

Determinants of Railroad Capital Structure, 1830-1885

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Abstract: U.S. Railroads suffered repeated financial crises in the 19th and 20th Centuries. These crises were caused by a combination of high debt levels and strongly procyclical revenues and profits. Given the inherent instability of profits, why did railroads depend primarily on debt to finance their initial growth? I find that, over 1830-1885, railroads faced significant agency and control problems, which were partially mitigated by the use of debt. Around 1885, new developments reinforced the initial tendency towards debt-heavy capital structures.

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I. Introduction

During the Great Depression, the railroad corporations of the United States experienced a financial crisis of major proportions. The basic cause was a precipitous decline in operating revenues combined with weak balance sheets and high preexisting debt burdens. The heavy burden of debt service led to cutbacks in maintenance expenditures and employment, which would have been avoided in better financial circumstances (Schiffman 2001). Furthermore, the market for railroad bonds collapsed, exacerbating the problems of the banking sector, which held 16% of its assets in the form of railroad bonds (Horton 1937). The federal government recognized these facts and, beginning in 1932, it loaned large sums to distressed railroads through the Reconstruction Finance Corporation (RFC). The RFC loan program was at best a limited success, and at worst an outright failure.¹ By 1938, one-third of railway mileage was operated by bankrupt firms.

In many ways, the railroad crisis of the 1930's was merely a replay of earlier crises that began in the years 1857, 1873, 1884 and 1893. In each case, heavy burdens of debt service combined with external, economywide factors to precipitate a crisis. This fact motivates two central questions: (a) What were the initial considerations that determined the capital structures of railroads? Did these considerations shift over time? If so, how and why? (b) By the late 19th

¹ More research is needed on this point. See Schiffman (2001) for evidence that RFC loans failed to stimulate maintenance and employment.

Century, it was painfully obvious that highly leveraged firms could not survive a general economic downturn. Why didn't railroads respond to this reality by reducing their reliance on debt?

These questions are important for two reasons: (a) Railroad financial history provides an excellent case study for exploring the relationship between corporate governance and capital structure. (b) For the purposes of econometric work, it is useful to know whether or not financial variables (such as debt and interest payments) can be classified as predetermined with respect to the 1930's.

A proper treatment of the topic at hand requires more than one article. Therefore, this paper will concentrate on the first question (Why did railroads finance their initial growth primarily through debt?), and offer only general suggestions regarding the second question (Why didn't railroads change their financial policies, once the disadvantages of high leverage became clear?). A more comprehensive treatment is left for future work.

The essential findings of the paper are as follows: Early in the history of railroad finance, debt emerged as the leading instrument of external finance. The use of debt helped to mitigate significant agency and control problems that impinged on 19th Century financial markets. Furthermore, underwriting costs for stock issues were very high. Had railroads developed close relationships with banks, they would have been able to issue stock at much lower cost; but the unit banking system prevented them from doing so. Although the 20th Century saw

the emergence of large-scale stock financing, a number of factors prevented the railroads from taking full advantage of this development. These factors became significant around the year 1885.

The rest of the paper proceeds as follows: Section II examines the railroad debt problem from a Great Depression perspective, and establishes that debts originally incurred in the 19th Century played a role in the crisis of the 1930's. Section III asks whether observed railroad capital structures can be explained by means of insights from finance theory. Section IV describes three major factors that influenced the course of railroad finance during 1830-1885. Section V provides a general synopsis of developments after 1885, and Section VI concludes.

II. Railroad Debts: A Great Depression Perspective

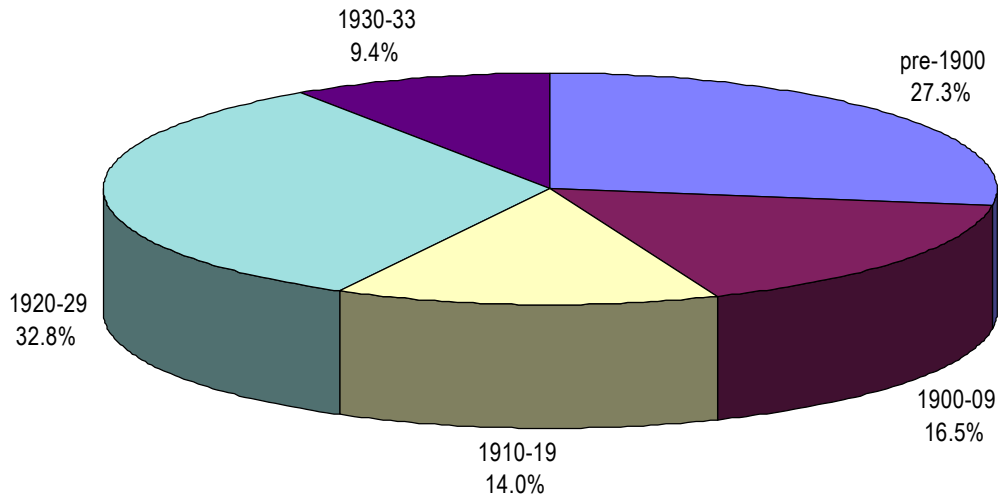
What were the origins of the railroad debt crisis of the 1930's? Did it come about through sharp increases in debt during the 1920's? Or was it caused by events that occurred before 1920, or even before 1900? In its annual report for 1938, the Interstate Commerce Commission (ICC) declared that the problem of railroad indebtedness was "rooted in a distant past."² Is this claim consistent with the facts? Horton (1937) examined the time distribution of the debts of 33

² In reading this statement, it is important to keep in mind that the ICC, established in 1887 as the nation's first regulatory agency, was not granted the power to regulate railway security issues until 1920. In the year 1938, railway mileage being operated in bankruptcy reached a peak of 32.5% of total railway mileage. Under fire from its critics, the ICC had a natural inclination to argue that decisions made *prior* to 1920 were the primary cause of this desperate situation.

major railroad companies, as of the end of 1933. His sample includes 76% of all railroad debt outstanding at that time. He found that most railway debt in existence at the end of 1933 had been issued prior to 1920, as shown in Figure 1.

Figure 1

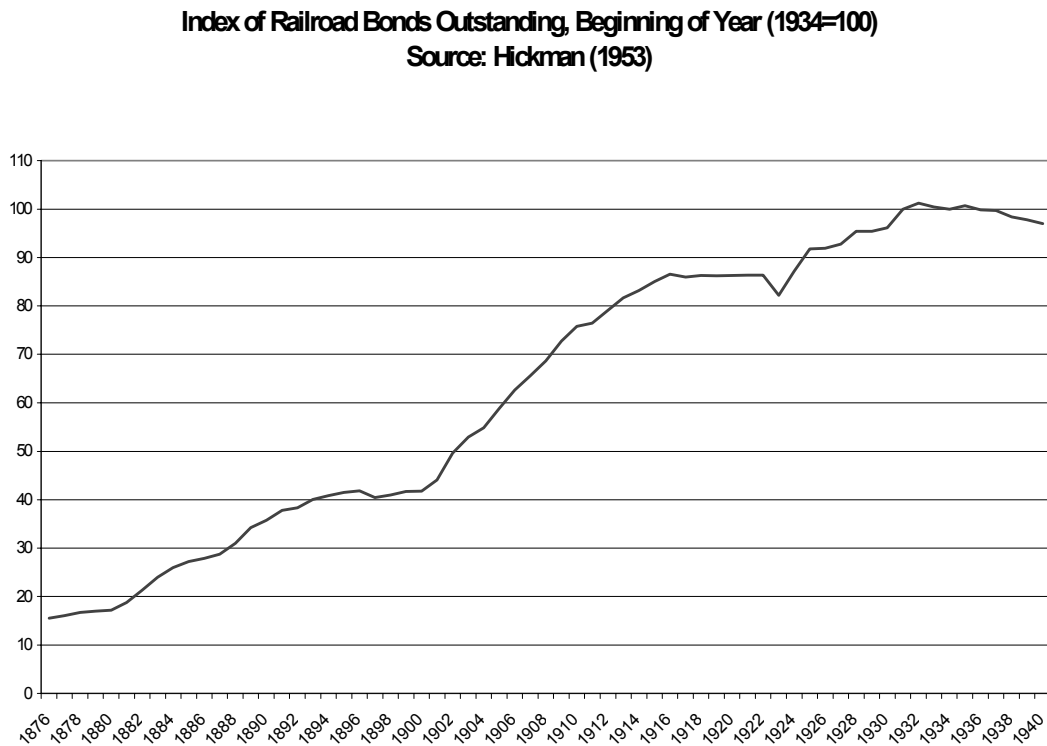
Distribution of Dates of Issue, Debts of 33 Class I Rways as of 12/31/33 (Source: Horton 1937)



According to Horton's estimates, pre-1920 debt comprised 57.8% of all debt, while pre-1900 debt comprised 27.3% of all debt. These figures are probably underestimates, since Horton did not distinguish between new borrowing and refunding of existing debts. Since fifty-year maturities were common in the field of railroad finance, many bonds dated 1920 or later were issued to refund obligations that were first contracted as early as 1870.

There is another imperfect but useful measure of the percentage of “old” debt. We can examine the amount of bonds outstanding in a given year, relative to the amount of bonds outstanding at the end of 1933. The series compiled by Hickman (1953) is most useful for this purpose, since it extends back to 1876.

Figure 2



We can see that the problem of railroad indebtedness was longstanding; it did not develop in the 1920's. A significant component predates the year 1900. Therefore, it is worthwhile to focus our attention on the financing choices made by the railroads in earlier years. This is the purpose of the remainder of the paper.

III. Why Did Railroads Rely So Heavily on Debt Finance? Theoretical Considerations

Why did creditors agree to lend so much money to railroads? Weren't creditors aware that railroads were risky? Actually, railroads were seen, *ex ante*, as a *low* risk sector, which would be ideal for conservative investors. During the 19th Century, railroad firms (along with utilities) had access to national markets for long term debt, while industrial firms did not. This peculiarity may be explained by using some ideas from finance theory.

As firms advance in size and maturity, they progress through a “pecking order” of financing possibilities. Young and small firms must rely upon internal finance and the contributions of “insiders.” Later on, they typically borrow from banks. As they get larger and establish a reputation as seasoned credit risks, they market debt instruments privately, and eventually they offer bonds to the public as well. The most seasoned firms are able to raise money through the sale of stock as well. Industries which have tangible, fixed assets can easily issue bonds with the assets as collateral. Therefore, we might expect this type of industry to reach the stage of public bond sales more quickly. Utilities and

railroads are perfect examples of such industries. The real estate sector was financed by mortgages for basically the same reason.³

Another essential characteristic that distinguishes railroads and utilities from other types of enterprises is the virtual absence of the “asset substitution effect.” This notion was originated by Jensen and Meckling (1976). Potential lenders hesitate to become involved with a concern whose equityholders have great influence on management, or where managers themselves hold equity. In such cases, managements have strong incentives to act contrary to the interests of lenders. “Once debt contracts are entered into, managers with an equity interest in the firm may have an incentive to take on greater risk, because they are only concerned with expanding the upper tail of the asset returns distribution” (Calomiris 1995, paraphrasing Jensen and Meckling 1976). Lenders can avoid this problem if they extend short term loans only, and refuse to renew those loans if the firm engages in risky activities.

In industries where the problem of asset substitution is minor or nonexistent, firms are more likely to have access to long term loans. Railroads and utilities are not likely to gamble large sums of money on new and untested inventions, for example. A sudden change to a new line of business is simply not

³ In 1929, real estate, utilities and railroads were the most indebted nongovernmental sectors in the economy. This conclusion is based on data compiled by Kuznets (1941). These data allow us to compute a measure of indebtedness by sector: Net interest payments on long term debt as a percentage of the sector’s contribution to National Income. The resulting figures are real estate, 27.8%; utilities, 11.9%; and railroads, 11.0%.

a realistic possibility. Also, political and regulatory pressure reduced the potential for asset substitution.⁴ This explains why railroads were able to secure financing in public bond markets more readily than industrial firms.

The lack of asset substitution problems can account for the willingness of investors to subscribe to large amounts of bonds, but not for the eagerness of railroads to issue them. According to finance theory, the variability of firm profits is an important determinant of optimal capital structure, given the physical costs incurred during financial distress. The greater the variability of profits, the lower the optimal debt to capital ratio. Altman (1970) applies this idea to railroads. He points to the extreme cyclicity and instability of railroad profits, and the high social costs of bankruptcy.⁵ These factors imply a low (optimal) debt to capital ratio. To Altman, the railroads' choice of a high debt to capital ratio provides "valid grounds for criticism of the industry's overall managerial efficiency."

⁴ Nevertheless, we cannot say that asset substitution never occurred on the railroads. A notable exception was the case of the New York, New Haven and Hartford Railroad, under the management of JP Morgan. Beginning around the turn of the 20th Century, the New Haven purchased streetcar lines, electric railways, steamship lines and warehouses. Critics of Morgan's dealings, led by future Supreme Court Justice Louis Brandeis, alleged that the New Haven sought to monopolize transportation in New England. The New Haven experienced a severe financial crisis in 1913, but did not go bankrupt. Another example: The Northern Pacific under Jay Cooke became involved in land speculation beginning in 1870, and helped precipitate the Panic of 1873.

⁵ The costs of bankruptcy included not only "obvious costs to corporate suppliers, creditors and stockholders, but also "social costs due to reduced service, higher rates, and government subsidies and/or loan guarantees necessitating higher taxes..."

While Altman's point is well-taken, I will argue that debt-heavy capital structures emerged in the 19th century as an equilibrium response to financial market frictions. Over a period that extended from 1885 to 1929, new external circumstances arose that encouraged the perpetuation of such capital structures, despite repeated episodes of financial distress and mass bankruptcy (beginning in 1857, 1873, 1884 and 1893). This would set the stage for the disaster of the 1930's, in which the poor financial state of railroads contributed to an economywide slump.

IV. The Early History of Railroad Finance: 1830-Circa 1885

(i) Foreign Investors as a Source of Funds

In the 1830's, when railroads were in their infancy, the railroad promoters of New York and New England raised funds by selling stock in Boston. Railways in the South and West found local financial markets to be too thin to provide for their financing needs. They turned to British markets, and succeeded in marketing sterling bonds through the agency of well-connected U.S. bankers. Foreign investors were attracted to railroads because of the tangible, concrete nature of their physical capital. While some foreigners did buy stocks, the vast majority preferred bonds, since they were not interested in becoming involved in matters of management. Around 1848, Boston became less receptive to stock

sales, and the Eastern railroads shifted to selling bonds (Chandler 1954). Through World War I, foreign investors remained a major source of funds for railroad expansion and development. British investors continued to be major purchasers, and other nations such as France and the Netherlands joined the club in the early 1900's. Beginning around 1900, U.S. investment bankers, led by JP Morgan and Kuhn Loeb, played a major role in marketing railway securities abroad (Carosso 1970).

(ii) Control, “Tunneling” and Discipline

New railroads were typically launched by a small, tightly knit group of promoters. It was in their interest to maintain control while contributing as little as possible from their personal funds, and keeping the maximum amount of profits for themselves. For this reason, they issued a limited amount of stock and held it closely, among business associates and allies. The bulk of the firm's financing needs were met by the sale of bonds. Bondholders had no vote and no say in governing the firm. But stockholders did have the right to vote, and the sale of new stock to strangers was bound to dilute control of the firm. Control could be maintained while issuing new shares, but only if “insiders” put up more money in order to purchase a substantial portion of these shares. Also, shareholders expect their dividends to be increased if the firm does well, whereas bondholders are only entitled to a fixed return. By holding stock closely while

selling bonds to strangers (who were often foreigners), the control group kept the bulk of profits earned by a successful railroad.

If maintaining control was an important objective, why didn't the railroads sell more non-voting preferred stock? After all, preferred stock was an invention of the railroads and could legally be issued in a number of states.⁶ Its very purpose was to raise new funds while perpetuating the existing control. Yet, the record says that preferred stock outstanding never exceeded 22.9% of all stock outstanding (in 1900) and 11.5% of all financial capital (in 1901).⁷

The most likely explanation is that the dividend rates demanded by investors in preferred stocks exceeded prevailing interest rates on bonds. This is understandable; because holders of preferred stock are exposed to greater risk than bondholders, they must be promised a higher return. In order to maximize the dividend rate on common stock, the control group tended to minimize the sale of stock, even if it carried no voting rights. This practice is widely cited in the historical literature, and was known as "trading on the equity."

Investors had reasons of their own for favoring debt. The finance literature stresses that the need to cover fixed interest payments imposes discipline on management. It cannot afford to become complacent or to tolerate

⁶ Nonvoting common stock appeared only in the 1920's and was frowned upon by the markets. See Berle and Means (1932) for an elaborate discussion of the legal aspects of corporate governance and financing.

⁷Preferred stock became increasingly important during the reorganization era of the 1890's, but declined in (relative) prominence thereafter.

wasteful practices within the organization. The more equity that managers hold, the more effective debt service is as a disciplinary device; a manager with a large equity stake has much to lose from bankruptcy.

Besides complacency and laziness, there were other ways in which management could act against the interest of investors. Many managements were engaged in the practice of “tunneling.” Johnson, La Porta, Lopez-De Silanes, and Shleifer (2000) define tunneling as “the transfer of assets and profits out of firms for the benefit of those who control them.” The 19th Century was the age of the “Robber Barons,” and often this derogatory name was well deserved (De Long 1998). Controlling groups had multiple ways of expropriating minority shareholders and enriching themselves. For instance, managers could spend company resources for private needs, then enter a fictitious expense on the books. Shareholders would never know that the true profits exceeded the reported profits, and that they were in fact entitled to a higher dividend than they actually received.

Minority shareholders were not well protected by the legal system; there was no federal regulation of railroad finance until 1920, and according to Berle and Means (1932), state regulation in this area was not very effective. There was a simple way to protect oneself against unscrupulous managers: Avoid becoming

a shareholder, and invest only in bonds. This behavior on the part of investors forced firms to submit to some measure of discipline.⁸

But avoiding stock ownership could not provide absolute protection against tunneling. There were also ways of expropriating both stockholders and bondholders, by taking actions that would dramatically increase bankruptcy risk. One of the most common schemes was that of the construction company. When the railroad needed to perform new construction, the controlling group would form a construction company and then automatically award it a contract with the railroad. For its services, the construction company would be paid an amount that was several times the actual cost of the work. The inflated construction bills were financed by the sale of bonds; as an inducement, prospective bondholders were offered “bonus” shares of stock. In effect, the firm increased its productive assets, but by a small amount relative to the new fixed charges incurred in the transaction. An egregious example of tunneling was the infamous Credit Mobilier scandal of the late 1860’s.⁹ As compensation for

⁸ However, when firms reach a point of financial distress, debt may lose its effectiveness as a disciplinary device. If managers become convinced that bankruptcy (which means loss of control) is inevitable, it is rational for them to engage in tunneling regardless of the amount of debt. I leave for further research the question of whether or not this phenomenon can be observed in the data.

⁹ The Credit Mobilier was formed in 1867 by the controlling interests of the Union Pacific, and was awarded construction contracts with that railroad at exorbitant prices. This occurred despite the fact that the federal government, by virtue of its loans and grants of land, had representation on the UP board. A Republican member of Congress sold Credit Mobilier shares to fellow Congressmen at a huge discount, in order to buy influence for the UP. This became an issue in the 1872 election, and soon afterwards a Congressional investigation was launched. It was found

constructing sections of the Union Pacific railroad, Credit Mobilier was paid 84% over actual cost (computed from figures in Trottman 1923).

(iii) Banks and Railroads: The Great Size Mismatch

Another important factor that favored the dominance of bond financing was the peculiar structure of the U.S. banking system (Calomiris 1995). Due to severe legal restrictions on branch banking, American banks were mainly small, unit (single office) operations. Consequently, they could not provide financing on the scale demanded by large firms. Unlike the U.S., Germany had a system of universal banks with branches throughout the country. In addition to traditional banking services, German banks underwrote securities and made loans to industrial firms. They maintained a very close relationship with their clients, holding corporate stocks, acting as board members and serving as trustees for stock portfolios. By monitoring corporate managers closely, developing a long term relationship with firms, and communicating information to potential investors, German banks were able to mitigate agency problems associated with

that the UP issued \$47 million in securities over and above the actual costs of construction. The scandal ended the career of Vice President Schuyler Colfax.

equity finance. Backed by a reputable bank, firms were able to gain access to equity markets to an extent that would not be possible otherwise.¹⁰

At an early stage in their development, many American railroads outgrew the resources of local and regional banks. Private bankers and syndicates arose to provide intermediation services for firms. However, they were not as effective as German bankers when it came to communicating information about firm quality to the markets. As a result, underwriting costs were quite high in the U.S., especially for equity issues. In 1913, flotation costs ranged from 4-10% for bond issues, and exceeded 20% for stock issues (Calomiris and Raff 1995). (Although earlier data on spreads are unavailable, there is no reason to believe that spreads were lower in the 19th Century.) Given such high costs, it is no wonder that railroads were not eager to finance their growth needs through the sale of stock.

V. Developments Since 1885: A Brief Summary

Around 1885, new factors began to emerge, which ensured that debt would retain its primary position in railroad financing. U.S. institutional investors came

¹⁰ Some researchers strongly question this interpretation (see Fohlin 1999). They argue that the “orthodox” view (that of Calomiris, among others) greatly exaggerates the beneficial impact of universal banking on German economic development. However, their arguments relate mainly to the “orthodox” claim that reusability of information and general economies of scope in German banking led to better economic performance. In this paper, however, the main point is that the small size of U.S. banks meant that there was a major size mismatch between them and railroad firms. Even if empirical support for other “orthodox” claims is weak, this point remains salient.

to regard railroad bonds as a safe, long term investment. They were generally unwilling, and later unable (due to state regulation) to absorb new issues of stock. The bankruptcy system developed highly innovative approaches to relieve railroads from the burden of fixed charges, but the long run dangers of these innovations were not well understood at the time. Finally, as railroad revenues grew robustly with the general economy (1898-1917), railroads were subjected to hostile regulation. Productivity growth and consolidation led to a strengthening of railroad profits and dividends. However, improved financial results provided justification for regulators to withhold rate increases and for unions to demand higher wages. The deleterious effects of this situation were not recognized until the emergency of World War I and the attendant federal control of railways. When private ownership was resumed, railroads found it necessary to initiate a new round of (primarily) debt-financed investment. The 1920's were marked by losses in transportation market share, but profits were sufficient to avoid widespread financial troubles until the advent of the Depression.

VI. Conclusion

We have seen that the financing choices of U.S. railroads were influenced by the complex interplay of several factors. To summarize, we can sketch the following stylized picture: Initially, railroads were characterized by heavy capital

intensity, concentrated ownership, assets that are highly tangible, and minimal possibilities for asset substitution by management. In the early years of railroad history (pre-1885), these considerations caused long-term bonds to emerge as the primary means of external financing.

Two important insights emerge from our historical analysis of the development of the railroad debt problem. (a) Many aspects of the pre-Depression U.S. economy were shaped by longstanding institutional forces. The Depression exposed structural problems within the railroad sector. These problems certainly did not originate in the 1920's. A significant portion of the problem was due to events in the previous century. Recent research in corporate finance has emphasized that observed financing choices depend critically on the mechanisms of corporate governance that are in place, the extent and nature of financial frictions, and the legal/institutional environment. The history of the railroad sector provides solid confirmation for this idea.

In future work, I plan to investigate developments in railroad finance after 1885. Did bankruptcy procedures exacerbate the problem of excessive debt? Did the railroads miss a golden opportunity to reorient their financing away from debt and towards equity? If so, to what extent was ICC regulation responsible for this outcome? The extent and nature of "tunneling", in the 19th and early 20th centuries, is another topic that deserves further consideration.

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