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APPENDIX G
Transportation

THE transportation segment is treated largely in terms of the industry groupings used by the Department of Commerce for the national income accounts. These follow the Standard Industrial Classification groupings, with a few exceptions to be noted.

Output and labor input estimates are available for the major groups: railroads, local railways and bus lines, water transportation, pipe lines, and air transport. In the case of highway passenger and freight transportation, output estimates are available only for the intercity portions, and we have tried to split employment accordingly. Included in the residual segment, for which we have employment but not output estimates, are the uncovered parts of highway transportation and the residual Commerce group "services allied to transportation," which is somewhat broader than the SIC group "services incidental to transportation."

For the most part, the output and employment or manhour estimates are based on those of Harold Barger.[1] Real capital estimates, by Melville J. Ulmer,[2] relate only to the railroad and local-transit groups, but may be derived for the segment as a whole. As far as the groups are concerned, then, our total factor productivity estimates are limited to the two mentioned—which accounted for almost four-fifths of national income originating in the segment in 1929, more in earlier years, and less recently. Since estimates of capital and labor inputs are available for the segment as a whole, estimates of output in the segment are derived by means of a coverage adjustment, and segment estimates of total productivity are shown in Table G-I.

Railroads

SIC Major Group 40, Railroads, is composed of three minor groups. Chief of these is Group 401, which includes line-haul operating railroads and electric railroads under the jurisdiction of the Interstate Commerce Commission, and switching and terminal companies (but not urban, suburban, and interurban railways, which are in Major Group 41). Companies having annual operating revenues generally above $1 million

[1] *The Transportation Industries, 1889–1946: A Study of Output, Employment, and Productivity*, New York (NBER), 1951.

[2] *Capital in Transportation, Communications, and Public Utilities: Its Formation and Financing*, Princeton University Press (for NBER), 1960.

are designated as Class I; those below, as Classes II or III. The major group also includes certain services allied to the railroads: Group 402, Sleeping car and other passenger car services; and Group 404, Railway express service.

OUTPUT

The indexes of railroad output, as calculated by Barger for 1890–1946 and extended in this study, are based on weighted averages of freight and passenger traffic. The basic units of measurement for these categories are the ton-mile and the passenger-mile. Unit revenues are used as weights.

In the case of ton-miles, no breakdown by type of commodity or length of haul is possible. The index is, therefore, based on a simple ton-mile aggregate. A weighted aggregate of tons originated, by types of commodities, shows only a slightly larger increase from 1899 to 1940 than an unweighted aggregate; so the absence of internal weights for ton-miles may not be significant.[3]

The basic data on ton-miles, shown in Barger's Appendix B, Table B-1, for 1890–1946, are taken from the Interstate Commerce Commission's annual *Statistics of Railways in the United States.* Barger's estimates were extended by reference to the same source, except in the last two years, for which use was made of the Association of American Railroads, *Statistics of Railways of Class I* (Washington). The ICC data cover Class I, II, and III roads. Coverage for 1911 and later years is substantially complete; Barger adjusted for slight undercoverage in earlier years. He also adjusted for a small discontinuity by eliminating the estimated ton-miles reported by switching and terminal companies before, but not after, 1907.

More detail is available with regard to passenger-miles.[4] For years after 1922, Barger was able to weight separately passenger-miles in three categories: commutation, coach (other than commutation), and parlor and sleeping car. For 1911–22, his index is based on two categories, since data for coach travel then included commutation. Prior to 1911, the index is based on unweighted passenger-miles. The difference in movement between the weighted and unweighted aggregates after 1911 is slight. The Marshall-Edgeworth method of weighting was used, and annual changes were adjusted to changes obtained by use of average unit revenue weights in the first and last years of the following periods: 1911–22, 1922–29, 1929–39, and 1939–47.

The basic data, taken from *Statistics of Railways,* are shown for 1890–1946 in Barger's Appendix B. For 1890–1911, total passenger-miles are for Class I, II, and III roads. The more detailed data for the period since

[3] See Barger, *op. cit.,* Table 18.
[4] *Ibid.,* Tables B-1 and B-2, pp. 184–87.

1911 relate to Class I roads and the Pullman Company. By means of an adjustment to the output index, described below, uniform coverage is secured throughout. Barger combined the freight and passenger traffic indexes by means of average unit revenue weights for the terminal years of the following subperiods: 1890–99, 1899–1909, 1909–19, 1919–29, 1929–39. Our extension to later years involved the use of average unit revenues in the years 1939 and 1947.

From 1921 on, to achieve comparability with the employment estimates, which are complete for the group, the combined index (which is based on data that do not include switching and terminal companies, express companies, or passenger-miles on Class II and III roads) was multiplied by an index of coverage based on the ratio of operating revenues of all companies to revenues of companies represented in the unadjusted index. The coverage index is quite stable, since the degree of undercoverage did not vary significantly from the 5.9 per cent that prevailed in 1929.

For 1890–1921, Barger has two indexes. One is adjusted to complete coverage and is continuous with the index just described. The other[5] is comparable with his employment estimates, which do not include switching and terminal companies, the Railway Express Company, or the Pullman Company prior to 1911. Table G-III shows the comprehensive index. It is presumably comparable with the capital estimates, and we have built up total employment estimates prior to 1921 correspondingly. That the coverage adjustment ratio for output moves similarly to the ratio of Barger's covered-employment estimates to our total implies that output per worker in the uncovered area moved closely with that in the covered area prior to 1921. Prior to 1916, it was necessary to average fiscal-year estimates in order to convert them roughly to a calendar-year basis.

The Barger index was extrapolated from 1890 to 1880 by the index prepared by Ulmer.[6] Ulmer extrapolated the movement between 1890 and 1880 for ton-miles and passenger-miles by Census data and interpolated by data from Poor's *Manual of the Railroads of the United States* for 1882–90, as extended by Census data covering 1880–82. Ulmer employed average unit revenues in 1880 and 1890 to weight the two components of his index.

The railroad output index was further extrapolated from 1880 to 1869 by means of a weighted aggregate of ton-mile and passenger-mile estimates by Edwin Frickey.[7] Ulmer's unit revenues in 1880 were used as weights.

[5] *Ibid.*, Table 23.

[6] *Trends and Cycles in Capital Formation by United States Railroads, 1870–1950*, Occasional Paper 43, New York (NBER), 1954, Table B-2, p. 66.

[7] *Production in the United States, 1860–1914*, Cambridge, Mass., Harvard University Press, 1947, Table 10B, p. 87.

The Frickey estimates were laboriously compiled from the various volumes of Poor's *Manual of the Railroads of the United States*, supplemented to some extent by Census records and annual reports of the railroads themselves.[8] They cover samples of roads representing approximately 50 per cent of gross earnings in each of six geographical regions. Frickey was able to compare total tons and passengers moved by his roads with comprehensive figures for 1871 and 1890. This comparison revealed little bias in his sample for passengers, but a small upward bias with respect to freight tonnage amounting to less than 5 per cent over the two decades. Frickey did not see fit to adjust, or "rectify," the ton-miles estimates, and we have followed his example.

Since no coverage adjustments were made prior to 1890, when Barger's total railroad output index was extrapolated as described, it is assumed that uncovered output moves with the output of the covered line-haul roads. The line-haul roads account for the great bulk of revenue, and the coverage adjustment after 1890 was slight. But the estimates prior to 1890 are of somewhat poorer quality than those based on ICC data.

EMPLOYMENT

Barger's index of employment is presented in his Table 23. The underlying estimates, taken from the same sources as the output estimates, are described in his Appendix B (Table B-1). From 1921 on, the employment estimates are complete for the component groups. For 1911–21, they cover Class I, II, and III line-haul roads and the Pullman Company, and prior to 1911, only the former category.

For the Class I roads, the annual estimates for 1890 to 1914 are based on a single count on June 30; to put these on a more representative basis we have given the current year's count a weight of 2, and the adjacent years, 1 each. The estimate for 1915 is an average of 6 counts; 1916-21, 4 counts; and for the years since 1922, 12 monthly counts have been averaged. For the other categories, the annual estimates are frequently based on less than 12 counts, even in recent years. The total annual estimates of employment from 1929 forward are virtually identical to those contained in the Commerce *National Income Supplement, 1954, Survey of Current Business*, and we have used the latter for consistency with other industries.

In order to estimate total employment from 1890 to 1921, it was first necessary to estimate employment of switching and terminal companies for 1907–21, since in 1908 the ICC stopped collecting employment data for these companies, which were previously included with the Class I, II, and III line-haul roads. Estimates for 1915 and 1916 were available from *Statistics of Railroads*, and interpolations for 1916–21 and 1907–15 were

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[8] Cf. *Ibid.*, Chapters V and VI.

made on the basis of line-haul employment. Estimates of Railway Express employment had been made back to 1910 by King;[9] and an estimate for 1890 was available from the Census. Interpolation between 1910 and 1890 was done on the basis of line-haul employment. Estimates of Pullman Company employment by Barger were available back to 1912; the 1912 estimate was extrapolated to 1890 by employment on the line-haul roads. As Table G-1 shows, the direct total estimates are quite close

TABLE G-1

Railroad Employment, by Type, 1890, 1910, and 1921
(thousands)

	Line-Haul Roads	Switching and Terminal Companies	Pullman Companies	Express Companies	Total of Direct Estimates	Extrapolated Total, Using Coverage Adjustment
1890	747		7	46	800	801
1910	1,643	29	16	58	1,746	1,768
1921	1,705	59	22	83	1,869	1,869

to those obtained by applying the same coverage adjustment that Barger used for output. It is thus implied that output per worker in the segments for which output estimates are not available moved with output per worker on the line-haul roads.

Estimates of railroad employment for 1870 and 1880 comparable with the estimate for 1890 were taken from Daniel Carson.[10] In 1880 and 1890 the figures are from the *Compendium of the Eleventh Census, 1890*, Part 3, p. 893. The 1870 figure was extrapolated by Carson on the basis of the Census data for steam railroad employment and his projection to 1870 of the ratio between the Census and the broader industry figures. In order to obtain decennial averages, employment for intercensal years prior to 1890 was interpolated on the basis of the output index.

MANHOURS

From 1916 forward, Barger presents estimates of manhours worked on Class I line-haul roads and the Pullman Company. These estimates are based on ICC data and are stated to be "the nearest approach to continuously comparable data on hours actually worked."[11] The estimates were extended from 1946 to 1953 by the sources and methods used by Barger.

[9] Willford I. King, *The National Income and Its Purchasing Power*, New York (NBER), 1930, pp. 57 and 61.

[10] "Changes in the Industrial Composition of Manpower since the Civil War," *Studies in Income and Wealth, Volume 11*, New York (NBER), 1949, p. 127.

[11] Barger, *op. cit.*, Table B-1, n. *e.*

For comparability with the total output index, we have multiplied the manhours estimates by the ratio of employment on Class I roads and the Pullman Company to total employment. This procedure involves an imputation of the average hours worked per year by employees in the covered segment to employees in the uncovered segment. It is a broadly reasonable imputation, and since employment in the covered segment is almost nine-tenths of the total, errors in total manhours because of the imputation are not significant.

It is possible to extend the series to 1915 by an average of ICC estimates of manhours worked for fiscal years 1915 and 1916. From 1915 back, we obtained manhours as the product of employment and estimated average hours worked per year. Leo Wolman has estimated that the standard workweek for steam railroads was 60 hours from 1917 back to 1890, the beginning of the period covered by his study.[12] The Aldrich Report (see Appendix A, note 24), which was the basis of the Wolman estimates, shows 10 hours a day from 1890 to 1869, so we have assumed that the 60-hour standard week applied back to the beginning of our period. Estimates of actual hours worked were obtained from a regression for 1916 to 1941 between the ratio of actual hours to standard hours (using the ICC and Wolman estimates) and the ratio of employment to labor force in the railroad group. The labor force estimates are those prepared by Carson for census years, interpolated linearly, and the employment estimates are those of Barger based on the ICC reports. The coefficient of correlation is +.96, which strongly confirms the presumption that both actual hours worked and employment are sensitive to cyclical movements in output. The average hours-per-week estimates, obtained by applying the ratios from the regression equation to standard hours, were used to extrapolate average hours worked per year from 1915 to 1869.

CAPITAL

The estimates of the value of road and equipment, in 1929 dollars, are based on those developed by Ulmer[13] annually as of January 1 from 1870 to 1951. A two-year moving average was taken in order to approximate more closely calendar-year averages, and the estimates were extended to 1953.

Ulmer's method involved the derivation of estimates of gross capital outlays (excluding land acquisition) and capital consumption in 1929 prices and the application of real net capital outlays to the estimated reproduction cost less depreciation of road and equipment, in 1929 prices, of all railroads on January 1, 1937. The sources, methods, and bases of judgment involved in this complex procedure are described in some

[12] *Hours of Work in American Industry*, Bulletin 71, New York (NBER), 1938.
[13] *Capital in Transportation*, Table C-1.

detail by Ulmer.[14] It is noted that the estimates prior to World War I are subject to larger margins of error than the later estimates, since the capital outlay figures are based on samples, and the construction and equipment cost indexes used for deflation are considerably rougher than those compiled by the ICC for the years since 1910–14.

Theoretically, we should like to include the real value of land and land rights in the capital stock estimates. Ulmer points out that, according to the 1880 Census, land comprised 2.1 per cent of the book value of capital assets. For the period since 1917, the ICC estimates indicate that about 3.7 per cent of gross capital outlays have been for land, but these outlays have been offset to an unknown extent by land sales. The general impression is that the trend of the real capital stock of the railroads, were it possible to include land, would differ little from the trend of the real value of road and equipment alone. Inventories are likewise not included, but these have been relatively unimportant in the transportation industries.

Electric Railways

This group comprises local street and interurban railway systems, including elevated or subway lines and trolley buses, but not the electrified divisions of steam railroads. It is basically SIC Major Group 41, exclusive of local bus lines, whether independent, affiliated, or subsidiary. Output, inputs, and productivity measures are given in Table G-V.

OUTPUT

The traffic indexes from 1902 forward are based on a weighted aggregate of revenue passengers carried and freight car-miles on the electric railways. The indexes and underlying data are presented for 1890–1950 by Ulmer.[15] They represent an expansion and refinement of those contained in Barger.[16] Prior to 1902, the index represents revenue passengers only, a category which accounted for more than 98 per cent of the weighted aggregate in 1902 (using 1939 unit revenues as computed by Barger).[17] We have extended the estimates beyond 1950 using the sources and methods described by Ulmer.

The numbers of revenue passengers less those carried on municipally owned lines were drawn from successive reports of the *Census of Electrical Industries*, 1890, 1902, 1907, 1912, 1917, 1922, 1927, 1932, and 1937. Annual interpolations from 1907 to 1937 and extrapolations since 1937 were made on the basis of numbers of revenue passengers as reported by the American Transit Association (New York) in the annual *Transit Fact*

[14] *Ibid.*, Appendix A.
[15] *Ibid.*, Appendix I.
[16] *Op. cit.*, Chap. 5 and Appendix D.
[17] *Ibid.*, Tables 3 and 4.

Book.[18] The Association series includes municipal lines and, after 1917, does not include all pay-transfer passengers; for the extrapolation after 1937, Ulmer adjusted the Association estimates to eliminate passengers carried on municipal lines on the basis of data supplied by the Association relating to all local transit.[19]

Freight car-miles were derived by Ulmer from the Census reports beginning in 1902. Annual interpolations beginning in 1926 and extrapolations after 1937 were made possible by the ICC annual reports, *Transportation Statistics, Electric Railways*.

The passenger and freight traffic indexes were combined on an annual basis from 1926 forward and for the census years from 1922 to 1902. Annual interpolations between 1907 and 1926 were made on the basis of the passenger index. We have interpolated from 1902 to 1890 and extrapolated to earlier years by Frickey's estimates of revenue passengers carried.[20] His series after 1890 is merely an interpolation of Census estimates based on employment estimates and thus does not yield a basis for productivity estimates independent of the 1890 and 1902 figures. Prior to 1890, however, the Frickey series is based on mileage of street-railway lines, the trend of which after 1890 was closely related to numbers of passengers carried. Because of the approximate nature of the output estimates prior to 1890, we do not use them as a basis for industry productivity ratios, but only as a means of deriving the composite output index.

EMPLOYMENT AND HOURS

Employment was estimated by Barger[21] from Census and American Transit Association data for 1890, 1902, 1907, 1912, and annually from 1917 to 1946. We have extended the estimates by data found in Moody's. Annual interpolations for the early years were made on the basis of estimates by Paul H. Douglas,[22] which rely on state data for intercensal years. Extrapolation from 1890 to 1880 and 1870 was based on estimates of gainful workers in the industry, prepared by Alba M. Edwards.[23]

In order to obtain estimates for the privately owned sector of the industry, which is the basis for the output and capital estimates, we have deducted the estimated employment on municipal and state railways. In 1912, there was only one municipal line, employing thirty-three persons. Beginning in 1917, we have computed the ratio of private to total employment in the industry on the basis of data given in the quin-

[18] Reproduced for 1907–46 in *ibid.*, Table D-1.
[19] *Capital in Transportation*, Table I-26.
[20] Frickey, *op. cit.*, Table 15, pp. 108–109, and Appendix C, pp.216–19.
[21] *Op. cit.*, Table D-1.
[22] *Real Wages in the United States, 1890–1926*, Boston, Houghton Mifflin, 1930, p. 440.
[23] *Census of Population, 1940, Comparative Occupation Statistics for the United States, 1870 to 1940*.

quennial censuses through 1937, and interpolated linearly in order to estimate private employment in all years. From 1929 through 1937, however, we have made a further adjustment, using the ratio of the sum of our estimates of private employment in electric railways and local bus lines to the Commerce estimates for the group. The adjustment is minor, but serves the purpose of maintaining all our employment estimates on the Commerce basis from 1929 forward. From 1938 forward, we extrapolated the 1937 adjustment factor for the local-transit industry as a whole by the ratio of the Commerce estimates (private employment) to the American Transit Association estimates (private plus public). This procedure involves the assumption that the ratio for the subgroup moves as does the ratio for the group, which is an assumption parallel to the one made by Ulmer in adjusting the output estimates. Since the adjustment factor for employment moves very closely with that for output, the resulting productivity estimates are virtually the same as would emerge for the industry including the public sector. The employment estimates for private street railways alone after 1937 are less reliable, however, than the employment estimates for the local-transit industry as a whole.

Estimates of average hours worked per week by employees of street railways and bus lines by the Bureau of Labor Statistics are available back to 1932. We have used this series for the street-railway and bus components separately, since the close connection between the two branches of the industry suggests that average hours in each would be similar. Prior to 1953, the BLS series relates to the industry inclusive of municipal lines. The 1953 figure is for the private sector only. An overlap of the two series for the first three months of 1953 indicates that average hours worked in the private component were somewhat higher than in the total industry, but we have not adjusted the earlier figures on this account.

Estimates of average hours actually worked per week for transportation other than steam railroads are available for 1920–22 from the study by King.[24] Data from state sources indicate that in 1920 standard hours were somewhat higher than the 51.8 reported by King (relative to actual hours of 51.0). Also, the hours data in the 1940 Census indicate that average hours worked in the street railway and bus industry were about 1 per cent higher than the average for all transportation other than steam railways. Accordingly, we have adjusted the King estimate for 1920 upward by 1 per cent to 51.5 to approximate average actual hours worked per week in the local-transit industry, as revealed by the state averages which were used for earlier years. A figure of 50 hours for 1929 was arrived at on the assumption that the downward trend of hours in the industry up to 1919 continued, and amounted to the 2-hour drop estimated for all

[24] *Employment, Hours and Earnings in Prosperity and Depression, United States, 1920–22*, New York (NBER), 1923.

manufacturing. We then interpolated linearly between 1929 and 1932, the first year for which BLS presents hours estimates.

CAPITAL

Estimates of the value of electric railway plant and equipment, in 1929 dollars, are contained in Ulmer.[25] His estimates are as of January 1, 1870 to 1950; a two-year moving average of the estimates was used to approximate annual averages.

The Ulmer figures start from an estimate of the total net value of plant and equipment on January 1, 1870. Other years are derived by the successive addition of each year's net capital outlays in constant dollars. The estimates exclude publicly-owned facilities and the electric power departments of privately-owned facilities. Inventory change is not taken into account. The value of land and land rights is also excluded. Although land is estimated to have comprised around 8 per cent of the total value of fixed plant in 1890, the data do not permit the estimation of a time series for land.

Local Bus Lines

This industry (SIC Group 415) comprises companies primarily engaged in operating street and suburban passenger bus lines within the confines of a single municipality, contiguous municipalities, or a municipality and its suburban areas. A few bus lines are operated by local railways, but the scope of such operations is small relative to operations of local bus lines not connected with railways. The productivity summary for the group is given in Table G-VI.

OUTPUT

The output index is based on the estimated numbers of revenue passengers carried by private bus lines. Following Ulmer, we drew the basic data from the American Transit Association's annual *Transit Fact Book*. The data from 1925 forward relate to numbers of revenue passengers carried on all local bus lines. For 1937 to 1950, Ulmer adjusted this series to exclude the estimated number of passengers carried on publicly owned municipal lines. This adjustment was based on unpublished data furnished by the Association relating to passengers carried by municipal railway and bus lines on the assumption that the municipal proportion of the total is applicable to local railway and bus lines separately.[26] We obtained data to make the adjustment in 1950–1953. For years prior to 1937, it was assumed that the 1937 ratio of municipal to total passengers was constant. From 1922 to 1926, estimates of total bus passengers (including nonrevenue

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[25] *Capital in Transportation*, Appendix F.

[26] Ulmer, *Capital in Transportation*, Table I-26.

passengers, who accounted for 11.5 per cent of the total in 1926), were used to extrapolate the revenue passenger index back to 1922. Rough estimates for several earlier years are available from Barger.[27]

EMPLOYMENT AND HOURS

Estimates of employment on all local bus lines (private and public) have been made by the American Transit Association for the years since 1929. Although data relating to motorbus lines were first collected in the *Census of Electrical Industries* for 1922, these related only to companies affiliated with electric railways. The Census for 1937 was the first to collect comprehensive data for the entire industry inclusive of lines operated by companies affiliated with, or subsidiary or successor to, electric railways and independent bus companies. In order to derive employment estimates for the entire industry prior to 1929, the ratio of passengers to employment was extrapolated by that for the affiliated companies and then applied to the total passenger estimates, as shown in Table G-2.

TABLE G-2

Local Bus Lines: Employment in Relation to Revenue Passengers,
Selected Years, 1922–53

	1922	1927	1929	1932	1937	1948	1953
Total industry							
Revenue passengers (millions)[a]	357	2,028	2,301	1,862	2,997	8,893	6,593
Employment (thousands)[b]	(10.0)	(40.0)	43.5	39.6	58.4	138.0	126.0
Passenger-employment ratio[c]	(34.8)	(50.8)	52.9	47.0	51.3	64.4	52.3
Companies affiliated with electric railways							
Revenue passengers (millions)	12.41	163.2		749.4	1,306		
Employment (thousands)	0.40	3.6		17.9	26.7		
Passenger-employment ratio	31.0	45.3		41.9·	48.9		

NOTE: Includes both public and private lines.

[a] Estimates of the American Transit Association, with the exception of 1922, which was obtained by extrapolating revenue passengers in 1926 by all passengers on local bus lines, 1922–25.

[b] Estimates by the A.T.A., with the exception of 1922 and 1927, which were obtained by dividing numbers of passengers by the passenger-employment ratio.

[c] Numbers of passengers divided by numbers employed, except 1922 and 1927, which were obtained by extrapolating the 1932 ratio by the ratios shown for companies affiliated with electric railways.

This procedure involves the assumption that output per employee in the whole industry moved with that in a relatively small portion of the industry, but it seemed better than alternative expedients. The marked

[27] *Op. cit.*, Table 7.

trend toward bigger buses, which largely accounts for the increase in the productivity ratio, undoubtedly affected the entire industry. An employment estimate of 8,000 is obtained for 1920 if we project the 1922–27 rate of increase in passengers per employee and apply it to estimated output. This compares with an estimate by Barger of 7,000, based on extrapolation of the 1929 estimate by the number of buses. Prior to World War I, the industry did not exist on an organized basis, although public jitney-type operations began around 1912.

According to the 1937 Census, 96.2 per cent of the employees in the industry worked for private companies. In order to retain consistency with Ulmer's treatment of revenue passengers, we have adjusted the employment estimates from 1920 to 1937 by the 1937 ratio of private to total, although the first data on this point for a portion of the industry in 1932 indicate a ratio of 95.2 per cent. A small further adjustment was required for 1929–37 in order to achieve consistency with the Commerce estimates for the transit group. We have likewise used the ratio of private to total employment for the group, discussed in the preceding section, in order to extrapolate the 1937 ratio to more recent years.

The estimates of average hours worked per week on local railways and bus lines, described above, were also used for bus lines alone. Although average hours worked in each of the two types of local-transit operation probably tend to conform to the average for both, it is obvious that man-hours for the two industries in combination should be somewhat more accurate than for each taken separately.

CAPITAL

The capital estimates are based on Ulmer's estimates of the value of plant and equipment in 1929 dollars.[28] A two-year moving average of his January 1 estimates was taken to convert them to a calendar-year basis. His stock estimates are derived by the cumulation of real net capital outlays. The gross capital outlay estimates are largely based on transit industry sources, with adjustments described in Ulmer's Appendixes F and G. Capital consumption is estimated from the capital outlay figures on the basis of a calculated average thirteen-year life.

The Local-Transit Group

A somewhat higher degree of accuracy in the productivity estimates is obtained by combining the output and input estimates for street railways and local bus lines to arrive at estimates for SIC Major Group 41. As implied in the previous discussions, this is desirable since some of the data related to the group as a whole and had to be broken down on the basis of

[28] *Capital in Transportation*, Table G-1.

incomplete information; other data, such as average hours worked and factor cost weights, related to the major group but had been used for the components.

The output indexes were combined on the basis of the relative revenue weights given by Barger for 1939[29] and extrapolated to 1929 by the quantity indexes. The labor and capital inputs in constant dollars were added, and indexes computed. Because the weights used for combining the inputs were based on relative compensation in the industry as a whole, the results are the same as if manhours and real stocks had each been added and weighted.

Summary Table G-IV shows the estimates from 1919 forward. Since the local bus transportation industry was insignificant on an organized basis prior to 1919, the estimates for the major group would be virtually identical with those for street railways (Table G-V) in the early period.

Intercity Bus Lines

Available estimates for intercity bus lines fall within SIC Group 431, Passenger bus lines, except local, which excludes local buses, school buses, sightseeing and other chartered buses, as well as terminal facility operations. Our longer series (Table G-VII) relate to Class I, II, and III carriers, but consistency between the output and employment estimates is not exact. From 1942 forward, more precisely comparable estimates of employment and passenger-miles are available from the ICC for Class I carriers. The latter were defined prior to 1949 in terms of revenues generally in excess of $100,000, whereas from 1949 on the lower limit has been $200,000. Overlapping data in 1949 made possible continuous index numbers.

OUTPUT

Following Barger, we have taken revenue passenger-miles as the measure of the output of intercity bus lines. For the years from 1939 to date, the ICC has prepared estimates of revenue passenger-miles carried by Class I, II, and III intercity bus lines on regular route schedules.[30] These estimates are based on data relating to bus-miles and average revenue passenger loads per bus reported regularly by Class I carriers since 1938, on corresponding data for Class II and III carriers from occasional special surveys beginning in 1939, and on regular annual reports from 1948 to date. The estimates do include intracity traffic of reporting bus lines, but not the relatively small amount of intercity traffic of primarily local carriers. From

[29] *Op. cit.*, Tables 3 and 4.
[30] Revised series published in *Transport Economics*, Monthly Comment, Bureau of Transport Economics and Statistics, Interstate Commerce Commission, November 1955, p. 11.

1949 on, the ICC has also estimated intercity revenue passenger-miles by carriers other than these on regular route schedules.[31]

The ICC estimates have been pushed back to 1929.[32] These estimates are quite similar to those prepared by Barger[33] from passenger estimates of the National Association of Motor Bus Operators, multiplied by estimates of the length of the average journey, based on trade opinion. We have used the Barger estimates for 1920–29. Table G-VII also shows estimates by the ICC, from 1943 on, of passenger-miles traveled on Class I intercity buses only and the corresponding employment estimates.

EMPLOYMENT AND HOURS

For some years, the McGraw-Hill Publishing Company has published estimates of employment of intercity and local bus lines based on reports from the carriers. These estimates purport to cover all Class I, II, and III carriers, but not charter and special-service buses. Since the classification of operations is left up to the reporting companies, it is possible that some primarily suburban companies are included with the intercity carriers. Comparability of the employment estimates with the ICC passenger-mile estimates is also not precise because the latter include passenger operations of companies classed as carriers of property. But insofar as the possible discrepancies are not large and maintain a relatively fixed relation to the basic series, the quotient of the two series provides a fair indication of trends in output per worker in the industry, and we have computed it for key years. Estimates by the ICC of employment on Class I intercity motor carriers of passengers for selected years are presented in Table G-3.

TABLE G-3

Class I Intercity Motor Vehicle Passenger Carriers:
Employment in Relation to Numbers of Buses and of Bus-Miles, 1939, 1948, and 1953

	Employment (number)	Buses	Bus-Miles (millions)	Employees Per Bus	Employees Per Million Bus-Miles
1939	22,659	7,263	529.2	3.12	42.8
1948	50,700	16,362	1,200.4	3.10	42.2
1953	40,850	13,500	993.0	3.03	41.1

The McGraw-Hill series is available back to 1947. Since the estimates relate to December 31, we have averaged the year-end figures to approximate average employment during the year. The derived values have been

[31] *Intercity Passenger-Miles*, Statement 5517, File No. 10-D-8, mimeo, July 1955.
[32] See *Bus Facts, 23rd Edition*, Washington, National Association of Motor Bus Operators, 1954, p. 4.
' [33] *Op. cit.*, Table E-1.

linked to estimates presented by Barger for 1920, 1929, and 1939.[34] The 1929 and 1939 figures are Commerce estimates which, in turn, are tied to the employment estimate in the 1935 *Census of Business, Motor Bus Transportation* as extrapolated by numbers of intercity buses owned or bus-miles operated. This was the same device used by Barger to obtain the 1920 figure. In order to obtain annual estimates to build up the segment totals, we have interpolated by the number of intercity buses as given in *Motor Bus Transportation.* Table G-3 shows the close relation between buses and employment in years for which both are available. It suggests a slight tendency for employment to fall relative to the number of buses. If this were true in earlier years, the Barger estimate for 1920 may be on the low side.

Estimates of average hours worked per week in the intercity motorbus industry for selected dates during 1933, 1934, and 1935 are contained in a report of the Federal Coordinator of Transportation.[35] We have carried an average of the two survey estimates for October 1935 (covering up to one-third of the industry) of 45.4 hours into 1936 and extrapolated forward by the BLS estimates of average hours worked on street railways and local bus lines. The 1933 average of 50.0 hours is not much below the King estimate for transportation other than steam railroads. Assuming that the King estimate is representative of the intercity bus companies, we have held the estimate for 1922, based on his study, constant until 1929, and between 1929 and the 1933 interpolated averages obtained from the Federal Coordinator's study. These estimates are obviously crude, and we have used them on an annual basis only for building up total manhours in the segment and the economy.

Intercity Motor Trucking

In this section, we are concerned with SIC Industry 4213, Trucking, except local. It includes companies that are preponderantly in the "over-the-road" trucking business, either as common or contract carriers. The large volume of traffic handled by trucks owned by companies classified in other industries is not included. Moreover, the data since 1939 relate to companies subject to the jurisdiction of the Interstate Commerce Commission, which accounted for about three-fourths of the "for-hire" intercity traffic in 1950. Relative to SIC Major Group 42, Trucking and warehousing, the industry covered here accounts for about one-third of income originating in the group. Continuous data are not available relating to the other main components: local trucking and draying, terminal facilities, and warehousing and storage.

[34] *Ibid.,* Table 4.
[35] *Hours, Wages, and Working Conditions in the Intercity Motor Transport Industries, Part I, Motor-Bus Transportation,* 1936.

OUPUT

From 1939 to date, the Interstate Commerce Commission has prepared estimates of intercity freight traffic carried by all agencies as well as by property carriers submitting regular reports. It will be observed in Table G-4 that total ton-miles have increased more than ton-miles carried

TABLE G-4

Ton-Miles of Intercity Motor Vehicle Freight Traffic,
by Type of Carrier, 1939–54
(millions)

	Total Private and "For-Hire"[a]	Class I, II, and III Carriers[b]	Class I Carriers[b]
1939	52,821	19,646	
1940	62,043	20,683	
1941	81,363	26,835	
1942	59,896	28,083	16,000
1943	56,784	28,768	17,184
1944	58,264	27,253	17,901
1945	66,948	27,289	18,143
1946	81,992	30,448	20,480
1947	102,095	37,693	25,512
1948	116,045	46,706	34,070
1949	126,636	47,891	37,880
1950	172,860	65,648	48,749
1951	188,012	72,292	54,145
1952	194,607	70,843	56,188
1953	217,163	76,510	62,873
1954	214,626	69,392	

SOURCE: Interstate Commerce Commission.

[a] Includes all private trucks and for-hire carriers not subject to federal regulation.

[b] Common and contract carriers operating under ICC authority. The reported figures have been raised to full coverage.

by the Class I, II, and III companies. Commission studies indicate that this is not due so much to a change in the relative proportions of private and for-hire carriers as to a substantial rise in the share of for-hire carriers not required to report to the ICC.

It is also evident that Class I carriers have become relatively more important than Classes II and III. This is partly because of rising rates, which have brought an increasing number of smaller carriers above the lower limit of $200,000 gross revenue ($100,000 prior to 1950). Our

interest is in the for-hire carriers only. And because reliable employment estimates are available only for the Class I carriers, the output-employment ratios are based on estimates for this class alone (Table G-VIII).

Prior to 1939, we have the estimates of Barger, purporting to cover all for-hire ton-miles.[36] The estimates are admittedly rough, and should be used with this qualification in mind. The absolute level of the Barger estimate for 1939 is somewhat higher than the ICC figure; the difference may be attributed to the fact that Barger included for-hire trucking concerns not reporting to the ICC, as well as to a difference in estimating method. Since the nonreporting for-hire carriers were a relatively small factor in the industry in 1939, we have treated the series as essentially continuous.

EMPLOYMENT AND HOURS

From 1942 to date, estimates by the ICC of employment by the Class I carriers are available. It is from the estimates for the Class I carriers that our basic output-per-worker indexes are calculated. By imputing the same movements in output per worker to the employees of the Class I, II, and III carriers, however, we can estimate the change in employment for the broader category by dividing the index of ton-miles carried by the Class I, II, and III intercity trucking concerns by the index of output per worker for Class I carriers. This we have done in order to narrow the uncovered portion of the motor transport industry.

Following Barger, we have extrapolated employment of the carriers under ICC jurisdiction from 1942 to 1929 by the Commerce estimates for the highway freight transportation industry as a whole. Since this procedure is based on the assumption that the intercity portion of the industry group accounted for a constant proportion of total employment over the period, the estimates are obviously subject to a considerable margin of error. The same is true of the extrapolation from 1929 to 1920, which has been made on the basis of total private-truck registrations, since here the assumption is that a constant proportion of trucks in use have been employed in intercity for-hire trucking. In view of the imprecise nature of the estimates prior to 1942, these have been used only to build up the segment totals, and Table G-VIII shows annual estimates only for the later period. The earlier figures indicate an even greater rate of gain in output per worker than has been the case since 1942.

Information regarding average hours worked per week in motor trucking exists for scattered years. For 1933 and 1935 the results of sample surveys are available.[37] An average for the entire industry can be computed for

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[36] *Op. cit.*, Tables 8 and F-4, pp. 40 and 242, and the description of sources and methods in Appendix F.

[37] *Hours, Wages, and Working Conditions* . . . , *Part II, Motor Truck Transportation.*

the week of March 24–30, 1940, from a distribution of employment by average hours class intervals.[38] Estimates by the Bureau of Labor Statistics were begun in 1953. The BLS has also published annual estimates of average full-time union hours of truck drivers and helpers going back to 1936. Although these relate to local trucking, it was felt that they could serve to interpolate the trend of hours in the intercity trucking industry between the years in which direct surveys of actual average hours were made. This was done, except for the war period. From 1941 to 1946, the interpolation was made on the basis of the BLS estimates of average hours actually worked per week in the local-transit industry, since a full-time hours series was clearly inappropriate for a period in which actual hours rose substantially in most industries for which records were available.

The result of the field survey for 1933 indicated a level of average hours worked almost precisely the same as that indicated for all nonrailroad transportation operations in 1922 by the survey conducted by King.[39] In the absence of data on hours worked in the trucking industry in early years, we have assumed that the King estimates are representative; and it is worth noting that the 1940 Census shows average hours worked in motor trucking to be close to the average for all nonrail transport. We therefore held average hours worked in intercity trucking at 50.4 per week from 1922 to 1933 and extrapolated to 1920 by the King averages. Obviously, the year-to-year changes in the average hours series have little validity; but the general trend, particularly since 1933, should be reasonably accurate.

Waterways

The estimates of output and employment of United States water transportation companies are built on those presented by Barger.[40] We have broadened the coverage of the output measure to include coastwise and inland passenger traffic, but due to the relatively small weight of this segment our output index is close to Barger's. More important, we have made output and employment estimates for census years between 1889 and 1920, interpolated annually and have extended the estimates to 1953. The results are presented in Table G-IX.

OUTPUT

Separate indexes have been prepared for freight and passenger traffic. These are based on physical-unit data by the several categories shown in Table G-5. The relative 1929 weights were calculated by applying the

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[38] *Census of Population, 1940*, Vol. III, The Labor Force, Part I, Table 86, p. 259.

[39] *Employment, Hours and Earnings*, Table XXXIII, p. 82.

[40] *Op. cit.* Chapter 7 and Appendix H.

TABLE G-5

Waterway Traffic: Percentage Weights,
by Category, 1929

Freight	86.7
International	38.3
Noncontiguous	6.6
Intercoastal	12.8
Coastwise	14.5
Great Lakes	10.5
Other inland	4.0
Passenger	13.3
International	6.2
Coastwise, intercoastal, and noncontiguous	1.5
Great Lakes, river, and other inland	4.0
Ferry	1.6

1939 revenues per unit[41] to the number of units (ton-miles, passenger-miles, or passengers) carried in 1929.

In terms of the Standard Industrial Classification, it will be noted that we have not explicitly estimated the output of two small components of local water transportation: Industries 4453, Lighterage, and 4454, Towing and tugboat services. Employment in these categories is included in the waterways total employment estimates; we assume that the output of these groups is proportional to the covered traffic. We have likewise not included the output of services incidental to water transportation (SIC Group 446: Piers and docks, stevedoring, canal operation, and water transportation not elsewhere classified). Although shore employment of companies engaged primarily in water transportation is included in our estimates, we follow the Commerce Department in excluding employment of companies engaged primarily in incidental services. Such employment is included in the estimates for the transportation segment as a whole, and the corresponding output is included in the total output of the transportation segment through a coverage adjustment.

Freight traffic. The index of weighted freight ton-miles prepared by Barger[42] has been used for the years available: 1889, and 1920–40 annually. The index number for 1946 required revision; estimates for years since 1946 were prepared by essentially the same sources and methods as those described by Barger.

[41] *Ibid.*, Table 30, p. 128.
[42] *Ibid.*, Table 8, pp. 40–41.

The Barger estimates of ton-miles in 1889 are derived from data given in the *Census Report on Transportation Business in the United States, 1890*, Part II, *Transportation by Water*, and from 1920 on, from various reports of the Maritime Commission, the Army Corps of Engineers, and the Bureau of the Census.[43] Except in the case of inland and Great Lakes traffic, the series are derived from separate tonnage and average haul estimates.[44]

To fill the gap between 1889 and 1920, we first drew estimates of the number of net tons of freight carried by all American vessels and craft (of five tons net register and over) from the Bureau of the Census reports (see Table G-6). These were used to interpolate the years 1906 and 1916 between Barger's index numbers of freight ton-miles for 1926 and 1889.

TABLE G-6

Freight Carried by American Vessels, Selected Years,
1889–1926

	Freight and Harbor Work (million tons)	*Freight Carried*	
		Tons (millions)	Index (1926 = 100)
1889	129.9		19.4
1906	265.5	177.5	39.6
1916	381.4	258.1	57.6
1926		448.1	100.0

SOURCE: Bureau of the Census, *Water Transportation, 1926*, Table 61, p. 101, and *Transportation by Water, 1916*, Table 1, p. 20. Data cover vessels of five tons net register and over, excluding fishing vessels.

Barger's index of weighted ton-miles increased somewhat more between 1889 and 1926 than the straight tonnage figures. Use of the latter series for interpolation involves the assumption that the implied increase in the average haul of all freight, owing in part to shifts in the composition of trade, occcurred regularly over the period.

Intercensal-year interpolations were made on the basis of a weighted average of the following series: net tonnage capacity of American vessels engaged in carriage of foreign trade entered and cleared at all ports (adjusted where necessary to a calendar-year basis); and the gross tonnage of documented merchant vessels engaged in the coastwise and internal trade of the United States.[45] The index shows much the same trends as the

[43] *Ibid.*, notes to Table H-1, pp. 254–55.

[44] *Ibid.* Illustrative calculations of average hauls are shown in Tables H-3, H-4, H-5, and H-6, pp. 257–62. In some years, it was assumed that the average haul was the same as in a year for which estimates were available.

[45] *Historical Statistics of the United States, 1789–1945*, Dept. of Commerce, 1949, Series K 147, K 153, and K 102.

Census estimates of tons of freight carried, but registers a 20 per cent smaller increase over the period as a whole, reflecting a rise in the ratio of freight tonnage carried to the tonnage capacity or tonnage of the merchant marine. This relationship is itself one aspect of the rising productivity of water transport, reflecting increased speed of voyage and turnaround and, possibly, fuller utilization of capacity. The Barger index was extrapolated back of 1889 on the basis of its relationship to the combined vessel tonnage index between 1889 and 1926.

It will be noted that the Census estimates of harbor work for 1906 and 1916 show a virtually constant ratio to vessel freight carried. This helps support the reasonableness of our assumption of constancy after 1916. From 1906 to 1889, the only aggregate tonnage estimates available include both vessel and harbor carriage.

Passenger traffic. This component was estimated by Barger for 1889 and annually from 1920 to 1940. From 1928 forward, it was based on Maritime Commission estimates of passenger arrivals and departures broken down by intercoastal, noncontiguous, and international categories (including cruises).[46] These estimates, in further detail, were multiplied by estimated average hauls in order to arrive at a passenger-mile total. Prior to 1928, the index numbers were based on data relating to passengers carried in foreign travel only, i.e., arrivals plus departures at United States ports in vessels of all flags, adjusted by changes in the ratio of American-flag vessels to all entrances and clearances.[47] Data on foreign travel after 1940 were not available to Barger.

The series for international travel on American vessels was available on an annual basis for all years and was used to fill the gap between 1920 and 1889, and for extension to earlier years. The Barger series was extrapolated from 1939 to 1946 and subsequent years by the numbers of arrivals and departures from and to foreign countries on American-flag vessels given in the *Annual Report of the Immigration and Naturalization Service*, Department of Justice, Tables 31 and 32, for the relevant years.

Estimates of other passenger travel by American vessels could be obtained for 1929–46 from the annual reports of the Army Chief of Engineers.[48] Indexes based on numbers of passengers carried were prepared by the categories shown earlier. In the case of Atlantic, Gulf, and Pacific ports, it was necessary to subtract the number of arrivals and departures from and to foreign countries, a procedure used by Barger to obtain detailed estimates of coastal and intercoastal passenger traffic for 1939.[49]

[46] Barger, *op. cit.*, Table 33, note a, p. 139; Table H-2, pp. 256–57.

[47] *Overseas Travel and Travel Expenditures*, Bureau of Foreign and Domestic Commerce, Economic Series 4, 1939.

[48] *Annual Report of the Chief of Engineers*, U. S. Army, Part 2, *Commercial Statistics, Water-Borne Commerce of the United States*.

[49] *Op. cit.*, Table 30, pp. 128–9.

Data for 1889, 1906, 1916, and 1926 are given in the censuses of water transportation (see source notes to Tables G-6 and G-7). The classifications are essentially the same as those given by the Army Chief of Engineers from 1929 forward, although there is a somewhat divergent treatment of excursion passengers. Accordingly, we have extended the Census series to 1929, for splicing with the Engineers' data, on the basis of the series on the gross tonnage of vessels engaged in the coastwise and inland trade of the United States, cited above. This series was also used for annual interpolations prior to 1926 and for extrapolation of the Engineers' series after 1946.

Although it is not certain that the several Census estimates (Table G-7)

TABLE G-7

Domestic Waterway Passenger Traffic on American Vessels, by Category,
Selected Years, 1880–1926
(millions of passengers)

	FERRY PASSENGERS	PASSENGERS, EXCLUDING FERRY			
		Atlantic, Gulf and Pacific Ports			Lake, River and Other Inland
		Reported Total	Estimated Overseas[a]	Total Domestic[a]	
1926	445.0	20.9	0.5	20.4	12.1
1916	292.2	26.4	0.3	26.1	13.0
1906	330.7	24.6	0.5	24.1	11.5
1889	182.0	13.0	0.2	12.8	5.6[b]
1880	153.6	11.4	0.1	11.3	3.2[b]

SOURCE: Estimates for 1926, 1916, and 1906 from *Water Transportation, 1926*, Bureau of the Census, Table 73, p. 125; estimates for 1889 and 1880 from *Eleventh Report on Transportation Business in the United States, 1890, Part II, Transportation by Water*, Bureau of the Census, pp. xii, 43, 53, 223, 339, 357, 448–49.

  [a] Adjustment to reported Census figures made as described in text.

  [b] Census figures for the Great Lakes and St. Lawrence and for rivers of the Mississippi Valley plus our estimates for other inland waterways not reported for 1880 and 1889 (based on extrapolation of the 1906 figure by vessel tonnage on inland waterways).

are entirely comparable, the movements implied do not appear unreasonable. The resulting series should represent total passenger traffic more fully than the foreign travel series alone, used by Barger prior to 1928. It seems reasonable that domestic waterway travel increased less from 1880 to 1926 than foreign waterway travel, as shown by the estimates, due to the rapid growth of competing carriers in the domestic area.

LABOR INPUT

Employment. From 1929 forward, the Office of Business Economics estimates of full- and part-time employees plus proprietors engaged in water transportation are used. These include vessel and shore employees

of water transport companies, but not the employees of companies engaged primarily in services incidental to water transportation (such as stevedoring), which are included in Services allied to transportation.

Employment estimates for 1906, 1916, and 1926 are available from the several censuses of water transportation. The movements of our series prior to 1926 differ somewhat from those shown by the Barger series[50] because we attempt to cover total employment in order to be consistent with estimates after 1929, whereas Barger excludes employees on tugs, ferries, and on shore. Estimates of total employment on commercial vessels (including tugs and ferries) for 1926 and 1916 are given in the 1926 Census (p. 24). We assume that shore employment moved with vessel employment, since the numbers employed on shore, given in the Census for 1916 (but not for 1926), comprised approximately 55 per cent of vessel employment, the same percentage as in 1929 according to the OBE estimates for the latter year.

For 1916 and 1906, the 1916 Census gives total employment (p. 20), which is used to obtain the movement over this decade. Some drop in the ratio of shore to vessel employment is indicated by the estimates. From the same source, vessel employment is given for 1906 and for 1889. These figures are used to extrapolate the employment series from 1906 to 1889, a procedure which involves the assumption that the ratio of shore to vessel employment did not change further. The Census employment estimate for 1889 is exclusive of employment on canal boats. We derived a figure of 9,500 for the latter by extrapolating the estimate for 1906 back to 1889 by the estimated change in the gross tonnage of canal boats.[51] An employment estimate for 1880 was based on estimates of employment on steam vessels in 1880 and 1889,[52] to which was added an estimate of employment on sailing vessels, canal boats, and barges, obtained by extrapolating the figures for 1889 back to 1880 by the gross tonnage of these classes of vessels, with allowance for the tendency of employment to decline relative to tonnage. The percentage change in employment so derived is very close to that revealed by statistics of gainful workers in the relevant occupations in 1880 and 1890.[53] The latter approach was used to estimate the percentage change in employment from 1880 to 1870. Annual interpolations between census years were made on the basis of the gross tonnage of documented merchant vessels, excluding those engaged in fisheries.[54]

A final problem was involved in linking the series based on Census data from 1926 back to the OBE estimates from 1929 forward. The

[50] *Ibid.,* Table H-7, p. 263.

[51] Derived from Census data in *Transportation by Water, 1916,* p. 201.

[52] *Report on Transportation Business in the United States, 1890,* Part II, *Transportation by Water,* p. xiii.

[53] See Edwards, *op. cit.,* p. 109.

[54] *Historical Statistics,* p. 207.

estimates used by Barger for 1926–29 are interpolations between the Census and OBE estimates and involve a significant drop in employment. It was our impression that the two estimates were not fully comparable. Accordingly, we extrapolated the OBE estimates to 1926 and linked them to the Census figures. Estimates for the major component of the series, employment on American-flag merchant vessels, were available from Maritime Administration records, and showed an increase from 58,600 in 1926 to 64,500 in 1929. Employment on Great Lakes and Inland vessels was extrapolated back from 1929 to 1926 by its relation to tonnage carried from 1929–39. Change in shore employment was computed to parallel the change in vessel employment, since the ratio of the two in 1929 was practically the same as that in the 1916 Census.

Hours. For 1934, the Interstate Commerce Commission conducted a survey of employment, hours, and compensation on Class A and B carriers under its jurisdiction.[55] The survey covered 20,700 employees out of 34,700 on the regulated carriers (total employment on American-flag commercial vessels was about 152,000). The survey revealed that vessel employees worked an average of 2,625 hours per year, and shore employees of the carriers, an average of 1,660 hours. The average annual hours for all employees, weighted by the relative numbers of the sample, were 2,040.

The 1934 average was very close to the average given in the ICC report *Carriers by Water* for 1947, when regular reporting of hours worked by employees on the Class A and B carriers was begun. This series was used for the years since 1947. The 1934 estimate was held constant to 1941. Vessel employee hours were also held constant from 1941 to 1947, but shore employee average hours were interpolated between 1941 and 1947 on the basis of average hours worked in manufacturing.

In extrapolating to years before 1934, we have also assumed that average hours worked by vessel employees remained at the 2,625 level. This is a relatively high figure, and it suggests that in this occupation average hours worked depend to a large extent on technical factors in the industry. The hours of shore employees, on the other hand, might be expected to change more in line with the hours of workers in other industries. Accordingly, we have extrapolated back the 1934 average hours per year of shore employees by average hours in manufacturing.

Again, the average hours estimates are subject to a considerable margin of error, with the exception of the years for which ICC estimates are available. They are not shown in Table G-IX, but are used in obtaining aggregate manhours in the segment.

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[55] *Water Line Statistics, 1920–34*, Statement 364, File No. 48-C-18, mimeo, January 1936.

Airlines

The output and input estimates described in this section relate to scheduled (common carrier) airlines, certified and uncertified (SIC Group 451). Unscheduled (contract) carriers and companies primarily engaged in operating fixed facilities or providing services related to air transportation are included in the residual sector. The estimates in Table G-X begin in 1929; although scheduled airlines were in operation for several years prior to that, the volume of traffic and employment was negligible, and the data pertaining thereto was not sufficiently precise to permit the calculation of output-input ratios.

OUTPUT

The estimates of output are made in terms of the two broad subdivisions: domestic airlines and American-flag international airlines. From 1929 to 1946 the indexes are Barger's,[56] based on data collected by the Civil Aeronautics Administration (CAA) and predecessor agencies. From 1935 forward, the index of domestic traffic is based on a weighted aggregate of revenue passenger-miles, express and freight ton-miles, and mail ton-miles. In earlier years, the index is based on total passenger-miles. The American-flag international component represents passenger traffic throughout: 1937 forward, revenue passenger-miles; 1930–37, all passenger-miles; 1928–30, all passengers. Data for 1946–53 were taken from the 1954 issue of the CAA *Statistical Handbook of Civil Aeronautics*.

Barger weighted the components of domestic traffic by the 1939 revenues per unit of traffic. He assumed the same revenue per passenger-mile on the international as on the domestic lines in order to obtain a weight for the former. We have reweighted the components for the period after 1939 by the average unit revenues in 1939 and 1947.

LABOR INPUT

The annual employment estimates by Barger[57] are averages of year-end data compiled by the CAA. They are virtually identical with the OBE estimates, derived from the same source, through 1941. From 1942 forward, however, the OBE estimates are based on Social Security Administration data. Since these estimates also represent complete coverage of the same segment and are more accurate averages of employment throughout the year, we have shifted to the OBE series for 1942 and subsequent years.

A time series of average hours worked per week by airline employees does not exist. For purposes of obtaining manhours to include in the segment total, we have used the estimate derived from 1940 Census data

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[56] Barger, *op. cit.*, Table 37, pp. 154–55, for annual indexes. The underlying data are summarized in Table I-1, p. 266.

[57] *Ibid.*, Table I-1, p. 266.

for all peacetime years from 1934 to date. This accords with the general picture of stability of average hours in the other transportation groups during this period. In order to catch the general drop in hours experienced from 1929 to 1933, and the bulge during World War II, we have extrapolated and interpolated for these years by the average hours series for the local-transit industry.

Pipe Lines

This industry (SIC Major Group 46) includes companies engaged primarily in the pipe line transportation of crude petroleum and refined petroleum products. Pipe line transmission of natural gas is classified as part of the the gas utilities.

Barger's estimates of output and employment,[58] 1921–46, which we have extended to earlier and later years, cover interstate trunk lines as reported to the Interstate Commerce Commission. These have comprised a quite stable proportion, around 82 per cent, of total trunk line mileage over the period. Gathering lines are not covered, but the traffic mileage on these is small relative to the trunk lines. The output-input ratios are based on the ICC data. In aggregating for the segment, however, we gave the pipe line output its full weight, including an allowance for trunk line movements on interstate pipe lines.[59] Also, in aggregating employment for the segment, we raised the ICC employment estimates by a constant ratio, to represent full coverage. The adjusting ratio was based on a comparison of OBE estimates for the industry, which are tied into full-coverage Social Security data from 1942 forward, with the ICC estimates; the comparison showed a relatively constant relation between the two series. Our procedure for the segment implies that output-input relationships on the ICC lines are representative of the industry as a whole. The final estimates appear in Table G-XI.

OUTPUT

Since 1936, estimates of billions of ton-miles of crude and refined oil transported over the trunk lines of companies reporting to the ICC have been available in its annual report, *Statistics of Oil Pipe Line Companies*. For 1920–36, Barger estimated ton-miles from ICC data on oil received into the system. He assumed that the 1936 ratio of barrels originated to barrels received into the system held for earlier years. He further estimated the change in the average haul over the period, and by converting barrels into tons for crude and refined separately, was able to derive ton-mile estimates.

For use in an industry output aggregate (Tables A-IV and G-I) we pushed the ton-miles estimates back to 1889 on the basis of estimates of

[58] *Ibid.*, Chapter 6 and Appendix G.
[59] *Ibid.*, Table 4, p. 21, and methodological note, pp. 249–50.

interstate trunk pipe line mileage by Walter Splawn,[60] adjusted by an extrapolation of the trend in the ratio of ton-miles transported to pipe line mileage, 1921–52. The ratio increased at an average annual rate of around 5 per cent, reflecting a gradual increase in the average diameter of pipe, the use of more efficient pumping machinery, and improvements in construction and maintenance. This procedure results in index numbers on 1929 as base of 22 in 1920 (Barger's earliest year), 8 in 1910, 2 in 1900, and less than 0.5 in 1890. While helpful for the purpose indicated, the estimates prior to 1919 are not firm enough to use in direct productivity comparisons.

<div align="center">EMPLOYMENT AND MANHOURS</div>

Estimates of employment are available annually since 1921 in *Statistics of Oil Pipe Line Companies*. While they represent employment by companies engaged primarily in interstate transmission of oil, they are not exactly comparable with the output series since some of the employees work on gathering as well as on trunk lines. Since ICC gathering-line mileage fell somewhat relative to trunk-line mileage, the output-employment ratio is subject to some upward bias, but Barger considers this to be "slight" because of the preponderance of trunk line movement.[61] The level of the ICC estimates has been raised by 7 per cent to correspond with the OBE employment figures in computing the total for the segment. Carson has estimated that gainful workers in the pipe line industry numbered 3,500 in 1910, compared with 11,600 in 1920.[62] Even allowing for some variation in the percentage of gainful workers employed between the two dates, the figures imply virtual stability in output per worker, using the output extrapolation described above. This result does not seem plausible in view of the rapid increase in output per worker since 1920, and reinforces our decision not to present output-employment ratios prior to 1919. We have, however, used Carson's estimates to carry back the employment series for purposes of estimating total employment in the economy.

Estimates of average hours worked per week relating specifically to pipe lines do not exist. In order to build up total manhours in the segment, we have used the estimates of average hours worked in the refining branch of the petroleum industry (see Appendix D).

The Residual and Total Transportation Industries

In the preceding eight sections we have described the output and input estimates for major and minor industry groupings within the transportation segment for which direct output estimates are feasible. This portion of the segment accounted for more than four-fifths of total employment in

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[60] *Oil and Gas Journal*, September 27, 1938.

[61] Barger, *op. cit.*, p. 125.

[62] *Op. cit.*, Table 6, p. 54.

1929. Uncovered were parts of SIC Major Group 43: School buses (432), Taxicabs (433), and Motor vehicle transportation not elsewhere classified (439), which includes chartered vehicles, horse-drawn carriages, livery stables, etc.; parts of Group 42: Local trucking and draying (4212), Warehousing and freight terminal facilities (422 through 429); and all of the National Income Division's Services allied to transportation: Fixed facilities for motor vehicle transportation (438 and 4784), Services incidental to water transportation (446), Contract flying (452), Airports and flying fields (458), and Services incidental to transportation (Group 47), such as forwarding, packing and crating, and inspecting and weighing.

Employment figures based on Commerce estimates are available for the residual area since 1929, and can be derived for earlier years (see Table G-8). Direct capital estimates are available only for the steam railroads and local-transit groups, but estimates can be derived for the total segment and, thus, for a residual area broader than that which we have just specified.

OUTPUT

It has not been practical to estimate output directly in the residual sector. It is also not reasonable to assume that uncovered output moved as did covered output. Employment in the residual area increased steadily from about 18 per cent of the total in 1929 to 28 per cent in 1953. Based on labor-force estimates (Table G-8), the proportion in the uncovered area fluctuated between one-fourth and one-third from 1870 to 1900, and fell to about one-fifth between 1910 and 1930 before rising again.

For the purpose of building up aggregate output estimates by industry division, and in order to have figures to compare with capital estimates for the entire transportation division, we have calculated total output for key years by means of coverage adjustments based on the assumption that output per worker in the uncovered area moved with that in the covered. While this procedure suffices to yield rough estimates of total output, it must be held in mind that the output-input ratios are more accurate for the areas in which direct estimates are feasible and for the covered portion of the segment as a whole (Table G-II). The output index for the covered portion of the segment was obtained by weighting together the group output indexes using changing national income weights calculated by the Marshall-Edgeworth formula, as discussed in Appendix A.

EMPLOYMENT AND MANHOURS

The OBE provides estimates of total employment in transportation from 1929 forward. By subtracting estimates for the covered industries (which are consistent with the Commerce estimates) we obtain estimates of employment in the uncovered area. Ratios of total to covered employment are

used for the coverage adjustment to the output index. The estimate of employment in the uncovered area in 1930 was used as a base for extrapolation to earlier years in order to be able to build total transportation employment estimates prior to 1929.

The employment extrapolation is based on estimates of the industrial distribution of gainful workers in census years from 1870 to 1930, as shown in Table G-8. The estimates are largely those by Carson, supple-

TABLE G-8

Residual Transportation: Derivation of Employment, Decennial, 1870–1930
(thousands of persons 10 years old and over)

Line No.		1870	1880	1890	1900	1910	1920	1930
1	Total manpower, regulated industries	617	816	1,476	2,034	2,978	3,616	3,886
2	Public utilities and communications	24	38	68	168	394	610	992
3	Transportation	593	778	1,408	1,866	2,584	3,006	2,894
4	Railroads and express companies	274	425	761	1,033	1,675	1,951	1,809
5	Street railways	7	17	54	99	191	232	209
6	Water transport	141	139	126	123	159	195	226
7	Pipe lines and air transportation	...	...	...	1	4	12	43
8	Other	171	197	467	610	555	359	607
9	Adjusted to employment basis	161	186	443	564	536	616	537
10	Other: OBE level	210	243	579	737	701	775	702
11	Of which: intercity motor carriers						57	174

SOURCE

LINE

1 The sum of "transportation and public utilities" and "miscellaneous transportation and communication" less "garages, greasing stations, etc.," as given in Daniel Carson, "Changes in the Industrial Composition of Manpower since the Civil War," *Studies in Income and Wealth, Vol. 11,* New York (NBER), 1949, pp. 47 and 55.

2 The sum of "electric light and power," "gasworks," "telephone and telegraph," and "radio broadcasting," for census years 1910–30, from Carson, pp. 54–55; the 1910 figures were extrapolated back by our estimates of employment derived as described in Appendix H.

3 Line 1 less line 2.

4 The sum of "steam railroads" and "express companies," 1910–30 (Carson, p. 54), extrapolated to 1870 by the Carson (p. 127) estimates of railroad employees.

5 1910–30: Carson, p. 54. The 1910 estimate was extrapolated to 1890 by the employment estimates by Harold Barger, *The Transportation Industries, 1889–1946,* New York (NBER), 1951, p. 216, and from 1890 to 1870 by Alba M. Edwards, *Census of Population, 1940, Comparative Occupation Statistics for the United States, 1870 to 1940,* p. 109.

6 1910–30: Carson, p. 54, extrapolated to 1870 by our estimates, which were tied into Census estimates as described in Appendix G.

7 Carson, pp. 54–55, extrapolated from 1910 to 1900 by pipe line mileage.

8 Line 3 less lines 4–7.

9 Line 8 times the ratio of employment to labor force, as estimated, 1890–1930, by Clarence Long, *The Labor Force under Changing Income and Employment,* Princeton University Press (for NBER), 1958, Table C-1; percentage employment ratios of 94.5 and 94.0 used for 1880 and 1870.

10 From Office of Business Economics; 1930 employment including proprietors extrapolated by line 9.

mented to some extent by the estimates in this appendix and in Appendix H. The residual, line 8, purports to cover SIC Major Groups 42 and 43, and the Services allied to transportation. We have employment estimates for parts of the two former groups for 1920 and 1930 and we subtracted these from the employment estimates extrapolated by line 8 in order to get employment in our residual area. Before extrapolation, however, we changed the index of the residual gainful-workers estimates to an employment basis using an index of the ratio of employment to labor force, as estimated by Clarence D. Long. The procedure is spelled out in Table G-8. The 1930 "other" employment based on the Commerce estimates is considerably higher than the adjusted gainful-workers estimate. As explained in Appendix A, differences in concept can account for some discrepancy. The size of the discrepancy in this case, however, suggests that the coverage of the Carson "other" groups may not be complete. We assume, nevertheless, that the trend is correctly indicated thereby.

It is striking that the trend of "other" employment remained virtually stable from 1900 through 1930. This stability was due to substantial declines in employment in the industries associated with horse-drawn vehicles, offset by substantial increases in employment in the industries associated with motor vehicle transport. Lebergott, in his estimates, assumed no change in the "other" category from 1900 to 1929. Although it yields approximately the same result, we chose this procedure, particularly since we needed to push the estimates back to 1870. It is apparent that there were substantial increases in "other" employment prior to 1900. A particularly sharp increase during the 1880's occurred primarily in the occupational category of draymen, teamsters, and carriage drivers, according to the detailed analysis of Edwards. Despite the general reasonableness of the residual employment estimates, however, it is clear that they are subject to a considerable margin of error.

In building up annual estimates of total employment prior to 1929, we have interpolated the estimates for the residual areas by employment in the covered area. Practically all the proprietors engaged in transportation are associated with the residual industries. This group comprised about 30 per cent of the total number of persons engaged in this area in 1929 according to the Commerce estimates. Although we used the separate Commerce estimates for proprietors from 1929 on, raised by 10.7 per cent to include unpaid family workers, our pre-1929 extrapolations are on the basis of all persons engaged and, thus, include proprietors and unpaid family workers. For the purpose of estimating manhours, however, we have segregated this class of worker in earlier years by assuming the continuance of the 1929 ratio of proprietors to total persons engaged.

The movement of average hours worked by employees in the residual area was assumed to be the same as that for the average for all the covered transportation groups back to 1920. We extrapolated the 1920 figure by an average of estimates shown in various state reports for teamsters, hostlers, draymen, carriage drivers, stevedores, and longshoremen. The data have been taken for decennial years and interpolated linearly. The same average hours series was used for the estimated number of proprietors and unpaid family workers, raised by 10 per cent in accordance with the divergence revealed by the special Census Bureau survey in 1953.

Manhours worked in the various groups were weighted by the mean of average hourly earnings in the first and last years of the several subperiods beginning in 1919. The averages for 1919 and 1929 were used for earlier periods. Table G-9 shows the effect of the weighting procedure.

TABLE G-9

Transportation: Labor Input Based on Alternative Methods of Weighting,
Key Years, 1869–1953
(1929 = 100)

	Manhours (unweighted aggregate)	Labor Input (weighted aggregate of 8 groups)
1869	23.1	21.7
1879	31.2	30.1
1889	60.4	57.5
1899	79.3	75.8
1909	109.2	108.7
1919	115.2	116.0
1929	100.0	100.0
1937	72.0	70.4
1948	94.1	91.1
1953	85.7	81.9

CAPITAL

Direct capital estimates were made by Ulmer, and used here, only for steam railroads and the local-transit group (electric railways and local bus lines). A total for all "regulated industries" was arrived at by Ulmer through coverage adjustments of capital stock estimates in the base period, and annual net investment estimates were used to obtain stock figures annually. Several manipulations were necessary to obtain the capital stock estimates for total transportation from the broader Ulmer estimates. A residual capital stock series for transportation other than railroads and local transit could be obtained by subtraction. This was done only for

purposes of assessing the reasonableness of the total. The probable margin of error attaching to total productivity estimates for the broad residual would be too great for them to be used separately because part of the output series and all of the capital series would hinge on the validity of coverage adjustments; also, part of the employment estimates prior to 1929 are based on gainful-worker estimates. The following paragraphs, therefore, are devoted to describing the capital estimates for the transportation segment as a whole.

Ulmer's estimate of the real value of stocks of plant and equipment for all regulated industries in 1870 was based on his estimates for steam railroads and street railways, inflated by 15.14 per cent to include other transportation, communications, and public utilities.[63] The blow-up factor was derived from his estimates of the book value of the covered groups in relation to a total for the segment. As the first step in cumulating net additions on this base, gross capital outlays of the industries studied by Ulmer in detail were blown up by factors based on the ratio of changes in book values for all industries to book values for covered groups in selected periods to 1919;[64] while total capital outlays were estimated directly in later years.[65] Total real capital consumption estimates were similarly derived,[66] and the resulting real net capital outlays cumulated on the 1870 base.

To get the implied total capital stocks in the transportation segment by subtraction, we estimated total stocks in public utilities and communications as follows. A coverage adjustment was applied to our estimates of real capital stocks for the electric light and power, gas, and telephone industries (see Appendix H, noting that with the exception of the gas industries the estimates are those by Ulmer). The adjustment factors are those applied by Ulmer to the real value of output for the same selected industries; they are based on the ratio of operating revenues of the covered industries to total operating revenues, extrapolated prior to 1922 by the book value of capital estimates for the covered industries relative to the total.

The total transportation capital estimates do not appear to be unreasonable, despite their indirect derivation. Railroad and local-transit capital comprised about 95 per cent of the total in 1889 and about 85 per cent in 1950. While capital in the uncovered segment increased sixfold over the period, compared with a twofold increase in railroad and local-transit capital, this is in relation to percentage increases of 88 and 113 in employment in the covered and uncovered areas, respectively.

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[63] *Capital in Transportation*, Tables B-1 and B-9.
[64] *Ibid.*, Tables B-6, B-9.
[65] *Ibid.*, Tables B-2, B-3.
[66] *Ibid.*, Tables B-11, B-12.

The aggregate real capital stock for the segment (unweighted) was combined with real labor input, using the average unit compensation of each factor class in the first and last years of the several subperiods since 1919 as weights (Table G-10). The 1919–29 averages were used for earlier years.

TABLE G-10

Transportation: Relative Weights of Labor and Capital Inputs,
Subperiods, 1919–53
(per cent)

	Labor	Capital
1919–29	78.7	21.3
1929–37	82.9	17.1
1937–48	87.6	12.4
1948–53	88.7	11.3

TABLE G-I

Transportation: Output, Inputs, and Productivity Ratios, Key Years, 1869–1953

(1929 = 100)

	Output	Persons Engaged	Output per Person	Manhours	Output per Manhour	Labor Input	Output per Unit of Labor Input	Capital Input	Output per Unit of Capital Input	Total Factor Input	Total Factor Productivity
1869	4.0	18.6	21.3	23.1	17.1	21.7	18.2	24.5	16.2	22.3	17.8
1879	7.9	25.1	31.7	31.2	25.5	30.1	26.4	36.2	22.0	31.4	25.3
1889	20.2	47.0	43.0	60.4	33.4	57.5	35.1	51.2	39.5	56.2	35.9
1899	35.7	62.5	57.1	79.3	45.0	75.8	47.1	61.6	58.0	72.8	49.0
1909	55.8	88.2	63.3	109.2	51.1	108.7	51.3	77.5	72.0	102.1	54.7
1919	82.2	110.0	74.7	115.2	71.4	116.0	70.9	95.1	86.4	111.5	73.7
1929	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1937	103.1	77.1	133.7	72.0	143.2	70.4	146.4	97.0	106.3	74.9	137.7
1948	211.8	98.8	214.4	94.1	225.1	91.1	232.5	95.2	222.5	93.1	227.5
1953	228.9	97.5	234.8	85.7	267.1	81.9	279.5	103.5	221.2	85.7	267.1

TABLE G-II

Transportation, Aggregate of Groups Covered by Output Data:[a] Output, Labor Inputs,
and Productivity Ratios, 1869–1953
$(1929 = 100)$

	Output of Covered Industries	Persons Engaged	Output per Person	Manhours	Output per Manhour	Labor Input	Output per Unit of Labor Input
1869–78[b]	4.7	18.6	25.2	22.7	20.6	23.0	20.3
1879–88[b]	10.3	27.9	36.9	34.5	29.9	35.6	28.9
1889	15.6	36.9	42.3	46.0	33.9	47.6	32.8
1890	17.2	39.3	43.8	49.4	34.8	51.2	33.6
1891	18.5	41.1	45.0	51.8	35.7	53.7	34.5
1892	19.7	43.2	45.6	54.8	35.9	56.9	34.6
1893	19.5	43.9	44.4	55.3	35.3	57.3	34.0
1894	18.7	42.6	43.9	52.3	35.8	54.2	34.5
1895	19.9	42.3	47.0	51.4	38.8	53.2	37.4
1896	20.8	43.6	47.7	52.8	39.4	54.6	38.1
1897	22.2	44.6	49.8	54.0	41.1	55.9	39.7
1898	24.9	46.5	53.5	56.4	44.1	58.5	42.6
1899	27.5	49.3	55.8	60.7	45.3	63.0	43.7
1900	29.7	52.6	56.5	65.6	45.3	68.1	43.6
1901	31.8	56.4	56.4	70.5	45.1	73.3	43.4
1902	34.5	61.0	56.6	77.0	44.8	80.0	43.1
1903	36.6	65.4	56.0	82.9	44.1	86.2	42.5
1904	38.5	68.1	56.5	85.5	45.0	89.0	43.3
1905	42.4	71.8	59.1	90.2	47.0	93.8	45.2
1906	47.0	77.8	60.4	98.9	47.5	103.0	45.6
1907	48.2	80.9	59.6	102.3	47.1	106.5	45.3
1908	47.1	79.4	59.3	97.8	48.2	101.5	46.4
1909	50.5	81.0	62.3	98.9	51.1	102.7	49.2
1910	54.1	86.5	62.5	106.8	50.7	110.9	48.8
1911	55.2	89.4	61.7	110.4	50.0	114.8	48.1
1912	59.2	92.0	64.3	114.1	51.9	118.6	49.9
1913	61.6	94.0	65.5	116.8	52.7	121.5	50.7
1914	59.4	91.0	65.3	110.7	53.7	115.1	51.6
1915	62.9	87.1	72.2	103.9	60.5	107.8	58.3
1916	71.6	91.6	78.2	111.4	64.3	115.7	61.9
1917	78.6	96.1	81.8	116.3	67.6	120.9	65.0
1918	81.0	101.0	80.2	120.8	67.1	125.6	64.5
1919	78.1	106.1	73.6	110.4	70.7	114.3	68.3

(continued)

TABLE G-II (concluded)

	Output of Covered Industries	Persons Engaged	Output per Person	Manhours	Output per Manhour	Labor Input	Output per Unit of Labor Input
1920	86.8	113.9	76.2	120.8	71.9	124.7	69.6
1921	68.4	98.7	69.3	97.0	70.5	99.1	69.0
1922	74.0	97.4	76.0	99.5	74.4	101.3	73.1
1923	86.2	107.3	80.3	110.2	78.2	112.5	76.6
1924	83.4	102.8	81.1	103.3	80.7	104.8	79.6
1925	88.2	102.3	86.2	102.9	85.7	104.3	84.6
1926	94.3	104.1	90.6	105.4	89.5	106.6	88.5
1927	93.6	102.4	91.4	102.9	91.0	103.7	90.3
1928	95.1	99.0	96.1	98.9	96.2	99.2	95.9
1929	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1930	89.3	91.4	97.7	88.5	100.9	88.2	101.2
1931	76.7	79.2	96.8	73.6	104.2	73.0	105.1
1932	63.4	67.1	94.5	59.8	106.0	59.0	107.5
1933	66.7	63.9	104.4	56.8	117.4	55.9	119.3
1934	73.7	66.1	111.5	59.3	124.3	58.6	125.8
1935	78.2	66.6	117.4	60.0	130.3	59.3	131.9
1936	92.7	70.1	132.2	65.2	142.2	64.6	143.5
1937	103.3	73.5	140.5	68.1	151.7	67.6	152.8
1938	90.1	63.9	141.0	58.2	154.8	57.7	156.2
1939	102.7	66.6	154.2	61.6	166.7	61.2	167.8
1940	112.8	68.9	163.7	64.0	176.2	63.6	177.4
1941	140.7	75.1	187.4	71.8	196.0	71.2	197.6
1942	187.6	81.1	231.3	79.7	235.4	78.7	238.4
1943	221.9	88.5	250.7	90.3	245.7	89.5	247.9
1944	227.9	94.1	242.2	95.6	238.4	95.6	238.4
1945	218.3	96.7	225.7	97.2	224.6	97.6	223.7
1946	196.9	95.0	207.3	91.0	216.4	91.2	215.9
1947	208.4	93.1	223.8	88.6	235.2	88.5	235.5
1948	210.5	90.9	231.6	85.4	246.5	84.9	247.9
1949	187.3	83.5	224.3	75.9	246.8	75.7	247.4
1950	211.3	85.5	247.1	74.3	284.4	74.0	285.5
1951	232.4	89.8	258.8	78.2	297.2	78.4	296.4
1952	225.0	88.8	253.4	76.6	293.7	77.0	292.2
1953	226.3	88.6	255.4	76.0	297.8	76.6	295.4

a Comprises railroads, electric railways, and waterways throughout; pipe lines beginning 1899; local bus lines, intercity bus lines, and intercity trucking beginning 1919; and airlines beginning 1929. Estimates of persons engaged and manhours for the motor transport groups are exclusive of proprietors.
b Annual average for decade.

TABLE G-III

Railroads: Output, Inputs, and Productivity Ratios, 1869–1953
(1929 = 100)

	Output	Persons Engaged	Output per Person	Manhours	Output per Manhour	Capital Input	Output per Unit of Capital Input	Total Factor Input	Total Factor Productivity
1869–78[a]	.5.3	18.0	29.4	22.8	23.2	36.4	14.6	26.3	20.2
1879–88[a]	12.6	30.0	42.0	38.0	33.2	49.3	25.6	40.8	30.9
1889	19.2	40.4	47.5	51.3	37.4	57.2	33.6	52.8	36.4
1890	21.1	43.4	48.6	55.7	37.9	58.3	36.2	56.4	37.4
1891	22.7	45.4	50.0	58.4	38.9	59.5	38.2	58.7	38.7
1892	24.1	47.7	50.5	61.9	38.9	61.6	39.1	61.8	39.0
1893	23.6	48.3	48.9	62.3	37.9	64.7	36.5	62.9	37.5
1894	22.4	46.7	48.0	58.5	38.3	66.6	33.6	60.6	37.0
1895	23.7	46.0	51.5	56.8	41.7	66.7	35.5	59.3	40.0
1896	24.7	47.3	52.2	58.3	42.4	65.9	37.5	60.2	41.0
1897	26.5	48.5	54.6	59.6	44.5	65.0	40.8	61.0	43.4
1898	29.9	50.6	59.1	62.6	47.8	64.8	46.1	63.2	47.3
1899	33.2	54.0	61.5	67.8	49.0	64.2	51.7	66.9	49.6
1900	36.0	57.9	62.2	73.9	48.7	64.6	55.7	71.5	50.3
1901	38.4	62.2	61.7	79.6	48.2	65.0	59.1	75.9	50.6
1902	41.7	67.9	61.4	87.7	47.5	65.3	63.9	82.0	50.9
1903	44.0	72.7	60.5	94.4	46.6	65.6	67.1	87.1	50.5
1904	46.0	75.2	61.2	96.8	47.5	66.2	69.5	89.0	51.7
1905	50.8	79.2	64.1	102.0	49.8	67.1	75.7	93.1	54.6
1906	56.6	86.3	65.6	112.7	50.2	68.8	82.3	101.5	55.8
1907	57.6	89.4	64.4	116.3	49.5	71.2	80.9	104.8	55.0
1908	55.9	86.6	64.5	109.4	51.1	73.9	75.6	100.3	55.7
1909	60.2	88.3	68.2	110.5	54.5	76.6	78.6	101.9	59.1

(continued)

TABLE G-III (continued)

Railroads: Output, Inputs, and Productivity Ratios, 1869–1953
(1929 = 100)

	Output	Persons Engaged	Output per Person	Manhours	Output per Manhour	Capital Input	Output per Unit of Capital Input	Total Factor Input	Total Factor Productivity
1910	64.5	94.6	68.2	119.9	53.8	79.7	80.9	109.6	58.9
1911	65.5	97.4	67.2	123.8	52.9	82.7	79.2	113.3	57.8
1912	70.3	100.1	70.2	127.9	55.0	85.4	82.3	117.1	60.0
1913	73.0	102.5	71.2	131.4	55.6	88.0	83.0	120.3	60.7
1914	70.1	98.5	71.2	123.6	56.7	89.9	78.0	115.0	61.0
1915	75.0	93.0	80.6	114.2	65.7	90.5	82.9	108.2	69.3
1916	86.3	98.8	87.3	124.0	69.6	90.4	95.5	115.4	74.8
1917	95.1	104.0	91.4	130.0	73.2	90.7	104.9	120.0	79.2
1918	98.0	110.4	88.8	136.1	72.0	90.9	107.8	124.6	78.7
1919	92.8	114.5	81.0	119.9	77.4	90.4	102.7	112.4	82.6
1920	102.2	121.8	83.9	130.7	78.2	89.9	113.7	120.3	85.0
1921	77.7	101.3	76.7	99.1	78.4	89.9	86.4	96.8	80.3
1922	82.9	98.4	84.2	101.0	82.1	90.1	92.0	98.2	84.4
1923	98.0	111.3	88.1	114.7	85.4	91.2	107.5	108.7	90.2
1924	92.4	105.5	87.6	105.9	87.3	93.2	99.1	102.7	90.0
1925	97.2	105.0	92.6	105.7	92.0	94.7	102.6	102.9	94.5
1926	102.4	107.1	95.6	108.3	94.6	96.1	106.6	105.2	97.3
1927	98.4	104.4	94.3	104.7	94.0	97.5	100.9	102.9	95.6
1928	98.1	99.7	98.4	99.4	98.7	98.7	99.4	99.2	98.9
1929	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(continued)

TABLE G-III (concluded)

Year									
1930	85.7	89.9	95.3	86.7	98.8	101.6	84.4	89.7	95.5
1931	69.2	76.2	90.8	69.8	99.1	102.1	67.8	76.2	90.8
1932	52.4	62.6	83.7	54.6	96.0	101.2	51.8	63.9	82.0
1933	55.0	58.8	93.5	51.3	107.2	99.8	55.1	61.0	90.2
1934	59.7	60.8	98.2	54.7	109.1	98.4	60.7	63.4	94.2
1935	62.6	60.3	103.8	54.9	114.0	97.2	64.4	63.3	98.9
1936	75.5	64.7	116.7	61.3	123.2	96.3	78.4	68.3	110.5
1937	80.9	67.8	119.3	64.2	126.0	96.2	84.1	70.6	114.6
1938	65.9	57.5	114.6	53.3	123.6	95.9	68.7	61.1	107.9
1939	74.8	60.4	123.8	57.1	131.0	95.0	78.7	64.2	116.5
1940	83.0	62.9	132.0	59.9	138.6	94.5	87.8	66.6	124.6
1941	105.5	69.6	151.6	68.6	153.8	94.5	111.6	74.4	141.8
1942	148.0	77.5	191.0	78.2	189.3	94.8	156.1	82.7	179.0
1943	179.3	83.1	215.8	87.6	204.7	94.7	189.3	90.9	197.2
1944	185.0	87.6	211.2	91.7	201.7	94.3	196.2	94.5	195.8
1945	172.4	88.2	195.5	91.0	189.5	94.0	183.4	93.8	183.8
1946	143.3	84.8	169.0	83.2	172.2	93.6	153.1	86.9	164.9
1947	147.2	83.6	176.1	81.8	180.0	93.3	157.8	85.7	171.8
1948	141.8	81.5	174.0	79.4	178.6	93.9	151.0	83.6	169.6
1949	117.4	73.1	160.6	67.1	175.0	94.9	123.7	72.7	161.5
1950	128.6	74.4	172.8	63.5	202.5	95.6	134.5	69.6	184.8
1951	141.2	77.7	181.7	66.0	213.9	96.2	146.8	72.0	196.1
1952	134.5	75.0	179.3	62.9	213.8	96.9	138.8	69.3	194.1
1953	131.6	73.7	178.6	61.4	214.3	97.5	135.0	68.0	193.5

[a] Annual average for decade.

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TABLE G-IV

Local Railways and Bus Lines: Output, Inputs, and Productivity Ratios, 1889–1953
(1929 = 100)

	Output	Persons Engaged	Output per Person	Manhours	Output per Manhour	Capital Input	Output per Unit of Capital Input	Total Factor Input	Total Factor Productivity
1889	10.7	25.1	42.6	31.1	34.4	16.9	63.3	28.8	37.2
1899	25.8	45.2	57.1	53.4	48.3	68.9	37.4	56.3	45.8
1909	52.9	86.0	61.5	96.4	54.9	133.9	39.5	103.2	51.3
1919	77.5	107.3	72.2	111.6	69.4	135.1	57.4	116.0	66.8
1920	82.0	111.0	73.9	114.3	71.7	131.5	62.4	117.5	69.8
1921	77.9	103.2	75.5	105.5	73.8	126.7	61.5	109.7	71.0
1922	83.3	107.8	77.3	109.5	76.1	123.0	67.7	112.0	74.4
1923	87.6	109.8	79.8	111.3	78.7	120.6	72.6	113.0	77.5
1924	89.4	107.8	82.9	109.1	81.9	117.7	76.0	110.7	80.8
1925	93.5	106.4	87.9	107.5	87.0	114.0	82.0	108.7	86.0
1926	99.0	106.6	92.9	107.5	92.1	110.1	89.9	108.0	91.7
1927	100.2	104.7	95.7	105.1	95.3	106.4	94.2	105.3	95.2
1928	99.3	101.9	97.4	102.1	97.3	103.1	96.3	102.3	97.1
1929	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1930	92.0	93.9	98.0	90.5	101.7	96.9	94.9	91.3	100.8
1931	82.5	85.4	96.6	79.3	104.0	93.6	88.1	81.1	101.7
1932	71.3	76.4	93.3	68.1	104.7	89.5	79.7	70.7	100.8
1933	67.3	71.1	94.7	62.9	107.0	84.6	79.6	65.6	102.6
1934	72.2	71.8	100.6	62.5	115.5	80.3	89.9	64.7	111.6

(continued)

TABLE G-IV (concluded)

1935	73.9	72.1	102.5	63.3	116.7	77.4	95.5	65.0	113.7
1936	81.1	72.9	111.2	65.5	123.8	75.7	107.1	66.8	121.4
1937	81.6	73.9	110.4	66.1	123.4	74.3	109.8	67.1	121.6
1938	77.6	66.8	116.2	58.2	133.3	72.3	107.3	59.4	130.6
1939	81.0	65.7	123.3	58.3	138.9	70.7	114.6	59.4	136.4
1940	84.3	60.7	138.9	54.4	155.0	64.2	131.3	55.4	152.2
1941	76.9	57.5	133.7	52.7	145.9	58.0	132.6	53.5	143.7
1942	106.7	60.4	176.7	57.0	187.2	56.6	188.5	57.5	185.6
1943	131.2	65.8	199.4	63.8	205.6	53.8	243.9	63.9	205.3
1944	139.7	67.1	208.2	66.0	211.7	50.7	275.5	65.8	212.3
1945	142.5	67.5	211.1	67.9	209.9	48.3	295.0	67.5	211.1
1946	143.6	72.5	198.1	69.5	206.6	46.9	306.2	69.0	208.1
1947	138.8	70.7	196.3	66.2	209.7	45.4	305.7	65.8	210.9
1948	120.5	61.1	197.2	56.8	212.1	43.9	274.5	56.7	212.5
1949	106.9	59.3	180.3	53.8	198.7	42.3	252.7	53.7	199.1
1950	96.7	56.1	172.4	50.9	190.0	40.2	240.5	50.8	190.4
1951	86.8	53.9	161.0	49.9	173.9	38.3	226.6	49.8	174.3
1952	84.9	51.4	165.2	47.7	178.0	36.3	233.9	47.5	178.7
1953	76.4	50.0	152.8	45.1	169.4	34.3	222.7	44.9	170.2

TABLE G-V

Local Electric Railways: Output, Inputs, and Productivity Ratios, 1889–1953
(1929 = 100)

	Output	Persons Engaged	Output per Person	Manhours	Output per Manhour	Capital Input	Output per Unit of Capital Input	Total Factor Input	Total Factor Productivity
1889	14.4	28.9	49.8	35.8	40.2	17.5	82.3	32.4	44.4
1899	34.6	52.0	66.5	61.4	56.4	71.5	48.4	63.3	54.7
1902	41.7	59.9	69.6	69.6	59.9	91.0	45.8	73.6	56.7
1903	46.8	66.6	70.3	77.0	60.8	98.1	47.7	80.9	57.8
1904	52.9	75.0	70.5	86.2	61.4	106.0	49.9	89.9	58.8
1905	57.6	81.3	70.8	93.0	61.9	114.4	50.3	97.0	59.4
1906	62.4	87.6	71.2	99.7	62.6	122.8	50.8	104.0	60.0
1907	66.2	92.6	71.5	104.8	63.2	131.1	50.5	109.7	60.3
1908	66.8	96.4	69.3	108.5	61.6	137.1	48.7	113.8	58.7
1909	71.1	98.9	71.9	110.8	64.2	139.0	51.2	116.1	61.2
1910	75.9	106.0	71.6	117.9	64.4	140.3	54.1	122.1	62.2
1911	80.1	112.7	71.1	124.4	64.4	142.1	56.4	127.7	62.7
1912	84.5	118.2	71.5	129.5	65.3	142.3	59.4	131.9	64.1
1913	88.4	119.0	74.3	129.5	68.3	142.1	62.2	131.9	67.0
1914	88.7	117.8	75.3	127.2	69.7	142.6	62.2	130.1	68.2
1915	87.8	118.2	74.3	126.7	69.3	143.0	61.4	129.7	67.7
1916	94.4	118.2	79.9	125.8	75.0	142.7	66.2	129.0	73.2
1917	100.3	123.1	81.5	130.0	77.2	142.1	70.6	132.3	75.8
1918	99.3	119.7	83.0	125.4	79.2	141.8	70.0	128.5	77.3
1919	104.1	123.4	84.4	128.3	81.1	140.2	74.3	130.5	79.8

(continued)

TABLE G-V (continued)

Year									
1920	109.1	127.1	85.8	130.9	83.3	136.4	80.0	131.9	82.7
1921	102.4	117.3	87.3	119.9	85.4	131.6	77.8	122.1	83.9
1922	108.7	122.3	88.9	124.3	87.4	127.5	85.3	124.9	87.0
1923	111.0	122.3	90.8	124.0	89.5	124.5	89.2	124.1	89.4
1924	108.7	117.5	92.5	118.9	91.4	120.8	90.0	119.3	91.1
1925	107.2	113.5	94.4	114.6	93.5	116.5	92.0	115.0	93.2
1926	107.2	111.3	96.3	112.2	95.5	111.9	95.8	112.1	95.6
1927	104.8	106.7	98.2	107.1	97.9	107.6	97.4	107.2	97.8
1928	101.2	102.6	98.6	102.8	98.4	103.7	97.6	103.0	98.3
1929	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1930	91.2	93.4	97.6	90.0	101.3	96.5	94.5	91.2	100.0
1931	80.6	84.1	95.8	78.0	103.3	92.9	86.8	80.8	99.8
1932	67.7	73.6	92.0	65.7	103.0	88.5	76.5	70.0	96.7
1933	62.9	67.7	92.9	59.8	105.2	83.4	75.4	64.2	98.0
1934	65.3	68.3	95.6	59.4	109.9	78.7	83.0	63.0	103.7
1935	64.2	66.6	96.4	58.5	109.7	74.9	85.7	61.6	104.2
1936	66.3	64.7	102.5	58.1	114.1	71.9	92.2	60.7	109.2
1937	63.3	62.4	101.4	55.8	113.4	69.4	91.2	58.3	108.6
1938	58.7	54.9	106.9	47.9	122.5	66.9	87.7	51.5	114.0
1939	58.3	50.5	115.4	44.8	130.1	64.8	90.0	48.5	120.2

(continued)

TABLE G-V (concluded)

Local Electric Railways: Output, Inputs, and Productivity Ratios, 1869–1953

(1929 = 100)

	Output	Persons Engaged	Output per Person	Manhours	Output per Manhour	Capital Input	Output per Unit of Capital Input	Total Factor Input	Total Factor Productivity
1940	57.7	44.8	128.8	40.1	143.9	57.1	101.1	43.3	133.3
1941	49.8	39.8	125.1	36.5	136.4	49.2	101.2	38.9	128.0
1942	60.5	39.1	154.7	36.9	164.0	46.6	129.8	38.7	156.3
1943	74.9	44.7	167.6	43.4	172.6	43.7	171.4	43.5	172.2
1944	78.0	45.2	172.6	44.5	175.3	41.1	189.8	43.9	177.7
1945	78.0	44.6	174.9	44.9	173.7	38.7	201.6	43.7	178.5
1946	76.3	43.6	175.0	41.8	182.5	36.8	207.3	40.9	186.6
1947	70.1	40.9	171.4	38.3	183.0	33.7	208.0	37.4	187.4
1948	54.6	34.1	160.1	31.7	172.2	30.8	177.3	31.5	173.3
1949	44.7	31.6	141.5	28.7	155.7	29.4	152.0	28.8	155.2
1950	39.6	29.8	132.9	27.1	146.1	28.2	140.4	27.3	145.1
1951	41.3	27.5	150.2	25.5	162.0	27.2	151.8	25.8	160.1
1952	31.6	28.0	112.9	26.0	121.5	26.1	121.1	26.0	121.5
1953	28.2	26.3	107.2	23.7	119.0	25.0	112.8	23.9	118.0

TABLE G-VI

Local Bus Lines: Output, Inputs, and Productivity Ratios, 1919–53
(1929 = 100)

	Output	Persons Engaged	Output per Person	Manhours	Output per Manhour	Capital Input	Output per Unit of Capital Input	Total Factor Input	Total Factor Productivity
1919	6.8	14.4	47.2	15.0	45.3	2.3	296.9	12.6	54.0
1920	9.7	18.6	52.2	19.2	50.5	2.5	391.1	16.1	60.2
1921	12.6	21.5	58.6	22.0	57.3	2.6	488.4	18.4	68.5
1922	15.5	24.2	64.0	24.6	63.0	7.2	215.3	21.3	72.8
1923	25.4	38.2	66.5	38.7	65.6	20.6	123.3	35.3	72.0
1924	38.0	51.9	73.2	52.5	72.4	35.8	106.1	49.4	76.9
1925	57.1	65.7	86.9	66.4	86.0	48.9	116.8	63.0	90.6
1926	77.2	79.7	96.9	80.3	96.1	63.1	122.3	77.1	100.1
1927	88.1	93.7	94.0	94.1	93.6	75.9	116.1	90.7	97.1
1928	94.4	98.1	96.2	98.3	96.0	88.2	107.0	96.4	97.9
1929	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1930	94.3	96.9	97.3	93.4	101.0	107.3	87.9	95.1	99.2
1931	87.7	92.5	94.8	85.8	102.2	112.1	78.2	89.0	98.5
1932	80.9	92.8	87.2	82.8	97.7	114.5	70.7	86.7	93.3
1933	78.9	90.6	87.1	80.1	98.5	116.2	67.9	84.5	93.4
1934	90.4	92.0	98.3	80.0	113.0	122.1	74.0	85.2	106.1
1935	99.8	103.9	96.1	91.2	109.4	140.6	71.0	97.3	102.6
1936	120.6	120.0	100.5	107.8	111.9	173.2	69.6	115.8	104.1
1937	130.2	140.3	92.8	125.4	103.8	200.9	64.8	134.7	96.7
1938	128.1	135.0	94.9	117.7	108.8	211.4	60.6	127.6	100.4
1939	141.6	153.4	92.3	136.2	104.0	222.6	63.6	146.5	96.7

(continued)

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TABLE G-VI (concluded)

	Output	Persons Engaged	Output per Person	Manhours	Output per Manhour	Capital Input	Output per Unit of Capital Input	Total Factor Input	Total Factor Productivity
1940	155.2	152.4	101.8	136.6	113.6	247.0	62.8	148.2	104.7
1941	149.0	159.4	93.5	146.0	102.1	283.8	52.5	159.4	93.5
1942	229.7	182.6	125.8	172.4	133.2	315.0	72.9	187.2	122.7
1943	281.0	186.7	150.5	181.1	155.2	312.4	89.9	195.6	143.7
1944	303.9	193.5	157.1	190.4	159.6	297.4	102.2	204.1	148.9
1945	314.3	199.8	157.3	201.0	156.4	294.3	106.8	214.5	146.5
1946	322.9	239.1	135.0	229.1	140.9	306.1	105.5	242.9	132.9
1947	321.9	242.5	132.7	227.0	141.8	347.3	92.7	243.0	132.5
1948	295.9	216.4	136.7	201.3	147.0	381.8	77.5	219.2	135.0
1949	272.4	218.8	124.5	198.7	137.1	374.7	72.7	216.2	126.0
1950	248.7	207.7	119.7	188.6	131.9	348.8	71.3	204.6	121.6
1951	207.9	206.5	100.7	191.2	108.7	322.5	64.5	204.6	101.6
1952	226.7	188.4	120.3	174.8	129.7	298.2	76.0	187.3	121.0
1953	204.6	186.7	109.6	168.4	121.5	274.3	74.6	179.3	114.1

TABLE G-VII

Intercity Passenger Transportation:
Output, Employment, and Output per Employee, 1919–53

	Output	Employment	Output per Employee
	INTERCITY BUS LINES (1929 = 100)		
1919	10.2	25.1	40.8
1929	100.0	100.0	100.0
1937	151.5	76.2	198.8
1948	346.0	164.2	210.7
1953	288.7	141.2	204.5
	CLASS I INTERCITY MOTOR CARRIERS OF PASSENGERS (1947 = 100)		
1943	97.8	83.8	116.7
1944	107.0	89.4	119.7
1945	108.2	94.5	114.5
1946	107.5	103.9	103.5
1947	100.0	100.0	100.0
1948	105.8	100.7	105.1
1949	93.5	95.8	97.6
1950	84.2	87.3	96.4
1951	90.9	87.7	103.6
1952	86.7	85.3	101.6
1953	83.3	85.3	97.7

TABLE G-VIII

Intercity Motor Trucking: Output, Employment, and
Output per Employee, 1919–53
(1947 = 100)

	Output	Employment	Output per Employee
1919	0.7	15.0	4.7
1929	10.4	56.9	18.3
1937	36.0	65.3	55.1
1939	52.1	65.5	79.5
1942	74.5	89.7	83.1
1943	76.3	93.6	81.5
1944	72.3	85.3	84.8
1945	72.4	85.9	84.3
1946	80.8	93.2	86.7
1947	100.0	100.0	100.0
1948	123.9	107.2	115.6
1949	127.1	108.3	117.4
1950	174.2	129.7	134.3
1951	191.8	143.1	134.0
1952	187.9	150.1	125.2
1953	203.0	160.3	126.6

TABLE G-IX

Waterway Transportation:
Output, Persons Engaged, and Output per Person, 1869–1953
(1929 = 100)

	Output	Persons Engaged	Output per Person
1869	11.0	60.7	18.1
1879	11.8	62.4	18.9
1889	16.8	54.5	30.8
1899	24.4	52.2	46.7
1906	39.2	62.3	62.9
1916	54.6	78.3	69.7
1919	77.6	105.1	73.8
1929	100.0	100.0	100.0
1930	89.1	94.9	93.9
1931	74.0	86.4	85.6
1932	60.2	78.0	77.2
1933	68.6	80.2	85.5
1934	73.1	86.4	84.6
1935	76.1	88.7	85.8
1936	84.6	85.3	99.2
1937	95.7	90.4	105.9
1938	78.8	80.8	97.5
1939	86.4	84.7	102.0
1940	99.4	85.9	115.7
1941	n.a.	86.4	...
1942	n.a.	64.4	...
1943	n.a.	83.6	...
1944	n.a.	123.7	...
1945	n.a.	148.6	...
1946	n.a.	120.3	...
1947	175.1	98.3	178.1
1948	163.9	96.0	170.7
1949	150.2	84.2	178.4
1950	160.2	77.4	207.0
1951	189.9	85.3	222.6
1952	176.3	85.3	206.7
1953	169.4	81.9	206.8

n.a. = not available.

TABLE G-X

Airline Transportation:
Output, Persons Engaged, and Output per Person, 1929–53
(1947 = 100)

	Output	Persons Engaged	Output per Person
1929	0.5	2.3	22.6
1930	1.3	3.5	37.1
1931	1.5	5.5	27.3
1932	1.8	6.8	26.5
1933	2.4	7.2	33.3
1934	2.8	7.7	36.4
1935	4.6	8.9	51.7
1936	6.3	11.0	57.3
1937	7.1	13.0	54.6
1938	8.0	15.0	53.3
1939	10.6	17.6	60.2
1940	15.2	22.9	66.4
1941	20.4	29.3	69.6
1942	24.7	41.0	60.2
1943	31.7	55.4	57.2
1944	42.6	56.6	75.3
1945	60.9	63.9	95.3
1946	87.1	98.8	88.2
1947	100.0	100.0	100.0
1948	104.5	96.4	108.4
1949	117.3	95.2	123.2
1950	136.0	95.2	142.9
1951	171.2	108.4	157.9
1952	199.4	124.1	160.7
1953	228.5	132.5	172.5

TABLE G-XI

Pipe Line Transportation:
Output, Persons Engaged, and Output per Person,
1919, 1929, and 1937–53
(1929 = 100)

	Output	Persons Engaged	Output per Person
1919	20.7	51.1	40.5
1929	100.0	100.0	100.0
1937	145.6	103.2	141.1
1938	137.5	92.8	148.2
1939	138.9	88.4	157.1
1940	146.8	92.0	159.6
1941	168.5	95.3	176.8
1942	184.0	98.7	186.4
1943	216.3	99.9	216.5
1944	242.1	100.2	241.6
1945	236.0	101.2	233.2
1946	232.6	110.0	211.5
1947	255.5	115.5	221.2
1948	284.6	121.9	233.5
1949	279.8	116.8	239.6
1950	324.7	111.7	290.7
1951	388.0	116.0	334.5
1952	406.1	117.7	345.0
1953	430.3	113.4	379.5

TABLE G-XII

Transportation: Persons Engaged and Manhours, by Group, 1929

	Persons Engaged (thousands)	Manhours (millions)
Railroads	1,845	4,641
Local railways and bus lines		
Electric railways	239	621
Bus lines	41	107
Intercity motor transport		
Bus lines	45	118
Trucking	133	349
Waterways	168	411
Airlines	2	5
Pipe lines	25	67
All other[a]	553	1,630
Total	3,051	7,949

[a] Comprises local motor transport and services allied to transportation.