

## The American Railroad Network during the Early 19th Century: Private versus Public Enterprise

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At the founding, the United States were a bunch of experiments in self-government (note the use of the plural). Each state was very much free to determine its own destiny. Many states directed economic development through state enterprises, loan guarantees, and direct subsidies, mostly in banks and in canals and other transportation projects. Almost all of these interventions proved to be failures. These failures forced state governments to raise taxes and sell off their money-losing ventures. In some cases, states were forced into default. Many states then amended their state constitutions to prohibit state enterprises and loan guarantees, and to restrict government borrowing. It was, thus, almost entirely as private enterprise that the railroad network of the country was developed.

Post–New Deal revisionist history correctly tackled the “myth” that the early economy of the United States was characterized by *laissez-faire*, documenting the role of the states in directing early economic development (e.g., Handlin and Handlin 1969 [1947], Hartz 1968 [1948], Heath 1954, Pierce 1953, and Prumm 1954). Dunlavy (1994: 18–19) summarizes this revisionist history thusly:

The core of the old myth, to be sure, remains unchallenged: throughout the antebellum period, the federal executive remained comparatively weak, while the federal legislature inclined toward stalemate. Precisely because of its peculiar, fractured structure, moreover, the American state does not neatly fit with conventional understanding of an interventionist state. But the cumulative effect is clear: it has become impossible to speak of *laissez-faire* in the antebellum American context.

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This revisionist history, while correctly arguing that the country was not founded, ideologically, on *laissez-faire*, misleadingly argues that the development of the economic potential of the United States was due to, or even helped by, state intervention. The fact is that the state interventions were disasters, and it was from out of those disasters that there came a principled commitment, embodied in amendments to state constitutions, to *laissez-faire*.

This paper reviews the history of state interventions in banking, canals, and other modes of transportation during the antebellum period, and then looks, econometrically, at the development of the U.S. railroad network. Using state-level data observed decennially, from 1840 to 1860, it finds that the states that spent themselves into debt did not advance the development of their railroad networks, but that those that adopted amendments to their state constitutions restricting borrowing, investment, loan guarantees, and the like did.

As the first half of the 19th century unfolded, almost all of the states of the North became committed to *laissez-faire*. They opposed state-owned banks and supported balanced budgets and private enterprise. As a result, the North attracted labor and capital and grew in population and industry. Almost all the Southern states, however, remained committed to mixed economies, part slave and part socialistic, with many states having state-owned banks, weak currencies, and liberal debtor-relief laws. Thus, it could be said that, with the growing fear by the South of Northern domination, the antebellum period came to an end.

## State Interventions

In the banking industry, state intervention assumed several forms. In the South and the West, many state governments established state government-owned banks (Hawk 1973 [1934]: 352–58). While some of these state banks, such as those of Missouri and South Carolina, conducted themselves on a conservative basis, most proceeded speedily to inflation, corruption, and failure. In 1819, the Bank of the State of Tennessee—which came to be known as “the saddle bags bank”—was organized. Its paper money was supported by a law staying foreclosure by creditors who refused to accept it in payment for debts. In 1920, the Bank of the Commonwealth of Kentucky was formed, and authorized to issue \$3 million in legal tender notes based only on “public credit.”

In 1923, the Bank of the State of Alabama was organized, which soon became famous for the loans it made to members of the state

legislature and their friends. During one session of the state legislature, a member died, after which the other members wore black crepe on their arm as a sign of mourning. The black crepe came to be an indication that the wearer was eligible for bank loans. Consequently, when a backwoodsman in Tuscaloosa put on black crepe he was treated royally by the city's elite until his identity was suspected.

Antebellum banking has been described as a "war" between Andrew Jackson and the Second Bank of the United States, with one side favoring laissez-faire and hard money and the other side favoring government intervention and paper money. The truth is, even after the expiration of the charter of the Second Bank of the United States, the country did not enjoy free competition in banking, but something that could be described as "decentralism without freedom" (Smith 1936: 36). "The issue was between prohibition and state control, with no thought of free enterprise" (Hammond 1957: 186).

In transportation, state intervention included such things as grants of rights-of-way and monopoly privilege, bond guarantees and stock subscriptions, land grants, and state enterprise (Goodrich 1960, 1961, 1967). When the state became directly involved, the results—with only a few exceptions—were disastrous. In contrast to the grandiose projects undertaken by government, the railroad network was developed, mostly, by what could be described as "the piecemeal system"—that is, as numerous small projects, each one of which was justified on its own prospects, often with a subsequent phase of consolidation and rationalization. As explained by a contemporary,

The railway undertakings of the United States have nearly all been the result of private enterprise, called into action to meet the requirements of the particular neighborhoods or districts through which they pass. As in England, there has been an almost total absence of any great design, or connected system of national advancement in the first adoption. The disadvantages arising from this have not been so great as might be imagined; for the formation of one line of railway, in any direction, prepares the way for its extension beyond the limits first proposed, and, indeed soon renders such extension a matter of social necessity. Through adoption of what may be called the piecemeal system, it undoubtedly happens that lines are formed which do not fulfill, in the highest degree, the full and general benefits which would have arisen from a more comprehensive plan, and the best route between the more important points of the country is scarcely to be selected; but it must be remembered that the railway system of this country, and of the United States, has been the growth of a principle unknown in its relation before, and the consequences of which it was impossible to have fully anticipated [William 1852].

The next several sections look at the major state enterprises—initially, canals—in New York, Pennsylvania, Ohio, and then elsewhere. Table 1 lists the major canals of the antebellum period.

## The Erie Canal

Perhaps the most successful state enterprise of the early 19th century was the Erie Canal (Miller 1959, 1962; Rubin 1961a; Whitford 1906). The canal, known as “Clinton’s Big Ditch,” ran from Albany on the Hudson River to Buffalo on Lake Erie, a distance of 364 miles. When first constructed, it was 40’ wide at the top, allowing two-way traffic, 4’ deep, and contained 84 locks. The canal reduced the cost of transporting bulk cargo from something like 20 to 30 cents per ton-mile by wagon, to something like 2 to 3 cents. In addition, the canal increased the speed of transportation to 3 miles per hour (i.e., the pace of the mules that pulled the canal boats), reducing the trip from Buffalo to New York from a month to 10 days. The canal also made transportation dependable in the months of the year during which the canal was not frozen.

The Erie Canal opened the Mohawk Valley of New York for development. Before, it was prohibitively expensive to produce crops there for sale in coastal cities or for export. The cost of transporting wheat from Buffalo to New York City, for example, was three times the value of the wheat at New York City. But, with the canal, the coastal cities and Europe could be supplied. Accordingly, the canal gave New York City an advantage in its competition with Boston, Philadelphia, Baltimore, and other port cities as the commercial and financial center of the new country. It made the other states envious, and the people of New York excited with plans for further development, and it induced them all into ruinous follow-up projects.

The natural advantages of the Mohawk Valley as a route to the inland were long recognized. George Washington, as a colonel in the Virginia militia during the French and Indian Wars, considered it preferable to routes through Pittsburgh from Philadelphia, Baltimore, or Alexandria. In 1783, on a tour of New York, he was impressed “with the vast inland navigation of these United States,” and remarked to Governor George Clinton “would to God we may have wisdom enough to improve them.”

Attempts to secure national funding for construction of a canal through the Mohawk Valley proved unsuccessful. Thomas Jefferson described the proposal as marvelous, but “a century in advance of its age.” Then, in 1815, an ambitious and capable politician, DeWitt Clinton, a nephew of the prior governor mentioned above, rallied public support for a state effort to construct the canal. Two years

TABLE 1  
MAJOR CANALS OF THE ANTEBELLUM PERIOD

Canal	Original Owner	Canal Route		Canal Length (miles)	Slack Water (miles)	Work Began	Completed	Abandoned
		From	To					
Black River Canal	New York	Rome, N.Y.	Carthage, N.Y.	35	43	1838	1855	
Blackstone Canal	private	Worcester, Mass.	Providence, R.I.	45		1826	1828	1848
Champlain Canal	New York	West Troy, N.Y.	Whitehall, N.Y.	66		1817	1823	
Chemung Canal	New York	Watkins, N.Y.	Elmira, N.Y.	23		1830	1823	1878
Chenango Canal	New York	Utica, N.Y.	Binghamton, N.Y.	97		1834	1836	1878
Chenango Canal Extension	New York	Binghamton, N.Y.	Pennsylvania Line	40		1865		1878
Chesapeake & Delaware Canal	private	Delaware City, Del.	Chesapeake City, Md.	14		1824	1829	
Chesapeake & Ohio Canal	Maryland	Washington, D.C.	Cumberland, Md.	180	5	1828	1850	1889
Cumberland & Oxford Canal	private	Portland, Maine	Sebago Pond, Maine	20		1827	1829	1875
Delaware & Hudson Canal	private	Roundout, N.Y.	Honesdale, Pa.	105	3	1825	1829	
Delaware & Raritan Canal	private	Bordentown, N.J.	New Brunswick, N.J.	42		1831	1834	
Dismal Swamp Canal	private	Elizabeth River, Va.	Pasquotank River, N.C.	28	1	1787	1794	
Erie Canal	New York	Albany, N.Y.	Buffalo, N.Y.	364		1817	1825	
Genesee Valley Canal	New York	Rochester, N.Y.	Olean, N.Y.	107		1837	1837	1878
Hocking Branch Canal	Ohio	Carroll, Ohio	Athens, Ohio	56		1836	1844	1895

*continued*

TABLE I (continued)  
MAJOR CANALS OF THE ANTEBELLUM PERIOD

Canal	Original Owner	Canal Route		Canal Length (miles)	Slack Water (miles)	Work Began	Completed	Abandoned
		From	To					
Illinois & Michigan Canal	Indiana	LaSalle, Ind.	Chicago, Ill.	96	6	1836	1848	
James River & Kanawha Canal	Virginia	Richmond, Va.	Buchanan, Va.	45	152	1825	1851	1880
Lehigh Canal	private	Mauch Chunk, Pa.	Easton, Pa.	36	12	1827	1829	
Miami & Erie Canal	Ohio	Cincinnati, Ohio	Toledo, Ohio	244		1825	1845	
Michigan & Illinois Canal	Illinois	Chicago, Ill.	Illinois River	61		1836	1848	
Middlesex Canal	private	Lowell, Mass.	Charleston, Mass.	27		1793	1804	1853
Morris Canal	private	Phillipsburg, N.J.	Newark, N.J.	101		1825	1831	
New Haven & Northampton Canal	private	Northampton, Mass.	New Haven, Conn.	78		1825	1835	1846
Ohio & Erie Canal	Ohio	Portsmouth, Ohio	Cleveland, Ohio	309		1825	1833	
Ohio & Pennsylvania Canal	Ohio	Akron, Ohio	Pennsylvania	87			1838	
Oswego Canal	New York	Syracuse, N.Y.	Oswego, N.Y.	20	18	1825	1828	
Penn Canal-Delaware Dv	Pennsylvania	Easton, Pa.	Bristol, Pa.	60		1827	1830	
Penn Canal-Erie Dv	Pennsylvania	Beaver, Pa.	Erie, Pa.	106	32		1844	1870
Penn Canal-Main-Eastern Dv	Pennsylvania	Columbia, Pa.	Duncan's Island, Pa.	46		1826	1834	1899

AMERICAN RAILROAD NETWORK

Penn Canal—Main— Juniata Dv	Pennsylvania	Juniata, Pa.	Holidaysburg, Pa.	110	17	1827	1834	1890
Penn Canal—Main— Western Dv	Pennsylvania	Johnstown, Pa.	Pittsburgh, Pa.	104		1827	1830	1863
Penn Canal—Northern Dv	Pennsylvania	Northampton, Mass.	Wilkesbarre, Pa.	60	4		1830	1899
Penn Canal—Northern Dv Ext	Pennsylvania	Wilkesbarre, Pa.	New York State Line	103		1836	1850	1865
Penn Canal— Susquehanna Dv	Pennsylvania	Clark's Ferry, Pa.	Bellefonte, Pa.	134		1828	1833	1901
Sandy & Beaver Canal	Ohio	Bolivar, Ohio	Smith's Ferry, Ohio	74		1835	1846	1852
Santee Canal	private	Cooper Creek, N.C.	Santee River, N.C.	22		1793	1802	1850
Schuylkill Canal	private	Port Carbon, Pa.	Philadelphia, Pa.	68	42	1816	1825	
Susquehanna & Tidewater Canal	private	Columbia, Pa.	Havre de Grace, Md.	43	2	1837	1840	1895
Union Canal	private	Middletown, Pa.	Reading, Pa.	78		1821	1827	
Wabash & Erie Canal	Indiana	Ohio Line	Evansville, Ind.	379		1832	1851	1874
Wabash & Erie Canal	Ohio	Lake Erie	Ohio Line	66		1832	1843	1874
Walhonding Branch Canal	Ohio	Rosce, Ohio	Rochester, Ohio	25		1836	1842	1896
Whitewater Canal	Indiana	Lawrenceburg, Ind.	Cambridge, Ind.	74				

SOURCE: Adapted from Whitford (1906).

later, DeWitt Clinton was elected governor, and work commenced on the canal. The work continued through his two terms in office, at the end of which he declined to run for reelection. In 1824, he was again elected governor. Thus, in 1825, when the canal was opened, he presided over the celebration as chief executive of the state. The boat that took him from Buffalo to New York City—the “Seneca Chief”—depicted Hercules resting after his labor on its masthead.

While DeWitt Clinton is rightly remembered for the canal, his accomplishments both in and out of office were many. He was instrumental, in New York, in ending slavery and debtors’ prison, in advancing public schools, and in promoting charity, science, and the humanities. His political program, including the canal, was completely in line with Jeffersonian republicanism, which endorsed government construction of roads and other internal improvements (although Jeffersonians restricted federal public works to intersectional projects). The differences between the Jeffersonian and Federalist positions on government involvement in the economy were, from our vantage, subtle. The Jeffersonian Republicans were less accepting of national projects, tending to favor state over federal government. They were suspicious of private concentrations of power, and so favored state enterprises in banking and transportation, which they regarded as monopolies. Republicans also favored farmers and mechanics, i.e., Jeffersonian freeholders, while Federalists favored manufacturing, commerce, and finance.

As the Jeffersonian Republicans evolved into Jacksonian Democrats, and as the Whigs emerged, differences in economic policies changed, but not in a way that would be easy to describe. While Andrew Jackson is famous for vetoing the rechartering of the Second Bank of the United States and for requiring specie in payment for federal land, Democrats often supported government involvement in banking, paper money, and internal improvements *at the state level*.

Jeffersonian Republicans and, later, Jacksonian Democrats, Whigs, and even Lincolnian-Republicans when they arrived on the scene, all used government to bring about what they viewed to be freedom and equality. Internal improvements, such as canals, turnpikes, and railroads, along with public education would produce, in the words of New York Governor William H. Seward, a Whig, “the highest attainable equality.”

Construction of the Erie Canal did not initially cost the taxpayers of New York a penny as it was financed by bonds, \$8.4 million worth. These securities were bought, at first, mostly by New Yorkers, and, later, mostly by foreign investors. Then, when the canal opened, it attracted sufficient business to pay its operating expenses and the interest on the bonds.



Soon the entire state was clamoring for new, bond-financed development projects. Eight new canals, costing \$9.4 million, were approved, as was reconstruction of the Erie Canal itself, widening it and deepening it, as were dozens of turnpikes, and bond guarantees for a railroad to traverse the mountainous southern tier of the state—that is, the Erie Railroad mentioned above. In 1829, Governor Martin Van Buren, a Democratic Republican, signed legislation creating the New York Safety Fund, guaranteeing the bank notes and deposits of participating banks, mostly the “country banks” of the interior, that otherwise would have found it difficult to get their money into circulation. A speculative boom got under way.

But the new canals failed to cover their operating costs, not to speak of the interest on their bonds. The turnpikes were also money-losers. The Erie Railroad went bankrupt, forcing the state to assume its bonds. Eight of the banks participating in the Safety Fund failed, in case after case due to “reckless banking,” causing the Safety Fund itself to fail. New York was pushed to the brink of default, and only avoided doing so by raising taxes.

While the Erie Canal is considered an unalloyed success, the fact is that the canal itself merely covered its cost, when its cost-of-capital is included. Relying on Whitford’s (1906) data, I have constructed the relevant cash flows from the Erie Canal from the first year of construction to the last year tolls were collected. The canal did in fact generate substantial revenue, and it is true—as it is often said—that the canal soon generated enough in revenue to cover its cost of construction. Yet this statement ignores operating expenses, the cost of “reconstructing” the canal and of various “improvements” to the canal, and the time value of the funds invested in the canal.<sup>1</sup> Taking these costs into account, the Erie Canal only recovered its full cost toward the end of its revenue-generating lifetime.

As I have estimated the net cash flows of the Erie Canal, it achieved an internal rate of return of 6.24 percent, which barely exceeds the interest rate (6 percent) New York paid on the first canal bonds it issued.

Also relying on Whitford’s (1906) data, I have constructed the relevant cash flows from the entire New York system of canals from the first year of construction to the last year tolls were collected. The figures for the first few years differ from those pertaining only to the

<sup>1</sup>While revenues are reported for each year, operating expenses are reported only for the entire period. I apportioned these expenses by the percent-of-sales method. Similarly, the costs of construction, of reconstruction, and of improvements are reported only for the entire period. I apportioned these uniformly over the relevant periods.

Erie Canal because of the Champlain Canal (extending from the Hudson River to Lake Champlain), constructed concurrently with the Erie Canal. Figures for the latter years differ because of the numerous lateral canals, including the Black River, Chemung, Chenango, and Genessee Valley Canals. Three of these canals extended south from the Erie Canal, one of them connecting with the Pennsylvania system of canals. The fourth extended north from the Erie Canal, reaching Lake Ontario.

As I have estimated the net cash flows of the New York State system of canals, it achieved an internal rate of return of 0.84 percent, well below any reasonable cost-of-capital. Thus, losses on the lateral canals dragged the return on New York State's investments in canals down to nearly zero.

### The Pennsylvania Mainline

While New York imprudently followed-up on the success of the Erie Canal, Pennsylvania reacted wildly (Hartz 1968, Lively 1955, Rubin 1961b, Scheiber 1972, Shade 1992). In order to compete with New York, Pennsylvania pushed its "Mainline," originating in Philadelphia, through to Pittsburgh. This was a composite road, consisting of a railroad from Philadelphia to Columbia, a canal from there to Hollidaysburg, a "portage railroad" over the Allegheny Ridge to Johnstown, and another canal to Pittsburgh. The portage railroad was itself a set of inclined planes over which canal boats placed onto railroad cars were pulled, at first by horses and later by stationary steam engines. The Mainline was completed in 1834 at a cost of \$14.6 million.

The Mainline represented a radical change in the state's prior involvement in economic affairs. From 1791 to 1817, the state invested the modest total of \$2.4 million in various projects. Much of this investment was in bank stock, bought on favorable terms, allowing the state to participate in what was expected to be the monopoly-like profits of banking.<sup>2</sup> Much of the rest of this investment consisted of relatively small amounts in private initiatives, such as the Schuylkill Canal (Gibbons 1990) and the Union Canal. With the Mainline, not

<sup>2</sup>In granting a charter to the Bank of Pennsylvania in 1793, the state bought \$1 million of stock in part with overvalued U.S. bonds and the rest with a loan from the bank. In granting a charter to the Bank of Philadelphia in 1804, the state bought \$500,000 of the bank's \$1.8 million in stock, paying for the stock with a loan from the bank. Later, as in the granting of a charter to the Farmers and Mechanics Bank in 1809, the state was simply given a portion of the newly chartered bank's stock. For further discussion, see Sylla, Legler, and Wallis (1987).

only was the project much larger, but the project was, directly, a state enterprise.

It took an entire afternoon to pull the first boat—the “Hit or Miss”—to the summit of the Allegheny Ridge. There, it “rested at night on the top of the mountain like Noah’s Ark on Araret, and descended the next morning into the valley of the Mississippi and sailed for St. Louis.” In his *American Notes*, Charles Dickens described his ride on the portage railroad as something like a modern-day roller coaster, being as it was “laid upon the extreme edge of a giddy precipice.”

The climb over the ridge put the Mainline at a severe disadvantage.<sup>3</sup> Not only did the climb increase the time and expense involved in travel, but delays due the transshipment of goods at the several junctions in the composite road made travel problematic. The Mainline never attracted much interregional traffic. And, until the eastern “trunk line” railroads pushed through to the Midwest, the goods originating in the Ohio Valley continued to be moved to market via New Orleans.

While the Mainline never turned a profit, it did cover its operating expenses and make a contribution to interest. The remaining deficit was covered by certain taxes earmarked for the road. According to a financial analyst of the time, “By stopping expenditure, and allowing the business of the works to develop itself, the swelling of these taxes would soon have defrayed the interest, and permitted a relaxation of taxes” (*Hunt’s Merchants’ Magazine*, March 1849: 259). But speculative fever was rampant, and a large industry of contractors interested in new construction, and bankers interested in marketing new bonds urged the legislature on. Six more canals, costing another \$6.5 million, were approved. These canals failed even to cover their operating costs.

At about the same time as the state was considering its follow-up projects, the need of the Philadelphia office of the Bank of the United States to recharter as a state bank sparked the imagination of the politicians. As the “price” of obtaining a state charter, the bank was forced to make \$12 million in low-interest-rate loans to the state and its various enterprises. The legislature suspended many of the state’s taxes, and attempted to fund its operating budget and the deficits of its enterprises, as well as new construction, by borrowing.

Soon the state of Pennsylvania found itself unable to borrow on reasonable terms. The state then induced several of its banks to turn

<sup>3</sup>Even with a tunnel through the Allegheny Ridge, part of the Pennsylvania Railroad’s justification of its acquisition of the New York Central Railroad in 1970 was shifting about one-third of its traffic over the lower grade route of the New York Central (Wilner 1997: 111).

over to it \$3.1 million in small denomination bills, known as “relief notes,” in return for state bonds bearing interest at 1 percent. The state attempted to pay its bills with these relief notes, but found that they fell to half their stated value (Wainwright 1953: 88).

The eight largest banks of the state, the so-called city banks of Philadelphia, including the Bank of North America, the Bank of Pennsylvania, the Philadelphia Bank, and the Bank of the United States (now a state-chartered bank), as well as Stephen Girard’s private bank refused to accept the relief notes at par. Because the state prohibited its banks from discounting the relief notes, the city banks refused to accept them at all, and restricted their own issues accordingly. The circulating medium of the entire state, including Philadelphia, became the relief notes issued by relatively small banks such as the Bank of Penn Township, many of which failed during the ensuing recession.

In 1842, the state of Pennsylvania defaulted on its debts, paying the interest and principal coming due on its bonds in scrip. Two years later, when taxes were raised, and the Mainline and other state enterprises were sold off or abandoned, the state was able to refinance its scrip and resume payments on its debt. The Pennsylvania Railroad, a private corporation, paralleled the canals of the Mainline with iron rails, and began the work of replacing the portage railroad with a tunnel. Philadelphia, however, never regained its position as the financial capital of the nation.

## Ohio’s Canal Extravaganza

As the work on the Erie Canal progressed, the state of Ohio became excited by the prospect offered by canals for its own development (Bogart 1924; Ransom 1967, 1970). At the time, Ohio was on the frontier. Pioneers traveled to the state via the National Turnpike out of Cumberland, Maryland, which reached the state in 1818. The turnpike was itself a federal development project, approved by President Jefferson in 1802. It was built to open the frontier to settlement, and was funded by the sale of public lands on the frontier. Constructed of stone, 6–9” thick, and 30’ wide, it eventually reached Vandalia, Illinois, in 1837. Today, we know it as U.S.-40.

Travel along the turnpike was essentially one way, with settlers and manufactured goods going westward and hardly anything going eastward. It was simply too costly to ship bulk goods east via wagon. Export of goods from the region, including wheat and timber, traveled southward, via flatboat, along the Ohio and Mississippi Rivers to New Orleans. The trip down the river was both financially and physi-

cally treacherous. Even so, by 1820, Cincinnati emerged as a thriving town, and a growing number of farms were being carved out of the nearby region.

The growth of Cincinnati and most other “Western” cities would be more facilitated by the emergence of a new private enterprise, steamboats (e.g., Haites and Mak 1970, Mak and Walton 1975), than by canals constructed by state enterprise. These steamboats would tremendously lower the cost of transportation, in terms of both time and money. A correspondent to *Nile’s Register* (March 16, 1833: 36) from Cincinnati wrote, “At that time [1819], barges were from three to four months coming up from New Orleans, and freight was five cents a pound. Now [1833], the steamboats come up in eight or ten days, and freight is three-fourths of a cent a pound.” As a consequence, the prices in Cincinnati of goods shipped from New Orleans fell, and the prices of goods shipped from Cincinnati to New Orleans rose.

But the state was fascinated with canals, not with steamboats. Supposedly, a canal connecting the Ohio River to Lake Erie would, via the Erie Canal, make shipping bulk goods eastward profitable for those who had already settled the southern sections of the state, and open the central and northern sections to development.

In 1822, the state legislature organized a canal commission and it recommended construction of two canals, one—the Ohio and Erie Canal—from Portsmouth on the Ohio River through Columbus, to Cleveland on Lake Erie, and the other—the Miami and Ohio Canal—from Cincinnati to Toledo. The commission argued that the increase in land values engendered by the canals would make the burden of any debt incurred “light and trivial.”

Work commenced in 1825. Seven years, and \$5.2 million later, the two canals were completed. As in New York and Pennsylvania, if the public works had been concluded upon the completion of their initial, economically promising phase, the state might have benefited financially, and would have at least avoided catastrophe.

However, during the elections of 1836 and 1838, politicians from the areas of the state not served by these canals demanded “equalized benefits,” and not as a favor, “but as a right.” As one legislator argued, “The same enlightened and liberal policy should be extended to all portions of our great and growing state . . . which have not yet been benefited by the public disbursements which they have contributed to raise” (Scheiber 1969: 90). During the next several years, new projects totaling \$15 million were approved, including six additional state canals, two private canals, 26 turnpikes, and six railroads.

Most of these additional projects were merely unprofitable. Some were outright frauds. The Ohio Railroad, for example, which received

a \$249,000 loan from the state, consisted entirely of a set of car-wheels and axles, a pile-driver, and a saw when it was seized by the state for nonpayment. Only one of the six railroads proved to have any economic value, and it—the Little Miami Railroad—had to be reorganized by Boston capitalists (Johnson and Supple 1967: 81).

By 1841 interest on the state's growing debt reached \$800,000 per year and was being paid by borrowing. Investors then started to balk at additional bond issues. The canal commission scrambled for cash, issuing \$1.3 million in short-term debt, and \$300,000 in unauthorized "tax anticipation notes," personally countersigned by the members of the commission in case the state legislature would not retroactively approve the transaction. The next year the commission issued more short-term debt and started to pay contractors in scrip.

In 1843, the state legislature faced the financial difficulties head-on. Over the protests of the new Jacksonian Democrats, it refinanced the debt and arrears and raised taxes to cover the interest. "This is the way they take money out of the pockets of the people of Ohio . . . and put it in the hands of their friends, the British lords and capitalists" (Scheiber 1969: 157). That year, the legislature legally prohibited any additional borrowing, and eight years later incorporated the prohibition into the state's constitution. The state having withdrawn from the business of road building, private enterprise stepped in. By 1860, 2,000 miles of railroad were constructed, at a total cost of \$111 million, only \$8 million of which was provided by local subsidies.

## Other Frontier States

Indiana, which had, in 1836, approved \$10 million for canals, turnpikes, and railroads, was forced into default in 1840. Michigan did not do as badly. In 1837, it approved a less grand total of \$5 million for internal improvements. Furthermore, the state was able to recover 90 percent of the cost of one of its partially constructed railroads, and 43 percent of the cost of another when these roads were sold to private interests. As in Ohio, Boston capitalists were involved in the reorganization (Johnson and Supple 1967: 99–100).

The apparent success of the Illinois-Michigan Canal, which ran from Chicago on Lake Michigan to the headwaters of the Illinois River (and there through to the Mississippi River), enticed Illinois to follow up in grand style. In 1837, \$10.2 million was approved for a variety of internal improvements, including 1,341 miles of railroad. After the money was spent, the only thing that had been constructed was 26 miles of railroad known as the Northern Cross. Interest on the debt thus accumulated exceeded the state's revenue and forced Il-

linois into default. The high taxes needed to resume payments helped to persuade pioneers to continue westward to settle in Iowa and Wisconsin.

Instrumental to the passage of Illinois' public works bill was Abraham Lincoln. He was elected to the state legislature as an advocate of state involvement in railroad construction. When he was a young man, Lincoln had twice taken flatboats down the Ohio. As a member of the state militia during the Black Hawk Wars, he had encountered the difficulty of transporting men and supplies over land without the aid of roads. And, as a member of the influential "long nine" from Sangamon County, so known because of their height, he was successful in gaining the support he needed for passage by including projects in the bill for every section of the state. Abe Lincoln the rail-splitter could rightfully also be called Abe Lincoln the log-roller.

The experiences of other frontier states notwithstanding, the state of Missouri embarked on its own program of internal improvements in 1850 (Million 1896). As they say in Missouri, "Show me." By 1856, 914 miles of railroad were built, at a cost of \$33.4 million. The state had to assume \$31.8 million in debt because of the bankruptcy of all but one of the new railroads. The state itself defaulted in 1861. At that point the state sold or abandoned the roads it had seized, and in 1875 adopted a constitutional amendment prohibiting the use of the credit of the state to assist any private or corporate enterprise.

In Indiana, Illinois, Michigan, and Missouri, a pattern emerges similar to that observed in New York, Pennsylvania, and Ohio. Either as a follow-up to an initial success (e.g., Illinois, with the Illinois-Michigan Canal), or as an initial effort, these states undertook massive transportation projects that failed miserably. Only after the failures did these states swear off direct involvement in economic development. Then, with a commitment to private enterprise in place, development proceeded rapidly.

## The South

Prior to the civil war, most of the states of the South entered into banking. Many also entered into the canal, turnpike, and railroad businesses. Easy profits in these investments were supposed to lower, or even eliminate, the burden of taxes. Hence, the original constitution of the state of Alabama prohibited taxation. In fact, losses, often made enormous through corruption, increased the burden of taxation tremendously. Three Southern states—Arkansas, Florida, and Mississippi—defaulted on account of failures of state government-owned

banks. Florida and Mississippi, exercising their sovereign powers, subsequently repudiated their debts.

In Arkansas, Florida, and Mississippi, the bankruptcies of state-owned banks were so spectacular that banks were not reestablished until after the Civil War. In North Carolina and Tennessee throughout the antebellum period, and Alabama, Georgia, Kentucky, and Louisiana prior to reforms of their banking systems, including the closing of their state-owned banks, banknotes circulated at substantial discounts even when the banks were “current” (i.e., specie-paying).

Phillips ([1908] 1968) describes how the states of the Southeast were not reluctant to become involved in developing their transportation networks in order to get the products of their plantations to market. State involvement in economic development could be said to have been part of the “sectional” culture of the Old South (Sydnor 1948).

Among the Southern states, several—Virginia and South Carolina, for example—suffered only moderately from their interventions into the economy. Perhaps not coincidentally, these states did not much intervene in banking. Prior to 1838, the state of Virginia chartered only a few banks, including the Bank of Virginia and Farmers Bank of Richmond, Valley Bank of Winchester, and Northwestern Bank of Wheeling. The first two were large, well-capitalized, branching-banks, with conservative policies and management independent of government (even though the state held stock in them). The latter two, while similar in design, were simply much smaller and far removed from the centers of commerce of the state (Starnes 1931).

Virginia’s involvement in transportation was, initially, limited to a modest investment of \$50,000 in the James River Company (Dunaway 1922). This company gained a franchise to improve navigation on the James River by constructing a canal of seven miles around the falls of the river at Westham, west of Richmond, and clearing the river from Crow’s Ferry to Westham, a distance of about 220 miles. In return for these improvements, the company was allowed to charge a toll on boats entering Richmond from the west. The total invested by the company was \$231,000, on which it was able to make a reasonable profit, paying its first dividend of 3 percent in 1801, and paying a dividend of 12 percent beginning in 1808.

Following the War of 1812, the state began agitating for an extension of the canal. Eventually, the state took over the project, pushing it over the Blue Ridge Mountains and thence to Buchanan, at the foothills of the Alleghenies, at a cost of \$8.26 million. In its peak year (1853), the canal generated an operating income of \$170,000, a return of only 2 percent on capital. Following the Civil War, some consid-



eration was given to extending the canal to the Ohio River. In congressional hearings, it was said that the cost of the extension would be something like \$60 million, \$48 million of which was necessary for a tunnel through the Alleghenies. Fortunately, the floods of 1870 and the Panic of 1873 put an end to this foolish idea. In 1879, the company was sold to the newly formed Richmond and Alleghany Railroad, which itself was subsequently acquired by the Chesapeake and Ohio Railroad.

During the antebellum period, the state of Virginia participated in several railroad, turnpike, and other transportation projects, although none of these involved anywhere as large a financial outlay as the James River and Kanawha Canal. Nevertheless, as a result of its investments during the antebellum period, the state accumulated a substantial debt.

South Carolina, like Virginia, got involved in banking and transportation projects. The state's first bank, the Bank of South Carolina, was partially owned by the state. Nevertheless, the bank was independently and conservatively managed. Some historians of the institution are only partially facetious when they say that the Bank of South Carolina owned the state government and not the other way around (Clark 1922).

During the 1820s, South Carolina began to spend heavily on internal improvement. By 1825, it completed a water route involving several bypass canals from Charleston to Abbeville, and a state road from Charleston to Columbia. In 1847, the Governor declared that the improvements constructed "at an immense expense" had with one exception "proved entirely useless" (Sydnor 1948: 83).

Maryland, which did not get much involved in banking, nevertheless poured money into its canal project, the Chesapeake and Ohio Canal, originating in Georgetown, in the District of Columbia. The Chesapeake and Ohio Canal is today part of the National Park system, with canal boats operating in Georgetown during most of the year, a long path along the north shore of the Potomac River suitable for recreation, and the Paw Paw Tunnel, a tunnel of 3,118 feet that took 14 years to dig. It was an engineering marvel and a financial disaster.

In 1842, with its debt totaling \$15 million, the state was forced into default. For the next several years, the state struggled to raise the taxes necessary for debt service. Local governments were often unable to find men to serve as tax collectors, and the governor was empowered to make the appointments. When the Chesapeake and Ohio Canal finally reached Cumberland, in 1850, the governor of Maryland said, "Thus after twenty years of the most unprecedented

difficulties and misfortunes which grew darker and thicker as it dragged its slow length along, this stupendous work has reached its destination. . . . The result is now before us. How far relief may come out of it, time alone can show. I shall not venture to fix the day nor the year.”

The experiences with state-directed development in North Carolina and Georgia were similar in some respects to the experiences of the other original states of the south, but different enough to warrant some additional discussion. Neither of these two states, being relatively isolated, got much involved in the canal-building. Later during the antebellum period, upon the development of the railroad, Georgia and North Carolina “engaged in a sort of state socialism by building and operating railroads” (Eaton 1961: 208).

Both North Carolina and Georgia got involved in populist forms of banking, financially weak state-owned banks, organized to extend loans to the masses of farmers based on mortgage collateral. In Georgia, a state-owned bank known as the “Central Bank” was formed to make loans in the counties of the state in proportion to population (Cowen 1938). In both of these states, the government was lax to enforce the obligations of contract upon their banks, so that their circulating notes were often irredeemable paper currency.

## The Old Southwest

Kentucky, in 1806, organized the Bank of Kentucky, whose president and directors were elected by the state legislature. It failed in 1814, and had to be recapitalized. The bank failed again in 1818. In 1820, the Bank of the Commonwealth of Kentucky was formed, and authorized to issue \$3 million in legal tender notes based only on “public credit.” The market value of this paper money, the constitutionality of which was always in doubt, soon fell to half of its face value (*Nile's Register* May 16, 1829: 181; April 26, 1834: 132; and November 8, 1834: 148).

It appears that prices in the state were quoted in terms of the currency of the Bank of the Commonwealth of Kentucky, with exchange-like adjustment when transactions involved hard currency. “A person lately paid \$5 to a printer in Kentucky, tendering a ten dollar bill of one the banks of Virginia, and was surprised at obtaining a discharge of his debt and three five dollar notes in the way of change for his own.”

Following a reform of the banking system in Kentucky, the reporting of domestic exchange in the *New York Journal of Commerce*

indicates that the paper money issued by solvent Kentucky banks was usually accepted by brokers in New York at a discount of not much greater than 1 percent. As 1 percent can be taken as the upper limit of the cost of redemption during the period, this indicates some, but not great, concern for the solvency of Kentucky banks following the demise of the Bank of the Commonwealth of Kentucky.

Tennessee, in 1811, formed the Bank of the State of Tennessee. It failed, and was replaced in 1819 by a second Bank of the State of Tennessee—or, as it came to be known, “the saddle bags bank” (Campbell 1932). Its paper money was supported by a law preventing creditors who refused to accept it from foreclosing on debtors. In 1821, this law was declared unconstitutional by the state supreme court, whereupon the state legislature named a new state supreme court. From 1819 to 1826, almost all of the banks of the state were in suspension, and the paper currencies of the Second Bank of the United States, as well as of New York, Boston, and New Orleans banks, passed at a premium of 13 to 17 percent within the state. In 1826, the “Old Court” party won control of the state legislature, revoked the debt relief laws, and reinstated the former state supreme court. Even following these reforms, Tennessee paper money remained weak throughout the antebellum period.

Alabama entered the union in 1819, and four years later organized the Bank of the State of Alabama. This bank failed in 1837, at which time it was recapitalized with \$7.5 million of state funds. It failed again in 1841, and was liquidated at a loss of \$35 million.

## Constitutional Amendments

As summarized in Table 2, most states that undertook internal improvement projects ran into financial difficulties during the recession that followed the Panic of 1837. Almost all of the Northern states that ran into financial difficulty swore off deficit spending and industrial policy. New York, in 1846, added the following language to its state constitution (Article 7, Sections 1 and 2): “The credit of the State shall not in any manner be given or loaned to or in aid of any individual, association or corporation.” And, “The State may, to meet casual deficits or failures of revenues, or for expenses not provided for, contract debts, but such debts, direct or contingent, singly or in the aggregate, shall not at any time exceed one million dollars.”

Michigan, in 1850, amended its state constitution (Article 14, Section 3) “The State may contract debts to meet deficits in revenue. Such debts shall not in the aggregate at any one time exceed fifty

TABLE 2  
ANTEBELLUM CONSTITUTIONAL LIMITATIONS ON STATE INDEBTEDNESS

State (When Admitted)	Development Projects	Financial Difficulty?	Constitutional Amendment
Alabama (1819)	State Bank	Yes-1842, sold State Bank, raised taxes	
Arkansas (1836)	State Bank, etc.	Yes-1842, prohibited banks	1849
California (1850)			
Connecticut	None	No	
Delaware	Minor	No	
Florida (1845)	State Bank	Yes-1841, repudiated	
Georgia	State Bank, RRs	Yes-1820, suspended specie, adopted debtor relief laws, later reformed banking	
Illinois (1818)	Banks, Canals, Turnpikes, RRs	Yes-1842, suspended payment of interest. 1847, dedeed canal to trustees, raised taxes.	1848
Indiana (1816)	Banks, Canals, Turnpikes, RRs	Yes-1841, suspended payment of interest. 1847, offered bonds of canal for half the principal, and to resume interest payments on other half. The canal later defaulted.	1851
Iowa (1846)			1846
Kansas (1861)			1855
Kentucky (1892)	State Bank	Yes-1820, suspended specie, adopted debtor relief laws, later reforming banking	1850

AMERICAN RAILROAD NETWORK

Louisiana (1812)	State Bank	Yes-1842, sold State Bank, reformed banking	1845
Maine (1820)	Minor	No	1848
Maryland	C&O Canal, B&O RR	Yes-1842, suspended payment of interest. 1848, raised taxes.	1851
Massachusetts	Minor	No	
Michigan (1837)	Banks, Canals, Turnpikes, RRs	Yes-1842, suspended payment of interest. 1846, sold railroads, and offered \$1,000 for fully paid bonds, \$404 for partially paid bonds.	1843
Minnesota (1858)			1857
Mississippi (1817)	State Bank	Yes-1841, repudiated	
Missouri	RRs	Yes-1861, sold RRs	1875
New Hampshire	None	No	
New Jersey	None	No	1844
New York	Erie and Lateral Canals, Erie RR	Yes-1842, raised taxes.	1846
North Carolina	State Bank, RRs	Yes-1820, suspended specie, adopted debtor relief measures	
Ohio (1803)	Canals	Yes-1841-42, paid contractors in scrip. 1843, raised taxes.	1851
Oregon (1859)			1857
Pennsylvania	Banks, Mainline, Lateral Canals	Yes-1842, started to pay interest in scrip. 1844, raised taxes, sold its public works.	1857
Rhode Island	None	No	1842

*continued*

TABLE 2 (continued)  
 ANTEBELLUM CONSTITUTIONAL LIMITATIONS ON STATE INDEBTEDNESS

State (When Admitted)	Development Projects	Financial Difficulty?	Constitutional Amendment
South Carolina	Banks, Canals, Turnpikes	Not really, but did accumulate some debt	
Tennessee (1896)	State Bank	Yes-1820, suspended specie, adopted debtor relief measures	
Texas (1846)	None	No	1845
Vermont (1891)	JR&K Canal	Not really, but did accumulate some debt	
Virginia			
Wisconsin (1848)			1848

thousand dollars.” (The limit for such casual debts was later increased to \$100,000.) Furthermore, “The credit of the State shall not be granted to or in aid of any person, association or corporation” (Section 6). “No scrip, certificate or other evidence of State indebtedness shall be issued except for the redemption of stock previously issued” (Section 7). “The State shall not subscribe to, or be interested in the stock of any company, association or corporation” (Section 8). And, “The State shall not be a party to, or interested in, any work of internal improvement, nor engage in any such work except in the expenditure of grants to the state of land or other property” (Section 9).

Some states included “sinking fund” provisions in their state constitutions, providing for the gradual retirement of their debts. For example, Article 9, Section 11, of the Pennsylvania constitution of 1857 reads, “To provide for the payment of the present State debt, and any additional debt contracted as aforesaid, the General Assembly shall continue and maintain the sinking fund sufficient to pay the accruing interest on such debt, and annually to reduce the principal thereof by a sum not less than two hundred and fifty thousand dollars.” Following the Civil War, almost all of the debts of the Northern states, both those incurred during the antebellum period and those incurred in support of the war effort, were gradually paid off.

Even the experiment with free banking could be characterized as *an attempt* to divorce the state from currency and banking. “Free banking” allowed free entry into banking provided certain preconditions were satisfied, and was favored by “locofoco” Democrats. The soundness of free bank-issued paper money was supposed to be guaranteed by bond collateral. Yet, when the market values of these bonds fell, these banks fell in droves (Rockoff 1974, Rolnick and Weber 1983). With the restriction of qualifying bonds to those of stable value, free banks worked well enough. In New York, during the antebellum period, this was accomplished by specifying that only U.S. Treasury and New York State bonds qualified.

The states of the South, however, did not generally amend their state constitutions so as to mandate balanced budgets, remove the state from currency and banking, and leave economic development to private enterprise. Of the three that did, two—Kentucky and Maryland—were border states, and the third—Louisiana—was a regional center of banking and finance and, so, had a parochial interest in the soundness of its money and credit. Indeed, in addition to adopting a constitutional amendment restricting the state in matters of economics and finance, Louisiana also reformed its banking system, requiring banknotes and deposits to be “backed” one-third by specie and two-thirds by short-term loans and bills.

## Regression Analysis

The constitutional amendments that were adopted could be viewed as attempts by states to bond themselves to creditors (and, for that matter, to taxpayers), in light of the fact that several states had recently run into financial difficulty. If successful, these states would be able to attract capital (and immigrants) in spite of any apprehension by investors either in state-issued securities or in enterprises that, by reason of their tie to the land, could be made subject to discriminatory taxation or regulation. In order to examine this possibility, data on state debts and investment in railroads (as measured by miles of railroad) were collected for the years 1840, 1850, and 1860 for 28 states east of the Mississippi River—that is, all of the states east of the Mississippi River except Iowa and Minnesota, realizing that prior to the Civil War West Virginia was still part of Virginia. (See Table 3 for data on railroad mileage and cost for 31 states during the antebellum period.)

Table 4 reports regressions of the following form:  $R_{it} = a + b_j X_{jit} + cC_{it} + dD_{it} + e_{it}$ , where  $R_{it}$  is railroad mileage in the state in state “i” during year “t”,  $X_{jit}$  is an array of control variables,  $C_{it}$  is an indicator variable denoting states that adopted constitutional amendments restricting state borrowing or investment in banking and industry, and  $D_{it}$  is a measure of state debt. The results are quite satisfactory.

Population is used to scale the observations (and the square root of population to weight the observations in the weighted regressions). In some exploratory analysis, it was found that both the level of population and its recent growth contributed to the explanation of railroad mileage. In addition, urban population proved significant. Its negative coefficient might be interpreted as signifying that the dispersion of population throughout the rural areas of a state contributed more to the growth of the railroad network than did the concentration of population in cities. It should be noted that, in order to minimize the simultaneous determination of railroad construction and population, population figures are taken from the prior decennial census.

The coefficient on the lagged value of railroad mileage—being greater than 1—indicates that, during the period, railroads beget railroads. That is, once started, the railroad network developed a dynamic of its own. This could be explained by a “learning curve” in the operation of railroads. To be sure, these first few variables are included only as control variables.

The first variable of interest, the constitutional amendment variable, is set equal to one-tenth of the number of years during the prior 10 in which the state had a constitutional amendment restricting state



TABLE 3  
RAILROAD MILEAGE AND COST OF THE ANTEBELLUM PERIOD

	Miles			Cost (Millions of \$)	
	1840	1850	1860	1850	1860
Alabama	46	183	743	2.6	17.6
Arkansas	0	0	38	0.0	1.2
California	0	0	23	0.0	1.6
Connecticut	82	402	601	14.0	22.0
Delaware	39	39	127	2.3	4.4
Florida	0	21	402	0.2	8.6
Georgia	275	643	1,420	13.3	29.1
Illinois	24	111	2,790	1.4	104.9
Indiana	0	228	2,163	8.4	70.3
Iowa	0	0	0	0.0	0.0
Kentucky	29	78	862	2.0	24.1
Louisiana	27	80	335	1.3	12.0
Maryland	239	259	386	11.6	21.4
Massachusetts	305	1,035	1,264	47.9	58.9
Maine	13	245	472	7.0	16.6
Michigan	118	342	779	8.9	31.0
Mississippi	0	75	862	2.0	24.1
Missouri	0	0	817	0.0	42.3
New Hampshire	37	467	661	14.8	23.3
New Jersey	197	206	560	9.3	29.0
New York	363	1,361	2,682	65.5	131.3
North Carolina	92	283	937	3.3	16.7
Ohio	49	575	2,946	10.7	111.9
Pennsylvania	625	1,240	2,598	62.5	143.5
Rhode Island	58	68	108	2.8	4.3
South Carolina	204	289	973	7.5	22.4
Tennessee	0	0	1,253	0.0	29.5
Texas	0	0	307	0.0	11.2
Vermont	0	290	554	10.8	23.3
Virginia	285	481	1,379	12.6	65.0
Wisconsin	0	20	905	0.6	33.6

borrowing and investments in banking and industry. In the case of a state that had such an amendment throughout the 10-year period, this would equal one. Because population is used to scale this variable, its coefficient is interpreted as the effect on railroad mileage per 1,000 people in the state of such a constitutional amendment. Thus, the regression indicates that a state with a population of 1 million would see its railroad network increase by 400 miles following the adoption

TABLE 4  
THE DETERMINANTS OF RAILROAD MILEAGE: REGRESSION RESULTS

Independent Variables	Unweighted Observations	Weighted Observations
Constant	3.65 (0.05)	21.24 (0.19)
Population Increase 10 years prior (in thousands of people)	$P_{it-10} - P_{it-20}$	1.23 (2.53)
Population 20 years prior (in thousands of people)	$P_{it-20}$	0.43 (2.11)
Urban Population 10 years prior (in thousands of people)	$U_{it-10}$	-3.85 (5.47)
Constitutional Amendment (per 1000 people)	$P_{it-10} \sum_{s=t-9,t} C_{is}/10$	0.40 (3.37)
State Debt (in millions of \$)	$(D_{it-10} + D_{it})/2$	11.33 (1.39)
Railroad Mileage 10 years prior	$R_{it-10}$	1.85 (7.02)
$R^2$	68.7%	NA
N	84	84

NOTES:  $R_{it}$  is railroad mileage,  $P_{it}$  is population (in thousands),  $U_{it}$  is the urban population of the state (in thousands),  $C_{it}$  is an indicator variable denoting the states that adopted constitutional amendments restricting state borrowing and investing in banking and industry, and  $D_{it}$  is state debt (in millions). Absolute values of t-statistics are in parentheses. The sample consists of 28 states observed decennially in 1840, 1850, and 1860.

SOURCES: Population—*Historical Statistics of the United States* (1976); state debt (figures for 1840 and 1850 being interpolated from data of 1838, 1841, and 1853) and constitutional amendments—Ratchford (1941); railroad mileage—*Poor's Manual* (1899).

of the just described type of constitutional amendment. This variable is highly significant and proved to be robust across a range of alternative specifications of the regression equation.

The state debt variable, set equal to the average of the current and the 10 prior years' figures for state debt, is not statistically significant. This result is informative because much of the state debt of the period was incurred specifically to promote internal improvements. The insignificance of the coefficient indicates that state enterprise mostly crowded out private enterprise. Perhaps a few miles of railroad were constructed by state enterprise that would not have been constructed by private enterprise. Ignoring the insignificance of the coefficient, the addition might be 6 to 11 miles of railroad per million dollars of state debt. This is to be compared to an average cost during the period of roughly \$35,000 for a mile of railroad.

The regression analysis verifies what appears obvious from the history of the period reviewed above. The states that abandoned state intervention into their economy and, instead, embraced *laissez-faire* enjoyed greater economic growth.

## Canals versus Railroads

For some historians, the failure of state enterprise in transportation was due to the technological obsolescence of canals upon the development of the railroad. To be sure, it is convenient to think of the period of state intervention as a period of canal building, and the period of private enterprise as a period of railroad building. However, this dichotomy is neither correct nor important.

As is detailed in Table 1, a majority of the canals constructed during the antebellum period, and all of the canals longer than 110 miles, were state enterprises. Nevertheless, 14 major canals were constructed as private enterprises (some admittedly with state subsidies). While almost all of the state enterprises were financial failures, most of the private enterprises were financially successful.

Railroads did not immediately make canals uneconomic. The reason is that early locomotives were not powerful enough to transport bulk cargo as cheaply as canals. From the beginning, the great advantage of railroads was speed. Only later did railroads also lower the money cost of transportation (for all but the heaviest cargo). As an English civil engineer put it, "The experiments previous to, and the subsequent practice of that Railway [the Stockton and Darlington], since the opening, have exhibited a result as astounding as it is important." Namely, that with the use of locomotives, an average speed

of 15 miles an hour “is kept up with the greatest ease; and, on an extraordinary occasion, nearly double that rate, or 30 miles in one hour” was achieved (Wood 1838: xi–xii).

The idea that a locomotive could attain such speeds was, at the time, astounding. The story is told of the time when the great developer of the railroad, John Stephenson, was going before a committee of Parliament to secure a railroad charter. He was warned not to claim a speed of more than 15 miles an hour. A member of the committee, in opposition to the proposed railway, attempted to “embarrass” Mr. Stephenson in this way:

“Well, Mr. Stephenson,” he asked, “perhaps you could go 17 miles an hour?”

“Yes.”

“Perhaps 20 miles an hour?”

“Certainly.”

“Twenty-five, I dare say. You do not think that impossible?”

“Not at all impossible.”

“Dangerous though?”

“Certainly not.”

“Now, tell me, Mr. Stephenson, will you say that you can go 30 miles an hour?”

“Certainly.”

At this they all leaned back in their chairs and roared with laughter. They imagined that this was the very climax of absurdity [Martin 1871: 159].

According to Wood (1838: 683–84, 698), canals actually enjoyed a slight cost advantage for bulk cargo, 1.02 to 1.36 pence per ton-mile, versus 1.065 to 1.565 pence per ton-mile for railroads. As he explains it, this cost advantage derived from the more complete reduction of friction capable in canals compared to the reduction of friction of which railroads were capable. To be sure, even for bulk cargo, canals were slower than railroads, 2.5 mph versus 8 mph, but with bulk cargo, speed was not very important. With passengers, the difference of cost was insignificant (and not necessarily to the advantage of canals) compared to the great advantage of railroads in speed.

Furthermore, as a big part of the cost of both canals and railroads was their cost of capital, the relevant cost of continuing to operate an already-built canal could be quite low. Thus, long after it would be economic to construct a new canal, it might be economic to continue to operate an old one.<sup>4</sup>

<sup>4</sup>Eventually, advances in railroading made even operating most old canals uneconomic. In particular, more powerful locomotives and automatic brakes allowed reductions in crew

Among the privately built canals listed in Table 1 are three (the Delaware and Hudson Canal, the Lehigh Canal, and the Schuylkill Canal) that were constructed to bring anthracite coal from northeastern Pennsylvania to market. These canals were thus built to serve an immediate purpose. If they also facilitated general transportation or economic development, this would have been characterized by economists as “positive spillover.”

These anthracite coal canals were operated, or came to be operated, by large corporations (the Delaware and Hudson Co., the Lehigh Coal and Navigation Co., and the Reading Co.) whose purpose was not specifically to operate a canal. Each of these companies built railroads, initially to augment their canals, and later to offer general transportation services. These companies continued to maintain and operate their canals as long as that made economic sense; that is, treating the cost of construction as a sunk cost.

The other 11 privately built canals in Table 1 were constructed to be public carriers, at least to some extent. The Middlesex Canal, in Massachusetts, was built to connect the manufacturers relying on water power at the falls of the Merrimac River in New Hampshire with merchants in Boston. The canal was reasonably profitable and was eventually acquired by the Boston and Lowell RR so it (the railroad) could consolidate its position in the area.

The Morris Canal (that crossed northern New Jersey) and the Delaware and Raritan Canal (that crossed the middle of the state) were two other reasonably profitable private canals (Crammer 1961, [1955] 1978). Both came to be acquired by railroads looking to consolidate their positions in their areas. In 1871, the Morris Canal was assumed by the Lehigh Valley Railroad, a hard coal road. The Lehigh Valley continued to operate the canal for transportation until 1899, at which time it used a portion of the canal to supply water to Newark, New Jersey.

The Delaware and Raritan Canal was effectively merged with the Camden and Amboy Railroad soon after it was chartered. Later, the two were formally consolidated as the United New Jersey Railroad and Canal Co., which in 1871 was leased by the Pennsylvania Railroad. The canal continued to be used for transportation into the early 20th century, although at a perennial operating loss after 1893. In such manner, utilization of transportation technology evolved from

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size. And the use of steel minimized the slight depression of the rails when the wheels of the train roll over, which causes trains to always be going “uphill.”

canal to railroad with due consideration for the marginal costs involved.

Thus, the canal era, while mostly characterized by state enterprise, also involved quite a bit of private enterprise. The key difference between state canals and private canals is that the former often were projects of enormous scale and were constructed as part of ambitious development projects. Private canals, on the other hand, were not so enormous and were constructed with reasonable prospects of immediate profitability.

Similarly, while the railroad era was mostly characterized by private enterprise, it also involved state enterprise. As was already mentioned, in the South and in the West, many of the initial railroads were public enterprises. Among the five trans-Appalachian railroads opened around 1850, all five had some connection to public enterprise. Working from North to South, the New York Central Railroad was amalgamated in 1853 from 10 roads built to parallel the Erie Canal, allowing passengers and fast freight to gain the advantage of speed. In this case, private enterprise followed an opportunity opened up by public enterprise, first constructing a series of short railroads, and then consolidating the pieces into a large and more efficient system.

As was already mentioned, the Erie Railroad was constructed with substantial bond guarantees from New York State, part of the package of internal improvements put together in the state legislature following up on the success of the Erie Canal. As was also already mentioned, the Pennsylvania Railroad was organized in order to acquire the state works of Pennsylvania. While all three of these northern railroads had some connection to state programs of internal improvement, each quickly assumed its status as a private enterprise.

The first of the two Southern trans-Appalachian routes—the Baltimore and Ohio Railroad—was underwritten in large part by the State of Maryland and by the City of Baltimore. Each of these political jurisdictions appointed certain of the directors of the company into the late 19th century. The company only became a “pure” private enterprise following its reorganization by J. P. Morgan in 1894. The second of the two Southern trans-Appalachian routes—formed by the South Carolina Railroad, the Georgia Railroad, and the Western and Atlantic Railroad—included two railroads built and owned by the state of Georgia.

Southern railroads reflected the “sectionalism” of the South in ways in addition to state ownership and finance. For example, consolidation of individually small roads into large systems, which was under way in the north prior to the Civil War, was delayed in the South until

late in the 19th century, and was primarily effected by Northern capitalists (Stover 1955). It is sufficient for present purposes to observe that, in keeping with the above discussion of the continuing role of the states of the South in banking and industry, both of the Southern trans-Appalachian railroads involved state participation in one form or another.

Inevitably, discussion of the development of the railroad network during the antebellum period provokes discussion of economic development in general, population growth especially as it involved immigration, the opening of the West or the “free land” issue, and the issue of slavery itself. Economic policies codifying the adoption of laissez-faire by most of the states of the North and by few of the states of the South can only be approximated by statistical measurement and can always be criticized for being imprecise. Nevertheless, it does appear that the development of the railroad network was facilitated by the swearing off of state projects of internal improvements and by deferring to the “piecemeal” system of private enterprise.

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