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## Appendix B

### Index of Output, U.S. Steam Railroads, 1880-1950

The index of output used in this study was constructed originally by Harold Barger for the years 1889-1946 and presented in *The Transportation Industries 1889-1946: A Study of Output, Employment, and Productivity* (National Bureau of Economic Research, 1951). This index was based essentially on passenger miles and freight ton miles appropriately weighted. Using Barger's method we have extended the output index forward to 1950 and backward to 1880. The absence of comparable data on railroad traffic precluded their extension backward to 1870. In order to expedite comparison with our value of capital stock series, the output index has been expressed in terms of 1929 dollars throughout.

The annual and five-year moving average of the output series is given in Table B-1. Derivation of the extensions to Barger's original series is given in Tables B-2 and B-3.

TABLE B-1

## Output, U.S. Railroads, 1880-1950

YEAR	INDEX <sup>a</sup>	1929 DOLLARS (MILLIONS)	
	(1929 = 100) (1)	Annual Data <sup>b</sup> (2)	5-Year Moving Averages (3)
1880	9.3	\$610	
1881	10.3	675	
1882	11.3	741	
1883	12.0	787	\$728
1884	12.6	826	784
1885	13.6	892	847
1886	15.1	990	917
1887	16.6	1,088	990
1888	17.6	1,154	1,077
1889	19.2	1,259	1,175
1890	21.1	1,383	1,274
1891	22.7	1,488	1,373
1892	24.1	1,580	1,451
1893	23.6	1,547	1,493
1894	22.4	1,469	1,528
1895	23.7	1,554	1,554
1896	24.7	1,619	1,585
1897	26.5	1,737	1,668
1898	29.9	1,960	1,809
1899	33.2	2,177	1,971
1900	36.0	2,360	2,150
1901	38.4	2,518	2,350
1902	41.7	2,734	2,535
1903	44.0	2,885	2,703
1904	46.0	3,016	2,897
1905	50.8	3,330	3,135
1906	56.6	3,711	3,344
1907	57.6	3,776	3,500
1908	55.9	3,665	3,686
1909	60.2	3,947	3,866
1910	64.5	4,229	3,982
1911	65.5	4,294	4,149
1912	70.3	4,609	4,373
1913	73.0	4,786	4,503
1914	70.1	4,596	4,640
1915	75.0	4,917	4,913
1916	86.3	5,658	5,238
1917	95.1	6,235	5,566
1918	98.0	6,425	5,864
1919	92.8	6,084	6,220
			6,108

TABLE B-1 (cont.)

YEAR	INDEX <sup>a</sup> (1929 = 100) (1)	1929 DOLLARS (MILLIONS)	
		Annual Data <sup>b</sup> (2)	5-Year Moving Averages (3)
1920	102.2	\$6,700	\$5,948
1921	77.7	5,094	5,948
1922	82.9	5,435	5,942
1923	98.0	6,425	5,877
1924	92.4	6,058	6,201
1925	97.2	6,372	6,404
1926	102.4	6,713	6,405
1927	98.4	6,451	6,505
1928	98.1	6,431	6,354
1929	100.0	6,556	5,919
1930	85.7	5,618	5,315
1931	69.2	4,537	4,750
1932	52.4	3,435	4,222
1933	55.0	3,606	3,919
1934	59.7	3,914	4,002
1935	62.6	4,104	4,376
1936	75.5	4,950	4,518
1937	80.9	5,304	4,716
1938	65.9	4,320	4,984
1939	74.8	4,904	5,376
1940	83.0	5,441	6,246
1941	105.4	6,910	7,707
1942	147.3	9,657	9,119
1943	177.3	11,624	10,258
1944	182.5	11,965	10,738
1945	169.8	11,132	10,734
1946	142.0	9,310	10,269
1947	147.0	9,637	9,416
1948	141.9	9,303	8,880
1949	117.4	7,697	
1950	128.9	8,451	

<sup>a</sup> 1880-1889: Averages of data for adjacent fiscal years shown in Table B-2; 1890-1915: from Harold Barger, *The Transportation Industries, 1889-1946: A Study of Output Employment, and Productivity* (National Bureau of Economic Research, 1951), with base shifted to 1929 and data for fiscal years averaged; 1916-1946: *ibid.*, with base shifted; 1947-1950: Table B-3.

<sup>b</sup> Column (1) times railway operating revenues in 1929 — \$6,556 million. The 1929 revenue figure is based on data reported by Interstate Commerce Commission for all railroads (\$6,486 million) adjusted to include railroads not reporting to ICC by use of the ratio of track mileage of reporting companies to track mileage of all companies (.9893).

TABLE B-2

## Index of Output, U.S. Railroads, 1880-1890

Year Ending June 30	Passenger Miles (Poor's) (1)	Freight Ton Miles (Poor's) (2)	Passenger Miles (Census) (3)	Freight Ton Miles (Census) (4)	Passenger Miles <sup>a</sup> (5)	Freight Ton Miles <sup>a</sup> (6)	Index <sup>b</sup> (1890 = 100) (7)	Index <sup>c</sup> (1929 = 100) (8)
1880								
1881			5.7	32.3	5.9	32.3	42.38	8.6
1882	7.7	39.3	6.5	38.1	6.6	37.7	48.90	9.9
1883	8.5	44.1	7.7	40.2	7.7	39.3	52.61	10.7
1884	8.8	44.7			8.5	44.1	58.76	11.9
1885	9.1	49.2			8.8	44.7	59.92	12.1
1886	9.7	52.8			9.1	49.2	64.79	13.1
1887	10.6	61.6			9.7	52.8	69.40	14.1
1888	11.2	65.4			10.6	61.6	79.53	16.1
1889	12.0	68.7			11.2	65.4	84.33	17.1
1890	12.5	79.2	12.0	79.2	12.0	68.7	89.05	18.1
					12.5	79.2	100.00	20.3

<sup>a</sup> 1882-1890: *Poor's Manual of the Railroads of the United States* (columns 1 and 2); 1880: Census data (columns 3 and 4) adjusted to the level of *Poor's* series by use of the 1890 ratios between the two sets of figures (column 1 to column 3 and column 2 to column 4); 1881 derived by interpolation of the data for 1880 and 1882 by use of Census data for 1880-1882 (columns 3 and 4).

<sup>b</sup> Derived from columns 5 and 6 weighted with unit revenues for 1880 and 1890 in accordance with the Edgeworth formula.

The 1880 unit revenues (2.51 cents per passenger mile and 1.29 cents per freight ton mile) were obtained from Census: the 1890 unit revenues (2.17 cents per passenger mile and 0.93 cents per freight ton mile) are from *Poor's*.

<sup>c</sup> Derived by linking column 7 in 1890 to the index shown by Harold Barger, *The Transportation Industries, 1889-1946: A Study of Output, Employment, and Productivity* (National Bureau of Economic Research, 1951), shifted to a 1929 base.

TABLE B-3  
Index of Output, U.S. Railroads, 1939-1950

YEAR	PASSENGER MILES* (BILLIONS)				INDEXES (1939 = 100)		
	Freight Ton Miles <sup>a</sup> (1)	Commuta- tion (2)	Coach (3)	Parlor & Sleeping Car (4)	Freight <sup>b</sup> (6)	Passenger <sup>c</sup> (7)	Total <sup>d</sup> (8)
1939	335	4.01	11.12	7.53	100.0	100.0	100.0
1940							111.0
1941							140.9
1942							196.9
1943							237
1944							244
1945							227
1946							189.9
1947	658	6.01	27.67	12.26	196.4	197.8	196.6
1948	641	5.86	24.32	11.02	191.3	176.7	189.7
1949	529	5.48	20.27	9.35	157.9	149.9	157.0
1950	592	4.99	17.44	9.34	176.7	138.0	172.3

\* Interstate Commerce Commission, *Statistics of Railways in the United States*. The classification follows that adopted by Harold Barger, *The Transportation Industries, 1889-1946: A Study of Output, Employment, and Productivity* (National Bureau of Economic Research, 1951). "Free riders" are estimated by subtracting parlor and sleeping car passenger miles reported by the railroads from passenger miles reported by the Pullman Company.

<sup>b</sup> Based on aggregate ton mileage shown in column 1.

<sup>c</sup> Based on columns 2 to 5, combined with 1939 unit revenues as weights. The 1939 unit revenues from ICC are:

Commutation	1.02 cents
Coach	1.80
Parlor & sleeping car	2.98 (railroad unit revenue plus Pullman charge)
Free riders	.65 (Pullman charge)

<sup>d</sup> Based on columns 6 and 7, combined with 1939 revenues from freight and passenger traffic as weights. The weights, from ICC data, are \$3,293 million for freight and \$418 million for passenger traffic. For comparison, the index for 1949 for passenger traffic and for total traffic was computed in accordance with the Edgeworth formula on a 1939 base. The index for all traffic was identical with that given above.

## NOTES TO TABLE 10

Sources of basic data: *Eleventh Census of the United States, Part I, Transportation by Land for 1880-1890* and from U.S. Interstate Commerce Commission, *Statistics of Railways in the United States* for subsequent periods.

### Line

- 1 Changes in the book value of road and equipment are gross of depreciation. For the years prior to 1916 it is possible that some negligible amounts of depreciation had been deducted from book values, though the original sources are not clear on this point.
- 3 Comprised of various categories of long-term investments including physical properties such as mines and timber tracts. Figures shown for the periods ending June 30, 1890, and December 31, 1916, are amounts outstanding on these dates, since neither the July 1, 1880, nor the July 1, 1907, figures were shown separately.
- 4 Not identified in detail prior to 1916. In that year comprised working funds advanced to general and special agents, insurance, pension, and other funds, rents and insurance paid in advance, discount on capital stock and funded debt, property abandoned chargeable to operating expenses, and deferred assets and unadjusted debits.
- 6 In the earlier balance sheet statements this item was called "Profit and Loss."
- 7 Of the balance sheets that entered directly into this table, the statement for 1916 first included depreciation reserves. The earliest depreciation reserve figure is an ICC estimate of \$170 million for June 30, 1910. Accordingly, the entire depreciation reserve outstanding at the end of 1916 is assumed to have been accumulated during 1907-1916 and the accumulation in the previous period is assumed to have been zero. While not strictly correct, it is a rough approximation. It was not until 1907 that the ICC required the roads to depreciate any of their property. It is known that such depreciation as had been charged on a voluntary basis in previous years was very small.
- 9a,b 1916 outstanding carried at par value; outstandings in prior years apparently at par value.
- 9c Securities held (mainly those of affiliated companies), carried in the balance sheets under assets, have been omitted from uses of funds and are here deducted from total securities outstanding, to eliminate intercompany duplications.
- 10 Not identified in detail prior to 1916. Included the following in that year: liability for provident funds, tax liability, premium on funded debt, insurance and casualty reserves, operating reserves, and other deferred liabilities and unadjusted credits.

NOTES TO TABLE 11

Sources of basic data: Interstate Commerce Commission, *Statistics of Railways in the United States* except as indicated.

Line

- 1a 1914-1930 data derived from gross capital expenditure series including land, of Class I and II roads and their lessors reported by ICC, adjusted by the ratios .869 in 1914-1920 and .987 in 1921-1930 in order to eliminate the expenditures of roads other than those covered in the table. These ratios reflect the proportion of expenditures of Class I and their lessors to Class I and II roads and their lessors in 1929 and 1930, and of Class I to Class I and II and their lessors in 1918. For 1931-1949, gross capital expenditures for Class I and lessor roads were available separately.
- 1b Mines, timber lands, commercial power plants, hotels, and other nonrailroad physical property before subtracting reserves.
- 2a At cost less depreciation.
- 2b In 1914 and 1920 a portion of receivables may have been included with other current assets.
- 2c In 1914 a portion of deposits may have been included with other current assets. Beginning with 1941 includes an account called temporary cash investments which combined portions of various current accounts and holdings of United States Treasury certificates, marketable securities, time drafts receivable, demand and time loans, deposits, and other similar investments of a temporary character.
- 3 Cost less writedowns to reflect actual or anticipated impairment of value, exclusive of market fluctuations.
- 4 Includes unadjusted debits such as rents and insurance premiums paid in advance, and during the period 1931-1949, deferred assets. This latter account and a corresponding "deferred liabilities" account included under "other" liabilities were grossly inflated in the 1920 balance sheet by the large number of claims and counterclaims developed by the railroads and the U.S. government as a result of federal operation of the railroads during the war. These claims, in general, did not represent cash flows, and their inclusion would have seriously distorted the sources and uses statement in adjoining periods. Therefore, for the periods 1914-1920 and 1921-1931 both deferred assets and deferred liabilities were eliminated, even though in so doing some actual cash transactions may have been inadvertently excluded from our statement. The changes in these eliminated accounts, and in total sources and uses including these accounts, are as follows:

	July 1, 1914- Dec. 31, 1920	Jan. 1, 1921- Dec. 31, 1930
<i>Uses</i>		
Deferred assets	-1,211.9	-1,659.6
Total uses	5,611.5	6,176.0
<i>Sources</i>		
Deferred liabilities	-1,882.5	-2,102.9
Total sources	6,597.0	3,737.6

Line

- 6 Net income less cash dividends, plus the following: (a) defaulted interest since 1929 (the difference between interest accruals, treated in income state-



ments as an expense, and interest payments); (b) profit on road and equipment, except that after 1935 the profit on depreciable property was credited to depreciation reserves, and was not readily available for inclusion in retained income; (c) delayed income credits (available separately until 1912, thereafter included directly in net income).

- 7 Includes depreciation charges plus the value of retirements charge to operating expense. Source: Association of American Railroads, *Statistics of Railways of Class I, United States, Statistical Summary Numbers 3, 13, 27, and 35*. This compilation covers Class I roads and their lessors for this account and hence had to be reduced by 16.07 per cent for the period 1914-1920 in order to eliminate lessors. The ratio represents book value of road and equipment of the lessors of Class I roads to the book value of road and equipment of Class I roads and their lessors on December 31, 1920.
- 8a Short-term loans, bills, and miscellaneous accounts payable.
- 8b Accrued tax liability includes payroll taxes in later years. Prior to the period 1931-1940, taxes were included with "other liabilities."
- 9a,b,c Common stock and preferred shares are at par values. Bonds represent cash raised, with the exception of bonds sold to other railroads which are valued at par. Except as noted, derived from R. W. Goldsmith's forthcoming *A Study of Savings in the United States* to be published by the Princeton University Press. Goldsmith's series on bonds include the railroad net bonds issued series of the National Bureau of Economic Research Corporate Bond Research Project plus equipment obligations and income bonds. His series on stocks represent the changes in stocks outstanding as reported by ICC adjusted for changes in intercorporate holdings, changes due to reorganization, changes due to stock dividends and to conversion of bonds, and for duplications. Net interrailroad security sales were added back to the Goldsmith series. In the case of stocks such data were directly available in Goldsmith's compilation. For bonds the change in interrailroad holdings, as reported by ICC were taken except for the 1941-1949 periods when the effect of reorganization revaluations was seriously evident. The ratio of the change in interrailroad holdings to net bonds issued during 1914-1940 was employed to estimate net interrailroad bond sales in this period.

In order to eliminate stocks and bonds issued by railroads other than those represented in our sources and uses statement, the series described above were reduced by 22.9 per cent in 1914-1920, 8.5 per cent in 1921-1930, 8.9 in 1931-1940 and 7.7 in 1941-1949. The ratios represent the proportion of the book value of road and equipment of railroads not included in our table to those covered by the original stock and bond series.

In addition, for completeness, changes in unpaid conditional sales contracts outstanding for Class I roads for 1938-1949 were added to the debt data with an estimate for their lessors based on the value of road and equipment.
- 9d Investment in affiliated companies, reported in the ICC balance sheets under assets, have been excluded from uses of funds and are here deducted from net new issues in order to eliminate intercompany duplications.
- 10 Unadjusted credits and deferred liabilities.
- 12 Line 5 minus line 11.