

This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: Freight Transportation in the Soviet Union, Including Comparisons with the United States

Volume Author/Editor: Ernest W. Williams, Jr.

Volume Publisher: UMI

Volume ISBN: 0-691-04131-8

Volume URL: <http://www.nber.org/books/will62-1>

Publication Date: 1962

Chapter Title: APPENDIX C Sources

Chapter Author: Ernest W. Williams, Jr.

Chapter URL: <http://www.nber.org/chapters/c1962>

Chapter pages in book: (p. 186 - 208)

## APPENDIX C

### Sources

#### I. RAILROAD FREIGHT TRAFFIC

##### C-1 *Tariff ton-kilometers*

Col. 1	1913A, 1913 1914-16 1917-21 1921/22-26/27 1928-40, 1945-56  1941   1942-44   1957-58 1959 1960	38, vol. 104, 2. See notes. 24, 6. See notes. 64, 258. See notes. 14, 20 f. 70, 32. For 1929, another source (14, 20 f) gives 112.9 bill. ton-kms. Traffic in first half of 1941 is stated (86, 15) to be 90% of amount planned for first half of 1942 (510 bill. ton-kms, 72, 450). Second half of 1941 interpolated between first half of 1941 and first half of 1942, which is taken to be half of 1942. Based on total traffic ( <i>gruzooborot</i> ) in 1942-44 (which is stated to be 3.4 times 1915-17 traffic, 13, 3/16/46) and annual relatives for 1943 (113% given for operating ton-kms, 90, 1944, No. 10-11, 18, adjusted to 112.1% since excess of operating over tariff ton-kms increased between 1942 and 1943) and 1944 (116%, 43, 200). 45, 545. 67, 168. 46a, 531.
Col. 2	1913A, 1914-15, 1917-20	38, vol. 3, 14 ff. Given in pood-versts. See notes.

This series, like C-2, C-3, C-4, C-5, and C-6, covers all railroad freight traffic except company material hauled in nonrevenue trains. The 1913 figure is adjusted by Bureau of Railroad Administration downward to cover USSR territory and upward to include company material hauled in revenue trains. The figures for 1914-16 cover slow speed railroad freight traffic, excluding company material but including military traffic, on the territory of the Russian Empire. They are a rough approximation of the figures adjusted to cover USSR territory and to include company material in revenue trains, since the company material in revenue trains in 1913 about equaled traffic in the Western territories ceded in 1918. The coverage of the figures for 1917-20 varies with the changing territory during the civil war. According to 38, vol. 3, 8, the railroads were requested, in 1921, to fill out a special form giving the data for the preceding four years. Since only about half of all the railroads were able to supply any information and even much of this was fragmentary, the data are incomplete and inaccurate.

APPENDIX C

<i>C-2 Tons originated</i>	
1913A, 1913	38, vol. 104, 2. See notes to series C-1.
1914-16	24, 6. Rough estimates, according to 59, 48. For coverage, see notes to series C-1.
1917-21	64, 258. Incomplete data. See notes to series C-1.
1921/22-26/27	14, 20 f.
1928-40, 1945-56	70, 32.
1941-42	Ton-kms (series C-1) divided by ALH (series C-3).
1943	Based on 1944 traffic and announced annual relative (118.3%, 43, 200).
1944	ADC (series C-4) times ALC (series C-5) times 365.
1957-58	45, 545.
1959	67, 169.
1960	46a, 537.
<i>C-3 Average length of haul (ALH)</i>	
Col. 1 1913A, 1913	38, vol. 104, 2.
1914-16, 1918, 1921, 1922/23, 1928-40, 1943-49	Ton-kms (series C-1) divided by tons originated (series C-2). For coverage for 1914-16, see notes to series C-1.
1917, 1919-20	64, 258. See notes to series C-1.
1921/22, 1923/24-26/27	14, 20 f.
1941	69, 1945, No. 7-8, 11.
1942	ALH in 1942 is stated (43, 192) to be 86 kms longer than in 1940.
1950-56	70, 34.
1957-58	45, 545.
1959	46, 495.
1960	46a, 537.
Col. 2 1918, 1921, 1922/23, 1925/26	64, 258. For 1922/23, also 14, 20 f.
1929	14, 21. Given for 1928, which appears to be a misprint for 1929.
1933-34	27, 23.
1940-41	90, 1946, No. 10, 39. For 1941, for first half of year only.
1946-47	30, 26.
1949	ALH in 1949 is stated (81, 106) to be 104% of 1940.
1950, 1954-55	90, 1956, No. 4, 40.
1952-53	48, 1954, No. 6, 52.
<i>C-4 Average daily carloadings (ADC)</i>	
1913A, 1913	38, vol. 104, 2. Computed by Bureau of Railroad Administration from assumed ALC of 800 poods. See notes.

APPENDIX C

1917, 1919-21	38, vol. 2, 34 f; vol. 8, 162 f. Sum of freight and tank cars counted by axles.
1918, 1956-60	Tons originated (series C-2) divided by estimated ALC (series C-5) divided by 365. For 1918, 38, vol. 2, 34 f, gives 5.95 thous., which was not used since it gives a load per car of 17.12 tons which is unrealistically high.
1921/22-1933	14, 16. See notes.
1934-39	26, 60. For 1934-35, also 65, 424; and for 1936-39, also 28, 56.
1940	28, 56.
1941	Estimated tons originated (series C-2) divided by estimated ALC (series C-5) divided by 365. 90, 1947, No. 11, 8, gives 107 thous. for first half of 1941.
1942-44	Based on 1945 ADC and announced annual relatives for 1943-45 (106.8% and 121.8% for 1943 and 1944, 90, 1947, No. 11, 9; and 111.6% for 1945, 13, 2/6/46).
1945	ADC in 1946 are stated (88, 21) to be 7,630 more than in 1945.
1946-49	Based on 1950 ADC and announced annual relatives for 1947-50 (108.5% for 1947, 43, 217; 119.3% for 1948, 51, 1/20/49; 116% for 1949, 18, 1/18/50; and 112.8% for 1950, 13, 4/17/51).
1950	ADC in 1950 are stated (44, 28 f) to be 121% of ADC in 1940 and 431% of ADC in 1913.
1951-52	ADC in 1951 and 1952 are stated (44, 28 f) to be 108% and 117%, respectively, of ADC in 1950.
1953	ADC in 1953 are stated (44, 28 f) to be 125% of ADC in 1950.
1954-55	ADC in 1954 and 1955 are stated (44, 28 f) to be 571% and 618% of ADC in 1913, 160% and 173% of ADC in 1940, and 132% and 143% of ADC in 1950.

Official prerevolutionary railroad statistics did not include ADC for the network as a whole. Therefore all figures before 1917 are based either on an assumed load per car or on reports from individual railroads. The figure of 27,400 is given for 1913 in all official Soviet statistics but it appears to be understated in light of an unofficial figure of 58,000 (33, 642) and the official Russian data on the avg. dynamic load per car of 10.7 tons. See also notes to series C-5.

For 1921/22-33, reporting is based on all cars loaded (*zaniato*) including double counting of cars reloaded (e.g., from bad-order cars on the line,

APPENDIX C

reclassification of freight, etc.). ADC reported after Jan. 20, 1934, exclude all such technical reloadings and are based on cars loaded with new freight received by railroads. The exclusion of double counting resulted in understatement of ADC estimated to be 1-2% (14, 115, 16).

For 1945-55, narrow-gauge, West European gauge, and South Sakhalin railroads are not included (29, 41).

C-5	<i>Average load per car (ALC)</i>	
	1913A, 1913, 1917, 1919-40, 1942-43, 1946-55	Tons originated (series C-2) divided by ADC (series C-4) divided by 365.
	1918	Interpolated.
	1941	Estimated tons originated (series C-2) divided by ADC of 107 thous. (90, 1947, No. 11, 8, given for first half of 1941) divided by 365.
	1944-45	90, 1946, No. 1, 68, and No. 7, 23.
	1956-60	Arbitrarily extrapolated.

Official Soviet statistics assumed an ALC of 800 poods (64, 256 f) though it could have been computed directly from available statistical data. The assumed ALC appears to be too high and also distorts other indexes derived from it. Using our computed figure, the ADC are raised to 33,067 for the USSR territory and to 39,510 for the Russian Empire territory. This would also affect the turnaround time of freight cars, decreasing it to 10.17 days.

The ALC reported by Soviet statistics (64, 256 f, and 29, 20) appears to be based on tons terminated rather than on tons originated.

C-6	<i>Operating ton-kilometers</i>	
Col. 1	1913, 1928-29, 1939-41, 1943-44, 1946, 1948-54	Tariff ton-kms (series C-1) plus excess of operating over tariff ton-kms (derived from col. 2).
	1945	78, 45.
	1947	Based on statement (79, 31) that produc- tivity on Kishinev and Omsk railroads in 1947 was 113 and 865 th. m. tons per operating worker, respectively, or 38.8% and 296% of the network average, respectively, and operating labor force (series C-40).
	1930-33	14, 21.
	1934-35	74, 278.
	1936	47, 122.
	1937	72, 222.
	1938	13, 3/9/39.
	1942	Based on 1943 operating ton-kms and announced annual relative (113%, 90, 1944, No. 10-11, 18).
	1955-60	90, 1961, No. 10, 4.

APPENDIX C

Col. 2	1913, 1928-29	Extrapolated.
	1930-38, 1942,	Operating ton-kms (col. 1) minus tariff
	1945, 1947, 1956-60	ton-kms (series C-1). For 1933-36,
		63, 1937, No. 6, 55, gives 4.5%, 5.4%,
		4.0%, and 2.8%, respectively.
	1939	68, 1955, vol. XI, 427.
	1940	28, 237.
	1941, 1946, 1948-49,	Interpolated.
	1951-52	
	1943-44	2, 61.
	1950, 1954-55	4, 68.
	1953	90, 1955, No. 11, 53.
Col. 3	1930-39, 1945	68, 1955, vol. XI, 427 and 46.
	1940	2, 61.
C-7	<i>Commodity composition, tons originated</i>	
Col. 1		14, 26 f.
Col. 2		65, 420 ff. For mineral building materials,
		see 114, 303.
Cols. 3, 5-7		45, 548 f.
Col. 4		114, 347. For rounded data, see 70, 35 ff.
Col. 8		46a, 537.
C-8	<i>Commodity composition, ton-kilometers</i>	
Col. 1		14, 26 f.
Col. 2		65, 420 ff.
Cols. 3, 5-7		45, 546 f.
Col. 4		114, 347. For rounded data, see 70, 35 ff.
Col. 8		46a, 536.

II. RAILROAD PASSENGER TRAFFIC

C-9	<i>Total passenger-kilometers</i>	
	1913A, 1913, 1921-22/23	38, vol. 104, 4; vol. 17, 4 f; vol. 36, 16.
	1923/24-26/27	14, 36 f.
	1928-40, 1945-56	70, 32. For 1938, 2, 77, gives 91.7 bill.
	1957-58	45, 552.
	1959	67, 170.
	1960	46a, 538.
C-10	<i>Total passengers</i>	
	1913A, 1913, 1921	38, vol. 104, 4; vol. 8, 194. For 1913, 59,
		279, gives 238.6 mill.
	1914-16	3, vol. 24, 764. 59, 279, gives 269, 298.8,
		and 350.4 mill.
	1917-20	59, 209.
	1921/22-26/27	14, 36 f.
	1928-40, 1945-56	70, 32. For 1938, 2, 77, gives 1, 177.8 mill.
	1957-58	45, 552.
	1959	67, 171.
	1960	46a, 538.

APPENDIX C

<i>C-11</i>	<i>Average length of trip</i>	
	1913A, 1913, 1922/23	38, vol. 104, 4; vol. 36, 16.
	1921-21/22, 1938-39, 1946-49, 1957-60	Passenger-kms (series C-9) divided by no. of passengers (series C-10).
	1923/24-33	14, 36 f.
	1934-35	65, 427.
	1936-37	84, 365.
	1940, 1949	29, 68.
	1945, 1950-56	70, 42.
<i>C-12</i>	<i>Long-distance passenger-kilometers</i>	
	1913A, 1913	38, vol. 104, 4.
	1923/24-33	14, 36 f.
	1934-35	65, 427.
	1936-38	84, 365.
	1939, 1945, 1949-50, 1952-60	Total passenger-kms (series C-9) minus suburban passenger-kms (series C-15).
	1940	88, 469.
	1951	29, 70.
<i>C-13</i>	<i>Long-distance passengers</i>	
	1913A, 1913	38, vol. 104, 4.
	1923/24-33	14, 36 f.
	1934-35	65, 427.
	1936-40	88, 496.
	1945, 1949-50, 1952-60	Total no. of passengers (series C-10) minus no. of suburban passengers (series C-16).
	1951	29, 70.
<i>C-14</i>	<i>Average length of long-distance trip</i>	
	1913, 1913A	38, vol. 104, 4.
	1923/24-30, 1933, 1935, 1939, 1945, 1949-60	Long-distance passenger-kms (series C-12) divided by no. of long-distance pas- sengers (series C-13).
	1931	29, 70.
	1932, 1934	84, 365.
	1936-38, 1940	11, 303.
<i>C-15</i>	<i>Suburban passenger-kilometers</i>	
	1913A, 1913	38, vol. 104, 4.
	1923/24-33	14, 36 f.
	1934-35	65, 427.
	1936-38	84, 365.
	1939	No. of suburban passengers (series C-16) times estimated avg. length of suburban trip (series C-17).
	1940	88, 469. 10, 248, gives 27.7 bill.
	1945, 1950-56	70, 41.
	1949	68, vol. 13, 401.

APPENDIX C

	1957-58	45, 552.
	1959	46, 495.
	1960	46a, 538.
<b>C-16</b>	<i>Suburban passengers</i>	
	1913A, 1913	38, vol. 104, 4.
	1923/24-33	14, 36 f.
	1934-35	65, 427.
	1936	84, 365.
	1937-40	2, 77. For 1939, 88, 496, and 11, 250, give 981.1 mill.
	1945, 1950-56	70, 41.
	1949	68, vol. 13, 401.
	1957-58	45, 552.
	1959	46, 495.
	1960	46a, 538.
<b>C-17</b>	<i>Average length of suburban trip</i>	
	1913A, 1913	38, vol. 104, 4.
	1923/24-33	14, 36 f.
	1934-35	65, 427.
	1936-38	84, 365.
	1939	Interpolated.
	1940	88, 497.
	1945, 1949-60	Suburban passenger-kms (series C-15) divided by no. of suburban passengers (series C-16).

III. FREIGHT TRAIN PERFORMANCE

<b>C-18</b>	<i>Average section ("commercial") speed</i>	
	1913	12, 10.
	1917-21/22	38, vol. 2, 39; vol. 7, 108; vol. 36, 18.
	1922/23-33	14, 56.
	1934-37	25, 300.
	1938	63, 1939, No. 6, 25.
	1939	23, 132. Also, 48, 1939, No. 8, 165.
	1940	44, 177. Also, 12, 10.
	1945	88, 384.
	1946	"Commercial" speed is stated (61, 3) to have increased 6.8 kms between 1945 (interpreted as 1946) and 1955.
	1947	"Commercial" speed is stated (76, 108) to have increased more than 20% in the last 12 years.
	1948	"Commercial" speed is stated (13, 5/2/50) to have increased 1 km between 1948 and 1949.

APPENDIX C

1949	"Commercial" speed in 1949 is stated (13, 12/11/49) to be 1.9 kms below the previous level.
1950-56	70, 52.
1957-58	45, 554 f.
1959	90, 1960, No. 3.
1960	46a, 539.

The section, or "commercial," speed of freight trains includes stops at way stations.

C-19 Average "technical" speed

1913	12, 10.
1922/23-33	14, 56.
1934-40	25, 294.
1945, 1950-56	70, 54.
1947	"Technical" speed in 1947 is stated (76, 108) to be 135% of 1935.
1957-58	45, 554 f.
1959-60	46a, 539.

The "technical" speed of freight trains excludes stops at way stations.

C-20 Average gross train weight

1913	23, 132.
1924/25-33	14, 56.
1934-40	25, 294. For 1940, 70, 61, gives 1,301 tons.
1941	69, 1947, No. 12, 5. For first half of year.
1945, 1950-56	70, 61.
1946	Gross train weight is stated (90, 1947, No. 10, 23) to have decreased by 28 tons between 1945 and 1946.
1947	Gross train weight in 1947 is stated (90, 1948, No. 8, 2) to be 4.6% less than in 1940.
1948	Gross train weight in 1948 is stated (73, 5/1/49) to be 42 tons above prewar norm.
1949	It is stated (13, 5/14/50) that in the summer of 1950 gross train weight was to increase 27 tons over 1949 and 119 tons over 1940.
1957-58	45, 557.
1959	46, 498.
1960	46a, 540.

C-21 Average net train weight

1913A, 1921/22-33	14, 56. For 1913, 59, 203, gives 297 tons and 38, vol. 53, 10, gives 320.6 tons. For 1922/23-24/25, 38, vol. 53, 10, gives 291, 331, and 388 tons.
-------------------	--

APPENDIX C

1913	Assumed to be the same as for 1913A.
1914-15, 1919-21	59, 203.
1934-37	16, 305. For 1937, 70, 59, gives 682 tons.
1938, 1946-49	Gross train weight (series C-20) times ratio of net to gross train weight interpolated between neighboring years.
1939	23, 132.
1940	69, 1946, No. 8-9, 5.
1945, 1950-56	70, 59.
1957-58	45, 557.
1959-60	46a, 540.

C-22 *Total train kilometers*

1913A, 1913, 1921/22	38, vol. 104, 7; vol. 53, 7.
1922/23-33	14, 48.
1934-35	65, 430.
1936-40, 1945-60	Operating ton-kms (series C-6) divided by avg. net train weight (series C-21).

IV. LOCOMOTIVES

C-23 *Locomotives in inventory fleet*

1913A, 1921/22-26/27	38, vol. 36, 6; vol. 104, 34. For 1913A and 1921/22-22/23, annual averages.
1913, 1932, 1937	84, 469.
1928, 1938-40, 1950	Total tractive effort of locomotives in inventory fleet (series C-24) divided by avg. tractive effort per locomotive derived as 11.3 tons for 1928 (12, 10), 14.6 tons for 1938 (read from a graph, 69, 1947, No. 11, 12), 14.9 tons for 1939 and 1940 (23, 140; 12, 10), and 16.9 tons for 1950 (interpolated on the basis of rate of increase).
1929-31, 1933-34	Based on locomotives under railroad jurisdiction (14, 44) and percentage that they were of inventory fleet (interpolated between percentages for 1928, 1932, and 1935, which were derived from locomotives under railroad jurisdiction in 14, 44, and locomotives in inventory fleet for these years).
1935-36	47, 121.
1942-43	Locomotives in inventory fleet at beginning of 1943 (taken as end of 1942) are stated (86, 104) to be 85% of 1941 (taken as end of 1940) and to have increased by 2,000 by end of 1943.

APPENDIX C

1944-45	Based on locomotives in 1943 and assumed minimum annual increases of 600 per year.
1953	132, 168.
1954	Locomotives in inventory fleet in 1953 plus 1,036 locomotives produced in 1954 (44, 56).
1955	Locomotives in inventory fleet in 1954 plus 982 locomotives produced in 1955 (44, 56).

C-24 *Total tractive effort of locomotives in inventory fleet*

1913A, 1929-31, 1933-34, 1945, 1953, 1955	Locomotives in inventory fleet (series C-23) times avg. tractive effort per locomotive, derived as 10.2 tons for 1913A (assumed to be same as for 1913, 12, 10), 11.6, 12.0, 12.4, 13.0, and 13.3 tons for 1929-31 and 1933-34 (read from a graph, 69, 1947, No. 11, 12), 15.9 and 17.5 tons for 1945 and 1953 (interpolated on the basis of rate of increase), and 17.9 tons for 1955 (20.1% increase in postwar period, 85, 1956, No. 10, 40).
1913	Total tractive effort in 1937 is stated (43, 182) to be 194% of effort in 1913.
1928	Total tractive effort in 1928 is stated (43, 182) to be 106.9% of effort in 1913.
1932	Total tractive effort in 1932 is stated (43, 182) to be 141.7% of effort in 1913.
1935-36	47, 121.
1937	84, 469.
1938	Interpolated.
1939	Total tractive effort in 1939 is stated (43, 182) to be 214.5% of effort in 1913.
1940	Avg. tractive effort of a steam locomotive in 1941 (taken as end of 1940) is stated to be 225% of effort in 1928. However, since this contradicts absolute figures for avg. tractive effort (12, 10), it must apply to <i>total</i> tractive effort.
1950	Total tractive effort per 100 kms is stated (85, 1952, No. 4, 33) to have increased 16% during the postwar five year plan.

C-25 *Average daily kilometers per locomotive-day*

Col. 1	1913A, 1917-21/22	38, vol. 53, 10; vol. 2, 39; vol. 7, 108. For 1913A, covers all types of traffic.
	1913, 1940	44, 177. For 1940, also 85, 1952, No. 4, 36.
	1922/23-33	14, 56.

APPENDIX C

1934-36	84, 409.
1937	69, 1947, No. 12, 5.
1938	Avg. daily kms per locomotive-day in 1938 are stated (13, 3/18/39) to be 87.3 kms more than in 1933.
1939	23, 132.
1945, 1950-55	70, 57.
1948-49	Based on announced annual relative for 1949 (108.4%, 13, 5/24/50) and statement (13, 4/23/50) that avg. daily kms per locomotive-day in 1949 were 18 kms more than in 1948.
1956-58	45, 555.
1959-60	46a, 539.
Cols. 2, 3, and 4	
1945, 1950-55	70, 57.
1956-58	45, 555.
1959-60	46a, 539.

V. FREIGHT CARS

C-26	<i>Active fleet, revenue trains</i>	
Col. 1	1913A, 1913, 1917-20	38, vol. 104, 6; vol. 2, 16 ff.
	1921-60	ADC (series C-4) times turnaround time of freight cars (series C-29). 38, vol. 19, 42 f, and vol. 36, 63, gives 228.5, 214.3, 190.6, and 209.4 for 1921-23/24.
C-27	<i>Fleet under railroad jurisdiction</i>	
	1913A, 1913,	38, vol. 6; vol. 53, 6.
	1921/22-22/23	
	1920-21	Based on inventory fleet and ratio of fleet under RR jurisdiction to inventory fleet per verst of line operated (derived from 38, vol. 7, 106 f).
	1923/24-33	14, 44.
	1934-35	65, 430.
	1936-37, 1939-40,	Based on active fleet (series C-26) and percentage that active fleet was of fleet under RR jurisdiction (86.7% and 86.2% for 1937 and 1940, 29, 98; interpolated for other years).
	1944-45, 1950, 1955	
	1938	Fleet under RR jurisdiction in 1938 is stated (13, 3/9/39) to be 134% of 1934 fleet.
	1942-43	Fleet under RR jurisdiction at beginning of 1943 is stated (86, 104) to be 80% smaller than in 1941 (taken as end of 1940) and to have increased by 56,000 by end of 1943.

APPENDIX C

<i>C-28 Percentage of four-axle units in total inventory fleet</i>	
1928, 1932-35	65, XLI.
1929, 1931	Interpolated.
1930	62, 22.
1936-40	49a, 24.
1945, 1955	Extrapolated.
1946, 1954	13, 4/20/55.
1950	Based on statement (13, 6/6/51) that 76% of all freight cars are equipped with automatic brakes and statement (39, 153) that 97% of 4-axle and 64% of 2-axle freight cars are equipped with automatic brakes.
1958	90, 1960, No. 3, 30.
<i>C-29 Turnaround time, active fleet</i>	
Col. 1 1913, 1940	44, 177. For 1913, also 48, 1939, No. 8, 165. For 1940, also 88, 384.
1920/21-21/22	38, vol. 53, 19.
1922/23-33	18, 55.
1934-35	65, 432.
1936-37	84, 409.
1938	48, 1939, No. 8, 165.
1939	23, 132.
1941	75, vol. 57, 394.
1942-43	86, 104.
1944	Interpolated.
1945, 1950-56	70, 48.
1946	Turnaround time is stated (88, 21) to have been speeded up by 0.85 days between 1945 and 1946.
1947	79, 18.
1948	Turnaround time is stated (13, 11/30/49) to have been reduced 0.92 days between 1947 and 1948.
1949	Based on unrevised turnaround time in 1950 (derived as 7.57 days from statement, 13, 11/11/51, that turnaround time decreased 58 hours between 1946 and 1950) and announced annual relative (92.4%, 13, 12/31/51).
1957-58	45, 555.
1959	46, 497.
1960	46a, 539.
Col. 2 1913, 1920/21-31, 1939, 1941-44, 1946-49, 1959-60	Converted from days in col. 1.
1932	90, 1945, No. 1, 11.
1933-35	65, 433.

APPENDIX C

1936-38	63, 1939, No. 6, 25.
1940, 1945, 1950-56	70, 49.
1957-58	45, 556.
<i>C-30 Average daily kilometers per active car-day</i>	
1913A, 1922/23-33	14, 55. For 1913A, covers revenue freight trains only. For 1913A, 38, vol. 104, 8, gives 72 kms for all freight trains.
1913	Assumed to be same as for 1913A. 10, 282, gives 72 kms.
1917-21/22	38, vol. 2, 39; vol. 53, 10 and 19.
1934-38	63, 1939, No. 6, 25.
1939	23, 132.
1940	25, 304.
1941-44, 1946-49	Total turnaround trip (series C-31) divided by turnaround time (series C-29).
1945, 1950-56	70, 48.
1957-58	45, 555.
1959	46, 497.
1960	46a, 539.
<i>C-31 Average total turnaround trip</i>	
1913A, 1913, 1920/21-26/27, 1936-39, 1945, 1950-57, 1960	Turnaround time (series C-29) times avg. daily kms per car-day (series C-30).
1928-33	14, 55.
1934-35	65, 432.
1940	88, 384.
1941-44	Total turnaround trips in 1941, 1942, 1943, and 1944 are stated (90, 1945, No. 5-6, 43) to be 106.6%, 126.5%, 132.1%, and 123.5%, respectively, of 1940.
1946-49	Loaded turnaround trip (series C-32) divided by percentage that loaded was of total trip (100 minus col. 2 of series C-33).
1958-59	90, 1960, No. 3, 35.
<i>C-32 Average loaded turnaround trip</i>	
1913A, 1913	Based on total turnaround trip (series C-31) and percentage that loaded is of total (71.4% for 1913A, 38, vol. 53, 10; assumed same for 1913).
1920/21-21/22	38, vol. 53, 19.
1922/23-33	14, 55.
1934-35	65, 432.

APPENDIX C

1936-38	Based on ALH (series C-3) and percentage that loaded turnaround trip is of ALH (103.3%, 105.1%, and 106.3% for 1936-38, 68, vol. XI, 427).
1939	25, 308.
1940, 1944-45, 1950-57	Total turnaround trip (series C-31) minus empty turnaround trip (series C-33).
1941-43	Loaded turnaround trips in 1941, 1942, and 1943 are stated (90, 1945, No. 5-6, 43) to be 110.1%, 125.7%, and 126.2%, respectively, of 1940.
1946, 1949	Interpolated.
1947-48	Based on statement (13, 7/1/51) that average loaded turnaround trip in 1947 and 1948 was 7.4% and 8.9% longer than average length of haul (series C-3).
1958-60	90, 1960, No. 3, 35; 1961, No. 3, 31.
<i>C-33 Average empty turnaround trip</i>	
Col. 1	
1913A, 1913, 1921-39, 1940	Total turnaround trip (series C-31) minus loaded turnaround trip (series C-32). 88, 384.
1942-44	90, 1946, No. 7, 30.
1945-59	Based on total turnaround trip (series C-31) and percentage that empty is of total (col. 2).
Col. 2	
1913, 1929-33	14, 55.
1920/21-28, 1940-44, 1960	Empty turnaround trip (col. 1) divided by total turnaround trip (series C-31).
1934-35	65, 432.
1936-37	84, 409.
1938-39, 1946-53	24a, 300.
1945, 1954-56	70, 48.
1957	Interpolated.
1958-59	90, 1960, No. 3, 35.

VI. RAILROAD NETWORK AND TRAFFIC DENSITY

<i>C-34 Total road operated, annual averages</i>	
1913A, 1913-16, 1921	38, vol. 104, 2; vol. 3, 14 ff; vol. 7, 107. Converted from versts at 1 verst = 1.067 kms.
1917-20, 1921/22-33	14, 6 f.
1934-35	65, 440.
1936	16, 293.

APPENDIX C

1937	Tariff ton-kms (series C-1) divided by freight traffic density (series C-36). 16, 293, gives 85.3 thous. kms.
1938-39, 1943-60	Unweighted annual averages derived from two successive end-of-year figures (series C-35). For 1953, also 19, 8, where road operated in 1955 is stated to be 155% of road operated in 1928. For 1939, 11, 30, gives 88.4 thous. kms.
1940	49, 5.

The figures for 1913-37 and 1940 are weighted annual averages obtained by weighting the length of lines in permanent operation by the number of days operated by the railroads under the Ministry of Transportation. The figures for 1938-39 and 1943-60 are unweighted annual averages.

C-35	<i>Total road operated, end of year</i>	
	1913A, 1913, 1917,	70, 28.
	1920-40, 1945-56	
	1914-16, 1918-19	Estimated from total road built at end of year plus undated spurs minus railroads ceded to other countries multiplied by a factor to convert road built into road operated (38, vol. 42, 52 ff). This factor was derived from the known road built and the road operated at end of 1917. Road operated is distance between centers of passenger stations. Road built represents total length of main tracks between connecting and ending points (31, 143).
	1942-43	Railroad network is stated (43, 193) to have increased 18,746 kms, or 29.8%, between 1942 and 1943.
	1944	Railroad network is stated (43, 200) to have increased 29,000 kms between 1943 and 1944.
	1957-58	45, 544.
	1959-60	46a, 535.
C-36	<i>Freight traffic density</i>	
	1913A, 1913	38, vol. 104, 3. For wide-gauge and revenue trains only. For 1913, also 14, 8.
	1917-20, 1921/22	64, 248 f.
	1921, 1936, 1938-40, 1943-60	Tariff ton-kms (series C-1) divided by avg. road operated (series C-34). For 1953, 48, 1954, No. 6, 56, gives 7,100 thous. kms. For 1954, 13, 10/22/55, gives 7,600 thous. kms. For 1954, 90, 1956, No. 4, 40, gives 8,600 thous. kms.

APPENDIX C

1922/23-33	14, 8.
1934-35	65, 417.
1937	84, 181.

C-37 *Passenger traffic density*

1913A, 1913	38, vol. 104, 4. For 1913, also 14, 8.
1921-21/22, 1936, 1938-40, 1945-60	Passenger-kms (series C-9) divided by avg. road operated (series C-34).
1922/23-33	14, 8.
1934-35	65, 417.
1937	43, 181.

VII. RAILROAD LABOR FORCE AND PRODUCTIVITY

C-38 *Composite passenger-ton-kilometers*

Col. 1	1913A, 1913, 1921-26/27, 1930-40, 1945-60	Passenger-kms (series C-9) plus tariff ton-kms (series C-1).
	1928-29	74, 278.
Col. 2	1913, 1928-40, 1945-60	Passenger-kms (series C-9) plus operating ton-kms (series C-6).

C-39 *Labor productivity*

Col. 1	1913A, 1913	38, vol. 104, 10. For 1913, also 29, 169.
	1925/26-26/27	14, 60.
	1928-30	74, 278.
	1931-40, 1950-60	Composite passenger-ton-kms (series C-38) divided by operating labor force (series C-40). For 1950, also 44, 34, where productivity in 1950 is stated to be 295% of 1928 and 110% of 1940. For 1951-55, also 44, 34, where produc- tivity in 1951-55 is stated to be 109%, 113%, 120%, 124%, and 139%, respec- tively, of 1950. For 1952, also 43, 279, where productivity in 1952 is stated to be 112.8% of 1950. For 1953, also 13, 5/5/54, and 85, 1955, No. 4, 66, where productivity in 1953 is stated to be 119.6% of 1950 and 131.1% of 1940. For 1954, also 13, 2/22/55, where productivity in 1954 is stated to be 124.1% of 1950.
	1945-49	Based on productivity in 1950 and an- nounced annual relatives for 1946-50 (109.6%, 102.9%, 116.0%, 111.5%, and 110.4%, 85, 1955, No. 4, 66).
Col. 2	1913, 1928-40, 1945-60	Composite passenger-ton-kms (series C-38, col. 2) divided by operating labor force (series C-40).

APPENDIX C

For data derived from slightly different coverages, see 74, 278; 78, 16; and 14, 61.

C-40	<i>Operating labor force</i>	
	1913A, 1913	38, vol. 104, 10. Includes 132.6 and 116.3 thous. temporary workers in 1913A and 1913, respectively. For 1913, also 14, 58, and 84, 121, which covers workers and employees on operating appropriations payroll. This coverage is about 15% broader than 1932 coverage.
	1925/26-26/27	14, 58. Covers workers and employees on operating appropriations payroll.
	1928-31	74, 278. Also, 14, 159. For 1928, also 44, 180.
	1932, 1934-37	84, 557 and 553. Covers workers and employees in railroad operations. For 1932 and 1934-35, 74, 278, gives 1,016, 1,111, and 1,209 thous. workers, coverage being more restricted.
	1933, 1939	Composite passenger-ton-kms in all trains (derived as 254.6 and 501.8 bill. from series C-38, col. 2, plus operating ton-kms in nonrevenue trains, 14, 21, for 1933, and interpolated from data in 28, 239, for 1939) divided by labor productivity for all trains (249.3 and 384.0 thous. composite passenger-ton-kms per operating worker, 29, 169). For 1933, 74, 278, gives 992 thous. workers, restricted coverage.
	1938	63, 1939, No. 8, 7.
	1940, 1950-56	70, 64.
	1945, 1947-49	Composite passenger-ton-kms (series C-38) divided by labor productivity (series C-39).
	1946	60, 52.
	1957-58	45, 558.
	1959-60	46a, 541.

For variant coverages, see 84, 548; 60, 52; 38, vol. 104, 10; and 14, 59. For 1940, variants relating to inclusion of railroad operations in acquired territory appear 12a, 532.

APPENDIX C

VIII. POWERED FREIGHT TRAFFIC ON INLAND WATERWAYS

C-41. *Ton-kilometers*

Col. 1	1913	32, 32. Excludes rafting.
	1924-27	38, vol. 83, 2; vol. 118.
	1928	83, 11.
	1929-35	56, 6. For 1929-33, also 83, 11. For 1933-35, also 65, 443.
	1936-38	82, 1940, No. 9, 3.
	1939	51, 2/11/41.
	1940, 1950, 1954-55	44, 181.
	1945-47	Tons originated (series C-42) times ALH (series C-43).
	1948	Based on 1947 traffic and annual relative (computed as 126.7% from statement, 57, 20, that shipments in 1947 and 1948 were 135% and 171% of shipments in 1945).
	1949	Based on 1948 traffic and announced annual relative (120.4%, 55, 1950, No. 3, 1).
	1951	Based on 1950 traffic and annual relative (computed as 112.5% from annual relative for 1952 and statement, 55, 1953, No. 2, 3, that traffic increased 26% during first 2 years of current five year plan).
	1952	Based on 1951 traffic and announced annual relative (112%, 51, 1/23/53).
	1953	Traffic in 1953 is stated (82, 3/11/54) to be 163% of traffic in 1940.
Col. 2	1913	84, 194.
	1923-29	38, vol. 83, 2; vol. 118, 2.
	1940	44, 181.
	1945-55	70, 116.
	1956-59	67, 168.
	1960	46a, 545.

C-42. *Tons originated*

Col. 1	1913	Ton-kms (series C-41) divided by ALH (series C-43).
	1924-28	38, vol. 83, 2; vol. 118, 2. For 1928, also 83, 11.
	1929-35	56, 6. For 1934, excludes double origination of oil by the Moscow-Oka and the Northwestern Steamship Agencies, which was not considered double

APPENDIX C

origination in previous years and was included in total tons originated (53,293,743). For 1933-34, also 83, 11, which excludes baggage.

	1936	48, 1937, No. 8, 197.
	1937-38	82, 1940, No. 9, 3.
	1939	21, 300.
	1940, 1950, 1954-55	44, 181.
	1945	73, 3/6/46.
	1946	Shipments in 1946 are stated (58, 138) to be 2,760,000 tons more than in 1945.
	1947-49	Based on 1946 shipments and announced annual relatives for 1947-49 (118.7%, 130%, and 121.2%, 55, 1948, No. 2, 1; 1949, No. 5, 1; 1950, No. 3, 1).
	1951-52	Based on 1950 shipments and annual relatives (announced as 113% for 1951, 13, 1/29/52; computed as 107.6% for 1952 from statement, 54, 1952, No. 1, 1, that shipments were to increase 12.3% in 1952 and statement, 41, 1953, No. 1, 1, that 95.8% of 1952 plan was fulfilled).
	1953	Based on 1954 shipments and announced annual relative (111%, 51, 1/21/55).
Col. 2	1913	82, 1940, No. 9, 3.
	1923-29	58, vol. 83, 2; vol. 118, 2.
	1930	84, 197.
	1940	44, 181.
	1945-55	70, 116.
	1956-59	67, 169.
	1960	46a, 545.

In 41, 1953, No. 1, 1, Shashkov stated that shipments (*perevozki*) increased 26% during the first two years of the current five year plan. Despite his use of the word shipments (*perevozki*), Shashkov must have been referring to ton-kilometers since otherwise his statement does not agree with the annual relative for 1952 nor with a statement by Vakhturov in 55, 1953, No. 2, 3, that traffic (*gruzooborot*) increased 26% during the first two years of the current five year plan.

C-43 Average length of haul

Col. 1	1913, 1936-39	48, 1941, No. 1, 45.
	1924-29, 1931, 1940, 1948-49, 1951-54	Ton-kms (series C-41) divided by tons originated (series C-42).
	1930, 1932-35	56, 6. For 1932-35, also 48, 1941, No. 1, 45.
	1945-47	30, 24 and 26.
	1950, 1955	85, 1956, No. 7, 21. Also, 13, 7/31/56.

APPENDIX C

Col. 2	1913, 1923-29, 1945-60	Ton-kms under ministry and other organizations (series C-41, col. 2) divided by corresponding tons originated (series C-42, col. 2).
	1940	89, 42.

IX. MARITIME FREIGHT TRAFFIC CARRIED IN SOVIET BOTTOMS

*C-44 Total ton-kilometers*

Col. 1	1913A, 1913, 1939	Sum of domestic ton-kms (series C-47) and foreign ton-kms (derived as 7.8, 7.1, and 6.8 bill. from foreign tons originated and foreign ALH, which were derived from total and domestic tons originated and interpolations). For 1913, also 44, 181.
	1928	Ton-kms for terminated trips (col. 2) converted into ton-kms for originated trips by factor 0.9. For further details, see Appendix B.
	1929-38	82, 1940, No. 9, 3. For 1929, also 44, 181.
	1940	12, 6.
	1945-55	70, 95. Converted from nautical ton-miles.
	1956-58	67, 168.
	1959-60	46a, 531.
Col. 2	1928	66, 40.
	1929-35	42, 8.

*C-45 Total tons originated*

Col. 1	1913A	82, 1932, No. 10, 40. Assumed to refer to Empire territory.
	1913	Sum of domestic tons originated (series C-48) and foreign tons originated (derived as 2.03 mill. from foreign tons originated carried in bottoms of all flags, 42, 6, and statement, 40, 1947, No. 11, 8, that 9.6% of export and import traffic was carried in Soviet bottoms). A later source (44, 181) gives 15.1 mill. tons.
	1920-27	38, vol. 8, 219; vol. 84, 2 f; vol. 107, 3 f. For 1920-21, petty cabotage only; for 1922-27, sum of petty and grand cabotage.
	1928	Tons originated for terminated trips (col. 3) converted into tons originated for originated trips by factor 1.05. For further details, see Appendix B.

APPENDIX C

	1929-38	82, 1940, No. 9, 3.
	1939	Interpolated by ratio of domestic tons originated (series C-48) to total between 1937 and 1940.
	1940	12, 6.
	1945-55	70, 95.
	1956-59	67, 169.
	1960	46a, 543.
Col. 2	1929-35	42, 6.
Col. 3	1928, 1936	48, 1937, No. 8, 197.
	1929-35	42, 8.
C-46	<i>Average length of total haul</i>	
	1913A, 1913, 1928-39, 1945-60	Total ton-kms (series C-44) divided by total tons originated (series C-45).
	1940	12, 6. Also, 30, 24.
C-47	<i>Domestic ton-kilometers</i>	
	1913A, 1913, 1946-54	Domestic tons originated (series C-48) times ALH (series C-49).
	1928-34	Estimated from ton-kms for terminated trips. For details, see Appendix B. For 1932, also 28, 20.
	1935	42, 6.
	1936	82, 1937, No. 3, 9. Preliminary.
	1937, 1940	28, 20.
	1938	Petty cabotage freight traffic in 1940 is stated (36, 5) to be 115.1% of 1938. Applied to domestic ton-kms since petty cabotage formed by the greatest part of domestic ton-kms.
	1939	21, 300.
	1945	Domestic maritime ton-kms are stated (29, 13) to be 3% of ton-kms carried by all types of transportation, and railroad ton-kms (series C-1) are stated ( <i>ibid.</i> ) to be 91.7% of total ton-kms. The former percentage has been adjusted downward by 0.05% in order to fit in with data on railroad as well as river transportation.
C-48	<i>Domestic tons originated</i>	
Col. 1	1913A	38, vol. 84, 2. Covers traffic carried in bottoms of all flags.
	1913, 1933-35	42, 6. For 1913, covers traffic carried in bottoms of all flags.

APPENDIX C

1928-32	Sum of col. 2 and estimated local freight traffic (taken as series in 82, 1940, No. 9, 3, minus Appendix Table B-4).
1936	82, 1937, No. 3, 9. Preliminary.
1937, 1940	28, 20.
1938	Interpolated by ratio of domestic to total tons originated (series C-45) between 1937 and 1940.
1939	21, 300.
1945	Domestic ton-kms (series C-47) divided by ALH (series C-49).
1946-54	Based on total tons originated (series C-45) and ratio $\frac{1f-1t}{1f-1d}$ . See Appendix B.
Col. 2 1924-28	38, vol. 107, 3 f. Sum of petty and grand cabotage freight traffic carried by Soviet foreign trade fleet and domestic freight traffic of the Caspian Sea maritime fleet.
1929-35	42, 6. Sum of petty and grand cabotage.
C-49	<i>Average length of domestic haul</i>
1913A, 1913, 1928-31, 1933-34	Estimated and adjusted for rounding of ton-kms. See Appendix B.
1932, 1937, 1940, 1945	29, 13.
1935-36, 1938-39	Domestic ton-kms (series C-47) divided by domestic tons originated (series C-48).
1946.	Assumed at level of preceding year and adjusted for rounding of ton-kms.
1947-53	Interpolated and adjusted for rounding of ton-kms. See Appendix B.
1954	1928-30 weighted avg. obtained from ton-kms (series C-47) for 1928-40 divided by tons originated for those years (series C-48).

X. OIL PIPELINE TRAFFIC

C-50	<i>Ton-kilometers</i>
1913, 1920/21-34	65, 126. Tons originated for each pipeline times corresponding length of pipeline.
1935-36, 1938-39	Interpolated.
1937, 1940, 1945, 1950-56	70, 210.
1946	Pipeline traffic is stated (50, 42) to be 0.9% and railroad traffic (taken as series C-1) 84.9% of aggregate volume of freight traffic.
1957-58	45, 572.
1959-60	46a, 552.

APPENDIX C

<i>C-51</i>	<i>Tons originated</i>	
	1913, 1920/21-34	65, 126.
	1935-36	48, 1938, No. 1, 53.
	1937, 1940, 1945, 1950-58	45, 572.
	1959-60	46a, 552.
<i>C-52</i>	<i>Average length of haul</i>	
	1913, 1920/21-34, 1937, 1940, 1945, 1950-60	Ton-kms (series C-50) divided by tons originated (series C-51).
	1935-36	95, 175.

XI. MOTOR FREIGHT TRAFFIC

<i>C-53</i>	<i>Ton-kilometers</i>	
	1913, 1917, 1920, 1923/24-40, 1945-56	70, 155.
	1957-58	45, 573.
	1959	67, 168.
	1960	46a, 553.
<i>C-54</i>	<i>Tons originated</i>	
	1913, 1917, 1920, 1923/24-40, 1945-56	70, 155.
	1957-58	45, 573.
	1959-60	46a, 553.
<i>C-55</i>	<i>Average length of haul</i>	
	1913, 1917, 1920, 1923/24-40, 1945-60	Ton-kms (series C-53) divided by tons originated (series C-54).