydroelectric power, derived from no. of grams of conventional fuel per kwh (given in *180*, 181). For firewood, 1 conventional ton of fuel (7,000 calories) equals 5.3 m^3 (see series 309, Table B-2).

also significantly smaller than the corresponding figures of 68.0 and 50.5 million cubic meters published in a recent Soviet technical source.[44]

The implied thermal content per cubic meter of firewood is, on the other hand, much higher in the recent Soviet abstracts than in other Soviet sources. According to the former, there are 7.3 thousand b.t.u. per cubic meter;[45] according to the latter, 5.2 thousand.[46] A partial explanation of this difference may be that the former sources give output on a dried basis, while the latter do not. Even if this were the case, the difference in output data could not be fully reconciled.

Our interwar data on total thermal content of firewood have been taken directly from Ioffe (*79*, 148). His figures are slightly more than double those in recent Soviet abstracts, but still no more than a third of those on total consumption cited above.

The data on production of firewood in the United States are also highly unreliable and almost certainly not comparable with the Soviet data. It will be noted from the appended tables that production of energy excluding firewood was about the same in the Soviet Union in 1913 as in the United States in 1870, while production including firewood was only about 40 per cent as large. It seems most improbable that firewood was relatively so much less important as a source of industrial energy in prerevolutionary Russia than it was in the United States of 1870.

RUBLE-DOLLAR PRICE RATIOS

Ruble-dollar price ratios can be calculated from two sets of data in our study: production indexes for Soviet industrial materials weighted in both Soviet and U.S. prices (summarized for a standardized product coverage in Table A-29) and estimated Soviet and U.S. value added in both dollars and rubles for the basic sample of forty-five industries (Table A-26). Ruble-dollar ratios derived from the first set of data apply only to Soviet baskets of goods, while those derived from the second apply to U.S. baskets as well. The resulting average ruble-dollar ratios are summarized in Table A-30.

When the two sets of ratios are compared for Soviet baskets of goods, it will be noted that there are some significant differences, particularly for 1955 and the categories of construction materials and consumer goods. These differences are attributable to different product coverages and procedures for estimating value added. In the case of industrial materials, product coverage and value-added weights were designed for the purpose

[44] *7*, 12.
[45] *180*, 133 and 249.
[46] *7*, 12, and *363*, 1936, No. 1, 61.

of constructing a production index, not for calculating ruble-dollar ratios. Much more care was given to the latter objective in matching counterparts and estimating unit value added in the case of the basic sample of forty-five industries. Both product samples account for about the same total value added in each year.[47] Hence the ruble-dollar ratios calculated from the latter data are probably more meaningful than those calculated from the former.

TABLE A-29

ESTIMATED VALUE ADDED CALCULATED IN RUBLES AND DOLLARS FOR SOVIET INDUSTRIAL MATERIALS: INDUSTRIAL GROUPS, 1913, 1928, AND 1955
(millions)

	1913 Value Added[a]		*1928 Value Added*[b]		*1955 Value Added*[c]	
	1913 Rubles	1914 Dollars	1928 Rubles	1929 Dollars	1955 Rubles	1954 Dollars
All industrial materials	2,426.4	1,190.8	4,981.7	1,991.5	136,279	16,449
Intermediate products	1,124.0	364.6	2,165.2	640.9	96,355	12,296
Metals	298.8	100.4	525.4	120.7	28,020	3,965
Fuel and electricity	467.2	95.6	719.4	216.7	35,634	3,802
Chemicals	111.8	41.0	229.2	67.0	14,658	1,139
Construction materials	246.2	127.6	691.3	236.6	21,520	3,391
Consumer goods	1,302.4	826.1	2,816.5	1,350.6	40,045	4,153
Food and allied products	806.6	660.1	1,282.6	987.3	27,972	2,929
Textiles and allied products	495.8	166.0	1,533.9	363.4	12,073	1,224

SOURCE: Tables D-10 and D-8. The 1955 unit value for fish catch is taken as 3,300 rubles (see note *b* to Table D-8).

[a] Forty-six products.

[b] Forty-nine products.

[c] Fifty products. Ruble prices exclude most of the applicable turnover taxes (see Chapter 5).

A major weakness of both sets of data, from the point of view of comprehensiveness, is failure to cover machinery and equipment. Ruble-dollar price ratios for machinery and equipment were apparently generally higher in 1913 and 1928 than the average for other products,[48] but few useful measures of them are available. Since machinery and equipment accounted for only about 5 per cent of persons engaged in Soviet industry in 1913 and about 7 per cent in 1928 (see Table A-39), the average ruble-dollar ratio for all industry based on the Soviet basket of goods would probably be little affected by including that category. This is not so likely to be the case for the ratio based on the U.S. basket,

[47] The fractions of value added of all industry accounted for by the forty-five industries are given in the first section of this technical note.

[48] See *500*, 127 ff.

TABLE A-30

ESTIMATED RUBLE-DOLLAR RATIOS FOR UNIT VALUE ADDED, BY INDUSTRIAL GROUP: U.S. AND SOVIET OUTPUT WEIGHTS, 1913, 1928, AND 1955

	SOVIET OUTPUT WEIGHTS						U.S. OUTPUT WEIGHTS		
	Industrial Materials[a]			*Basic Sample, 45 Industries*[b]			*Basic Sample, 45 Industries*[b]		
	1913[c]	1928[d]	1955[e]	1913[c]	1928[d]	1955[e]	1913[c]	1928[d]	1955[e]
All covered products	2.04	2.50	8.28	2.22	2.50	7.66	2.93	3.74	9.56
Intermediate industrial products	3.08	3.38	7.84	2.90	3.07	7.84	3.09	3.96	9.78
Metals	2.98	4.35	7.07	2.16	2.37	6.68	2.23	2.58	7.11
Fuel and electricity	4.89	3.32	9.37	4.78	3.99	10.44	5.10	4.38	10.49
Chemicals	2.73	3.42	12.87	3.58	2.70	13.60	1.96	5.90	15.68
Construction materials	1.93	2.92	6.35	1.57	2.70	3.57	1.65	2.73	4.10
Railroad cars	n.a.	n.a.	n.a.	1.59	2.69	3.80	1.62	2.75	4.58
Consumer goods	1.58	2.09	9.64	1.95	2.23	7.49	2.65	3.20	8.89
Food and allied products	1.24	1.30	9.55	1.27	1.34	7.43	1.55	2.06	8.88
Textiles and allied products	4.58	4.22	9.86	6.94	4.70	7.86	4.51	4.86	8.98
Bicycles and sewing machines	n.a.	n.a.	n.a.	0.61	0.47	6.05	1.68	1.01	6.80

n.a.: not applicable.

[a] From Table A-29.

[b] From Table A-26.

[c] Ratio, 1913 rubles to 1914 dollars.

[d] Ratio, 1928 rubles to 1929 dollars. Excludes beer.

[e] Ratio, 1955 rubles to 1954 dollars. Ruble prices exclude most of the applicable turnover taxes (see Chapter 5).

since machinery and equipment accounted for about 12 and 20 per cent of persons engaged and value added in U.S. industry in those two years (see Table A-38). Hence we can say that for 1913 and 1928 the ratios for "all covered products" in Table A-30 understate the appropriate ratios for all industry, more in the case of those based on U.S. output weights than in the case of those based on Soviet output weights.

TABLE A-31

SUMMARY OF RUBLE-DOLLAR PRICE RATIOS FOR INDUSTRY IN 1955: U.S. AND SOVIET OUTPUT WEIGHTS[a]

	Soviet Output Weights	U.S. Output Weights
All industry	7.3[b]	8.7[c]
Intermediate products and consumer nondurables	7.7[d]	9.7[d]
Machinery and equipment	4.8[e]	6.0[f]

[a] Ruble prices exclude most of the applicable turnover taxes (see Chapter 5).

[b] The two components weighted by relative persons engaged in 1955 (Table A-39). The ruble-dollar ratio for intermediate products and consumer nondurables is taken as applying to all products except machinery and equipment.

[c] The two components weighted by relative value added in 1953 (Table A-38), as described above. The same result obtains if persons engaged are used as weights.

[d] From Table A-26, excluding transportation equipment and consumer durables. Ruble-dollar ratios are for unit value added.

[e] The figure for machinery and equipment is taken to bear the same ratio to the figure for intermediate products and consumer nondurables in the case of Soviet output weights as in the case of U.S. output weights.

[f] *423*, 47. This value is the mean of adjusted sample price ratios weighted within groups by imputed U.S. value of shipments and among groups by imputed U.S. value added. The mean of unadjusted ratios, similarly weighted, is 6.9 (*423*, 31).

The situation is different for 1955. Abraham Becker has computed an average ruble-dollar ratio based on a large sample of machinery using the U.S. basket of goods,[49] and it lies between 6:1 and 7:1, both of which are significantly lower than our average ratio of almost 10:1 for other products, the bulk of applicable turnover taxes excluded (see Table A-31). We have assumed that the same relative differences would apply to ratios based on the Soviet basket of goods, and have accordingly estimated such a ratio for machinery. We have then proceeded to calculate average ratios for all industry by weighting the ratios for machinery and for other products by their respective shares of persons engaged in the case of the

[49] *423*.

Soviet Union and value added in the case of the United States. Use of persons engaged in the latter case makes no significant difference. The averages thus estimated are given in Table A-31 for all industry and the two components.

It goes without saying that calculations of this type are based on a number of arbitrary decisions as to the comparability of products and prices in the two countries. The difficulties are particularly acute in the case of heterogeneous and unique products, such as are found in the machinery category. Matching of all products has generally been based on physical likeness, without adjustment for relevant qualitative differences. As we point out in Chapter 3, Soviet goods are generally inferior in quality to their U.S. counterparts. Also, prices on official lists tend, for a variety of reasons discussed in the text, to be lower than the effective prices at which products get entered into Soviet accounts of gross production. In these respects, the ruble-dollar ratios for 1955 given here understate the appropriate values.

It is interesting to observe that ruble-dollar price ratios are systematically lower when based on Soviet output weights than when based on U.S. output weights. There are only two exceptions in Table A-30: chemicals and textiles in 1913. This means there is a weighted negative correlation between Soviet-U.S. ratios for price and output. Put in economic terms, those items whose production in the Soviet Union is smallest relative to the United States tend to have the highest prices relative to the United States. This implies a similar relation between relative scarcities and relative prices in the two countries.

AGGREGATIVE OUTPUT, EMPLOYMENT, AND VALUE DATA

Indexes of Industrial Production in the United States

For the purposes of this study, we have constructed an index of industrial production for the United States extending from 1860 through 1959 (Table A-32). From 1899 onward, the index covers manufacturing, mining, and electric and gas utilities; for earlier years, manufacturing and mining only. The new Federal Reserve Board index, revised as of December 1959,[50] is used from 1929 onward. For earlier years, component indexes (Table A-33) were combined by a system of moving income-originating weights (Table A-34). Links were constructed for each decade with a one-year overlap (1869–1879, 1879–1889, etc)., each weight for a link being the arithmetic average of weights in the terminal

[50] *620*, December 1959, 1469.

TABLE A-32

INDEX OF INDUSTRIAL PRODUCTION: UNITED STATES, 1860–1959
(1913 = 100)

Year	Index	Year	Index	Year	Index	Year	Index	Year	Index
1860	7.48	1880	20.3	1900	50.6	1920	124.0	1940	213.9
1861	7.49	1881	22.3	1901	56.7	1921	100.1	1941	275.5[a]
1862	6.94	1882	23.9	1902	63.2	1922	125.9	1942	340.3[a]
1863	7.88	1883	24.4	1903	65.4	1923	144.4	1943	405.2[a]
1864	8.35	1884	23.1	1904	62.3	1924	137.7	1944	398.7[a]
1865	8.00	1885	23.2	1905	73.6	1925	153.0	1945	343.6[a]
1866	9.84	1886	27.9	1906	78.9	1926	163.1	1946	291.7
1867	10.3	1887	29.5	1907	80.6	1927	164.5	1947	320.9
1868	10.8	1888	30.6	1908	68.0	1928	171.8	1948	333.9
1869	11.6	1889	32.6	1909	80.2	1929	188.3	1949	317.7
1870	11.7	1890	35.0	1910	85.3	1930	155.6	1950	366.3
1871	12.3	1891	36.0	1911	82.2	1931	129.7	1951	398.7
1872	14.6	1892	38.8	1912	93.7	1932	100.5	1952	411.7
1873	14.4	1893	34.7	1913	100	1933	119.9	1953	447.3
1874	13.9	1894	33.7	1914	94.1	1934	129.7	1954	421.4
1875	13.5	1895	39.7	1915	109.3	1935	149.1	1955	473.2
1876	13.4	1896	36.9	1916	129.6	1936	178.3	1956	489.4
1877	14.6	1897	39.7	1917	129.7	1937	194.5	1957	492.7
1878	15.5	1898	44.7	1918	128.8	1938	152.3	1958	457.0
1879	17.5	1899	49.2	1919	113.2	1939	188.0	1959	517.3

NOTE: These index numbers are derived from others (with varying base years) that are generally given with as few as two places. Our numbers being essentially ratios of the underlying data, we have recorded them here to an extra place so that the underlying data, or other ratios, might be faithfully reproduced. In the body of our analysis, they are rounded to one less place.

SOURCE: See Tables A-33 and A-34.

[a] The figures for these years are probably too high because of the methods used to estimate war production (see our discussion in Chapters 5 and 7 and *640*). The FRB is re-examining these years and has made a preliminary estimate (*620*, December 1959, 1469) that their current index overstates industrial production in 1943 by about 6 per cent. Accordingly, our index number would be reduced from 405 down to 382.

Other estimates are even lower. If Moore's index for industrial materials (*640*, 33) is combined with the new FRB index for electric and gas utilities (*620*, October 1956, 1063) by 1939 income-originating weights (*653*, 130), the following index numbers are derived: 1940, 216; 1941, 252; 1942, 255; and 1943, 257.

years. That is, a modified Edgeworth weighting formula was used.[51] The links were then chained together.

The new FRB index extends back to 1919, but we preferred to use NBER indexes for part of this period because they are derived directly from census data, while the FRB components for manufacturing and mining have been only partially adjusted to census benchmarks for the

[51] See *618*, 358 ff. The only exception was the first link, 1860–1869, in which only 1869 weights were used because of the unsatisfactory coverage of the 1860 census.

TABLE A-33

COMPONENT INDEXES USED FOR INDEX OF INDUSTRIAL PRODUCTION IN THE UNITED STATES

Sector	Period	Index
Manufacturing	1860–1899	Frickey, *622*, 54
	1899–1929	Fabricant, *618*, 44.
Mining	1860–1880	Persons, *642*, 170.
	1880–1899	Leong, *632*, 28.
	1899–1929	Barger and Schurr, *603*, 14.
Electric and gas utilities	1899–1929	Weighted index, Gould, *625*, 131. Gaps were filled in as follows: for all gas, 1900 interpolated linearly; for electricity, 1903–1906 and 1908–1911 interpolated logarithmically, and 1899–1901 extrapolated logarithmically on the basis of output of electricity in kilowatt hours in 1880 and 1902 (see our Table E-1). Resulting figures combined by implicit weights for 1902–1907 and 1907–1912 links in Gould's total weighted index.
Manufacturing, mining, and electric and gas utilities	1929–1959	*626b* and *626c*.

TABLE A-34

INCOME-ORIGINATING WEIGHTS USED FOR INDEX OF INDUSTRIAL PRODUCTION IN THE UNITED STATES
(million dollars)

	Manufacturing	Mining	Electric and Gas Utilities
1869	780	80	
1879	1,110	140	
1889	2,360	210	
1899	3,170	390	40
1909	5,550	730	170
1919	16,200	1,800	424
1929	21,888	2,048	1,631

SOURCE: *Manufacturing*, 1869–1909: Extrapolated by value added in manufacturing. From 1899 onward, taken from *618*, 638; for earlier years, from *609*, 1920.
1919: *629*, 163.
1929: *653*, 130.
Mining, 1869–1909: Extrapolated by value of minerals, as given in *626*, 141, and *606*, 66.
1919, 1929: Same as for manufacturing.
Electric and gas utilities, 1899, 1909: Extrapolated by sum of gross revenue for electricity and value of products for gas (*626*, 159, and *625*, 155). Revenue for 1909 is linearly interpolated between 1907 and 1917; for 1899, linearly extrapolated on the basis of 1902–1907.
1919: *629*, 660.
1929: *653*, 130.

relevant years.[52] The differences in the two sets of indexes are as follows:[53]

	1929 as % of 1919	*1939 as % of 1929*
Manufacturing		
FRB	153	98
NBER (Fabricant)	164	103
Mining		
FRB	151	99
NBER (Barger-Schurr)	166	94

If we had used the FRB index from 1919 onward instead of from 1929 onward, our index of industrial production would have read 434 for 1955 and 419 for 1958 (on 1913 = 100) instead of 473 and 457, or about 8 per cent lower. This is accounted for by the slower growth of the FRB index over 1919–1929 than of the combined NBER indexes.

Production indexes for industrial groups (see Table A-37) have been compiled from indexes with narrower coverage used in John W. Kendrick's book *Productivity Trends in the United States* (*628*). Kendrick's indexes apply to the narrowest industrial categories listed in Table A-35, being constructed with moving weights on the basis of a modified Edgeworth index-number formula. They have been combined into broader categories, comparable with those used for Soviet industry, by using 1929 value-added weights, also listed in the cited table.

Employment and Labor Productivity

Our data on industrial employment in the United States are also drawn from the Kendrick study and are summarized in Tables A-35, A-36, and A-37. Data on persons engaged (in full-time equivalents) and man-hours are unweighted aggregates. Both cover wage earners, salaried employees, proprietors, and estimated unpaid family workers. Industrial coverage has been adjusted to be as comparable as possible to our data for the Soviet Union. The percentage distributions of value added and persons engaged in Tables A-38 and A-40 are computed for a special purpose and exclude some sectors of industry, as specified there.

The data for the Soviet Union in Table A-39 are based on data discussed in technical note 7 of this appendix. As in the case for the United

[52] *620*, December 1953, 1249 f. The new FRB index uses the NBER (Gould) index for electric and gas utilities through 1929.

[53] *626*, 141 and 179; *613*, 66.

TABLE A-35

VALUE ADDED, PERSONS ENGAGED, AND MAN-HOURS OF PERSONS ENGAGED: UNITED STATES, INDUSTRIAL GROUPS, 1929

	Value Added (million dollars)	Persons Engaged (thousands)	Man-Hours (millions)
Ferrous and nonferrous metals			
Metal mining	1,184	124	314
Primary metal products	2,436	698	1,663
Fuel and electricity			
Fuel			
Anthracite mining	328	151	282
Bituminous mining	808	474	925
Crude petroleum and gas	1,075	218	513
Petroleum and coal products	781	124	330
Electricity			
Electric utilities	1,705	311	756
Chemicals			
Chemicals and allied products	1,727	350	824
Rubber products	538	172	401
Construction materials			
Wood materials			
Lumber and products except furniture	1,397	738	1,726
Paper and allied products	817	279	737
Mineral materials			
Nonmetallic mining and quarrying	961	90	279
Stone, clay, glass products	1,136	394	880
Machinery and allied products			
Machinery and equipment			
Machinery (except electrical)	3,069	927	2,373
Electrical machinery	1,386	422	1,039
Transportation equipment	2,356	651	1,453
Metal products			
Instruments and misc. manufacturing	769	274	609
Fabricated metal products	1,927	661	1,516
Food and allied products			
Food and kindred products	3,121	862	2,079
Beverages	193	44	100
Tobacco manufacturers	817	128	291
Textiles and allied products			
Textile mill products	2,227	1,199	2,930
Apparel and related products	1,678	702	1,470
Furniture	532	225	548
Leather and leather products	757	354	816
Total of above	33,725[a]	10,572[a]	24,854[a]
Printing and publishing	2,234[a]	581[a]	1,346[a]
Unallocated manufacturing	693[a]	785[b]	1,159[b]
Logging and fishing, n.e.c.	553[c]	236[d]	600[e]
Grand total	37,205	12,174	27,959

SOURCE: Except as noted, data compiled by Kendrick for *628*. Kendrick's industrial groups are classified in the stub according to our categories.

Notes continue on page 386.

TABLE A-36

OUTPUT AND EMPLOYMENT IN U.S. INDUSTRY: SELECTED YEARS, 1899–1955

	Amount[a]		*Index (1929 = 100)*		
	Persons Engaged (thousands)	Man-Hours (millions)	Output[b]	Persons Engaged	Man-Hours
1899	6,198	16,614	26.1	50.9	59.4
1909	9,013	23,379	42.6	74.0	83.6
1913	9,099	25,738	53.1	74.7	92.1
1919	12,086	28,779	60.1	99.3	102.9
1928	11,469	26,316	91.2	94.2	94.1
1929	12,174	27,959	100.0	100.0	100.0
1933	8,461	16,737	63.7	69.5	59.9
1937	12,207	24,421	103.3	100.3	87.3
1940	12,475	24,587	113.6	102.5	87.9
1948	17,082	35,734	177.3	140.3	127.8
1950	16,711	34,703	194.5	137.3	124.1
1953	18,952	39,312	237.5	155.7	140.6
1955	18,226	37,758	251.3	149.7	135.0

[a] Derived from data used in *628*. Covers mining, manufacturing, electric utilities, and agricultural services, forestry, and fisheries. While agricultural services and a part of forestry lie outside the scope of industry as defined in this study, employment was relatively small and could not be estimated independently. Data for electric utilities were extrapolated from 1953 to 1955 by persons engaged in electric and gas utilities, Department of Commerce national income series.

[b] From Table A-32.

States, the percentage distributions in Tables A-39 and A-41 exclude some specified sectors of industry.

Value Added by Industry

Estimates of value added by U.S. and Soviet industry, comparably defined, are given in Tables A-42 and A-43 for key years. Derivation of those estimates is fully explained in notes to the tables. Data on value added by industrial groups are presented in several other tables, where sources are also described.

Notes to Table A-35 (continued.)

[a] Census data with minor adjustments. These data, except printing and publishing and unallocated manufacturing, are used in calculations for industrial groups (see Tables A-37 and A-38).

[b] Difference for manufacturing between data from the Department of Commerce national income series (adjusted to include unpaid family workers) and data from the Census of Manufacturers.

[c] From Table A-42.

[d] Persons engaged in agricultural services, forestry, and fisheries from Department of Commerce national income series.

[e] Employees (127 million) and proprietors (109 million) times average hours (2,434 and 2,677, respectively) as estimated by Kendrick.

TABLE A-37

INDEXES OF OUTPUT AND EMPLOYMENT, BY INDUSTRIAL GROUP: UNITED STATES, BENCHMARK YEARS, 1899–1953
(1929 = 100)

	1899	1909	1919	1929	1937	1948	1953
Ferrous and nonferrous metals							
Output	27.5	51.1	65.6	100.0	92.3	140.8	169.2
Persons engaged	55.1	75.5	102.8	100.0	110.7	140.0	151.8
Man-hours	61.0	84.3	110.8	100.0	93.8	121.4	134.1
Output per person engaged	55.1	75.5	102.8	100.0	110.7	140.0	151.8
Output per man-hour	45.1	60.6	59.2	100.0	98.4	116.0	126.2
Fuel and electricity							
Output	16.4	30.8	52.4	100.0	116.1	217.2	294.3
Persons engaged	39.0	68.6	89.4	100.0	92.6	104.3	95.3
Man-hours	41.2	68.6	84.7	100.0	74.7	98.2	86.9
Output per person engaged	42.1	44.9	58.6	100.0	125.4	208.2	308.8
Output per man-hour	39.8	44.9	61.9	100.0	155.4	221.2	338.7
Fuel							
Output	24.7	42.9	61.7	100.0	103.9	161.6	182.1
Persons engaged	48.7	83.7	103.8	100.0	92.3	103.8	89.5
Man-hours	52.4	84.3	100.0	100.0	72.5	99.4	81.9
Output per person engaged	50.7	51.3	59.4	100.0	112.6	155.7	203.5
Output per man-hour	47.1	50.9	61.7	100.0	143.3	162.6	222.3
Electricity							
Output	2.0	9.7	36.0	100.0	137.5	314.8	491.0
Persons engaged	8.8	22.0	44.8	100.0	96.3	106.3	116.0
Man-hours	10.7	26.1	43.5	100.0	83.2	95.7	103.1
Output per person engaged	22.8	44.0	80.3	100.0	142.8	296.1	423.3
Output per man-hour	18.6	37.1	82.7	100.0	165.3	328.9	476.2
Chemicals							
Output	15.2	25.7	52.0	100.0	116.0	272.3	381.7
Persons engaged	33.1	49.2	110.5	100.0	101.9	162.1	185.8
Man-hours	39.1	57.4	115.8	100.0	88.1	146.6	169.0
Output per person engaged	45.9	52.2	47.1	100.0	113.8	168.0	205.4
Output per man-hour	38.9	44.8	44.9	100.0	131.7	185.7	225.9
Construction materials							
Output	46.1	70.7	64.0	100.0	89.2	146.3	181.8
Persons engaged	73.8	104.0	99.2	100.0	88.5	115.5	117.6
Man-hours	84.5	116.4	106.7	100.0	80.1	104.0	105.5
Output per person engaged	62.5	68.0	64.5	100.0	100.8	126.7	154.6
Output per man-hour	54.6	60.7	60.0	100.0	111.4	140.7	172.3
Wood materials							
Output	64.0	86.5	74.8	100.0	92.2	139.2	168.2
Persons engaged	75.0	103.0	100.9	100.0	87.0	106.0	105.8
Man-hours	88.3	117.1	108.3	100.0	79.0	95.7	94.8
Output per person engaged	85.3	84.0	74.1	100.0	106.0	131.3	159.0
Output per man-hour	72.5	73.9	69.1	100.0	116.7	145.5	177.4

(continued)

TABLE A-37 (concluded)

	1899	1909	1919	1929	1937	1948	1953
Mineral materials							
Output	27.2	53.9	52.6	100.0	86.0	153.7	196.1
Persons engaged	71.1	106.0	95.7	100.0	91.7	135.3	142.4
Man-hours	76.6	115.0	103.2	100.0	82.4	121.7	128.2
Output per person engaged	38.3	50.8	55.0	100.0	93.8	113.6	137.7
Output per man-hour	35.5	46.9	51.0	100.0	104.4	126.3	153.0
Machinery and allied products							
Output	18.5	32.5	63.4	100.0	96.2	200.6	310.5
Persons engaged	37.5	56.7	106.4	100.0	100.7	177.0	230.7
Man-hours	43.7	62.5	105.7	100.0	86.7	156.1	209.3
Output per person engaged	49.3	57.3	59.6	100.0	95.5	113.3	134.6
Output per man-hour	42.3	52.0	60.0	100.0	111.0	128.5	148.4
Machinery and equipment							
Output	16.8	27.5	63.6	100.0	95.7	204.6	333.1
Persons engaged	33.9	48.6	109.7	100.0	101.8	185.0	242.8
Man-hours	54.2	84.3	104.6	100.0	89.6	148.5	194.7
Output per person engaged	49.6	56.6	58.0	100.0	94.0	110.6	137.2
Output per man-hour	42.9	51.9	59.9	100.0	111.9	128.4	154.4
Metal products							
Output	23.1	45.1	62.8	100.0	97.3	190.7	253.5
Persons engaged	45.1	73.9	99.4	100.0	98.3	159.9	204.9
Man-hours	54.2	84.3	104.6	100.0	89.6	148.5	194.7
Output per person engaged	51.2	61.0	63.2	100.0	99.0	119.3	123.7
Output per man-hour	42.6	53.5	60.0	100.0	108.6	128.4	130.2
Food and allied products							
Output	42.6	62.8	70.3	100.0	133.9	215.9	231.5
Persons engaged	58.0	81.4	110.5	100.0	110.8	137.2	138.2
Man-hours	68.3	92.1	115.7	100.0	98.5	124.2	123.5
Output per person engaged	73.4	77.1	63.6	100.0	120.8	157.4	167.5
Output per man-hour	62.4	68.2	60.8	100.0	135.9	172.4	187.4
Textiles and allied products							
Output	40.4	59.5	69.5	100.0	103.6	151.4	156.6
Persons engaged	59.6	83.5	95.7	100.0	101.7	122.1	117.7
Man-hours	71.7	96.7	94.0	100.0	80.5	104.0	100.3
Output per person engaged	67.8	71.3	72.6	100.0	101.9	125.0	133.1
Output per man-hour	56.3	61.5	73.9	100.0	128.7	145.6	156.1

SOURCE: Special computations from data in *628*. See Table A-35 for coverage of industrial groups and for data necessary to reconstruct absolute figures for persons engaged and man-hours.

TABLE A-38

PERCENTAGE DISTRIBUTION OF VALUE ADDED AND PERSONS ENGAGED BY INDUSTRIAL GROUP: UNITED STATES, BENCHMARK YEARS
(per cent)

	1899	1909	1919	1929	1937	1948	1953
				VALUE ADDED			
Ferrous and nonferrous metals	16.0	12.8	11.2	10.7	11.8	9.6	10.7
Fuel and electricity	7.0	9.3	11.6	14.0	15.5	13.7	11.1
Fuel	6.3	7.3	9.0	8.9	9.6	10.8	7.9
Electricity	0.7	2.0	2.6	5.1	5.9	2.9	3.2
Chemicals	4.7	5.0	6.5	6.7	7.1	8.0	8.6
Construction materials	17.1	17.3	12.2	12.7	11.0	11.4	11.0
Wood materials	10.2	9.8	7.2	6.5	5.7	6.6	6.1
Mineral materials	6.9	7.5	5.0	6.2	5.3	4.8	4.9
Machinery and allied products	18.9	20.1	27.7	28.2	26.4	29.6	36.6
Machinery and equipment	11.9	12.0	20.6	20.2	19.1	21.5	27.3
Metal products	7.0	8.1	7.1	8.0	7.3	8.1	9.3
Food and allied products	17.5	16.6	12.4	12.3	14.9	13.5	11.4
Textiles and allied products	18.8	18.9	18.4	15.4	13.3	14.2	10.6
Totals	100.0	100.0	100.0	100.0	100.0	100.0	100.0
				PERSONS ENGAGED			
Ferrous and nonferrous metals	8.4	7.9	7.9	7.8	8.6	7.8	7.6
Fuel and electricity	9.2	11.1	10.7	12.0	11.2	9.0	7.5
Fuel	8.7	10.2	9.4	9.1	8.4	6.8	5.3
Electricity	0.5	0.9	1.3	2.9	2.8	2.2	2.2
Chemicals	3.2	3.2	5.4	4.9	5.0	5.8	5.9
Construction materials	20.5	19.8	13.9	14.2	12.6	11.8	10.8
Wood materials	14.1	13.3	9.6	9.6	8.4	7.3	6.6
Mineral materials	6.4	6.5	4.3	4.6	4.2	4.5	4.2
Machinery and allied products	20.3	21.1	29.2	27.8	28.0	35.3	41.5
Machinery and equipment	12.5	12.4	20.5	19.0	19.3	25.1	29.8
Metal products	7.8	8.7	8.7	8.8	8.7	10.2	11.7
Food and allied products	11.1	10.7	10.7	9.8	10.8	9.7	8.8
Textiles and allied products	27.3	26.2	22.2	23.5	23.8	20.6	17.9
Totals	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sums and detail may not agree because of rounding.

SOURCE: See Tables A-35 and A-37. Printing and publishing, unallocated manufacturing, and logging and fishing (n.e.c.) are excluded.

TABLE A-39

PERCENTAGE DISTRIBUTION OF VALUE ADDED AND PERSONS ENGAGED BY INDUSTRIAL GROUP: SOVIET UNION, BENCHMARK YEARS
(per cent)

	Value Added	*Persons Engaged*						
	1928	1913	1928	1933	1937	1940	1950	1955
Ferrous and nonferrous metals	4.9	7.5	5.4	6.9	5.5	4.8	6.5	6.0
Fuel and electricity	11.5	5.9	8.2	9.9	7.6	7.9	9.7	9.8
Fuel	9.9	5.6	7.7	8.7	6.5	6.8	8.2	8.2
Electricity	1.6	0.4	0.5	1.2	1.1	1.1	1.5	1.6
Chemicals	4.2	1.2	1.9	3.4	3.1	3.3	2.9	3.4
Construction materials	15.3	23.1	19.0	27.9	19.9	21.3	23.5	21.9
Wood materials[a]	11.5	19.0	14.8	21.6	16.9	17.7	18.2	15.6
Mineral materials	3.8	4.1	4.3	6.3	3.1	3.6	5.2	6.3
Machinery and allied products[b]	11.4	10.6	12.8	14.8	28.5	28.4	29.8	31.2
Civilian machinery and equip.	6.2	5.4	7.5	9.7	16.0	10.0	12.3	13.9
Metal products	5.2	5.3	5.2	5.1	12.5	18.4	17.5	17.2
Food and allied products	23.2	19.0	15.5	13.2	12.9	12.4	10.7	9.7
Textiles and allied products[c]	29.3	32.7	37.0	24.0	22.5	21.8	17.0	18.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sums and details may not agree because of rounding.

SOURCE: Value added, Table C-2; persons engaged, Table A-18. Excludes repair shops and unallocated industries.

[a] Includes paper and matches.

[b] Includes consumer durables and military products.

[c] Includes furniture for 1937 and later years.

Estimated U.S. Military Production in 1954

Data on production of conventional military end products in the United States are not published in comprehensive or easily accessible form. Summary series are published for the value of production and procurements, but these figures are likely to differ significantly from production alone, as may be seen in Table A-44. We present there such estimates of the value of output and value added for conventional military end products as we have been able to reconstruct from basic statistics in the 1954 census of manufactures. In the case of aircraft and ships and boats, statistics are available in adequate detail, but there is a problem in how to treat intermediate products since a final bill of goods is not specified. In the case of that large group of products covered by the category "ordnance and accessories," the only published figures are value added for the entire category and selected statistics for small arms. We have estimated the value of final ordnance products from value added and the relation between value added and value of output in related industries.

TABLE A-40

CUMULATED PERCENTAGE OF VALUE ADDED AND PERSONS ENGAGED ACCOUNTED FOR BY INDUSTRIAL GROUPS ARRAYED BY GROWTH IN LABOR PRODUCTIVITY OVER SELECTED PERIODS: UNITED STATES, BENCHMARK YEARS
(per cent)

INDUSTRIAL GROUPS ARRAYED BY GROWTH IN OUTPUT PER MAN-HOUR	CUMULATED PERCENTAGES											
	1909		*1919*		*1929*		*1937*		*1948*		*1953*	
	VA	PE	VA	PE	VA	PE	VA	PE	VA	PE	VA	PE
(1909–1953)												
1	2.0	0.9	2.6	1.3	5.1	2.9	5.9	2.8	2.9	2.2	3.2	2.2
2	7.0	4.1	9.1	6.7	11.8	7.8	13.0	7.8	10.9	7.8	11.8	8.1
3	14.3	14.3	18.1	16.1	20.7	16.9	22.6	16.2	21.7	14.8	19.7	13.4
4	21.8	20.8	23.1	20.4	26.9	21.5	27.9	20.4	26.5	19.3	24.6	17.6
5	41.9	41.9	50.8	49.6	55.1	49.3	54.3	48.4	56.1	54.6	61.2	59.1
6	58.5	52.6	63.2	60.3	67.4	59.1	69.2	59.2	69.6	64.3	72.6	67.9
7	77.4	78.8	81.6	82.5	82.8	82.6	82.5	83.0	83.8	84.9	83.2	85.8
8	87.2	92.1	88.8	92.1	89.3	92.2	88.2	91.4	90.4	92.2	89.3	92.4
9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
(1929–1953)												
1					5.1	2.9	5.9	2.8	2.9	2.2	3.2	2.2
2					11.8	7.8	13.0	7.8	10.9	8.0	11.8	8.1
3					20.7	16.9	22.6	16.2	21.7	14.8	19.7	13.4
4					33.0	26.7	37.5	27.0	35.2	24.5	31.1	22.2
5					39.5	36.3	43.2	35.4	41.8	31.8	37.2	28.8
6					54.9	59.8	56.5	59.2	56.0	52.4	47.8	46.7
7					61.1	64.4	61.8	63.4	60.8	56.9	52.7	50.9
8					89.3	92.2	88.2	91.4	90.4	92.2	89.3	92.4
9					100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE: Table A-37 and A-38.
VA: value added.
PE: persons engaged.

TABLE A-41

CUMULATED PERCENTAGE OF VALUE ADDED AND PERSONS ENGAGED ACCOUNTED FOR BY INDUSTRIAL GROUPS ARRAYED BY GROWTH IN LABOR PRODUCTIVITY OVER SELECTED PERIODS: SOVIET UNION, BENCHMARK YEARS

(per cent)

INDUSTRIAL GROUPS ARRAYED BY GROWTH IN OUTPUT PER PERSON ENGAGED[a]	CUMULATED PERCENTAGE								
	Value Added, 1928		*Persons Engaged*[b]						
	Unadjusted[b]	Adjusted[c]	1913	1928	1933	1937	1940	1950	1955
(1913–1955)									
1	1.6	4.6	0.4	0.5	1.2	1.1	1.1	1.5	1.6
2	6.5	10.3	7.9	5.9	8.1	6.6	5.9	8.0	7.6
3	17.9	13.6	18.5	18.7	22.9	35.1	34.3	37.8	38.8
4	27.8	24.6	24.1	26.4	31.6	41.6	41.1	46.0	47.0
5	32.0	27.4	25.3	28.3	35.0	44.7	44.4	48.9	50.4
6	55.2	54.1	44.3	43.8	48.2	57.6	56.8	59.6	60.1
7	84.5	84.1	77.0	80.8	72.2	80.1	78.6	76.6	78.1
8	88.3	86.3	81.1	85.1	78.5	83.2	82.2	81.8	84.4
9	99.8	99.9	100.1	99.9	100.1	100.1	99.9	100.0	100.0
(1928–1955)									
1	11.4	3.3		12.8	14.8	28.5	28.4	29.8	31.2
2	13.0	7.9		13.3	16.0	29.6	29.4	31.3	32.8
3	17.9	13.6		18.7	22.9	35.1	34.3	37.8	38.8
4	27.8	24.6		26.4	31.6	41.6	41.1	46.0	47.0
5	32.0	27.4		28.3	35.0	44.7	44.4	48.9	50.4
6	61.3	57.4		65.3	59.0	67.2	66.2	65.9	68.4
7	84.5	84.1		80.8	72.2	80.1	78.6	76.6	78.1
8	88.3	86.3		85.1	78.5	83.2	82.2	81.8	84.4
9	99.8	99.9		99.9	100.1	100.1	99.9	100.0	100.0

[a] Table 40.
[b] Table A-39.
[c] Table A-6, direct weights.

TABLE A-42

ESTIMATED VALUE ADDED IN U.S. INDUSTRY, 1913, 1928, AND 1955
(million dollars)

	1914	1929	1954
Manufacturing	9,386	30,591	116,913
Mining	1,086	4,356	11,546
Logging, n.e.c.	282	432	547
Fishing	111	121	356
Electric power	589	1,705	4,816
Total	11,459	37,205	134,178
	1913 in 1914 Prices	1928 in 1929 Prices	1955 in 1954 Prices
Total	12,181	33,931	150,682

SOURCE

Manufacturing, 1914, 1929, 1954: *626*, series J-10, as continued.

Mining, 1914: Value of mineral products (*626*, series G-1) times average ratio (0.5146) of census value added to value of mineral products for 1909 and 1919. Census value added taken as census value of products minus cost of supplies and materials, fuel and power, and contract work (*649*, 1926, 702).

1929: Estimates of Kendrick (sum of components in Table A-35).

1954: *649*, 1958, 720.

Logging, n.e.c., 1914: Cost of materials for the industrial category, lumber and timber products (*597*, 126).

1929: Cost of materials for the industrial category, forest products, basic industries (*649*, 1932, 740).

1954: Value of stumpage cut in the industrial category, lumber and timber basic products (*609*, 1954, 24A–20).

Fishing, 1914: Fish catch (Table E-1) times unit value (Table D-8).

1929: Fish catch (Table E-1) times 1930 unit value to fishermen (*649*, 1958, 703).

1954: Value of fish catch to fishermen (*649*, 1958, 703).

Electric power, 1914: Output (logarithmically interpolated in Table E-1) times unit value (Table D-8) times 1912 ratio for commercial central electric stations (0.7313) of value added to gross income (see notes to col. 8, Table A-26).

1929: Output (Table E-1) times unit value (Table D-8) times 1927 ratio for commercial central electric stations (0.7701) of value added to gross income (see notes to col. 10, Table A-26).

1954: Value added for electric utilities times ratio (1.155) of total output in kilowatt hours to output of utilities (*649*, 1956, 529). Value added taken as revenue (*649*, 1956, 532) minus operating expenses excluding maintenance (*650*, xxii, and *651*, xvi). For publicly owned utilities, covered operating expenses including depreciation were divided by 0.6, ratio of covered revenues to total revenues for publicly owned utilities as estimated by source, and maintenance was taken

TABLE A-43

ESTIMATED VALUE ADDED IN SOVIET INDUSTRY,[a] 1913, 1927/28, AND 1955
(million rubles)

1913	3,774
1927/28	7,894
1955	258,000

[a] Excludes repair shops.

SOURCE

1913: Gross value of output (9,245 million rubles as estimated in *506*) multiplied by 1928/29 ratio (0.4082) of value added to gross value (Table C-2). A very similar figure for 1913 value added (3,750 million rubles) is derived by projecting 1927/28 value added backward by the production index excluding miscellaneous machinery (Table D-3) and deflating the result by the price index for industrial materials with 1913 weights (Table A-17).

1927/28: From Table C-2.

1955: Net production excluding turnover taxes, from Table F-3.

TABLE A-44

ESTIMATED VALUE OF MILITARY PRODUCTION: UNITED STATES, 1954
(million dollars)

	Value[a]	Value Added[b]
Conventional military products		
Production[c]		
Aircraft	6,811	5,867
Ships and boats	465	297
Ordnance and accessories	4,500	2,040
Total	11,776	8,204
Production and procurements[d]		
Aircraft	8,334	
Missiles	504	
Ships	1,090	
Other	6,030	
Total	15,958	
Atomic energy[d]	1,895	

Notes to Table A-42 (continued)

as the same ratio (0.1456) of total operating expenses as for privately owned utilities.

Total, 1914, 1929, 1954: Sum of components.

1913, 1928, 1955: Value added in 1914, 1929, and 1954, respectively, times appropriate annual relative of industrial production (Table A-32).

Notes to Table A-44

[a] Represents value of final products only, that is, those products to be delivered to military users. Value of intermediate products produced and consumed within industry is excluded. Value of output is measured on a product basis, as opposed to an establishment basis, and generally by value of work done, as opposed to value of shipments.

[b] Except for ordnance and accessories, value added is adjusted to a product basis. At the narrowest industrial level for which such data are available, value added on an establishment basis was multipled by the ratio for corresponding gross value of data on a product basis to date on an establishment basis. Adjusted value added was then apportioned to appropriate subindustries on the basis of gross value on a product basis. For details, see notes to each item.

[c] Data from *609*, 1954.

[d] Data from *649*, 242.

NOTES ON DATA RELATING TO PRODUCTION (TABLE A-44)

Aircraft

Value of output: Sum for the following industries (figures in parentheses refer to SIC code): military-type aircraft (3721111); modifications, conversions, and overhaul of military aircraft (3721411); other aeronautical services on military aircraft, including guided missile production in aircraft plants and research and development (3721511); military aircraft engine parts (3722211); and other aeronautical services on military aircraft engines, including research and development (3722311). For engine parts, value of shipments; for all others, value of work done. The remaining products classified in the aircraft industry (372) are essentially parts and components for those already enumerated, and we have assumed that the former's value is reflected in the latter's. This treatment leads to some understatement of the value of final products, since some parts and components are purchased by military users as spare parts. We have treated engine parts (3722211) as purchased spare parts and counted their value accordingly.

Value added: Value added adjusted to a product basis (see note b) for aircraft and primary services (3721), aircraft engines (3722), aircraft propellers (3723), and aircraft equipment n.e.c. (37290) apportioned by the share of military products in total value of work done (or shipments) within each industry. For this purpose, value of shipments of military components and parts was, of course, counted within each industry. For aircraft propellers, apportionment was based on the military share for complete propellers (3723011); for aircraft equipment n.e.c., on the military share for aircraft (3721111).

Ships and boats

Value of output: Value of work in military shipbuilding and repairing (37311, 37312, and 37313) and military boat repairing (3732211), plus value of shipments in military boatbuilding (3732111).

Value added: Value added adjusted to a product basis (see note b) for shipbuilding and repairing (3731) and boatbuilding and repairing (3732) apportioned by the share of military products in total value of work done (or shipments) within each industry.

Ordnance and accessories

Value of output: Not published. Estimated as value added divided by 0.45, the approximate average ratio for such similar industries as internal combustion engines (3519), tractors (3521), farm machinery (3522), and construction and mining machinery (3531).

Value added: Summed value added on an establishment basis for private and governmental production. Adjustment to a product basis could not be done for lack of data. Excludes nonmilitary small arms (19512), whose value added was estimated from value of shipments and 1947 ratio for small arms (1951) of value added to value of shipments. Includes other nonmilitary products classified within this industry.

Technical Note 10 (Chapter 7): Basic Data on Fulfillment of Five Year Plans

This note presents the data underlying the analysis of the fulfillment of output goals in the five year plans. The physical output goals included in this analysis are given in Table A-45; the estimated value added corresponding to these goals and to actual outputs is given in Table A-46, expressed in both 1928 and 1955 rubles. In calculating value added, each output, planned and actual, has been multiplied by the relevant price net of the cost of nonindustrial materials, as that price is given in Table D-8. Estimated value added is shown for the full sample in each plan—that is, every product with an output goal that is also represented in our output series in Appendix B—and for the sample of eighteen products that is common to all plans (see Table A-47).

TABLE A-45

PHYSICAL OUTPUT GOALS OF SOVIET PRODUCTS AS GIVEN IN FIVE YEAR PLANS, 1932, 1937, 1950, AND 1955

			1932[b]				
		Unit[a]	Minimum	Maximum	1937	1950[c]	1955[c]
	Ferrous metals						
101	Pig iron	th.m.t.	8,000	10,000	18,000	19,500	(34,000)
102	Rolled steel	th.m.t.	6,300	8,000	14,000	17,800	(34,000)
103	Steel ingots	th.m.t.	8,300	10,400	19,000	25,400	(44,000)
704	Iron ore	mill.m.t.	14.8	19.4	36.9	40.0	
706	Manganese ore	mill.m.t.	0.96		2.7		
	Nonferrous metals						
201	Aluminum	th.m.t.			80		
202	Copper	th.m.t.	64.5	84.7	155.0	[215]	[470]
203	Lead	th.m.t.			120	[156]	[390]
204	Zinc	th.m.t.	38.0	77.4	100	[125]	[310]
	Fuel and electricity						
301	Electric power	bill.kwh	17	22	38.0	82.0	(164)
302–4	Coal	mill.m.t.	68.0	75.0	152.5	250.0	(373.4)
303.1	Coke	mill.m.t.			23.7	30.0	
305	Crude petroleum	mill.m.t.	19.0	21.7	45.0	35.4	(70.0)
306	Natural gas	mill.m^3			2,750	8,400	(10,370)
307	Oil shale	th.m.t.			2,600		(10,800)
308	Peat	mill.m.t.	10.4	12.3	25.0	44.3	(46.0)
309	Firewood	mill.m^3			107.1		
	Chemicals						
401	Soda ash	th.m.t.			750.0	800	(1,378)
402	Caustic soda	th.m.t.				390.0	(580)
404	Sulfuric acid	th.m.t.	1,270	1,450	2,080		
405	Mineral fertilizer	th.m.t.				5,100	(9,400)
405.1	Phosphoric fertilizer	th.m.t.	1,950	2,550	2,550		
406	Ground natur. phosphate	th.m.t.			2,900	400.0	
412	Synthetic dyes	th.m.t.			37.7	43.0	
416	Paper	th.m.t.	650	750	1,000	1,340	(1,740)
418	Motor vehicle tires	thous.			3,000		
1602	Rubber footwear	mill.pairs	60	75	120	88.6	
	Construction materials						
501	Red brick	mill.	7,700	9,300	8,000	[10,500]	[20,000]
502	Fire-clay bricks	th.m.t.			2,300	2,780	
504	Quartzite bricks	th.m.t.			800	980	
506	Cement	th.m.t.	6,000	7,000	7,500	10,500	(22,400)
509	Industrial timber	mill.m^3	116.6		174.4	(187)	(250)
510	Lumber	mill.m^3	32.8	42.5	43.0	39.0	
511	Plywood	th.m^3			735.0	810	
513	Roll roofing	mill.m^2				[190]	[386]
514	Roofing iron	th.m.t.	575				
516	Asbestos shingles	mill.				410	(1,420)
519	Window glass	mill.m^2	79	101	227	80	

(continued)

TABLE A-45 (concluded)

			1932[b]				
		Unit[a]	Minimum	Maximum	1937	1950[c]	1955[c]
	Transportation equip.						
901	Automobiles	thous.			60.0	65.6	
902	Trucks and buses	thous.			140.0	434.4	
903	Diesel and elec. locom.	units			290	520	
904	Steam locomotives	units	700	825	2,900	2,200	
905	Railroad freight cars	thous.	12.6				
906	Railroad passenger cars	units			3,500	2,600	
	Agricultural mach.						
1001	Tractors	thous.	50	55	96.0	112.0	(130)
1002	Tractor-drawn plows	thous.				111.0	
1007	Tractor-drawn cultivators	thous.				82.3	
1009	Tractor-drawn drills	thous.				83.3	
1025	Tractor-drawn threshers	thous.				18.3	
1016	Grain combines	thous.			25		
	Miscellaneous mach.						
1101	Steam boilers	th.m^2			385	540	(968)
1102	Water turbines	th.kw				1,022	(2,456)
1103	Steam and gas turbines	th.kw			1,400	2,906	(5,476)
1210	Machine tools	thous.			40.0	74.0	
1214	Looms	units				25,000	
	Food and allied products						
1501	Flour	mill.m.t.				19	
1503	Butter	th.m.t.			180	275	(578)
1504	Vegetable oil	th.m.t.	850	1,100		880	(1,450)
1504.1	Oleomargarine	th.m.t.			120	250	
1505	Cheese	th.m.t.			37		
1506	Meat	th.m.t.			1,250	1,300	(2,760)
1507	Fish catch	th.m.t.			1,900	2,200	(2,773)
1508	Soap (40%)	th.m.t.			1,300	870	
1509	Salt	th.m.t.	3,240	3,250			
1510	Raw sugar	th.m.t.	2,200	2,600	2,800	2,400	(4,490)
1513	Canned food	mill.cans	500	650	2,400		(3,200)
1519	Beer	th.hectol.	2,829		7,500	15,000	
1515	Cigarettes	bill.	75		140		
1516	Low-grade tobacco	th.crates	4,200	4,900	6,000		
1517	Matches	th.crates	10,700	12,200	13,000	9,900	
601	Crude alcohol	th.hectol.			7,500	10,080	
	Textiles and allied products						
1601	Boots and shoes	mill.pairs	70	80	205	240	(315)
1603	Cotton yarn	th.m.t.	570	620		685	
1604	Cotton fabrics	mill.m	4,360	4,700	6,250	4,686	(6,277)
1607	Linen fabrics	mill.m	424	492	591	420.0	
1611	Woolen and worsted fabrics	mill.m	192.0	270.0	270	159.4	(239)
1613	Hosiery	mill.pairs			1,000	580.0	
	Consumer durables						
1701	Bicycles	thous.			700		
1703	Electric light bulbs	mill.			180		
1704	Phonographs	thous.			1,500		
1705	Radios	thous.			700		

SOURCE: 1932, *165*; 1937, *175*; 1950, *55*; 1955, *29*.

[a] For abbreviations, see general note at the beginning of Appendix B.

[b] Where only one goal is given, it is shown in the middle of the two columns.

[c] Parentheses indicate the figure is derived from a base output and a given percentage increase; brackets, that the figure is derived from an estimated base output in the same way.

TABLE A-46

ACTUAL AND PLANNED (FIVE YEAR PLAN) VALUE ADDED OF SOVIET PRODUCTS, 1932, 1937, 1950, AND 1955

		1932			1937		1950		1955	
		Actual	*Planned*		*Actual*	*Planned*	*Actual*	*Planned*	*Actual*	*Planned*
			Min.	Max.						
		BILLION 1928 RUBLES								
All covered products	A	8.9	12.1	14.2	20.2	26.7	33.4	35.4	40.9	41.1
	B	7.0	9.0	10.5	12.9	16.7	22.1	21.8	37.2	31.1
Intermediate products	A	5.9	7.5	8.9	13.1	16.2	21.8	21.0	34.4	34.2
	B	5.2	6.3	7.4	10.4	12.5	19.0	18.3	32.6	32.3
Ferrous metals	A	1.0	1.4	1.8	2.8	3.2	4.2	3.9	6.6	6.5
	B	1.0	1.3	1.6	2.6	3.0	3.9	3.7	6.6	6.5
Nonferrous metals	A	0.1	0.1	0.1	0.3	0.4	0.4	0.4	0.8	0.9
	B	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.5	0.7
Fuel and electricity	A	2.5	2.7	3.3	6.3	7.2	12.2	11.5	21.2	20.5
	B	2.5	2.7	3.3	5.3	6.2	11.6	10.7	20.6	19.9
Chemicals	A	0.4	0.6	0.7	1.0	1.3	1.1	1.2	1.4	1.4
	B	0.2	0.3	0.3	0.4	0.4	0.5	0.6	0.8	0.8
Construction materials	A	2.0	2.7	3.0	2.7	4.1	3.9	4.1	4.3	4.8
	B	1.5	1.9	2.0	1.8	2.7	2.6	3.0	3.9	4.5
Machinery	A	0.4	0.4	0.4	3.0	3.9	5.3	7.4	1.2	1.1
	B	0.3	0.3	0.3	0.3	0.5	0.6	0.6	0.9	0.7
Transportation equipment	A	0.2	0.1	0.2	2.5	3.2	4.4	6.3	n.i.	n.i.
	B	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.
Agricultural machinery	A	0.3	0.3	0.3	0.5	0.7	0.7	0.7	0.9	0.7
	B	0.3	0.3	0.3	0.3	0.5	0.6	0.6	0.9	0.7
Miscellaneous machinery	A	n.i.	n.i.	n.i.	0.2	0.2	0.3	0.4	0.3	0.4
	B	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.
Consumer goods	A	2.6	4.2	4.8	4.1	6.7	6.3	6.9	5.3	5.8
	B	1.5	2.4	2.8	2.2	3.6	2.5	2.9	3.7	4.1
Food and allied products	A	0.4	0.8	0.9	1.8	2.5	2.7	2.8	2.2	2.5
	B	0.2	0.4	0.5	0.4	0.5	0.5	0.4	0.6	0.8
Textiles and allied products	A	2.1	3.5	3.9	2.0	3.5	3.6	4.1	3.1	3.3
	B	1.3	2.0	2.3	1.8	3.1	2.1	2.4	3.1	3.3
Consumer durables	A	n.i.	n.i.	n.i.	0.3	0.6	n.i.	n.i.	n.i.	n.i.
	B	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.

(continued)

TABLE A-46 (concluded)

		1932 Actual	1932 Planned Min.	1932 Planned Max.	1937 Actual	1937 Planned	1950 Actual	1950 Planned	1955 Actual	1955 Planned
		BILLION 1955 RUBLES								
All covered products	A	35.9	46.3	53.4	88.1	116.5	126.4	134.1	159.8	163.6
	B	28.6	36.3	41.4	50.3	65.9	82.0	82.7	130.7	132.8
Intermediate products	A	26.2	32.8	37.8	56.1	70.1	83.7	83.2	121.6	123.1
	B	23.2	28.1	31.9	42.3	52.9	71.7	71.5	115.8	116.9
Ferrous metals	A	4.7	6.3	7.9	12.5	14.4	18.1	17.1	28.7	28.3
	B	4.3	5.8	7.3	11.5	13.1	16.9	15.9	28.7	28.3
Nonferrous metals	A	0.3	0.5	0.7	1.4	2.5	2.9	2.8	5.4	6.6
	B	0.3	0.5	0.7	0.8	1.2	1.9	1.7	3.0	3.9
Fuel and electricity	A	8.7	9.1	10.6	23.3	26.4	37.9	36.5	59.2	56.9
	B	8.7	9.1	10.6	17.3	20.4	35.2	33.3	57.8	55.4
Chemicals	A	1.4	2.0	2.4	3.8	4.8	3.4	3.6	4.6	4.3
	B	0.9	1.2	1.4	1.6	1.9	2.3	2.5	3.5	3.3
Construction materials	A	11.2	14.8	16.2	15.2	22.1	21.5	23.2	23.8	27.1
	B	9.1	11.4	11.8	11.1	16.2	15.5	18.0	22.7	26.2
Machinery	A	2.1	1.9	2.1	6.8	9.4	10.5	14.5	3.3	3.0
	B	0.8	0.8	0.9	0.8	1.5	1.7	1.8	2.6	2.1
Transportation equipment	A	1.3	1.1	1.2	4.1	6.5	6.3	10.0	n.i.	n.i.
	B	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.
Agricultural machinery	A	0.8	0.8	0.9	1.7	2.1	2.5	2.5	2.6	2.1
	B	0.8	0.8	0.9	0.8	1.5	1.7	1.8	2.6	2.1
Miscellaneous machinery	A	n.i.	n.i.	n.i.	1.0	0.9	1.6	2.0	0.7	0.9
	B	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.
Consumer goods	A	7.6	11.6	13.5	25.2	37.0	32.2	36.4	34.9	37.5
	B	4.6	7.4	8.7	7.2	11.5	8.5	9.5	12.3	13.9
Food and allied products	A	3.6	5.6	6.4	18.2	24.6	25.0	27.8	25.4	27.3
	B	0.7	1.8	2.1	2.0	2.3	2.1	2.0	2.8	3.7
Textiles and allied products	A	4.0	6.0	7.1	6.3	11.0	7.3	8.6	9.5	10.1
	B	3.9	5.6	6.6	5.2	9.2	6.4	7.5	9.5	10.1
Consumer durables	A	n.i.	n.i.	n.i.	0.7	1.3	n.i.	n.i.	n.i.	n.i.
	B	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.	n.i.

SOURCE: Table A-45, B-2, and D-8.
n.i.: Not included.
A: Variable product coverage (see Table A-47).
B: Standard product coverage (see Table A-47).

TABLE A-47

LIST OF SOVIET PRODUCTS COVERED IN STUDY OF PLAN FULFILLMENT, 1932, 1937, 1950, AND 1955

	VARIABLE PRODUCT COVERAGE								Standard Product Coverage
	Valued in 1928 Prices				*Valued in 1955 Prices*				
	1932	1937	1950	1955	1932	1937	1950	1955	
All covered products	37	61	59	34	36	64	59	33	18
Intermediate products	21	31	28	21	21	32	28	20	13
Ferrous metals	5	5	4	3	5	5	4	3	3
101	X	X	X	X	X	X	X	X	X
102	X	X	X	X	X	X	X	X	X
103	X	X	X	X	X	X	X	X	X
704	X	X	X		X	X	X		
706	X	X			X	X			
Nonferrous metals	2	4	3	3	2	4	3	3	2
201		X				X			
202	X	X	X	X	X	X	X	X	X
203		X	X	X		X	X	X	
204	X	X	X	X	X	X	X	X	X
Fuel and electricity	4	8	6	6	4	8	6	6	4
301	X	X	X	X	X	X	X	X	X
302, 303, 304	X	X	X	X	X	X	X	X	X
303.1		X	X			X	X		
305	X	X	X	X	X	X	X	X	X
306		X	X	X		X	X	X	
307		X		X		X		X	
308	X	X	X	X	X	X	X	X	X
309		X				X			
Chemicals	4	8	7	4	4	7	5	3	1
401		X	X	X		X	X	X	
402			X	X			X	X	
404	X	X			X	X			
405			X	X					
405.1	X	X			X	X			
406		X	X			X	X		
412		X	X						
416	X	X	X	X	X	X	X	X	X
418		X				X			
1602	X	X	X		X	X	X		
Construction materials	6	6	8	5	6	8	10	5	3
501	X	X	X	X	X	X	X	X	X
502						X	X		
504						X	X		
506	X	X	X	X	X	X	X	X	X
509	X	X	X	X	X	X	X	X	X
510	X	X	X		X	X	X		
511		X	X			X	X		
513			X	X			X	X	
514	X				X				
516			X	X			X	X	
519	X	X	X		X	X	X		

(continued)

TABLE A-47 (concluded)

	VARIABLE PRODUCT COVERAGE								
	Valued in 1928 Prices				*Valued in 1955 Prices*				Standard Product Coverage
	1932	1937	1950	1955	1932	1937	1950	1955	
Machinery	3	9	15	4	3	10	15	4	1
Transportation equipment	2	5	5	0	2	5	5	0	0
901		X	X			X	X		
902		X	X			X	X		
903		X	X			X	X		
904	X	X	X		X	X	X		
905	X				X				
906		X	X			X	X		
Agricultural machinery	1	1	5	1	1	2	5	1	1
1001	X	X	X	X	X	X	X	X	X
1002			X				X		
1007			X				X		
1009			X				X		
1016						X			
1025			X				X		
Miscellaneous machinery	0	3	5	3	0	3	5	3	0
1101		X	X	X		X	X	X	
1102			X	X			X	X	
1103		X	X	X		X	X	X	
1210		X	X			X	X		
1214			X				X		
Consumer goods	13	21	16	9	12	22	16	9	4
Food and allied products	8	13	11	6	8	13	11	6	1
1501			X				X		
1503		X	X	X		X	X	X	
1504	X		X	X	X		X	X	
1504.1		X	X			X	X		
1505		X				X			
1506		X	X	X		X	X	X	
1507		X	X	X		X	X	X	
1508		X	X			X	X		
1509	X				X				
1510	X	X	X	X	X	X	X	X	X
1513	X	X		X	X	X		X	
1514	X	X	X		X	X	X		
1515	X	X			X	X			
1516	X	X			X	X			
1517	X	X	X		X	X	X		
601		X	X			X	X		
Textiles and allied products	5	4	5	3	4	5	5	3	3
1601	X	X	X	X	X	X	X	X	X
1603	X		X						
1604	X	X	X	X	X	X	X	X	X
1607	X	X	X		X	X	X		
1611	X	X	X	X	X	X	X	X	X
1613						X	X		
Consumer durables	0	4	0	0	0	4	0	0	0
1701		X				X			
1703		X				X			
1704		X				X			
1705		X				X			

NOTE: An X means the product is included in the indicated category in Table A-46. Products corresponding to the number code are given in the list of output series at the beginning of Appendix B. Standard product coverage applies to all years.