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Railroad Investment Before the Civil War

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IN THIS paper I re-examine the basic data on railroad investment before 1860. The project was designed initially to improve our understanding of the quantitative aspects of the role of the railroad in the economic development of the United States during the period. Our statistical knowledge is confined almost exclusively to Henry Varnum Poor's and Armin Shuman's annual data on total railroad mileage and net mileage added since 1830.¹ There are serious weaknesses in the series, not the least of which is the fact that they give a distorted picture of the amount of railroad investment in specific years.

Our available knowledge of early railway statistics makes it difficult to formulate reliable estimates of the investment entailed by annual additions to the railway network. We cannot even approximate the ratio of annual railway investment expenditures to total investment expenditures, the relative importance of annual railway construction expenditures compared with canal, road, and shipping construction expenditures, or the relation of railway investment expenditures to cyclical fluctuations in business activity.

Imperfect and disorderly as the data may be, an attempt ought to be made to answer these questions. Economic historians, and particularly historians of specific railroads, have too frequently ignored the problems connected with the compilation of the necessary detailed data. This paper examines the basis for additions to our knowledge of the annual volume of railway building.

Why this aspect of railway investment in the pre-Civil War period has been neglected is not, I think, difficult to explain. The knowledge propagated before World War I by Ripley, Cleveland, Powell, and others of the vagaries of railway finance has encouraged a general skepticism with respect to the reliability of railway reports and accounts. Experience in the post-Civil War period has perhaps influenced unduly

¹ For Poor's estimates see *Historical Statistics of the United States, 1789-1945*, Dept. of Commerce, 1949, p. 200. Shuman's estimates are contained in *1880 Census of the United States*, Vol. IV, *Report on the Agencies of Transportation in the United States*, Part 1, Armin E. Shuman, *Railroads in the United States*. In addition, there are the decade mileage estimates given in *Hunt's Merchants' Magazine* and the cost of construction estimates provided in the *1860 Census of the United States, Preliminary Report*; also Dionysius Lardner's cost estimates contained in his *Railway Economy*, London, Taylor, Walton and Maberly, 1850, pp. 403-406.

our attitude towards the usefulness of such documents of the pre-Civil War decades.

Emphasis on rate making, profitability, the railroad as a going concern tended to smother interest in railway documents as sources of historic costs. It is true that the item in the accounts labeled "cost of road" was improperly manipulated on occasion by management. But the manipulation involved in many instances charging operating expenses to construction account in order to deceive the public as to the condition of the road.²

Ideally, the national income statistician should have data on net as well as gross capital formation by railroads for the pre-Civil War period comparable with Melville J. Ulmer's recent estimates for the post-1870 period.³ However, Ulmer's estimates for the pre-1912 period are very rough approximations derived by sampling technique for selected years. Ulmer's annual estimates have many of the weaknesses of Poor's data, since interpolation of inter-sample years was based on Poor's data. These annual estimates cannot be regarded as a substitute for a historical investigation into either gross or net investment for 1870 to 1912.

My paper is divided into three parts. The first examines the reliability of existing data. In the second section, estimates of railway construction costs in the New England and Middle Atlantic states are presented from data collected by Poor. The concluding section summarizes the results of my own investigation into estimated initial construction costs for 1,000 miles of railroad in seven southern and three midwestern states for 1830-40.

Total Mileage Estimates

The data most frequently employed to illustrate the annual growth of U.S. railroads are Poor's estimates of net mileage added since 1830. In recent years the inclusion of Poor's data in the historical supplement to the *Statistical Abstract of the United States* has contributed to this practice. What is surprising, however, is the apparently uncritical acceptance of Poor's estimates and the even more uncritical applications

² William Z. Ripley, *Railroads, Finance and Organization*, Longmans, Green, and Co., 1915, p. 22. F. A. Cleveland and F. W. Powell define construction as "the building of all the fixed properties used by a railroad in conducting the business of transportation. It pertains, therefore, to the roadway and structures as distinguished from rolling stock and other equipment. In its fullest sense it comprehends grading, tunneling, construction of bridges, trestles and culverts; purchase and laying of ties, rails, and other parts of the roadway including ballast; building and equipping of stations and office buildings, shops, and engine-houses, as well as water front structures and power plants. It also includes engineering, supervision, and inspection, and the acquiring of fee title to lands and right of way." *Railroad Finance*, D. Appleton and Co., 1912, p. 50.

³ Melville J. Ulmer, *Trends and Cycles in Capital Formation by United States Railroads, 1870-1950*, National Bureau of Economic Research, Occasional Paper 43, 1954.

of them. This section inquires into the general reliability of Poor's estimates and examines critically the various uses to which his data have been put.

I have attempted to evaluate Poor's data for 1830-60 by comparing his estimates with those prepared by Armin Shuman for the 1880 census and also with my own estimates for eight states of the South and Midwest for the 1830's.

Poor's original estimates appeared in his *Manual of the Railroads of the United States for 1868-69* and were continued in successive volumes of the *Manual*.⁴ Annual net-mileage-added data are presented both by state and by region beginning in 1835 and continuing through 1867. Nowhere in this volume does he refer directly to the sources used for the compilation of his data. Presumably, for the early period, he relied principally on information from railroad reports and supporting documents.

Shuman's data are more detailed than Poor's and show net mileage added by individual railroad for 1830-80. Since Shuman's data are presented by railroad rather than by state, his estimates are easier to check for accuracy. His estimates were tabulated from data prepared for the census by every railroad corporation known to have been in existence in 1880. Of the 1,174 railroad corporations owning finished roads all made full reports on construction of their roads. The making of returns was entirely voluntary, but full coverage was sought in the following census memorandum:

In cases . . . in which the records have been lost, the officers of such companies and roads are requested to obtain and supply this information in the best form possible. The recollection of officers and employes long in the service of a road may be used as a basis in making up this statement, if more reliable data be not accessible.⁵

Table 1 compares the Poor and Shuman estimates of total and net mileage added by U.S. railroads for the first three decades of the railroad era. For the period as a whole the estimates are remarkably similar. At the end of the first decade (1839), the difference amounted to only 37 miles out of a total of more than 2,000 miles in existence. At the end of the second decade (1849), the percentage difference was even smaller—55 miles out of a total of over 7,000 miles. By 1859 the gap had widened, but not significantly. Out of a total of more than 27,000 miles, Poor's estimate exceeded Shuman's by 1,369 miles.

The general agreement on total mileage, however, should not obscure the differences between the two estimates for specific years. For

⁴ Henry V. Poor, *Manual of the Railroads of the United States for 1868-69*, H. V. and H. W. Poor, 1868, pp. 20-21.

⁵ *1880 Census*, Vol. iv, Part 1, p. 288.

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TABLE 1
 Poor's and Shuman's Estimates of Total Mileage and Net Mileage Added
 by United States Railroads, 1830-1860

Year	TOTAL MILEAGE		NET MILEAGE ADDED		Difference (4)-(3) (5)
	Poor (1)	Shuman (2)	Poor (3)	Shuman (4)	
1830	23	40	23	40	17
1831	95	139	72	99	27
1832	229	330	134	191	57
1833	380	446	151	116	-35
1834	633	660	253	214	-39
1835	1,098	798	465	138	-327
1836	1,273	1,078	175	280	105
1837	1,497	1,426	224	348	124
1838	1,913	1,879	416	453	37
1839	2,302	2,265	389	386	-3
1840	2,818	2,755	516	490	-26
1841	3,535	3,361	717	606	-111
1842	4,026	3,866	491	505	14
1843	4,185	4,154	159	288	129
1844	4,377	4,334	192	180	-12
1845	4,633	4,610	256	276	21
1846	4,930	4,943	297	333	36
1847	5,598	5,206	668	263	-405
1848	5,996	6,262	398	1,056	658
1849	7,365	7,310	1,369	1,048	-321
1850	9,021	8,572	1,656	1,261	-395
1851	10,982	9,846	1,961	1,275	686
1852	12,908	12,134	1,926	2,288	362
1853	15,360	14,304	2,452	2,170	-282
1854	16,720	17,746	1,360	3,442	2,082
1855	18,374	20,199	1,654	2,453	799
1856	22,076	21,670	3,702	1,471	-2,231
1857	24,503	23,747	2,427	2,077	-350
1858	26,968	25,713	2,465	1,966	-499
1859	28,789	27,420	1,821	1,707	-114
1860	30,626	28,920	1,837	1,500	-337

Source: *1880 Census of the United States*, Vol. IV, Part I, pp. 288-289. *Historical Statistics of the United States 1789-1945*, Dept. of Commerce, 1949, p. 200.

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example, Shuman estimated net mileage added in 1835 as 138; Poor's figure is 465. In 1847 Poor's data show 668 miles added. Shuman's data indicate only 263 miles. In 1854 Shuman's estimate exceeds that of Poor's by 2,000 miles. On the other hand, Poor's estimate for 1856 exceeds Shuman's by 2,200 miles. The differences between the two estimates for particular years are disturbing to anyone using them to compare railroad development from one year to the next.

One plausible explanation for the discrepancy is that the differences are due simply to errors of reporting. Furthermore, there is some ambiguity as to what exactly is being measured. Poor's data are allegedly estimates of "miles operated" and Shuman's "miles completed." The distinction might conceivably be important, though I doubt it. It is possible for mileage to have been completed and cars operated thereon without the road having been opened formally to commercial traffic. Since contracts were generally let by section, some sections were completed before others. The date of completion in each case might or might not correspond with the date a portion of the road was finally opened to traffic. The relevant documents are not always clear on this point.

My reason for thinking that the differences are due to errors of reporting is revealed in Table 2, which compares Poor's estimates of miles operated with the estimates given in *Hunt's Merchants' Magazine*, and with my own estimates of mileage completed for eight states in the South and Midwest for 1830-40.

TABLE 2
Total Railroad Mileage to 1840 for Eight Southern and Midwestern States as
Estimated by Poor, *Hunt's Merchants' Magazine*, and Wicker

State	MILEAGE OPENED TO DECEMBER 1840		
	Poor	<i>Hunt's Merchants' Magazine</i>	Wicker
Virginia	147	341	281
North Carolina	53	247	246
Georgia	185	212	210
South Carolina	137	136	136
Michigan	59	114	39
Louisiana	40	62	5
Alabama	46	51	45
Kentucky	28	32	28
Total	695	1,195	990

Source: H. V. Poor, *Manual of the Railroads of the United States for 1868-69*, H. V. and H. W. Poor, 1868, pp. 20-21. *Hunt's Merchants' Magazine*, Vol. xxv, September, 1851, pp. 381-382. My own estimates were prepared from railroad reports, railroad histories, and miscellaneous reports of state boards of internal improvements and public works.

Poor's estimate of total mileage operated at the end of 1840 for these eight states falls short of my estimate by almost 300 miles. The estimate in *Hunt's* exceeds mine by a little over 200 miles; however, the greater part of this difference is easily accounted for since my estimates for Michigan and Louisiana are incomplete.

The greatest disparity between Poor's data and mine occurs in the estimates for Virginia and North Carolina. My estimates exceed those of Poor by 327 miles but fall short of *Hunt's* by some 60 miles. There is no basis for Poor's estimate of 53 miles for North Carolina at the end of 1840. The Raleigh and Gaston Railroad (85 miles) was opened to traffic in April, 1840, and the Wilmington and Raleigh (161 miles) was completed on March 9, 1840.⁶ Moreover, I find no justification for Poor's figures for Virginia.

I think that the total mileage evidence clearly shows the unreliability of Poor's *annual* data for the 1830-40 period. The discrepancies are large and can be attributed more to carelessness in accumulating data than to interpretation.

Shortcomings in Poor's data arise also from the variety of purposes for which they have been employed. Net-mileage-added data can be used for four purposes: (1) to indicate annual geographical diffusion of the railroad, (2) to measure crudely the annual output of the railroad industry, (3) to show long-term trends in the growth of railroad mileage, and (4) to measure the volume of railway construction costs. The most satisfactory uses of Poor's data are the first and the third; that is, for constructing a trend rate of increase of railway mileage and as a measure of the annual geographical diffusion of the railroad. For want of a better index of output, net mileage added is useful. However, neither "miles completed" nor "miles operated" is entirely satisfactory as a measure of the volume of railway construction. However, L. H. Jenks has taken Poor's net mileage added data as a sufficiently good index of railroad construction to compare "railway building" with the "general contours of major business cycles." He has written:

The second moment of the railroad as an economic force came with the actual construction of new lines. The statistics of net mileage added in each year from 1837 to 1937 give a quantitative measure of this contribution of the railroad to development. . . . Two general statements are strikingly supported by these data. In the first place, railway building proceeded in an undulating pattern, paralleling closely the general contours of major business cycles until the First World War. From 1850 to the nineties, omitting the years of the Civil War, the rise and fall in new construction in fact led by a perceptible interval most other indices of business conditions.

⁶ C. K. Brown, *A State Movement in Railroad Development*, University of North Carolina Press, 1928, p. 48. See also H. D. Dozier, *A History of the Atlantic Coast Line Railroad*, Houghton Mifflin, 1920, p. 59.

In the second place, there was a long-run trend in new railway construction which was predominantly upward in absolute figures from the late 1840's to about 1890.⁷

Poor's and Shuman's data on net miles added probably do not approximate the volume of capital outlay for construction in specific years, because accurate estimates would require that actual construction be commenced and completed in the same calendar year. Otherwise, net-mileage-added figures do not reflect accurately the volume of capital outlay in the given year. Consequently, Poor and Shuman overestimate the volume of construction in the year mileage was opened to traffic and underestimate it in the immediately preceding years. The longer the period of construction, the greater the distortion. The distortion is even greater than at first appears, since the greatest expenditure—grading and masonry—is made in the initial construction stages, the later stages being taken up with the less expensive process of laying the rails.

This distortion is clearly revealed by two examples. The contracts for work on the first 13 miles of the Baltimore and Ohio Railroad were awarded in October, 1828. Work on this portion of the road began immediately. Twelve months later, 25 miles were ready and prepared for laying the rails. Only 3 miles, however, were actually completed in 1829. The cost of the work done on the 25 miles was more than \$735,000 (for grading and masonry). The first 13 miles of the road were not opened for traffic until May 1830, about eighteen months after construction commenced. The total expenditure reported in the company's fourth annual report from the date construction began was approximately \$756,000, most of which had been incurred in the preceding year. The time actually taken to lay the first 13 miles of track was estimated to be roughly six weeks, and the actual cost was not much more than \$4,000 per mile.

From the first four annual reports of the Baltimore and Ohio Railroad, it is apparent that net mileage added in the year 1830 gives a false impression of the outlay for construction for 1830. As the reports show, most of the construction costs for the initial 13 miles were incurred in the preceding year, 1829. Furthermore, an additional 12 miles, making 25 miles in all, were ready for rail-laying in 1829. However, that portion of the road was not opened for traffic until 1831.

Another example is the South Carolina Railroad, which commenced in January, 1830. By the end of that year only 6 miles had been completed. Two years later, in November 1832, 62 miles were opened for traffic. Moreover, the bulk of the construction expenditures on this portion of the road were incurred in the previous year, 1831, a fact

⁷ L. H. Jenks, "Railroads as an Economic Force in American Development," *Journal of Economic History*, May 1944, p. 4.

totally unrevealed by the net-mileage-added data. By May of 1832 the entire line (136) was under contract and proceeding as follows: "ninety-four miles had the piles driven, seventy-two miles were capped, forty-six miles were railed, and twenty-three miles in detached sections ready for running the cars."⁸

By assuming an average period of construction for the early U.S. railroads, we could use net-mileage-added data to construct an annual index that would more adequately reflect actual capital outlay. R. C. O. Matthews has suggested an index of expenditures for railroad building in Britain for 1833-43 based on mileage opened. He has assumed a two-year period of construction and has taken "as an indication of the amount of work on hand in any year the mileage opened in that year plus the mileage opened in the two succeeding years. . . ."⁹

If the data available are restricted to annual mileage opened, then Matthews's technique seems preferable to Jenks's; that is, using net-mileage-added data as an index of railway construction costs in a given year. Fortunately, prospects are more encouraging for a better index of railway construction costs for the United States.

Poor's Cost-of-Road Estimates

Jenks's suggestion that railway building since 1837, measured by net mileage added, has paralleled closely the general contours of the major business cycles is hardly more than a first approximation. Net-mileage-added data scarcely provide a reliable yardstick of railway investment by which to judge either the magnitude or the timing of its direct economic impact or its relative importance vis-à-vis other forms of investment. A re-examination of the available data on railway expenditures may suggest ways of filling these lacunae.

In addition to the estimates of total mileage contained in the *Manual*, Poor collected a miscellany of financial data on railway development in his *History of the Railroads and Canals of the United States*.¹⁰ The *History* was designed as "a comprehensive statement of the progress, cost, revenues, expenditures and financial condition of the Railroads and Canals of the United States." Although it was originally planned as three volumes, only one was ever published. The title is misleading; the book is merely a compendium of financial information contained in scores of railroad reports and accounts for the railroads of New England

⁸ S. M. Derrick, *Centennial History of South Carolina Railroad*, The State Company, 1930, p. 57.

⁹ R. C. O. Matthews, *A Study of Trade-Cycle History*, Cambridge University Press, 1954, p. 123.

¹⁰ Henry V. Poor, *History of the Railroads and Canals of the United States*, John H. Schultz and Co., 1860, p. v. For an account of the origins of this volume see Alfred Chandler Jr.'s *Henry Varnum Poor*, Harvard University Press, 1956, pp. 211ff.

and the Middle Atlantic states from their origins to 1859. Included are data on the date mileage was commenced and the date mileage was opened to traffic, annual mileage in operation, capital paid in, indebtedness (funded and floating), total liabilities, cost of road, receipts (passenger, freight, mails), operating expenses, and earnings and dividends. The data are summarized by states.

The weaknesses of the presentation are too numerous to list. The railroads had no uniform method of reporting, and Poor made no attempt to adjust the data for purposes of comparison.

The inadequacy of these early reports has been stressed repeatedly; nevertheless, the extent of their inadequacy can easily be exaggerated. There is good reason for thinking that the annual reports are a more reliable source of historical data than we have been led to believe by writers on railroad finance. An editorial attributed to Poor in the *American Railroad Journal* in 1852 stated:

Very few of the exhibits issued by railroad companies come up to the requirements. . . . From a great many of them, no distinct idea whatever can be formed of the condition of the companies. Everything is stated in general terms. We cannot tell how much a road has cost, how much will be necessary to complete it, nor whether the money expended has been well laid out or wasted. So with its operations. Receipts and expenses are stated in gross, and nothing given by which a person can form a correct estimate of the actual results.¹¹

Inadequacies in the cost-of-road account have aroused particular interest. More attention has been focused, I think, on the problem of whether or not the money expended has been well laid out or wasted than on the equally important problem of the reliability of the data on total construction expenditures, including replacement, maintenance, and repairs. Manipulation by management of the cost-of-road account was the result of infrequent attempts to include in capital cost items more properly chargeable to operating expenditures for the purpose of deceiving the public as to the proper condition of the road.¹² Since this manipulation involved in certain specific cases a distortion of net construction expenditures as distinguished from gross expenditures, it does not present as serious a problem to the historian of railroad investment costs as it does to the historian of the railroad as a going concern.

Despite some serious shortcomings in Poor's cost-of-road estimates,¹³ I thought it useful to construct a series on annual construction cost

¹¹ Quoted in Cleveland and Powell, p. 212.

¹² Ripley, p. 22.

¹³ Poor's data frequently, but not always, include costs of rolling stock in cost-of-road estimates. In addition, there are numerous mistakes concerning dates when mileage was opened to traffic.

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using Poor's data as a basis. Poor's cost-of-road estimates supposedly approximate net capital expenditures. However, due to the awkwardness of early accounting methods it would be extremely difficult to separate on a uniform basis for all railroads expenditures for improvements from current expenses on maintenance and repairs. Neither "net" nor "gross" investment in the generally accepted sense describes accurately the nature of the data collected by Poor. The series on construction costs contains the same kind of bias as that contained in Poor's net-mileage-added data; that is, initial costs of construction are "humped" in the year mileage was opened, thereby understating the outlay in the immediately preceding years. Nevertheless, in the absence of more reliable data it provides a tentative basis for judging the magnitude of annual construction spendings. Moreover, Poor's net-mileage-added data are probably more significant for measuring railway building when used in conjunction with his data on costs of road.

TABLE 3
Total Mileage in Operation and Cost of Construction of United States
Railroads by Region, 1850
(dollar figures in millions)

<i>Region</i>	<i>Mileage in Operation</i>	<i>Cost of Construction</i>
New England	2,507	\$ 97.2
Middle Atlantic	2,724	130.4
Southern Atlantic	1,717	36.9
Gulf	287	5.3
Interior	1,354	26.7
Total	8,589	296.5

Source: J. L. Ringwalt, *Development of Transportation Systems in the United States*, John L. Ringwalt, 1888, pp. 116-117. 1860 *Census of the United States, Preliminary Report*, pp. 230-231.

Although Poor's data on cost of road refer to mileage exclusively in the New England and the Middle Atlantic states, operated mileage in those states in 1850 was about 60 per cent of the United States total. The percentage of total construction costs represented by construction in the New England and the Middle Atlantic states doubtless was even higher; for, as a rule, construction cost per mile was higher in New England than in the South. According to the census report of 1860, these states possessed roughly 60 per cent of total railroad mileage in 1850 and accounted for almost 80 per cent of the total estimated construction costs. The figures given in Table 3 are quoted in Ringwalt's *Development of Transportation Systems in the United States* and are taken from the *Preliminary Report* of the 1860 census.

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TABLE 4
Poor's Estimates of Total Mileage, New England and Middle Atlantic States, 1830-1859

Year	Me.	Vt.	Mass.	R.I.	N.Y.	N.J.	Penn.	Del.	Md.	Conn.	N.H.	Total
1830							9		14			23
1831							28		61			89
1832					17		49		69			135
1833					39	52	54		89			234
1834					74	61	91		101			327
1835			114		100	89	217		101			621
1836			128		189	109	228		131			785
1837	11		128		259	132	365		131			1,026
1838	11		176		278	137	377		131			1,110
1839	11		225		367	194	384		179	18		1,378
1840	11		318		394	194	474		179	102		1,672
1841	11		391		414	197	474		199	102		1,788
1842	11		434		573	197	474		296	176	35	2,196
1843	62		442		659	197	474		296	176	35	2,341
1844	62		486	50	688	197	498		296	176	35	2,488
1845	62		570	50	722	197	503		296	202	35	2,637
1846	62		681	50	756	197	503		296	202	103	2,850
1847	62		760	50	766	197	507		296	202	151	2,991
1848	62		947	50	855	247	514		296	202	204	3,377
1849	62	40	1,047	50	1,261	254	522		296	289	376	4,197
1850	112	241	1,125	50	1,453	254	746		296	409	415	5,117
1851	284	378	1,167	50	1,706	269	898	16	324	453	472	6,017
1852	328	477	1,179	50	2,118	299	1,091	16	420	453	547	6,978
1853	384	477	1,184	50	2,312	327	1,217	16	498	577	547	7,589
1854	386	477	1,261	50	2,624	431	1,345	16	498	634	547	8,269
1855	386	488	1,348	64	2,632	450	1,580	16	523	649	547	8,683
1856	462	488	1,361	64	2,632	472	1,950	56	523	654	547	9,209
1857	484	488	1,371	64	2,643	481	2,057	92	548	654	547	9,229
1858	511	512	1,377	64	2,644	481	2,197	92	569	654	547	9,648
1859	511	512	1,393	64	2,644	503	2,350	92	573	665	547	9,854

Source: H. V. Poor, *History of Railroads and Canals of the United States of America*, John H. Schultz and Co.

The census data show 5,231 miles of railroad in operation in the New England and the Middle Atlantic states with an estimated total cost of \$227.6 million. This agrees closely with Poor's estimate of 5,117 miles and \$226.4 million for the year 1850.¹⁴

Table 4 shows Poor's estimates of total railway mileage in the New England and the Middle Atlantic states for which he has compiled data on costs of road. The mileage estimates accompany the financial data in Poor's *History*. The assembled data refer to approximately 80 per cent of the mileage in these states in 1840 and slightly more than 90 per cent in 1850. Poor's *History* contains data on 1,672 miles of railroad in the Middle Atlantic and New England states out of a total mileage of 2,083 in 1840 and 5,117 miles out of a total of 5,612 miles in 1850. The discrepancy between mileage given in Poor's *Manual* for these states and the figures in Poor's *History* arises from failure to obtain data for a large share of the mileage in Pennsylvania. According to Poor's *Manual* there were 754 miles in operation in Pennsylvania in 1840; whereas Poor's data on construction cost in the *History* refer to only 474 miles. In 1850 Poor's figures on construction cost refer to 746 miles in Pennsylvania out of an "actual" total of 1240.¹⁵

Poor's data on cost of road by state are given in detail in Table 5 and summarized in Table 6.

Table 6 reveals a fairly steady increase in expenditures for construction during the first decade with the exception of two sharp breaks, one in 1835 and the other in 1838. Two things however should be borne in mind about the data on construction costs. The first is that mileage completed in 1835 and opened to traffic had been under construction for at least three years. Poor's *History* indicates 114 miles of railway opened in Massachusetts in 1835 with an approximate construction cost of \$4 million. All of the mileage had been under construction since the end of 1832. The Boston and Lowell was commenced toward the end of November 1831 and opened June 26, 1835; the Boston and Worcester was started in August 1832 and completed July 3, 1835; the last of the three Massachusetts roads, the Boston and Providence, was put under construction in December 1832 and completed in June 1835. The greater proportion of the expenditures on all the roads had been incurred before 1835. The second point is that mileage under construction in 1835 included mileage opened in succeeding years. Considering that over 400 miles were opened in 1836 and 1837, it is reasonable to suppose that the greater part of this mileage was under construction in 1835, thus raising the construction costs figures above those of preceding years.

¹⁴ The data quoted by Ringwalt are taken from the *1860 Census, Preliminary Report*. The source of the construction cost estimates is not given. As far as I can determine, no further information appears in the published reports of the 1860 census. For Poor's estimates see Table 6.

¹⁵ Poor's mileage estimates by state are given in the *Manual*, p. 20.

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TABLE 5
 Poor's Data on Cost of Road for New England and Middle Atlantic States, 1830-1859
 (thousands of dollars)

Year	Me.	Vt.	Mass.	R.I.	N. Y.	N. J.	Penn.	Del.	Md.	Conn.	N. H.
1830							188		1,178		
1831							479		2,079		
1832					795		1,197		2,280		
1833					1,329	1,374	1,513		3,189		
1834					1,681	2,338	2,942		3,619		
1835			3,973		2,682	3,614	7,761		3,911		
1836			4,496		5,001	4,275	8,392		5,761		
1837	354		5,029		6,145	5,122	12,956		6,105		
1838	354		6,819		7,201	5,398	13,399		6,251		
1839	354		8,968		9,076	6,161	13,928		8,114	730	
1840	354		11,776		9,579	6,368	18,453		8,723	2,629	
1841	354		15,600		9,701	6,661	19,761		8,997	3,023	
1842	379		19,067		16,834	6,822	21,862		12,024	4,341	725
1843	1,427		19,624		19,516	7,213	22,477		12,213	4,380	743
1844	1,538		21,136	1,950	20,357	7,430	24,947		12,334	4,708	750
1845	1,615		23,705	1,920	22,269	7,731	26,478		12,534	5,269	800
1846	1,629		27,615	1,902	22,988	7,740	27,973		12,617	5,423	2,500
1847	1,639		33,922	1,899	24,849	7,756	29,965		12,986	5,928	5,245
1848	1,407		43,859	1,887	33,252	8,583	32,886		13,891	6,943	7,134
1849	1,427	800	49,822	2,094	50,514	9,615	35,160		14,141	8,834	11,710
1850	3,071	8,431	51,645	2,046	63,632	11,193	42,689	909	14,397	13,721	14,636
1851	8,405	15,753	52,729	2,000	72,495	12,992	50,113	909	18,881	15,495	15,116
1852	11,202	18,381	54,219	1,893	88,340	14,684	63,281	909	24,542	16,963	16,668
1853	13,017	19,364	57,616	1,976	106,330	15,304	67,553	909	27,300	22,438	16,930
1854	13,573	19,767	59,135	1,954	122,457	19,850	78,366	909	29,333	23,152	17,383
1855	14,142	21,763	61,836	2,364	129,148	21,627	97,725	909	30,125	23,993	17,910
1856	16,930	21,784	61,653	2,338	130,093	24,960	121,269	1,131	31,849	24,112	18,420
1857	17,026	21,786	61,848	2,306	129,284	26,898	130,926	2,180	33,745	24,204	17,557
1858	18,098	23,133	62,312	3,272	129,369	26,985	135,863	2,201	34,836	24,327	17,627
1859	18,382	23,133	62,527	3,259	131,539	27,399	139,729	2,421	35,228	24,748	17,627

Source: H. V. Poor, *History of the Railroads and Canals of the United States of America*, John H. Schultz and Co., 1860.

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TABLE 6
 Poor's Estimates of Cost of Road for New England and Middle
 Atlantic States, 1830-1859
 (dollar figures in millions)

Year	MILEAGE		COST OF ROAD	
	Total	Net	Total	Annual
1830	23	23	\$ 1.4	\$ 1.4
1831	89	66	2.6	1.2
1832	135	46	4.3	1.7
1833	234	99	7.4	3.1
1834	327	93	10.6	3.2
1835	621	294	21.9	11.3
1836	785	164	27.9	6
1837	1,026	241	35.7	7.8
1838	1,110	84	39.4	3.7
1839	1,378	268	47.3	7.9
1840	1,672	294	57.9	10.6
1841	1,788	116	64.1	6.2
1842	2,196	408	82.1	18
1843	2,341	145	87.6	5.5
1844	2,488	147	95.3	7.7
1845	2,637	149	101.3	6
1846	2,850	213	110.4	9.1
1847	2,991	141	124.2	13.8
1848	3,377	386	149.8	25.6
1849	4,197	820	184.1	34.3
1850	5,117	920	226.4	42.3
1851	6,017	900	264.9	38.5
1852	6,978	961	311.7	46.8
1853	7,589	611	348.7	37
1854	8,269	680	385.9	37.2
1855	8,683	414	421.5	35.6
1856	9,209	526	454.5	33
1857	9,429	220	467.8	13.3
1858	9,648	219	478	10.2
1859	9,854	206	486	8

Source: H. V. Poor, *History of the Railroads and Canals of the United States of America*, John H. Schultz and Co., 1860.

For similar reasons construction activity in 1838 was greater than that indicated in Table 6. Since 562 miles of road were opened in 1839 and 1840, Poor's reported expenditures for 1838 underestimate actual construction activity. Judging from net mileage added figures alone we notice a leveling off in construction beginning in 1843 and continuing almost uninterrupted until the upsurge beginning in 1848. Table 6 reflects this slackening, but indicates increased spendings after 1845. According to Cleveland and Powell, construction during the second

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decade of the railroad era was heaviest in the New England states. Expenditures increased from \$6 million in 1845 to \$47 million in 1852. Thereafter, they began to fall off. The New England and Middle Atlantic network neared completion, and activity shifted toward the interior.

Although Poor exaggerates the amount expended on mileage opened to traffic in a given year, it does not follow he necessarily exaggerates the amount of work under construction in that year. Construction in any year is related as well to net mileage opened in the immediately succeeding years. The amount of work undertaken in any particular year may be indicated, following Matthews, by the amount of net mileage opened in that year plus net mileage opened in succeeding years, depending upon the period of construction. Matthews has accepted an average period of construction of about two years for the mid-1840's in England. However, the period, he believes, may have been longer in the 1830's.

For the U.S. railroads during the 1830's and the early 1840's my guess is that the average period of construction was roughly two years, perhaps three. Of course, there is much variation, depending upon the amount of construction put under contract. The only information we have is the date mileage commenced and the date it was completed; often there is no information on the amount of road put under contract at any one time.

Table 7 provides an index of the amount of "work in progress" obtained from net-mileage-added data, taking as an index of the amount of work in progress, net mileage added in the given year and net mileage added in the two succeeding years.

It is interesting to compare this work-in-progress index with Poor's cost-of-road data for the same period. The work-in-progress index shows peaks in 1835, 1840, and 1842. Poor's cost-of-road data indicate peaks in 1835, 1837, 1840, and 1842. The work-in-progress index shows

TABLE 7
Index of Railway Building in New England and Middle Atlantic
States Based on Net Mileage Added, 1828-1845
(1838 = 100)

<i>Year</i>		<i>Year</i>	
1828	4	1837	92
1829	14	1838	100
1830	21	1839	105
1831	33	1840	127
1832	37	1841	104
1833	75	1842	108
1834	85	1843	68
1835	108	1844	79
1836	76	1845	78

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1840 as the year of most intense railway building, whereas Poor's data show 1842 as the peak year of railway investment.

In the absence of more detailed and reliable data for the New England and Middle Atlantic states, it is unlikely that we can resolve further the question as to the relative magnitude of railway building as given by Poor's net-mileage-added data when adjusted for work in progress and by Poor's cost-of-road estimates.

*Initial Construction Cost for 1,000 Miles of
Railway in the South and Midwest*

In the preceding sections I indicated the main sources and principal weaknesses of our quantitative knowledge of railway building in the pre-Civil War era. Here I shall summarize the results of my own investigation into construction costs for approximately 1,000 miles of railroad in seven southern and three midwestern states for the period 1830-40.

My purpose is to supplement Poor's data on construction costs and to suggest a method for improving his estimates for the New England and the Middle Atlantic states by a thorough re-examination of early railway reports and various supporting documents.

In Table 8, I show estimates of initial construction cost for approximately 1,000 miles of railroad, 1830-40. The estimates include only initial construction costs. No attempt is made to separate net and gross capital expenditures in subsequent years of the decade. The mileage is restricted to seven southern and three midwestern states for which Poor

TABLE 8
Estimated Initial Construction Costs of 1,004 Miles of Railroad
in Seven Southern and Three Midwestern States, 1830-1840
(thousands of dollars)

<i>Year</i>	<i>Estimated Initial Construction Cost</i>
1830	114
1831	321
1832	675
1833	665
1834	372
1835	876 ^a
1836	1,254
1837	3,412
1838	4,725
1839	3,420
1840	2,609

^a Not included are estimates for railway construction in Kentucky. Expenditures to 1836 are estimated to have been \$536,738. The Lexington and Frankfort, the first railroad in Kentucky, was completed in 1835.

has not published data. According to Poor's estimates, mileage in these states represented about 35 per cent of the total mileage in the United States in 1840.

Data were obtained from the annual reports of the individual roads and from the reports of the state boards of public works and internal improvements. Also helpful were railway histories, especially those of Phillips, Dozier, and Derrick; *Meyer's History of Transportation*; and *The American Railroad Journal*.¹⁶ Many of the older railway histories, however, suffer a notable absence of a critical approach to or even extensive use of available accounting records. Where they were used, their use was confined to the sources rather than the uses of finance.

During the 1830-40 period, railroads were financed largely by receipts from shares and were designed to serve local rather than regional or national needs.¹⁷ Cleveland and Powell have argued that "Construction of the early local railroads was generally financed by means of the proceeds of sales of corporate shares. It was the practice to begin with subscriptions to share capital by persons interested in local manufacturing or commercial enterprises or by local investors who had accumulated savings or inherited small estates. These subscriptions were paid in cash; . . . This is particularly true of the New England railroads. . . . This was the method common to the railroads of the Atlantic seaboard states prior to 1840."¹⁸ Nevertheless, some payments for construction work were made in the form of stock shares; for example, the fourth report of the Central Railroad and Banking Company of Georgia states: "By the condition of our late contracts for grading, the contractor is to receive in payment 75 per cent in the Stock of the Company at par value and the remaining 25 per cent in cash—prices at the estimate of the Engineer."¹⁹

Table 9 presents detailed figures on annual construction costs by individual railroad for the southern states. For the midwestern mileage, most of which was undertaken by the states, estimates of expenditures are shown by state rather than by separate railroad.

In this series, cost estimates for the southern railroads were not always available for each year during which the road was under contract. Sometimes detailed estimates were made by the chief engineer for the year construction commenced. Comparable detailed estimates sometimes were not given again until the work was substantially completed.

¹⁶ U. B. Phillips, *A History of Transportation in the Eastern Cotton Belt to 1860*, Columbia University Press, 1908. Howard D. Dozier, *A History of the Atlantic Coast Line Railroad*, Houghton Mifflin, 1920. Also, Samuel M. Derrick, *Centennial History of South Carolina Railroad*, The State Company, 1930, and *History of Transportation in the United States before 1860*, prepared under the direction of Balthasar H. Meyer, P. Smith, 1948.

¹⁷ George R. Taylor and Irene D. Neu, *The American Railroad Network 1861-1890*, Harvard University Press, 1956, p. 4.

¹⁸ Cleveland and Powell, pp. 50-51.

¹⁹ *Fourth Annual Report of the Central Railroad and Banking Company of Georgia*, p. 43.

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TABLE 9
Initial Railway Construction Costs: By Railroad for Fourteen Railroads in the South and by State for Alabama, Michigan, Illinois, and Indiana, 1830-1840
(thousands of dollars)

<i>Area and Completed Mileage</i>	1830	1831	1832	1833	1834	1835	1836	1837	1838	1839	1840	Total
BY RAILROAD:												
South Carolina (136)	42	284	332	293								951
Petersburg (59)			280	235								515
Portsmouth and Roanoke (62)				75	143	198	236	138	111			902
City Point (9)									146			146
Louisiana (22½)									114			243
Greenville and Roanoke (18)						50	151	38				239
Richmond, Fredericksburg, and Potomac (61)						327	141	506	43			1,017
Winchester and Potomac (27)					172	239	111	166	277			523
Richmond and Petersburg (22)							83	421	421			526
Central of Georgia (122)							70	391	394	308	359	1,580
Raleigh and Gaston (85)							65	391	394	99	99	1,343
Wilmington and Raleigh (161)								530	649	234	534	1,947
Georgia (88)						61	396	483	459	459	153	2,011
Ponchartrain (4½)	72											72
BY STATE:												
Alabama (45)		36	62	62	57							219
Michigan (38)								271	459	446		1,176
Illinois (24)									1,053	1,440	1,323	3,816
Indiana (20)								338	599	139	141	1,217
Total (1,004)	114	321	675	665	372	876	1,254	3,412	4,725	3,420	2,609	18,444

Detail may not add to totals because of rounding.

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The only estimate that I was able to obtain, for example, for the Central Railroad of Georgia was for 1839; for the Greenville and Roanoke railroad, data were available only for 1837. In most cases the gap was confined to one year. The problem, therefore, was to find a suitable procedure for interpolating construction costs in the years with no reports. Three techniques were considered.

The first involved multiplying the estimate of net mileage added in the year with no report by the average cost per mile computed when construction was completed. The second procedure, which was actually adopted, involved distributing the difference in total construction costs between the observed years on an average monthly basis. Suppose that the reported total cost of construction of a railroad to November 30, 1831 was \$100,000, and total construction cost to April 1, 1833 was \$260,000. The amount expended between November 30, 1831 and April 1, 1833 would be \$160,000. To obtain estimates on a calendar year basis, the \$160,000 would be allocated over the sixteen months, yielding an average monthly expenditure of \$10,000. Estimated expenditures in 1831 would total \$110,000; in 1832, \$120,000, and in 1833, \$30,000.

Both procedures are highly arbitrary. Nevertheless, there is good reason for thinking that the second involves a smaller degree of error. Actual construction cost, according to the first method, is underestimated since it fails to take into account construction in process; it simply estimates the total cost of mileage completed in a given year. The second method, moreover, tends to overestimate costs in the period immediately preceding completion of the road. Why? The larger proportion of construction costs are incurred in grading, excavating, grubbing, and so forth, which takes place before laying of the rails. Some idea can be formed of the relative importance of the different items in the construction accounts by selecting two examples from railroads in operation by 1845.

1. The total amount expended on construction by the Portsmouth and Roanoke to April 20, 1838 was apportioned as follows:²⁰

Excavation and embankment	\$202,365
Land damage and clearing	24,867
Engineering accounts	34,430
Iron spikes and plates	100,129
Superstructure	64,439
Rails, sills, and keys	95,836
Land and buildings erected	43,401
Contingent expenses	4,301
	<hr/>
Total	\$569,768

²⁰ *Seventh Annual Report of the Portsmouth and Roanoke Railroad, 1839.*

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2. The total estimated cost of the Central Railroad of Georgia was \$2,205,509 excluding motive power and cars. The cost of construction was distributed as follows:²¹

Grading	\$975,898
Culverts of masonry	49,000
Bridges	126,000
Superstructure	424,000
Iron rails, spikes, and plates	476,081
Engineering	154,530
Total	\$2,205,509

Although a large share of construction costs are taken up in the early stages with grading, excavating, bridging, and so forth, I do not think we can generalize on the ratio of total construction costs to cost of laying rails. The inability to specify the average magnitude of this ratio eliminates a third possible procedure for allocating costs in the years with no reports.

Estimates of annual railway construction costs in Michigan, Illinois, and Indiana are confined to those roads financed entirely by the state governments. Detailed data appear in the annual reports of the boards of public works and internal improvements in each of the three states. Tables 10 and 11 show aggregate state expenditures for individual railroad in Michigan and Illinois. Mileage commenced by Indiana was on a less ambitious scale. Twenty miles of railroad were completed in 1839, and an additional 37 miles were under construction.

Illinois had in 1838 500 miles of railway under contract, only 24 miles of which had been opened to traffic by January, 1840. Construction was halted in 1840 on the grounds that the original plan had been much too ambitious and involved expenditures beyond the financial capacity of the state.

Michigan had under construction approximately 580 miles at the end of 1839, 39 miles of which were opened to traffic.

The financial crisis of 1837 took its toll and brought the state "mania" for railway building and other improvements virtually to a halt by the end of 1840. There was little to show in the way of completed mileage—only 80 miles out of a projected total of more than 1,137 miles. But the expenditures by Michigan, Illinois, and Indiana exceeded \$6 million during the 1836–40 period, approximately 44 per cent of the estimated total construction costs of the 1,000 miles of railroad considered in this section.

It seems clear, therefore, that net mileage added data for 1837–40 cannot be made to support Jenks's conclusion about the relation of

²¹ *Tenth Annual Report of the Central Railroad of Georgia, March 25, 1844, p. 92.*

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TABLE 10
 Aggregate Expenditures of the State of Illinois for the
 Construction of Railroads, 1838-1840
 (thousands of dollars)

<i>Railroad</i>	<i>To Dec. 1 1838</i>	<i>Dec. 1, 1838 to June 1, 1839</i>	<i>June 1, 1839 to Dec. 2, 1839</i>	<i>Dec. 2, 1839 to Dec. 1840</i>	<i>Total</i>
Central Railroad	146	140	251	480	1,017
Great Western Mail	103	43	63	36	245
Alton and Mt. Carmel	77	66	83	127	354
Alton and Shawneetown	43	29	38	74	183
Northern Cross	515	193	244	401	1,354
Central Branch	51	31	34	16	132
Peoria and Warsaw	75	56	55	71	258
Bloomington and Makinaw	38	16	26	24	105
Rushville and Erie		^a	3	3	6
Alton and Shelbyville	5	35	33	67	140
Totals	1,053	608	832	1,301	3,794

Detail may not add to totals because of rounding.

^a \$370.

Source: *Report from the Committee on Internal Improvements*, H. R. December 27, 1839, pp. 14-15; H. R. December 15, 1840; and 12th Assembly, 2d sess., December 18, 1840.

TABLE 11
 Aggregate Expenditures of the State of Michigan for
 Construction of Railroads, 1837-1840
 (thousands of dollars)

<i>Railroad</i>	<i>1837</i>	<i>1838</i>	<i>1839</i>	<i>1840</i>	<i>Total</i>
Central Railroad	367	210	180	112	869
Southern Railroad	12	236	227	122	598
Northern Railroad	8	13	39	11	71
Totals	388	459	446	245	1,537

Detail may not add to totals because of rounding.

Source: *Annual Report of the Board of Commissioners of Internal Improvement*, December 20, 1839, S. Doc. 4; *Documents Accompanying the Journal of the Senate, Annual Session of 1840*, Vol. 1, p. 633; and *Annual Report of Board of Internal Improvement*, State of Michigan, Joint Docs. 4, December 24, 1841.

railway investment expenditures to cyclical fluctuations in business activity. Net-mileage-added data for this short period are thoroughly misleading as a measure of railway building. No idea whatsoever can be formed from mileage estimates alone of the actual extent of the capital outlay in Michigan, Illinois, and Indiana. Failure to recognize the weaknesses inherent in mileage data as a measure of railway building led Cleveland and Powell to the erroneous conclusion that: "Railroad construction was not checked by the depression following the panic of 1837."²² The experience of Michigan, Illinois, and Indiana is sufficient reason for dismissing this inference.

The shortcomings of my own estimates of railway building should not, however, be minimized. (1) Data refer to only 35 per cent of total railway mileage in 1840. (2) There is incomplete coverage of the railroads in the states I have selected. (3) The method used to interpolate construction costs for certain southern roads in years with no reports is quite arbitrary and not entirely satisfactory. (4) Data refer to initial or "first" costs of construction and do not measure gross investment in years after the railway was completed. (5) The estimates are restricted to only ten states in the South and Midwest.

Nevertheless, the extent to which these weaknesses impair the usefulness of the data depends very largely on the purpose for which the data are intended to serve. My purpose in this paper has been largely exploratory; that is, to re-examine the data on railway building with a view to improving our estimates of its total amount. My investigation would seem to indicate that total mileage estimates are generally unreliable as a guide to annual construction expenditures and that railroad reports and accounts are a useful but relatively unexplored source of reliable data on railway building in the pre-Civil War decades. It would be premature, I think, to judge the usefulness of these reports and accounts without undertaking a more extensive investigation. However, it would be equally premature to dismiss their significance before the results of such an inquiry are made known.

C O M M E N T

GEORGE ROGERS TAYLOR, Amherst College

E. R. Wicker has performed a useful service by raising serious doubts as to the reliability of early railroad statistics for indicating annual growth or change. My analysis is primarily designed to supplement his study rather than to subject it to detailed criticism. Both his paper and my comments are preliminary skirmishes in an area where little careful investigation has been attempted.

²² F. A. Cleveland and F. W. Powell, *Railroad Promotion and Capitalization in the United States*, Longmans, Green, and Co., 1909, p. 81.

MILEAGE STATISTICS

To know U.S. railroad mileage statistics is to doubt them. In his Table 1, Wicker reproduces the two most commonly used mileage series, that from Poor's *Manual* and that from the 1880 census. He emphasizes the substantial differences between these series. He might also have called attention to other series which show total mileage for the United States. Two cover nearly the whole period before the Civil War, others give annual data for shorter periods.¹ However, neither of these reveals a very helpful pattern, and they throw no light on the commonly used series reproduced by Wicker.

Wicker's Table 2 shows the mileage for eight states at the end of 1840 as reported in Poor's *Manual*, in *Hunt's Merchants' Magazine*, and as derived from his own research. The series show substantial differences, and he concludes that Poor's data before 1840 are unreliable. With equal justification he might have made a similar observation concerning the series from *Hunt's Merchants' Magazine*.² Moreover, his statement that the discrepancies in Poor's table "can be attributed more to carelessness in accumulating data than to interpretation" appears somewhat questionable.

My Table 1 shows the mileage reported by states for 1840, 1850, and 1860.³ The lack of agreement among these state series (and others) suggests that some factor other than mere carelessness has bedeviled the tabulators of mileage statistics. So I investigated the records of a single state—Maine. A state with more early railroad construction would perhaps have been a better choice. But Maine had two advantages: (1) the number of railroads before 1861 was relatively small, and (2) detailed information, though by no means complete, was readily at hand.

¹ David M. Balfour, "Progress of Railways in the United States," *Hunt's Merchants' Magazine*, May 1852, pp. 638-639 and the *American Railroad Journal*, January 5, 1861, p. 6. For shorter periods, see, for example, F. H. Stowe, *The Capitalist's Guide and Railway Annual*, Samuel T. Callahan, 1859, p. 7, and *1860 Census of the United States, Statistics*, p. 333.

² This series reprinted in *Hunt's Merchants' Magazine* (September 1851, pp. 381-382) is, at least for 1840, quite unreliable for many states.

³ A continuous annual series showing mileage by states, 1830-60 and later, appears in Henry V. Poor, *Manual of the Railroads of the United States for 1868-1869*, p. 20. The *Manual* in later years gives the breakdown by states only after 1840 and includes a few changes. Data for years after 1840 have been taken from the *Manual* for 1870-71, pp. xliv-xlv. Other series by states (which do not always agree) appeared from time to time after 1846 in *Hunt's Merchants' Magazine* and in the *American Railroad Journal*.

The *1860 Census, Statistics*, p. 333, provides annual mileage data by states for 1850 through 1860. A similar series which is limited to the New England and Middle Atlantic States and terminates in 1859 is given in Henry V. Poor, *History of the Railroads and Canals* . . ., John H. Schultz and Co., 1860, *passim*. This series differs substantially from that in Poor's *Manual*.

TABLE 1
Railroad Mileage by States, 1840, 1850, and 1860

States	1840			1850	
	Poor's Manual (1)	David M. Balfour (2)	Pacific Railway Report (3)	Poor's History (4)	Poor's Manual (5)
Maine	11	12	10	11	245
N.H.	53		15		467
V.					290
Mass.	301	219	270	318	1,035
R.I.	50	50	47		68
Conn.	102	212	94	102	402
N.E. states	517	493	436	431	2,507
N.Y.	374	496	453	394	1,361
N.J.	186	186	192	194	206
Pa.	754	893	576	474	1,240
Del.	39	16	16		39
Md. and D.C.	213	202	273	178	259
Middle states	1,566	1,793	1,510	1,242	3,105
Ohio	30	36	39		575
Mich.	59	138	114		342
Ind.			20		228
Ill.		22	26		111
Wis.					20
Iowa					
Mo.					
Western states	89	196	199		1,276
Va.	147	147	341		384
N.C.	53	87	247		283
S.C.	137	204	136		289
Ga.	185	271	212		643
Fla.			52		21
Ala.	46	46	51		183
Miss.		14	50		75
La.	40	40	62		80
Tex.					
Ky.	28	28	32		78
Tenn.					
Ark.					
Southern states	636	837	1,183		2,036
Calif.					
Oreg.					
Pacific states					
Total	2,808	3,319	3,328		8,924

In this and the following tables, detail may not add to totals because of rounding.

Col. 1: Henry V. Poor, *Manual of the Railroads of the United States, 1868-69*, p. 20.
Cols. 2 and 6: David M. Balfour, "Progress of Railways in the United States," *Hunt's Merchants' Magazine*, May 1852, pp. 638-639.
Cols. 3 and 9: *Hunt's Merchants' Magazine*, September, 1851, pp. 380-382 compiled by James P. Kirkwood for the Pacific Railway.

TABLE 1, continued

1850 continued				1860		
David M. Balfour (6)	1860 Census (7)	Poor's History (8)	Pacific Railway Report (9)	Poor's Manual (10)	American Railroad Journal (11)	1860 Census (12)
224	246	112	257	472	476	472
414	465	376	471	661	658	656
302	280	241	366	554	575	557
1,145	1,036	1,125	1,042	1,264	1,314	1,273
50	68	50	61	108	104	108
549	413	409	436	601	608	603
2,684	2,507	2,312	2,633	3,660	3,736	3,669
1,404	1,403	1,453	1,409	2,682	2,809	2,702
267	206	254	332	560	627	560
1,133	822	746	900	2,598	2,943	2,542
16	39	16	16	127	137	137
324	253	296	315	386	406	380
3,144	2,724	2,765	2,972	6,353	6,922	6,321
531	575		590	2,946	3,057	2,999
379	342		349	779	807	799
215	228		226	2,163	2,058	2,126
148	110		118	2,790	2,925	2,868
	20		20	905	937	923
				655	549	680
			4	817	813	817
1,273	1,276		1,307	11,055	11,146	11,212
413	515		341	1,740	1,805	1,771
249	248		249	937	887	889
263	289		270	973	978	988
665	644		666	1,420	1,402	1,404
54	21		52	402	326	402
113	132		112	743	643	743
60	75		60	862	798	872
117	80		89	335	328	335
				307	294	306
55	78		80	534	531	570
			48	1,253	1,284	1,198
				39	39	38
1,989	2,082		1,967	9,535	9,315	9,517
				23	70	70
						4
				23	70	74
9,090	8,590		8,879	30,626	31,126	30,794

Cols. 4 and 8: Henry V. Poor, *History of the Railroads and Canals*, John H. Schultz and Co., 1860, passim.

Cols. 5 and 10: Henry V. Poor, *Manual of the Railroads of the United States, 1870-71*, pp. xlv-xlv.

Col. 7 and 12: 1860 Census, *Statistics*, p. 333.

Col. 11: *American Railroad Journal*, January 5, 1861, p. 6. This also appears in *Hunt's Merchants' Magazine*, March 1861, p. 371.

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Table 2 presents detailed mileage statistics for Maine by individual railroads for most years for which I found published statements as well as for all years before 1849 in which my data show new construction. My series are based on annual reports of individual railroad companies and on Henry V. Poor's *History of the Railroads and Canals of the United States of North America*. No railroad mileage was added in any of my series without specific justification either in an annual report of the railroad concerned or in the text of Poor's *History*.⁴ I counted mileage which may have been temporarily or permanently abandoned after once being in operation and included private railroads not open for public use. I did not include the mileage of double tracks, turnouts, or sidings.⁵

TABLE 2
Mileage of Maine Railroads for Selected Dates 1836-1860

Railroads	1836	1842	1848	1849	
	Taylor (1)	Taylor (2)	Taylor (3)	Taylor (4)	Lardner (5)
Androscoggin					
Androscoggin and Kennebec				55	6
Atlantic and St. Lawrence ^a			28	28	36
Bangor, Old Town, and Milford	11	11	11	11	11.75
Calais and Baring ^b					3
Great Falls and South Berwick ^c					
Kennebec and Portland				23	
Lewy's Island					
Machiasport		8	8	8	8
Pennobscot and Kennebec					
Portland and Oxford Central				13	
Portland, Saco, and Portsmouth		51.3	51.3	51.3	51
Somerset and Kennebec					
York and Cumberland					
Boston and Maine ^d					
Total	11	70.3	98.3	189.3	115.75

State totals: other sources:

Poor's *Manual* 1870-71,

p. xlv-xlv

Poor's *History*, p. 12

11

62
11

90
62

168
62

Col. 5: Dionysius Lardner, *Railway Economy*, Harper, 1850, pp. 339-342.

⁴ I followed Poor's text, not his tables.

⁵ There were no double tracks over appreciable distances in Maine during this period.

continued on next page

RAILROAD INVESTMENT BEFORE THE CIVIL WAR

TABLE 2 continued

Railroads	1850				
	Taylor (6)	Hunt's Merchants' Magazine (7)	State of Maine (8)	1860 Census (9)	American Railroad Journal (10)
Adroscoggin					
Androscoggin and Kennebec	55	55	55	55	55
Atlantic and St. Lawrence ^a	48	70	47	48	67
Bangor, Old Town, and Milford	11	12	13	11	12
Calais and Baring ^b		12	6		3
Great Falls and South Berwick ^c					
Kennebec and Portland	23	34	34	59.5	34
Lewy's Island					
Machiasport	8			7.75	8
Pennobscot and Kennebec					
Portland and Oxford Central	13	13	12	13	13
Portland, Saco, and Portsmouth	51.3	52	51	51.3	51
Somerset and Kennebec					
York and Cumberland		10	9		11
Boston and Maine ^d					3
Total	209.3	258	227	245.55	257

State totals: other sources:

Poor's <i>Manual</i> 1870-71, p. xliv-xlv	245
Poor's <i>History</i> , p. 12	112

Col. 7: *Hunt's Merchants' Magazine*, July 1851, p. 115.

Col. 8: *Hunt's Merchants' Magazine*, October 1855, p. 518, from John A. Poor, Editor of the *State of Maine*.

Col. 9: Eighth Census, *Mortality and Miscellaneous Statistics*, p. 325.

Col. 10: *American Railroad Journal*, January 11, 1851, p. 22.

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INVESTMENT

TABLE 2 continued

Railroads	1851			1852		
	Taylor (11)	De Bow (12)	Ameri- can Railroad Journal (13)	Taylor (14)	Hunt's Mer- chant's Maga- zine (15)	Ameri- can Railroad Journal (16)
Androscoggin				20	36	20
Androscoggin and Kennebec	55	55	55	55	55	55
Atlantic and St. Lawrence ^a	79	79	79	79	79	79
Bangor, Old Town, and Milford	11	12	12	11	12	12
Calais and Baring ^b	6	6	6	6	6	6
Great Falls and South Berwick ^c						
Kennebec and Portland	62	36	59	69	69	69
Lewy's Island						
Machiasport	8	9	8	8	9	8
Pennobscot and Kennebec						
Portland and Oxford Central	13	10	13	13	10	13
Portland, Saco, and Portsmouth	51.3	52	51	51.3	52	51
Somerset and Kennebec						
York and Cumberland	10.5	12	11	10.5	19	10
Boston and Maine ^d						
Total	295.8	271	294	322.8	347	323

State totals: other sources:

Poor's <i>Manual</i> 1870-71, p. xliv-xlv	293	323
Poor's <i>History</i> , p. 12	282	328

- Col. 12: *DeBow's Review*, June 1852, p. 667.
 Col. 13: *American Railroad Journal*, January 3, 1852, p. 12.
 Col. 15: *Hunt's Merchants' Magazine*, January 1853, p. 107.
 Col. 16: *American Railroad Journal*, January 1, 1853, p. 2.

continued on next page

RAILROAD INVESTMENT BEFORE THE CIVIL WAR

TABLE 2 continued

Railroads	1853			
	Taylor (17)	<i>Hunt's Merchants' Magazine</i> (18)	<i>State of Maine</i> (19)	<i>American Railroad Journal</i> (20)
Androscoggin	20	36	20	20
Androscoggin and Kennebec	55	55	55	55
Atlantic and St. Lawrence ^a	79	79	79	79
Bangor, Old Town, and Milford	11	12	13	12
Calais and Baring ^b	6	6	6	6
Great Falls and South Berwick ^c				
Kennebec and Portland	69	69	72.5	69
Lewy's Island				
Machiasport	8	9	7.5	9
Pennobscot and Kennebec	3			
Portland and Oxford Central	13	10	12	13
Portland, Saco, and Portsmouth	51.3	52	51	51
Somerset and Kennebec				
York and Cumberland	18	19	18	18
Boston and Maine ^d				
Total	333.3	347	334	332

State totals: other sources:

Poor's <i>Manual</i> 1870-71, p. xlv-xlv	334
Poor's <i>History</i> , p. 12	384

Col. 18: *Hunt's Merchants' Magazine*, January 1854, p. 121.

Col. 19: *Hunt's Merchants' Magazine*, October 1855, p. 518, from John A. Poor, Editor of the *State of Maine*.

Col. 20: *American Railroad Journal*, January 7, 1854, p. 10.

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INVESTMENT

TABLE 2 continued

Railroads	1854			
	Taylor (21)	Hunt's Merchant's Magazine (22)	State of Maine (23)	American Railroad Journal (24)
Androscoggin	20	20	20	20
Androscoggin and Kennebec	55	55	55	55
Atlantic and St. Lawrence ^a	79	79	79	79
Bangor, Old Town, and Milford	11	12	13	12
Calais and Baring ^b	6	6	6	11.5
Great Falls and South Berwick ^c	6			
Kennebec and Portland	72.5	72	72.5	66
Lewy's Island				
Machiasport	8	3	7.5	8
Pennobscot and Kennebec	21	56		40
Portland and Oxford Central	13	13	12	13
Portland, Saco, and Portsmouth	51.3	52	51	61.5
Somerset and Kennebec				10
York and Cumberland	18	18	18	18
Boston and Maine ^d				
Total	360.8	386	334	394

State totals: other sources:

Poor's *Manual* 1870-71,
p. xliv-xlv 360
Poor's *History*, p. 12 386

Col. 22: *Hunt's Merchants' Magazine*, January 1885, p. 122.

Col. 23: *Hunt's Merchants' Magazine*, October 1855, p. 518, from John A. Poor, Editor of the *State of Maine*.

Col. 24: *American Railroad Journal*, January 6, 1855, p. 9.

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RAILROAD INVESTMENT BEFORE THE CIVIL WAR

TABLE 2 continued

Railroads	1855		1856		
	Taylor (25)	<i>American Railroad Journal</i> (26)	Taylor (27)	Rep't of State Legislature (28)	<i>American Railroad Journal</i> (29)
Androscoggin	20	20	26	20	20
Androscoggin and Kennebec	55	66	55	55	55
Atlantic and St. Lawrence ^a	79	79	79	79	79
Bangor, Old Town, and Milford	12.5	12	12.5	13	12
Calais and Baring ^b	6	11.5	6	6	11.5
Great Falls and South Berwick ^c	6		6		
Kennebec and Portland	72.5	74	72.5	72.5	74
Lewy's Island					
Machiasport	8	8	8	7.5	8
Pennobscot and Kennebec	55	53	55	55	55
Portland and Oxford Central	13	13	13	18	18
Portland, Saco, and Portsmouth	51.3	61.5	51.3	51.5	51.5
Somerset and Kennebec	21	25	21		37
York and Cumberland	18	18	18		18
Boston and Maine ^d					
Total	417.3	441	423.3	377.5	439

State totals: other sources:

Poor's *Manual* 1870-71,

p. xlv-xlv

415

429

Poor's *History*, p. 12

386

462

Col. 26: *American Railroad Journal*, January 5, 1856, p. 2.

Col. 28: *Hunt's Merchants' Magazine*, January 1857, p. 760, from the abstract published by the legislature of the state of Maine.

Col. 29: *American Railroad Journal*, January 3, 1857, p. 1.

continued on next page

INVESTMENT

TABLE 2 concluded

<i>Railroads</i>	1858		1860		
	Taylor (30)	<i>American Railroad Journal</i> (31)	Taylor (32)	1860 Census (33)	<i>American Railroad Journal</i> (34)
Androscoggin	32	37	36.5	37	36.5
Androscoggin and Kennebec	55	55	55	55	55
Atlantic and St. Lawrence ^a	79	79	79	79	79
Bangor, Old Town, and Milford	12.5	13	12.5	12.5	12.5
Calais and Baring ^b	6	11.5	6	6	6
Great Falls and South Berwick ^c	6	6	6	6	6
Kennebec and Portland	72.5	79.5	72.5	72.5	72
Lewy's Island	16.5	17	16.5	16.5	16.5
Machiasport	8	8	8	7.75	7.5
Pennobscot and Kennebec	55	54.5	55	54.78	55
Portland and Oxford Central	19	21.5	19	18.5	21.5
Portland, Saco, and Portsmouth	51.3	51.3	51.3	51.34	51.3
Somerset and Kennebec	37	39	37	37	37
York and Cumberland	18	18.5	18	18.5	18.5
Boston and Maine ^d					
Total	467.8	490.8	472.3	472.37	474.3

State totals: other sources:

Poor's *Manual* 1870-71,

p. xlv-xlv

468

472

Poor's *History*, p. 12

511

Col. 31: *American Railroad Journal*, January 1, 1859, p. 1.

Col. 33: 1860 *Census, Statistics*, p. 325.

Col. 34: *American Railroad Journal*, January 5, 1861, p. 2.

^a The total length of this road was 149 miles of which 79 miles lay in Maine and the remainder in New Hampshire and Vermont. To facilitate comparisons the mileage entered in this table was limited in all cases to 79 miles.

^b Although a small part of this road lay across the border in New Brunswick, the total mileage is included in this table.

^c This short railroad is counted as being wholly in Maine although it is partly in New Hampshire.

^d This road extended only about three miles into Maine and was rarely included in mileage totals for that state.

One feature stands out clearly in Table 2: all sources agree fairly closely on the mileage of particular roads in years when such roads were not under construction or were not being extended. Note, for example, how well all the series agree on the mileage of the Portland, Saco, and Portsmouth Railroad, which made no additions to its line after 1842, and the complete agreement on the length of the Androscoggin and Kennebec Railroad after 1849, the year in which it reached its maximum extent.

On the other hand, observe the data for the Kennebec and Portland Railroad. During the four years this road was under construction the series show substantial divergences. These disappear in 1852, when the original railroad was completed. Variations then reappear in 1853 and 1854 when a small addition was made, but thereafter disagreement disappears. The series for both the Atlantic and St. Lawrence and the Androscoggin railroads further illustrate this tendency.

Variations in annual reporting during periods of construction appear almost inevitable. For one thing, the exact dating of the annual series is not always clearly indicated in the source. Thus it is assumed, if not otherwise stated, that series printed in *Hunt's Merchants' Magazine* during 1851 include mileage added through, but not beyond 1850. But some mileage constructed early in 1851 may be included, which may account for Hunt's reporting seventy miles for the Atlantic and St. Lawrence Railroad in 1850 whereas other sources show a smaller total.⁶

But the chief cause of variation is the uncertainty involved in reporting "completed" railroad mileage or mileage "in operation." Usually, these terms seem to designate roads open for public use or, for specialized mining or lumbering roads, at least open for the transportation of the company's own products. I attempted to follow this usage and did not count a road as "in operation" until I could find a dependable statement that it was "completed" or "in operation."

The difficulties involved in reporting "mileage in operation" are illustrated by data for the Kennebec and Portland. We know that this sixty-nine mile road running from Portland to Augusta, including a branch from Brunswick to York, was begun in 1847 and opened through-out in January 1852. On the basis of Poor's *History* and an incomplete set of annual reports, I am fairly confident of my data for 1849 and 1851, despite the fact that Lardner reports no mileage for 1849 and the series from DeBow for 1851 indicates only thirty-six miles against my sixty-two miles. But what is the correct entry for 1850? I found no statement that any additional mileage was "completed" or "in operation" during 1850, although construction was proceeding rapidly.

⁶ Another reporting difficulty may lead to understatement. Many railroads had a fiscal year different from the calendar year. Mileage reported as completed on July 1 of a calendar year may well have come into operation during the last half of the preceding calendar year.

Other considerations occasionally appear to account for differences in the series. The Machiasport Railroad was omitted from two series in 1850, perhaps because it was a company-owned lumber railroad and so was not regarded as a public highway.⁷ Again, what should be done about temporarily or permanently abandoned railroad mileage? For a few years during the latter 1850's the Portland and Oxford Central Railroad (known also as the Buckfield Branch) was not in operation and at least one series omits this mileage from the state totals.⁸

Finally, the mileage of interstate railroads was not always carefully allocated to the proper state. Thus the whole 149 miles of the Atlantic and St. Lawrence is sometimes included in Maine totals although seventy miles lay outside the state. Where mileage data are given by individual railroads, variations due to this cause can be corrected.⁹ But where only state totals are shown, it is seldom possible to know whether such out-of-state mileage has been counted.

At least for the Maine data which I have examined, errors in reporting due to carelessness in tabulating or computing appear to have been rare. Possibly Hunt's report of twelve miles for the Calais and Baring Railroad in 1850 and the omission of the York and Cumberland from the Maine legislative report for 1856 fall in this category.¹⁰

In the lower part of Table 2 appear mileage data for Maine from Poor's *Manual* and from his *History*. The series from Poor's *Manual* agrees so closely with that from the 1860 census that it seems apparent that Poor's data for 1850-60 were taken directly from the census figures. My totals computed from the reports of individual railroads are for most years in substantial agreement with those in Poor's *Manual*. Insofar as my preliminary study proves reliable and Maine data prove representative, it appears that Poor's *Manual* provides a fairly reliable series, much superior to those in Poor's *History* and other sources except the census. However, Wicker's Table 2 casts doubt on the reliability of the series from Poor's *Manual* for most of the states he includes. It may be that the apparent accuracy of Poor's series for Maine is simply not typical of his data for other states.

⁷ That is the reason given by the *American Railroad Journal* for not including this road in its annual tabulation of total Maine mileage. *Hunt's Merchants' Magazine*, June 1859, p. 731. Many of the mining railroads of Pennsylvania were of this type.

⁸ In his study, *Trends and Cycles in Capital Formation by United States Railroads* (National Bureau of Economic Research, Occasional Paper 43, p. 52, n. 18), Melville J. Ulmer states that before 1910 the relative importance of abandonments and other retirements was negligible. While this is apparently true for abandonments relative to total mileage, it may not be relative to net mileage added annually. Possibly the abandonments (mostly temporary) following the panic of 1857 were negligible in this second sense but I wonder whether this was true for those Civil War years when considerable southern mileage was abandoned.

⁹ See footnotes to Table 3.

¹⁰ See Table 3, cols. 9 and 23.

I believe that no series for railroad mileage now available provides even reasonably accurate data on annual net mileage completed. This points up the need for a thorough research project which could, I believe, produce a reliable series—one at least much better than any we now have.¹¹

Wicker's remarks on the disadvantages of using net-mileage-added figures to determine the volume of annual gross capital investment seem to me well taken. If we had reliable mileage data, a fairly useful index might possibly be constructed along the lines used by R. C. O. Matthews for Britain in the period 1833-43. Certainly existing tables of annual mileage constructed could be considerably improved. However, I agree with Wicker that a more satisfactory index might result from a thorough investigation of actual railroad investment.

RAILROAD INVESTMENT

Beginning in the late 1840's, tables on the cost of constructing the railroads, based chiefly on the annual reports of the railroad companies, were printed in a number of railroad and commercial journals. But except for the cost data by states which were printed in the 1860 census, Henry V. Poor seems to have been chiefly responsible for most of the estimates. The *American Railroad Journal*, of which Poor was editor, published cost totals by states annually beginning in the late 1840's. Poor's *History* dated 1860 gives annual cost totals for the New England and Middle Atlantic states beginning with 1835. These two series are for most states quite unlike; apparently partly because the *American Railroad Journal* series spread the cost over the years of active construction, but this was not done in the series prepared for the *History*. Table 3 presents two series showing the total cost of U.S. railroad construction, and Table 4 shows the cost by states to the close of 1850 as reported by four more or less independent sources.

None of these early cost summaries can be taken very seriously. At least we should not consider them to be any more reliable than did informed contemporary observers. The *American Railroad Journal* stated in 1852 that it was impossible to represent the cost of building the railroads "with any accuracy."¹² Moreover, the rough agreement among the various series cannot be taken as proof of their reliability. I do not believe Wicker would find this agreement "surprising" if he

¹¹ I made no attempt to check on the detailed annual statistics by individual railroads which appear in the *1880 Census of the United States*, Vol. iv, Part 4, pp. 310-375. The difficulty here lies in the fact that railroads are listed under their names in 1880. Repeated changes in names, consolidations, and even abandonments would make this a laborious though probably not an impossible task. Because of this I am inclined to question Wicker's statement that the data in the 1880 census are easier to check than are those in Poor's *Manual*.

¹² January 3, 1852, p. 13.

INVESTMENT

TABLE 3
Cost of Construction of United States Railways
(thousands of dollars)

Year	Railroad Journal (1)	Other Sources (2)
1848	184,275	
1849	216,895	
1850	260,750	296,660
1851	313,460	335,151
1852	385,230	400,714
1853	470,525	489,603
1854	547,385	616,766
1855	654,830	
1856	750,715	
1857	850,150	988,147
1858	917,350	961,047
1859	1,118,921	
1860	1,177,994	1,151,561

Col. 1: 1848-58—*Hunt's Merchants' Magazine*, September 1858, p. 378, "from the *Railroad Journal*." 1859—*American Railroad Journal*, January 7, 1860, p. 2. 1860—*American Railroad Journal*, January 5, 1861, p. 6.

Col. 2: 1850 and 1860—*1860 Census, Statistics*, p. 331. 1851—*DeBow's Review*, December 1852, pp. 572-573. 1852—*Hunt's Merchants' Magazine*, January 1853, p. 115. 1853—*Hunt's Merchants' Magazine*, January 1854, p. 129. 1854—*Hunt's Merchants' Magazine*, January 1855, p. 131. 1857 and 1858—*Hunt's Merchants' Magazine*, January 1859, p. 249.

had considered their common source. Even if they were not copied from each other without troubling to give credit, as was not an uncommon practice, the statistics had a common source in the annual reports of the railroad companies and of the state governments.

To make a preliminary examination of railroad investment statistics and to compare my findings with Wicker's, I extended my survey of Maine railroad statistics to cover the available material on construction cost. Table 5 reports annual cost totals for Maine as reported by Hunt and according to my own computations. And Table 6 presents four cost series for Maine showing the cost of each railroad to the end of 1850.

Contemporary tables of construction costs were derived largely from the annual reports of individual railroads. In general, "cost" seems to have included all expenditures made by a railroad company before it went into actual operation, usually including at least the initial disbursements for rolling stock. For most roads it also covered the cost of later extensions and of improvements including such items as grading,

RAILROAD INVESTMENT BEFORE THE CIVIL WAR

TABLE 4
Total Cost of American Railroads by States to the end of 1850
(thousands of dollars)

<i>States</i>	<i>Merchants' Magazine</i> (1)	1860 Census (2)	<i>Poor's History</i> (3)	<i>DeBow's Review</i> (4)
Maine	\$ 6,796	7,000	3,071	6,696
N.H.	14,146	14,774	11,710	14,146
V.	13,051	10,801	8,431	13,467
Mass.	51,885	47,887	51,645	51,885
R.I.	2,614	2,803	2,046	2,614
Conn.	17,499	13,990	13,720	17,499
N.E. states	105,990	97,254	90,623	106,306
N.Y.	60,784	65,456	63,632	61,446
N.J.	7,445	9,348	11,193	7,445
Pa.	44,107	41,683	42,689	46,047
Del.	600	2,282	909	600
Md. and D.C.	13,044	11,581	14,397	13,044
Middle states	125,980	130,350	132,820	128,581
Ohio	12,769	10,684		12,769
Mich	8,046	8,946		8,460
Ind.	4,600	3,381		5,100
Ill.	2,960	1,441		2,960
Wis.	400	612		400
Western states	28,775	25,064		29,689
Va.	7,798	12,585		7,798
N.C.	4,000	3,282		4,000
S.C.	7,243	7,526		7,244
Ga.	13,922	13,273		13,922
Fla.	250	210		250
Ala.	4,750	1,946		4,750
Miss.	1,718	2,020		1,718
La.	663	1,320		6,663
Ky.	1,500	1,831		1,500
Tenn.				600
Southern states	41,845	43,992		48,445
Total	302,590	296,660	223,443	313,022

Col. 1: *Hunt's Merchants' Magazine*, July 1851, p. 121.

Col. 2: *1860 Census, Statistics*, p. 331.

Col. 3: Henry V. Poor, *History of the Railroads and Canals*, passim.

Col. 4: *DeBow's Review*, October 1851, p. 43, from the *American Railway Times*.

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TABLE 5
 Cost of Construction of Maine Railroads, 1834-1860
 (thousands of dollars)

Year	Taylor		Poor's History	
	Added Cost (1)	Total Cost (2)	Added Cost (3)	Total Cost (4)
1834	54			
1835	100	154		
1836	100	254		
1837		254		354
1838		254		354
1839		254		354
1840		254		354
1841	604	858		354
1842	638	1,496	24	378
1843	52	1,548	1,048	1,426
1844	52	1,599	110	1,537
1845	32	1,632	77	1,615
1846	120	1,752	14	1,629
1847	495	2,248	10	1,639
1848	1,589	3,837		1,406
1849	2,068	5,904		1,427
1850	1,563	7,468	1,431	3,070
1851	1,140	8,608	5,333	8,404
1852	1,547	10,154	2,797	11,201
1853	1,617	11,772	1,860	13,061
1854	1,186	12,958	510	13,572
1855	860	13,818	569	14,141
1856	415	14,233	2,788	16,929
1857	298	14,531	95	17,025
1858	153	14,684	1,072	18,098
1859	34	14,718	283	18,382
1860	93	14,811		

Col. 1 and 2: see the text.

Col. 3 and 4: Henry V. Poor, *History of the Railroads and Canals*, John H. Schultz, 1860, p. 12. These data are very similar and often identical with those given in the *American Railroad Journal*, April 9, 1859, pp. 234-235.

RAILROAD INVESTMENT BEFORE THE CIVIL WAR

TABLE 6

Five Estimates of the Cost of Maine Railroads to the end of 1850
(thousands of dollars)

<i>Railroads</i>	Taylor (1)	1860 Census (2)	<i>Merchants'</i> <i>Magazine</i> (3)	<i>State</i> <i>of Maine</i> (4)	<i>American</i> <i>Railroad</i> <i>Journal</i> (5)
Androscoggin	37				
Androscoggin and Kennebec	1,719	1,817	1,622	1,622	
Atlantic and St. Lawrence	1,692	1,642	1,500	2,245	1,642
Bangor, Old Town, and Milford	354	135	350	350	135
Callais and Baring	168		360	120	
Great Falls and South Berwick					
Kennebec and Portland	1,374	1,742	1,000	1,000	
Lewy's Island					
Machiasport	110	110			
Pennobscot and Kennebec					
Portland and Oxford Central	360	260	370	120	
Portland, Saco, and Portsmouth	1,297	1,294	1,294	1,313	1,294
Somerset and Kennebec					
York and Cumberland	357		300	360	
Total	7,468	7,000	6,796	7,130	3,071

Col. 1: See text.

Col. 2: *1860 Census, Statistics*, p. 325.

Col. 3: *Hunt's Merchants' Magazine*, July 1851, p. 115.

Col. 4: *Hunt's Merchants' Magazine*, October 1855, p. 518, from the *State of Maine*.

Col. 5: *American Railroad Journal*, April 9, 1859, p. 234.

erecting stations, buying additional land, and replacing rails and bridges.¹³

Where payments were made in stocks or bonds, their face value was usually entered as the cost figure. If bonds were marketed at a discount, the amount of the discount was commonly included as a cost item. This may also be true of stock issued to pay interest on bonds or even dividends on stock already issued. Finally, interest on bonds paid annually after the road was completed may also be included in the cost.

My cost series for Maine represent merely a tentative and crude computation in which I have, for the most part, accepted the concept of costs represented in the available series. Only a few improvements were attempted, chief of which was an allocation of costs to the calendar year in which they were actually made. In his *History*, Poor's annual cost tables typically represent the cost of construction as though it were all concentrated in the year in which the road was completed. Thus he

¹³ Most railroads constructed before the middle of 1840 and some constructed thereafter had to be largely rebuilt within less than a decade. Solid rails replaced strap iron, heavier bridges replaced light ones, solid embankments took the place of trestles erected on piles, and so forth.

significantly understates the expenditures on railroad construction in Maine, 1847-50, apparently because he did not enter the cost of building the Atlantic and St. Lawrence Railroad and probably also that of the Androscoggin and Kennebec and the Kennebec and Portland Railroads until 1851. On the other hand, other compilers of cost series often recorded expenditures in the year in which they were made.

A similar difficulty arises because most of the Maine railroads reported on the basis of fiscal years which differed from the calendar year. Poor and probably most of the other compilers did not adjust their series for this factor.

I attempted to correct for both distortions. Where possible, I followed the annual reports of the railroads during their period of construction, elsewhere I spread the costs arbitrarily over the construction period.¹⁴ The problem posed by differing fiscal years I treated in similar fashion. Thus if the annual report came close to the middle of 1850, I divided them equally between 1849 and 1850. Much more refined procedures could, of course, be developed, if it were worth while, even to the point of taking into account the Maine weather which is ordinarily more favorable for construction in the autumn than in the spring.

As with the mileage statistics, there was the problem of eliminating construction costs for parts of railroad lines which extend beyond the state's borders. On the basis of the annual reports of the railroad company, I allocated to Maine only that part of the total cost of the building of the Atlantic and St. Lawrence which seemed appropriate.

In a few other instances I adopted procedures different from those followed by Poor and, for the most part, by other tabulators. Two examples may be given. For 1842-47 Poor reported the cost of construction of the Bangor, Oldtown, and Milford Railroad as \$378,536. In 1848 he reduced his cost figure to \$135,000 because the road was bought for \$60,000 by a new company which then spent \$75,000 for relaying the rails. In my series I added the cost of relaying the rails to the original cost of the railroad, so that this railroad's construction costs increase by \$75,000, whereas according to Poor they decrease by \$243,536.

Some of the annual statements of the railroads include as costs items which are hard to justify as "cost of construction." Thus the treasurer of the Androscoggin Railroad stated in the annual report for that road dated December 1, 1860, that, although the cost of the railroad was reported as \$806,835.18, the "real and true amount expended in its construction" was \$535,008.38 because the former figure included

¹⁴ Wicker's "second procedure" was used. This method, as he suggests, takes no account of the fact that construction expenditures were often heaviest during the early part of the period.

interest on bills payable, discount on bonds sold, interest on assessments, and coupons paid amounting to \$270,772.94. By following his report my series are reduced by more than \$250,000 from Poor's as reported in 1859 and in the 1860 census.¹⁵

Much further study and analysis of the cost data for Maine is necessary. Although my data provide only a first step toward a reliable cost series for that state, they differ so substantially from Poor's series as to cast serious doubt on the usefulness of his statements of annual cost. Unless cost data for other states are much better, none of the existing tables provides anything even approaching a useful record of the annual amount invested in U.S. railroads. I do not believe that the cost data from Poor's *History*, reproduced by Wicker in his Table 6, provide a reliable indication of annual railroad investment. Nor can a useful cost index be erected on the basis of the existing, inaccurate annual mileage data. Our best hope, and I believe Wicker agrees, is that reasonably accurate and useful tables showing mileage and investment can be developed only through a re-examination of the original sources and the adoption of standard procedures and definitions.

Where the railroads were built by private corporations chief dependence will have to be placed on the annual reports of the railroad companies. Many of these are available in printed form in library collections; others will be found only as reproduced or summarized in contemporary periodicals; some have disappeared; and still others never existed. The first step in improving our railroad statistics for this period must be to bring together these annual reports and supporting documents which are now scattered from one end of the country to the other. Possibly this could be best done by photostatic or some other method of reproduction. The second and no less important step will require an elaborate study and analysis.

On the basis of my sampling examination of these annual reports of railroad companies a few tentative conclusions may be ventured. The annual reports are much more full and increase in usefulness as the period advances. They are more likely to be available and to give detailed information for the large than for the small roads. On the other hand, with the accounting procedures then in general use, it is ordinarily much easier to determine the original outlay on construction than to discover either the gross or the net outlays made for additions to plant in later years.¹⁶ Finally, I agree with Wicker that deliberate

¹⁵ A careful study of the annual reports would permit elimination of similar items from the cost of construction reported by a number of other Maine railroads. In the case of the Androscoggin and Kennebec Railroad this would amount possibly to as much as \$750,000.

¹⁶ For example, the *Annual Report* of the Portland, Saco, and Portsmouth Railroad for June 1857 states that, "Many improvements have been made on the Road, and paid for from income . . ." and proposes that an "improvement account" be set up to show such items.

manipulation of accounts does not seem to have been a common practice before the Civil War.

C O M M E N T

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Although I agree with E. R. Wicker that total mileage estimates heretofore computed are unreliable as a guide to annual construction expenditures and that railroad reports and accounts are a useful source of reliable historical data, I take the following exceptions to his paper:

1. I submit that mileage data, for the purpose he discusses, should be adjusted to show the "average mileage for the year," so that new construction opened for business the first month of the year will not carry the same weight as new construction opened during the last month. This is not too difficult to obtain if the source mentioned in my next paragraph is used.

2. Better than Poor, annual reports, and other sources mentioned by Wicker for mileage data is a mimeographed study which I expect (but do not know for certain) was made by every railroad as of 1914 for the valuation dockets of the Interstate Commerce Commission. Almost daily, I use a copy of the one made by the Boston and Maine Railroad and find it accurate except for a few minor errors or omissions.¹ It shows these facts for each of the original corporations that later became part of the Boston and Maine operation: name, dates incorporated and organized, location and dates the various small sections were opened for business, who operated the road and when, and dates of mergers, purchases, or abandonments. The ICC should be asked whether it has similar studies for all roads.

3. Mileage data computed as suggested above nevertheless would be unreliable as an indicator of construction costs because of the frequent and large differences in the average cost per mile constructed. Thus, more miles may have been constructed in one year at less cost than in another year because of different locations, different management decisions, or both. Extreme differences in cost per mile occurred among the roads, and even sections of the same road, in central New England.

4. Wicker implies in his third section that Poor's *History* gives the approximate gross "cost of road." On the contrary, Poor's data is closer to a net than a gross figure, at least for the roads that became the Boston and Maine system and a few other New England roads. For the eighteen largest roads in central New England I have reconstructed

¹ The title is *Corporate History of Boston and Maine Railroad (System) Including Owned, Leased and Controlled Lines as of Dates of Valuation June 30, 1914, and June 30, 1916, Prepared in Accordance with the Requirements of Valuation Order No. 20 Issued by the Interstate Commerce Commission, May 13, 1915*. It was used as an exhibit in Valuation Report 30 ICC 515. Undoubtedly the ICC has a copy for each road that made such a study.

the balance sheet and income statement items each year. With only one exception—the Eastern Railroad—they charged to their construction and equipment accounts only enough to approximate a net investment. Although I have not reconstructed the accounts for the thirty-five additional New England roads before 1860,² I find that their reports tend to give what is much closer to a net rather than a gross capital expenditure.

5. The data that Wicker computed for the southern and western states cannot be used to supplement Poor (which follows closely annual reports to stockholders or to legislatures) unless Wicker's figures include not only the original construction of the roadway and buildings but also the locomotives and cars and enough additions and improvements of both road and equipment to make a figure that approximates net capital expenditures. As I understand his paper, Wicker excluded both the cost of equipment (locomotives and cars) and later improvements. Poor's *History* lists a "cost of road" by states and a "cost of construction, etc." by roads. Each of these items includes the cost of equipment as well as the cost of the roadway, buildings, etc. If Wicker's series for the southern and western states is less inclusive, then it cannot be a useful supplement to Poor's. Also, if used to supplement Poor, Wicker's series should include as much improvements and additions (including additional equipment) as Poor used. It is not clear to me that he has done that.

Wicker states that "ideally the national income statistician should have data on net as well as gross capital formation" on the railroads before 1860. I submit that my research suggests that data for the net capital formation can be obtained at least as accurately as for the gross and with not much more work if annual reports and related sources are used.

² In addition to current research, covering 104 separately constructed steam railroads that made up the present Boston and Maine, I have used reports and minutes of the Boston and Worcester, Boston and Providence, Old Colony, and Western railroads in the pre-Civil War years for an article. Fifty-three of these roads were constructed and opened for business before 1860.

