Essays on Finance and Real Activity during the U.S. National Banking Period

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CHAPTER I

DID FINANCING CONSTRAINTS IN THE RAILROAD INDUSTRY AMPLIFY THE PANIC OF 1873?

1.1 Introduction

Waves of business failures are common features of economic downturns. Although these failures often reflect declines in real activity, they also have the potential to actively propagate real shocks. Bernanke (1983) proposes one channel through which firm defaults can amplify downturns, showing that defaults increased the cost of credit intermediation during the Great Depression. Following the Panic of 1873, business failures had the potential to affect real activity much more directly due to the undeveloped nature of bankruptcy procedures. At this time debt defaults of large corporate enterprises such as railroads were not governed by any bankruptcy laws. When creditors filed suit following a debt default, the judge would appoint a receiver charged with maintaining railroad operations while the railroad was reorganized. In theory, receivers should have been able to prevent any interruption in the firm's existing operations until the railroad was restructured. However, in practice receivers were often unable to engage in the kind of short-term borrowing needed to pay for working capital and maintain day-to-day operations.

This inability to borrow was primarily due to the severe debt overhang that railroads faced following a default. Debt overhang refers to a situation where the magnitude of existing debt prevents an organization from engaging in further borrowing, even to fund profitable investments. Firms in this position are unable to borrow because the proceeds from any

profitable activity would accrue to existing debt holders rather than new lenders.[1] In the case of railroad receiverships, these financing constraints meant that receivers were often unable to maintain full operations of the railroad (Tufano 1997). The inefficiency of the receivership process would later lead to the development of equity receiverships and the widespread adoption of receiver's certificates in the 1880s, along with the 1898 passage of the Bankruptcy Act. Together, these legal innovations would strengthen receivers and streamline railroad reorganizations. However, in the absence of these tools, the wave of railroad defaults in 1873 and 1874 disrupted transportation services as receivers struggled to maintain railroad service. This paper uses extensive data on railroads and national banks to demonstrate that railroad defaults significantly amplified the effects of the downturn on local economic activity following the Panic of 1873.

The core of my approach is to link railroads to local banks through a measure of economic proximity based on the existing transportation network. The geographic separation of railroads makes it possible to trace the impact of individual failures on local economic activity. I use extensive GIS data on the transportation network around each bank to construct a "service area" that captures all railroad lines within a given transport cost of the bank. These service areas isolate the railroad lines which should be most important for economic activity in that bank's city or town. The fraction of railroads within each bank's service area that went into default captures the incidence of default within a bank's local area. Using this measure I find that railroad defaults amplified shocks to real activity and therefore to bank balance sheets. Although real activity stalled everywhere following the panic, railroads that defaulted on their bond debt faced severe financing constraints and cut their operations to a much greater extent, decreasing the amount of freight hauled and passengers transported. Banks relying on these railroads saw correspondingly

[1] See Myers (1977) for a formal treatment of debt overhang in a general theory of corporate borrowing.

larger declines in loans and deposits. In short, railroad defaults magnified the shocks to real activity in their local areas.

To establish a causal link between railroad bond defaults and negative bank outcomes, it is necessary to control for the possibility that the downturn was simply more severe in some places than others. This heterogeneity would lead to weaker railroad demand in certain areas and simultaneously contribute to poor outcomes for local banks. To address this endogeneity, I instrument for railroad defaults with net earnings relative to debt in the fiscal year preceeding the panic. This measure captures how close each railroad was to default before the downturn. The results of this instrumentation strategy indicate that bond defaults led to steeper declines in economic activity as reflected in changes in the balance sheets of local banks.

There are several reasons to focus on national bank balance sheets in order to capture localized real activity. Banks at this time financed commercial activity by making local, short-term, self-liquidating loans. They made primarily local loans due to their inability to branch coupled with severe informational limitations. Banks also subscribed to the real bills doctrine, which held that loans should be short-term (a maximum of six months) and made only for self-liquidating purposes (commercial activities that would directly produce the cash required to repay the loan). These banking practices meant that loan activity expanded and contracted in tandem with local economic activity. One final advantage of national bank balance sheets is that they were reported annually. This frequency allows me to observe balance sheets just prior to the panic and also one year after. Although the panic itself had a direct impact on the banking system, leading to an immediate deterioration of aggregate balance sheets, these effects disappear by the following year's observation. This suggests that the direct financial effects of

the panic were sufficiently short-lived and that variation in bank balance sheets in 1874 reflects variation in real activity.

Importantly, national banks generally did not hold railroad bonds during this period. If national banks had held a significant portion of their assets in the form of railroad bonds, then bond defaults would have directly impacted banks regardless of whether or not railroad operations declined. This would confound the link between defaults, declining real activity, and deteriorating bank balance sheets. However, railroad bonds were generally bought by private banks centered in New York and wealthy individual investors. National banks, by contrast, were strongly incentivized to hold U.S. government bonds and held virtually no railroad bonds on their balance sheets.

In the final section of this paper, I investigate the determinants of railroad defaults themselves. The results highlight the role that land grant policy played in increasing the probability of default. Under this type of policy, state and federal governments agreed to give large amounts of land to railroad companies in exchange for choosing a particular route. The primary purpose of this policy was to encourage railroad building where it would not have been privately profitable. As a result, these railroads generally ran through less populated areas and had significantly weaker cash flows. Also, as they built out they accumulated land along their route as an asset on their balance sheets. The market value of this land strongly depended on expectations for the completion of the railroad itself, with the land losing much of its value if the railroad running through it was not completed.

In short, land grant railroads faced weaker demand and held assets that were highly sensitive to changing expectations for the railroad. As a result, land grant railroads were significantly more likely to default on their debts during the downturn. In this way, the subsidy

policies of state and federal governments contributed to the weaker financial condition of railroads, setting the stage for more debt defaults and a more severe downturn. This finding contributes to the historical literature on railroad overbuilding during this period. While evidence suggests that railroads were not built ahead of demand during the antebellum period (Fogel 1962 and Atack et al. 2010), the postbellum period shows stronger signs of building ahead of demand (Mercer 1974). My results point to land grant policy as a primary driver of this overbuilding. The structure of the paper is as follows: Section 1.2 discusses the historical context of the panic and the railroad industry. Section 1.3 describes the railroad and bank used. Section 1.4 details the construction of service areas and presents the primary results. Section 1.5 demonstrates the link between railroad defaults and land grant policy, providing an alternative explanation for the severity of the contraction. Section 1.6 concludes.

1.2 Historical Background

This section describes the key elements of the 1873 downturn and discusses the general features of railroad receivership at the time. The most important aspect of the downturn for this analysis was the central role of the railroad industry. The Panic of 1873 was triggered by the failure of the merchant bank Jay Cooke & Co. due to poor railroad investments. Jay Cooke had made large loans to the Northern Pacific Railroad to fund its construction, and his firm failed on September 18th following the inability to float additional bonds for the railroad. Runs began almost immediately on a number of New York banks, and the clearinghouse partially suspended cash payments. The stock market was shut down for the first time in its history.[2] The panic itself was short-lived, with the stock market reopening after ten days and currency flowing back into New York from country banks by mid-October. However, the downturn that followed (referred to by historians as the Long Depression) continued until 1879.

[2] For an in-depth account of the panic, see Wicker (2006).

This downturn was particularly harsh for the railroad industry. Sprague (1907), in his seminal history of the banking panics during this period, writes that in the run-up to the panic "the most serious weakness was disclosed in connection with railroad building. Bonds often sold at a heavy discount had provided the means for building many roads which were in advance of any considerable population, and whose traffic proved insufficient to meet fixed charges." He drew particular attention to the collapse in railroad construction, noting that for many railroads "construction had to be discontinued altogether, leaving a large mileage [of rail] connecting nothing in particular." The data on industrial production and railroad construction support his assessment. Machinery production declined by 18% in the year following the panic, and declined by a total of 37% by 1877 (Davis 2004). Railroad construction collapsed; while the total miles of rail had grown by 9% per year following the Civil War, this growth fell to 3% per year from 1873 to 1878.[3] The construction of railroads was financed primarily through the issuance of bonds, many of which had been sold in Europe during an investment boom. However, the stock market in Vienna crashed in May of 1873, and the appetite for railroad bonds from European investors quickly disappeared. In the face of these events, railroads found it increasingly hard to issue new debt and continue railroad construction.

The collapse in transportation demand and the inability to float new bonds resulted in a huge number of railroad defaults following the panic. In late 1873 and 1874, nearly a quarter of all railroad companies with outstanding bonds defaulted on this debt.[4] Although some railroads subsequently covered their missed debt payments and became solvent, most lingered in default and went into receivership. Figure 1 shows the extent of railroad bond defaults following the panic. Railroads highlighted in red are those that defaulted on their bond debt and remained in

[3] Source: *The Railroad Journal*, 1880
[4] Source: *The Commercial and Financial Chronicle*, 1874 p.174

delinquency through 1875. Although scattered defaults occurred in the northeast, the majority of railroad defaults were concentrated in the Midwest, the Plains, and the South.

The absence of adequate procedures for resolving defaults meant that receivers faced significant financing constraints when trying to maintain rail service. Railroads in receivership typically needed to raise substantial cash in order to meet current expenses and fund new investments. However, these firms faced the problem of debt overhang, whereby their existing debt was so large that they could not easily borrow money even to fund profitable endeavors. Because the legal rights of prior lenders were particularly strong, new potential lenders ran the risk that any profit made from a new loan would be used to pay existing debtors rather than the new lenders. Due to these issues, receivers often were not able to raise the short-term capital necessary to maintain full rail service, continue construction, or make new investments. These large inefficiencies would lead to the development of important new tools and practices for restructuring firms. For instance, receiver's certificates provided the standard mechanism by which railroads and courts dealt with the issue of debt overhang (Tufano 1997). These certificates superseded all other debt obligations, so purchasers of receiver's certificates did not need to worry about the extent of prior debt. This new tool allowed receivers to raise short-term capital by offering a credible repayment mechanism to new lenders. Although these certificates appeared sporadically as early as 1872, they did not enter widespread use until the late 1880s. When a judge allowed receivers to issue these certificates, he or she was unilaterally altering the terms of prior contracts between the railroad and previous borrowers. This raised significant constitutional issues, and receiver's certificates were not officially ruled as constitutional until a Supreme Court case in 1886. With their constitutionality undecided in 1873, they were generally unavailable to receivers, who were therefore unable to raise the working capital needed to

maintain full operation of the railroad. In the following sections, I demonstrate that not only did railroad bond defaults lead to a halt in construction on those lines, but they also resulted in diminished service for lines that were already operating. Ultimately, these railroad defaults exacerbated declines in real activity.

1.3 Data

This paper uses two primary sets of data: GIS data on the locations of all railroads and national banks, and bank balance sheet data for all national banks prior to and following the downturn. Data on national bank balance sheets comes from the Reports of the Comptroller of the Currency. The Comptroller reports contain annual bank balance sheet data on all national banks in operation during each year.[5] The 1873 data reflect bank balance sheets as of September 12, immediately preceding the failure of Jay Cooke and Co. and the onset of the crisis. Data from 1874 captures the state of banks' balance sheets over a year later, in October of that year. This timing is beneficial because the purely financial effect of the panic on banks appears to be gone. From September to December of 1873 aggregate loans and deposits fell by 9% and 13% respectively, likely reflecting lingering financial effects from the panic itself. However, by October of 1874 both loans and deposits were slightly above their pre-panic levels. Bank data at this point should therefore reflect variations in real activity between different areas rather than the aggregate effects of the panic on the banking system.

The data on the contemporary railroad network comes from a transportation GIS database created by Jeremy Atack (2015). This database contains precise information on the location of railroad lines in 1872, along with other transportation information on rivers and canals. Figure 2 shows the full set of transportation data available for 1872 (railroads in green and bolded, rivers

[5] Although state banks would eventually become more numerous than national banks, at this point they were still relatively insignificant (there were 277 state banks in operation in 1873, as opposed to 1968 national banks). Thus, the data from national banks should be sufficient to characterize the effects of this crisis.

and canals in blue) as well as the location of every national bank. Dots indicate cities that had at least one national bank.

This dataset was created using current satellite imagery to identify the historical paths of rail lines. Thus, it represents a significant improvement in accuracy over historical maps of railroads, which were very approximate and often contained outright errors. Although this dataset contains the precise locations of all rail lines in 1872, it does not indicate which companies actually operated which lines of track at the time of the panic. Thus, for every rail line in the data, I determined to the extent possible which company operated the track in 1873. Information on which firms operated particular routes comes from the *American Railroad Journal* (1873) and *Poor's Manual of Railroads* (1873). This allows me to match the geographical location of rail lines with financial data on railroad companies. Railroad firm data such as gross and net earnings, operating expenses, and amount of funded debt comes from *Poor's Manual of Railroads* (1873-1875). Data on railroad bond defaults comes from the *Commercial and Financial Chronicle* (1875). The *Chronicle* separates railroads that remained delinquent on their debt through 1875 from railroads that defaulted but either caught up with their debt payments debts or settled directly with bondholders. Railroads in this second group are not considered to be in default for the purpose of this analysis.

In section 1.5, I turn to the role of land grants in promoting riskier railroad building and contributing to railroad defaults. The information on land grants comes from a letter from the Secretary of the Interior to the House of Representatives documenting a comprehensive list of federal land grants given to particular railroads.[6] Railroad lines that received land grants are shown in brown in Figure 3.

[6] Source: United States. Cong. House. Committee on Public Lands, C. Delano. 42 Cong., 2 sess. H. Rept. 43.

Clearly, railroads that received land grants are concentrated in the Midwest, South, and West. This reflects the use of land grants to incentivize building in relatively unpopulated areas that would otherwise have been unprofitable. This data will be used to explore the relationship between land grants and vulnerability to default. County-level data on population and economic activity comes from the 1870 Census data as found in Haines (2004).

1.4 Service Areas and Main Results

This section describes the construction of service areas that link railroads to local banks through the transportation network, and also uses this tool in bank-level and railroad-level regressions to capture the impact of railroad defaults. These service areas are designed to accurately capture economic proximity between particular railroads and particular banks using the transportation network available at the time, thus significantly improving on simple geographic proximity. Regression results using these service areas indicate that bond defaults resulted in local banks making fewer loans, attracting fewer deposits, and keeping more cash in reserve. Further, a set of regressions at the railroad level shows that defaults are associated with a large drop in railroad operations. These findings together highlight the role of railroad defaults in amplifying real shocks by disrupting transportation services.

1.4.1 Service areas

The creation of service areas provides the vital link between railroads and local banks. A service area consists of the portion of the national rail network that falls within a certain maximum transportation cost of a particular city.[7] Figures 4 and 5 show the rail lines that lie within the service areas of four particular cities (defined by a maximum transport cost of $.50 per ton). These figures demonstrate the contrast that service areas capture between cities with many

[7] In calculating transportation costs, I follow Fogel (1962) and Donaldson and Hornbeck (2016) in setting the railroad transportation costs to 0.63 cents per ton-mile and water transportation costs to 0.49 cents per ton-mile. Transportation by wagon (in the absence of any other transportation option) costs 23.1 cents per ton-mile.

relevant railroad lines and cities with only several. Figure 4 shows the railroad lines included in the service areas for New York City and Ithaca, NY, while figure 5 shows the same for Chicago, IL and Iowa City, IA. The service areas around New York City and Chicago capture the larger number of lines relevant to those cities. If only one of these lines were to go through default, the impact on local banks should be relatively small due to the richness of the overall network. Ithaca and Iowa City, by contrast, are dominated by only a few proximate railroad lines. A single railroad default in these areas would have a much larger potential to disrupt local economic activity.

Using this method, I define an area of particular economic relevance for all cities containing national banks. In the following results, service areas are defined by a maximum transport cost of $.50 per ton. This radius captures the railroads of immediate importance without including too many far-out railroads to be of use.

1.4.2 Main results: Railroad defaults and declining banking activity

Using the service areas defined above, I show here that railroad bond defaults had significant negative effects on local banks in terms of loans, deposits, and excess reserves. However, there is a potential for endogeneity in relating railroad defaults to declining real activity. If the downturn were worse in some areas than others for unobservable reasons, railroads in those areas would have been more likely to default and local banks would fare worse, but this would not imply a causal relationship between bond defaults and declining real activity. In order to address this issue, I instrument for railroad bond defaults with each railroad's ratio of net earnings to bonded debt in the fiscal year prior to the downturn. The earnings to debt ratio captures the extent to which a railroad could still cover its bond payments even in the face

of declining demand. Thus, it should be correlated with railroad defaults but not with the intensity of the downturn in any particular area.

The bank-level regressions in columns 4-6 of table 1 use this instrumentation strategy. The precise variable of interest is the percentage of railroad miles within each bank's service area that defaulted on their bond debt following the panic. The instrument for this variable is the average ratio of net earnings to bonded debt prior to the panic for railroads within the service area (each railroad's ratio is weighted by the number of miles of rail it has within the service area). Table 2 shows the first stage regressions from this IV strategy. These results confirm that earnings to debt ratios strongly predict the incidence of default in the areas around each bank. The dependent variables in table 1 are the percentage change in loans, deposits, and excess reserves at the bank level, measured from immediately prior to the panic to one year later. If economic activity declines in a particular area, local banks should see their loans and deposits fall, while their excess reserves should rise as lending opportunities decrease and these banks shore up their balance sheets. The measures of loans and deposits come directly from the balance sheets. Excess reserves are easily calculated for country banks but not for banks in reserve and central reserve cities such as Boston, Philadelphia, and New York (87% of all banks were country banks). Because of this, the regression using excess reserves (column 3 in table 1) includes only banks outside of reserve and central reserve cities.[8]

The regressions also contain a number of bank balance sheet variables that control for other potentially important factors. Total assets captures the overall size of the bank. The initial

[8] For banks in reserve and central reserve cities, some (but not all) of their interbank deposits qualified as reserves. Thus it is impossible to determine their total reserves from their balance sheets. Country banks were required to hold in reserve 15% of their deposits, but 3/5 of this amount could be held as deposits in reserve city banks. Because these interbank deposits paid interest, country banks typically took full advantage of this. Thus, the typical requirement for deposits held within the bank was 6%. Excess reserves are therefore defined as total reserves minus 6% of deposits.

level of loans, deposits, and reserves are also included relative to assets. The capitalization of the bank might also affect how well it fared following the panic, so this is included as well. Indicators for the type of bank (county, reserve city, or central reserve city) are also included, as different types faced different regulatory standards. Standard errors are clustered at the city level (the results are robust to clustering at the county and state level).

Table 1 shows the results from this specification. Columns 1-3 show the naive OLS regressions which do not use any instrumentation strategy. The regressions in columns 4-6 instrument for railroad defaults with net earnings to debt ratios. In both specifications, railroad defaults are associated with significantly worse outcomes for banks in terms of loans, deposits, and excess reserves. However, the coefficients on railroad defaults are significantly larger in the IV specification. These results indicate that in areas where half of the local railroad miles went into default, banks saw a nearly 10% drop in loans, a 19% drop in deposits, and an increase in excess reserves of over 80% relative to banks that had no local railroad defaults. The variation in exposure to defaults between banks is quite large: 37% of the banks in the sample saw over half of their local railroads default, while 34% of banks saw no local defaults at all. These findings strongly support the view that railroad defaults amplified the effects of the downturn.

Turning to the other variables, it seems that larger banks show a correspondingly larger decrease in loans. As expected, better capitalized banks fare better. Loans and reserves also show a statistically significant convergence effect, but deposits do not. Banks in reserve cities and in the central reserve cities also fared better, as currency flowed into the major banking cities once the panic was over.

Table 2 shows the first stage regression for the IV strategy used in table 1. As expected, a higher ratio of net earnings to debt in a particular area is strongly correlated with a lower

incidence of railroad default. These results support the use of earnings to debt ratios as an instrument for railroad defaults.

The link between railroad bond defaults and bank outcomes would be more difficult to interpret if national banks directly held railroad bonds on their own balance sheets. In particular, if banks held the bonds of their local railroads as assets, these banks would suffer from defaults even without a disruption in transportation. However, in actuality national banks held virtually no railroad bonds during this period. The average national bank held 1.5% of its assets as "other stocks, bonds, and mortgages," of which railroad bonds were only a part. Railroad bonds were primarily purchased by large private banks in New York and by wealthy individual investors. National banks were strongly incentivized to hold government bonds instead and held virtually no railroad bonds.

Nevertheless, the importance of this channel can be tested by excluding banks with a high percentage of their assets held as other stocks, bonds, and mortgages. The results in table 1 are robust to the exclusion of all banks with more than 5% of their assets held in this category. Thus, national bank ownership of railroad bonds does not drive the results in table 1. This further supports the hypothesis that railroad defaults affected banks primarily through the disruption of transportation services.

1.4.3 Measuring the declining activity of financially-constrained railroads

The intuition for the results in section 1.4.2 is that following a railroad default, receivers were financially constrained and unable to fully maintain the operations of the railroad. This section provides support for this assertion by examining how railroad operations changed as railroads defaulted. The regressions in table 3 use data on railroad operating expenses to identify the effect of a default. Railroad operating expenses are the best way to characterize railroad

operations because they are available for the majority of railroads and provide a summary measure of the total amount of freight hauled and passengers transported by the railroad over its fiscal year. For the sample of railroads where data on passengers carried and freight hauled is also available, the correlation between these measures and operating expenses is very high (correlation coefficient of .7 and .8 respectively).

In order to properly isolate the impact of defaults on operations, it would be ideal to characterize exogenous changes in railroad demand from year to year. However, production data (either manufacturing or agricultural) is not available at the annual level during this time period. Instead, I use yearly meteorological data on drought conditions to capture exogenous changes in agricultural demand for railroad services. The Palmer Drought Severity Index (PDSI) uses historical precipitation and air temperature data to construct a measure of drought conditions relative to the usual climate for land areas in a 2.5° by 2.5° grid (Dai et al. 2004). The index ranges from -10 (extreme drought) to +10 (extremely wetness) and provides an important source of exogenous variation in farm output. Table 3 therefore includes a drought measure calculated from the Palmer index for every railroad in the sample. I follow Chabot and Moul (2014) in ignoring wetter-than-average years and constructing a drought measure captured by $Drought_{j,t} = (PDSI_{j,t} | PDSI_{j,t} > 0)^2$ for each land area j in the grid.[9] For each railroad, I average the drought measures for the counties in which the railroad operated. This summary measure should capture at least some of the exogenous changes in railroad demand from year to year, better isolating the impact of a default from other sources of variation.

Table 3 shows the results of a panel regression that explains railroad operating expenses by year with railroad defaults, the measure of drought along the rail line and fixed effects. The

[9] Unlike Chabot and Moul (2014), I am trying to capture year by year variations in farming output, so I do not calculate a weighted average over a five year span.

dependent variable is the log of operating expenses for the railroad in a given year, which is regressed against an indicator variable Default that takes a value of 1 if the railroad defaulted on its debt in that particular year and 0 otherwise. Column 1 also includes the drought measure and railroad fixed effects. Column 2 includes year fixed effects as well.

The results indicate that railroad defaults are strongly associated with declining operating expenses. For the average railroad, a debt default is associated with a 19% drop in operating expenses in that period. When year fixed effects are included, the impact of default decreases to 15%. In either specification, the impact of default is clearly large enough to negatively affect the balance sheets of local banks. Drought conditions are also associated with lower levels of railroad operations, although this effect is not statistically significant when year fixed effects are included.

One important caveat is that a number of railroads that went through default subsequently declined to publish any statements of earnings or operations. These railroads cannot be included in the above regression. However, it seems likely that these railroads fared even worse than those that did report their operations following a default (hence the decision not to report). If this were the case, then the results in table 3 would actually understate the true impact of default on firm operations.

This empirical link between default and declining operating expenses supports the intuition behind the results in section 1.4.2. Receivers that were unable to engage in short-term borrowing were forced to cut back on railroad operations that would have otherwise been profitable. This provides an explanation for the subsequent decline in real activity in these areas, as reflected in the loans, deposits, and reserves of local banks.

1.5 Causes of railroad bond defaults

The sheer magnitude of the downturn in the railroad industry, both in terms of the number of defaults and the drop in construction, is striking. This section addresses the more fundamental question of why so many railroads were in such a weak financial position in the first place. The results indicate that land grant policy significantly contributed to the weakness of railroads' cash flow and their likelihood of default. Theoretically, land grants can lead to unsound railroads for two reasons. First, land grants encourage building in relatively unpopulated areas with weaker fundamental demand for transportation services. As a result, land grant railroads would have lower net earnings relative to debt and be closer to default. Second, land grants result in the holding of assets (specifically, land along the route) that would drop sharply in value with declining expectations for the railroad. Land along a railroad is clearly more valuable if that railroad is completed than if construction is halted due to a default. When expectations about a particular land grant railroad suddenly reverse, the resale value of its assets drops significantly, harming its financial position. In actuality, land grant railroads did derive a significant portion of their revenue from land sales. Thus, a decline in the value of their land hurt their revenue stream directly. For both of these reasons, land grant policy provides an economic explanation for the high number of defaults and demonstrates that government policy contributed to the construction of unsound railroads, amplifying the severity of the downturn.

Table 4 shows the results of probit regressions on the determinants of default for railroad companies. The dependent variable Default takes a value of 1 if the railroad defaulted on at least one bond and 0 otherwise. 30% of railroad companies in the sample defaulted on at least one bond. The main variable of interest is an indicator variable that takes a value of 1 for land grant railroads and 0 otherwise. Also included in the first column are the railroad's ratio of debt to

capital and an indicator variable for whether the railroad's trunk line was completed or still under construction. All coefficients shown are marginal effects. The first specification indicates that land grant railroads were 22% more likely to default on their debt over this period relative to other railroads. Because land grant railroads were generally built in less-populated areas, some of this effect likely comes from the fact that these railroads had weaker cash flows than others. The second column also includes a measure for the average population density for counties along each railroad's route. In this specification, higher population density does indeed decrease the probability of default. The coefficient on the Default variable is also significantly lower, although it still indicates a 15% higher probability of default for land grant railroads (significant at the 10% level). Although population density accounts for a portion of the effect of land grants, it does not account for all of it. This suggests that the role of land as an asset held by the railroads may have also played a role in increasing the probability of default, declining in value when expectations for railroad construction change.

The third column includes additional county-level control variables for average output in 1870 from the census data. Generally speaking, when all county-level variables are included together, they are not statistically significant. However, the impact of the land grant indicator is robust to these specifications. The fourth column also includes a regional (western) indicator in addition to the land grant variable. This regression is intended to test for the possibility that the significance of the land grant indicator comes from a purely regional effect, given that the vast majority of land grant railroads are in the west. This variable takes a value of 1 if the railroad runs west of the Mississippi and 0 otherwise. The results indicate that the impact of land grants is not simply driven by a regional effect.

As a point of contrast to land grant policy, the fifth column instead includes an indicator variable for whether or not the railroad was a state aid railroad. State aid in this context means that the railroad received support in the form of direct loans or explicit debt guarantees from state governments. For example, the bonds of the Alabama and Chattanooga Railroad were guaranteed by the state of Alabama, thus significantly reducing the risk of default to bondholders. Because this form of government policy explicitly secured railroad debt (rather than encouraging building in riskier areas and letting these railroads fail), it had the opposite impact of land grants on the probability of default. The results in column 5 indicate that state aid railroads were significantly less likely to default. Thus, the type of government support for railroads made a huge difference. While explicit government guarantees of railroad debt made that debt less risky, land grant policy resulted in railroads that were more likely to default.

Table 5 reports the results from using a linear probability model for railroad defaults rather than a probit model. The results do not seem to be driven by the particular choice of model, as the coefficients are similar in sign and magnitude to those of the probit regressions in table 4. The linear probability models predict that land grant railroads are between 18% and 23% more likely to default than non-land grant railroads.

The findings in this section indicate that railroad defaults during this downturn were partially attributable to the overextension of land grant railroads into unpopulated areas, and to the fragility of these railroads. This supports the view expressed in Mercer (1974) that after the Civil War land grant railroads were likely to be built ahead of demand. Overbuilding left them in a weaker financial position and more vulnerable to default in response to declining demand for transportation.

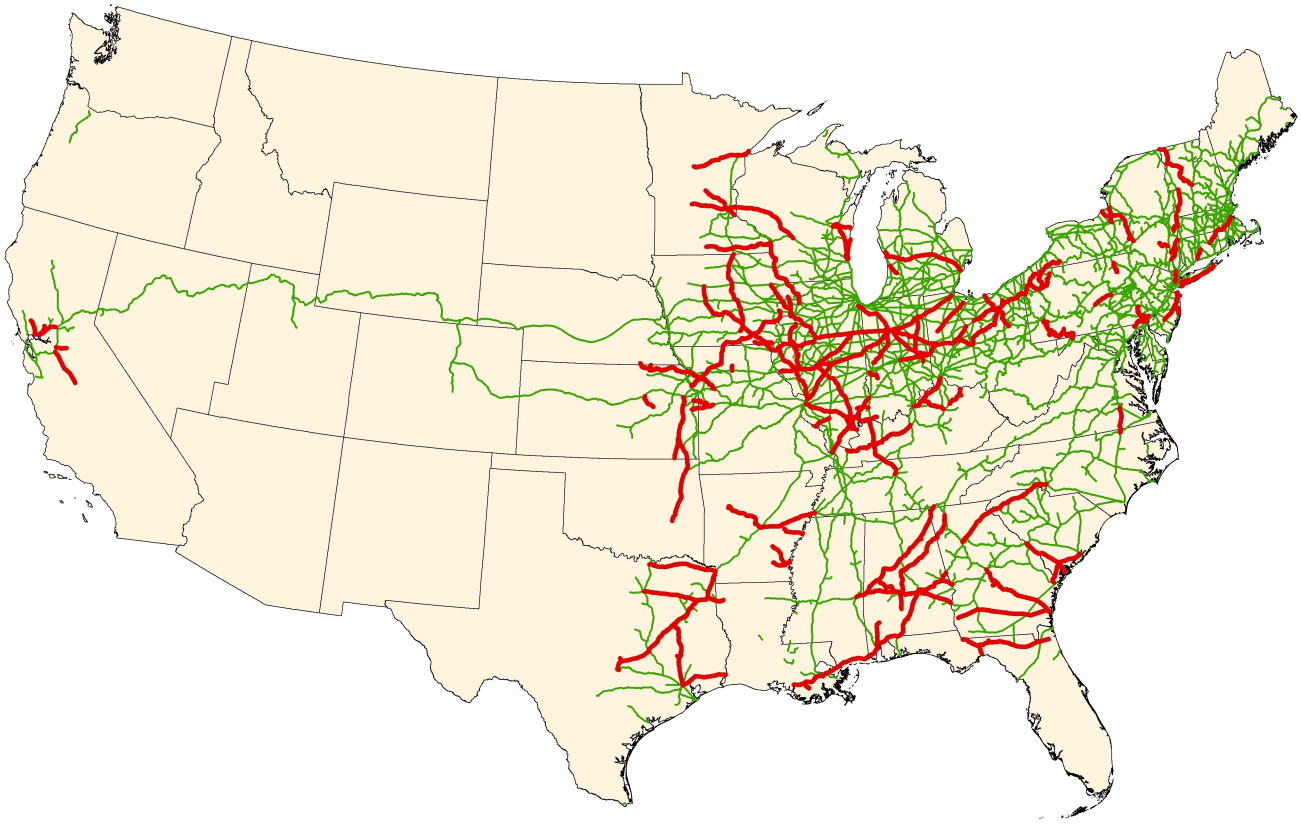
1.6 Conclusion

Although today firm bankruptcies are governed by laws designed to facilitate restructuring, in the 1870s the process of restructuring railroads lacked several crucial components that would have made it more efficient. In particular, equity receiverships had not yet been fully developed and receiver's certificates were not yet widely used. The result was that railroads in receivership were severely financially constrained, and often could not obtain the working capital necessary to fully meet the demand for their transportation services. Railroads in default cut back on operating expenses by over 15%, and banks in those areas saw large declines in loans and deposits as well as sharp increases in excess reserves. In short, railroad bond defaults amplified the general downturn following the Panic of 1873, and contributed to the length and depth of the Long Depression.

The number of defaults of major railroads was without precedent in 1873. Although there had been previous nationwide panics in 1837 and 1857, these panics did not result in waves of railroad bond defaults. This was primarily because railroads were financed mainly through equity rather than debt prior to the Civil War (Tufano 1997). The Panic of 1873 was the first time in U.S. history that so many railroads went through large and expensive debt defaults. The costs of these failures prompted the flurry of bankruptcy innovations that followed, ultimately leading to a more efficient process for funding and restructuring large bankrupt firms.

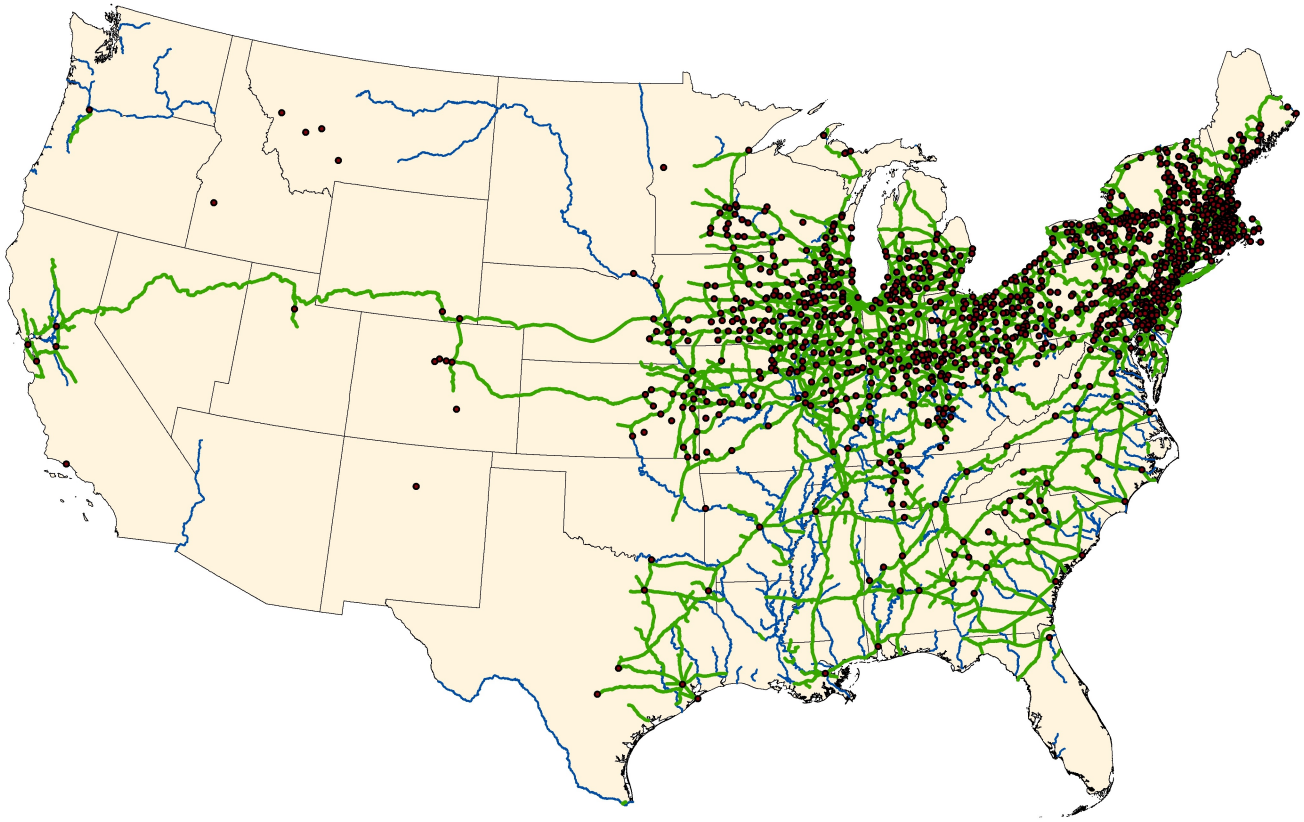
The sheer extent of railroad defaults following the panic can be partially explained by government policy. Specifically, land grants encouraged unsound railroad building and thus contributed to the severity of the downturn. Previous explanations for the origins of the Panic of 1873 have emphasized various causes. Kindleberger (1990) lists 13 distinct contributing factors, but focuses primarily on the speculative frenzy in Germany and Austria resulting from the French Indemnity in 1871-72 (a massive post-war payment from France to Germany, triggering

inflation and speculation). In his view, the appetite for U.S. railroad bonds in these countries following this stimulus set up an inevitable boom and bust cycle in U.S. railroads. In contrast, Bordo (1990) argues that the U.S.'s flexible exchange rate should have insulated it from international effects, and therefore that the U.S. crisis had domestic origins. He instead emphasizes the secular decline in the world's production of gold beginning in 1871. This decline led to strong downward pressure on prices and the subsequent failure of investments that were predicated on rising prices. My work suggests that U.S. land grant policy also contributed to the severity of the downturn. Land grants encouraged railroads to be overbuilt relative to demand and also resulted in railroads holding assets (land along the route) whose value was highly dependent on positive expectations for the economy and for the railroad in particular. This set the stage for these railroads to default at higher rates, and for the downturn to be more severe than it otherwise would have been.



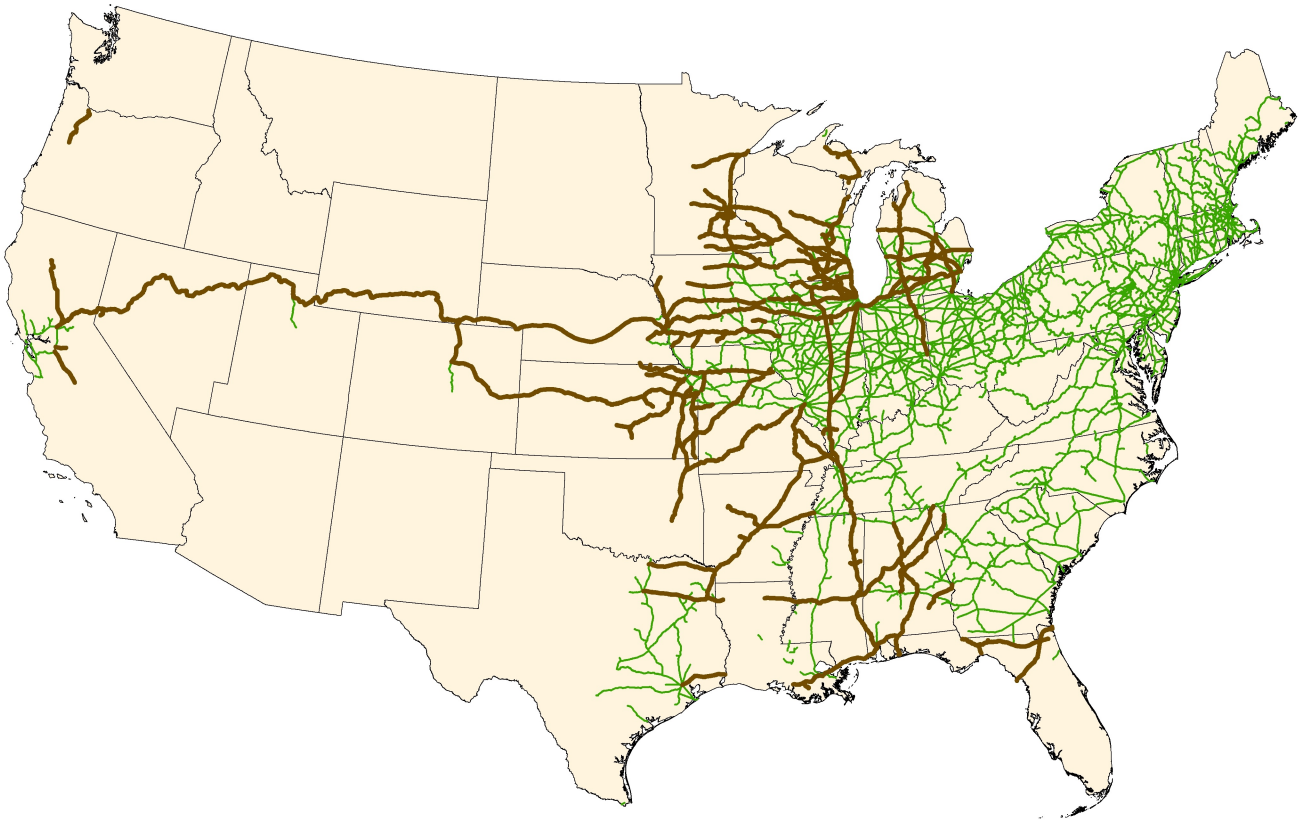
Railroads in default shown bold and in red.
Source: *Commercial and Financial Chronicle* (1875) p. 174 and *Poor's Manual of Railroads* (1873)

Figure 1. Railroad bond defaults from September 1873 to October 1874



Railroads bold and in green, rivers and canals in blue. Dots indicate national banks.
Source: Atack, Jeremy. "Historical Geographic Information Systems (GIS) database of U.S. Railroads for 1872".

Figure 2. Full transportation network and all national banks



Land grant railroads shown bold and in brown.
Source: United States. Cong. House. Committee on Public Lands, C. Delano. 42 Cong., 2 sess. H. Rept. 43.

Figure 3. Land grant railroads

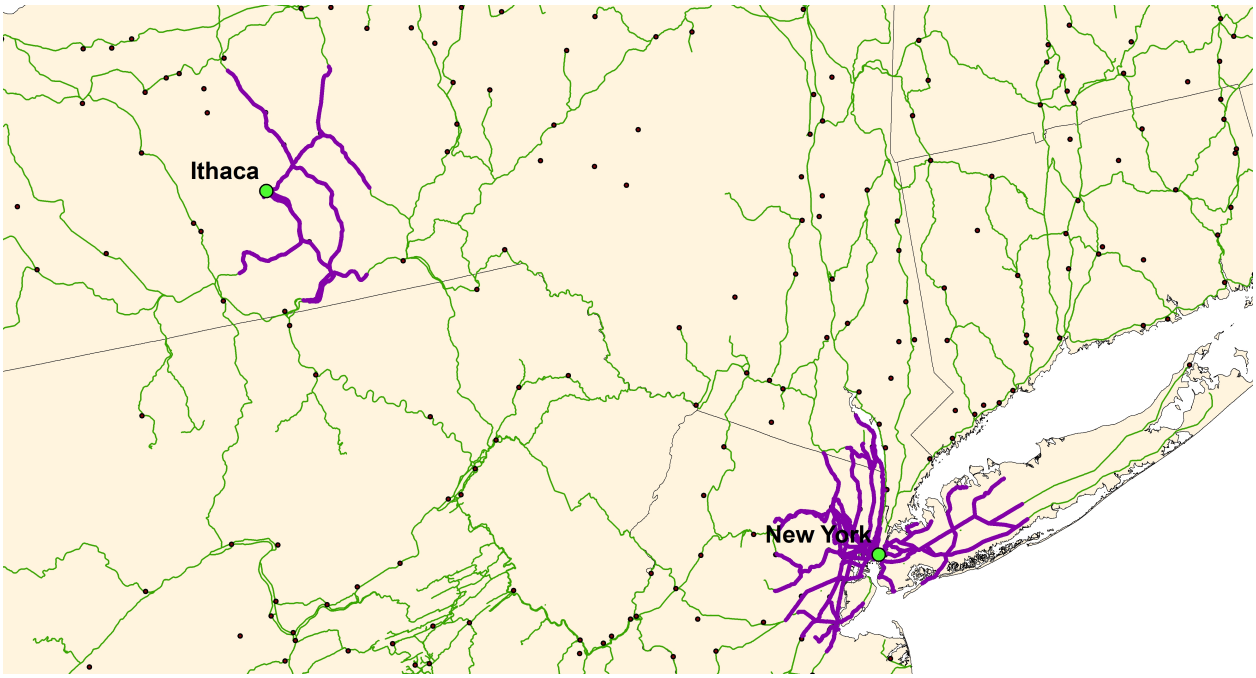
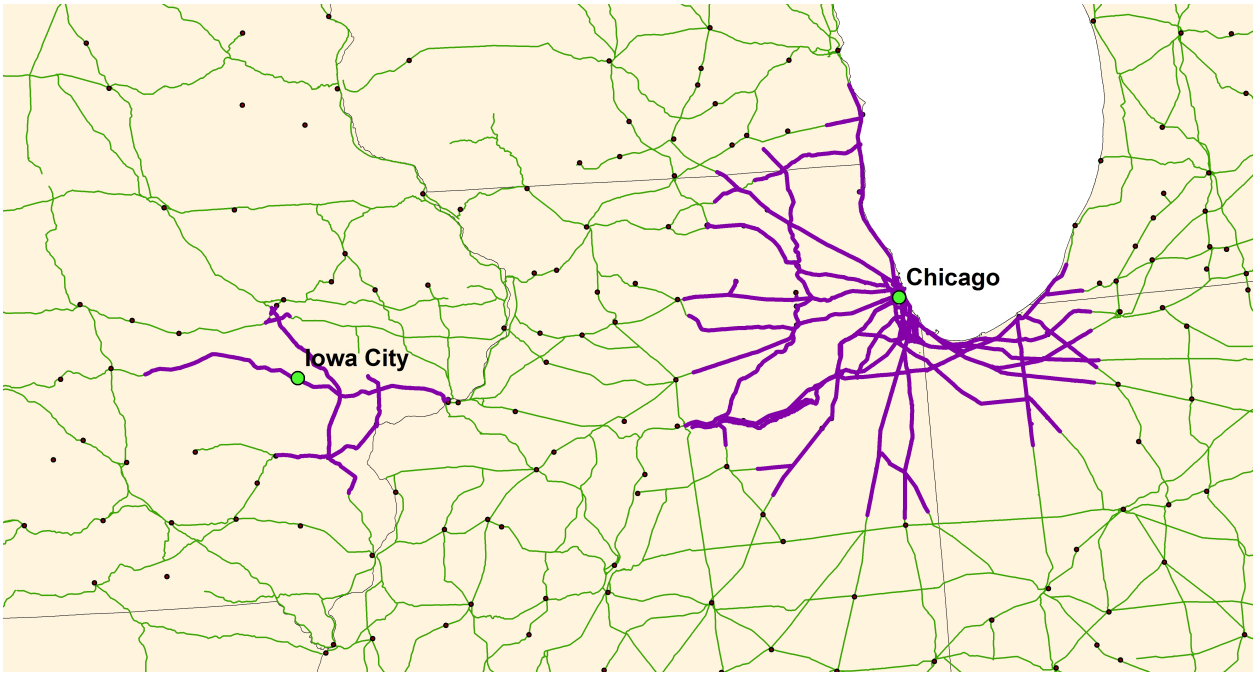


Figure 4. Example service areas around New York City and Ithaca



Railroad lines within each city's service area are shown in purple and bolded. All service areas shown here use a maximum transportation cost of $.50 per ton.

Figure 5. Example service areas around Chicago and Iowa City

Table 1. Railroad defaults and banking outcomes (2SLS)

Dependent variable: Percent change in banking variables from 1873 to 1874						
	Naive OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
	Loans	Deposits	Excess reserves	Loans	Deposits	Excess reserves
Percent of railroad miles	-0.132***	-0.189***	0.440*	-0.192**	-0.383***	1.683***
within service area in default	(-5.20)	(-4.00)	(1.76)	(-2.18)	(-2.65)	(3.86)
ln(Assets)	-0.0196***	0.0248**	-0.0703	-0.0219***	0.0170	-0.0230
	(-2.66)	(2.35)	(-1.54)	(-2.72)	(1.38)	(-0.49)
Capital/assets	0.390***	0.463***	-1.050**	0.375***	0.459***	-0.778
	(7.06)	(3.05)	(-2.05)	(6.04)	(3.07)	(-1.55)
Loans/assets	-0.121**			-0.128**		
	(-2.24)			(-2.25)		
Deposits/assets		-0.0121			0.0229	
		(-0.12)			(0.24)	
Reserves/assets			-1.901			-3.177**
			(-1.41)			(-2.19)
Reserve city indicator	0.0814***	0.0524**		0.0808***	0.0498*	
	(3.80)	(2.07)		(3.75)	(1.84)	
Central reserve city indicator	0.153***	0.174***		0.156***	0.186***	
	(7.41)	(6.21)		(7.45)	(6.34)	
Constant	0.195*	-0.472***	1.407*	0.242**	-0.355*	0.613
	(1.95)	(-2.64)	(1.92)	(1.97)	(-1.72)	(0.83)
Observations	1747	1744	1514	1746	1743	1513
R^2	0.088	0.046	0.011			
$F - First\ stage$				70.661	68.151	63.569

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 2. First stage of IV

Dependent variable: Percent of railroad miles within service area in default			
	(1)	(2)	(3)
Average earnings to debt ratio for railroads in service area	-0.312*** (-8.41)	-0.309*** (-8.26)	-0.314*** (-7.97)
ln(Assets)	-0.0187*** (-2.68)	-0.0200*** (-2.83)	-0.0189** (-2.28)
Capital/assets	-0.176*** (-3.34)	-0.00579 (-0.09)	-0.124** (-2.08)
Loans/assets	-0.0891* (-1.65)		
Deposits/assets		0.124** (2.39)	
Reserves/assets			0.836*** (3.59)
Reserve city indicator	-0.0342 (-1.48)	-0.0346 (-1.51)	
Central reserve city indicator	0.0262 (1.43)	0.0285 (1.56)	
Constant	0.568*** (5.72)	0.449*** (4.57)	0.467*** (3.96)
Observations	1746	1743	1513
R^2	0.177	0.179	0.175

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 3. Defaults and Operating Expenses

Dependent variable: Log of operating expenses		
	(1)	(2)
Default indicator	-0.188***	-0.154***
	(-3.51)	(-2.66)
Drought measure	-0.0143**	-0.00651
	(-2.14)	(-0.90)
Railroad fixed effects	Yes	Yes
Year fixed effects	No	Yes
Constant	13.03***	12.95***
	(1802.75)	(506.90)
R^2	0.0384	0.0783

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 4. Determinants of railroad bond defaults (probit)

	Dependent variable: Default indicator				
	(1)	(2)	(3)	(4)	(5)
Land grant indicator	0.224**	0.148*	0.185**	0.170*	
	(2.57)	(1.66)	(2.02)	(1.70)	
Western indicator				0.0323	
				(0.38)	
State aid railroad					-0.198***
					(-2.83)
Construction indicator	0.237***	0.191***	0.193***	0.189**	0.211***
	(3.31)	(2.63)	(2.63)	(2.56)	(2.66)
Bonded debt/capital	0.0429**	0.0401**	0.0398**	0.0396**	0.0369**
	(2.40)	(2.31)	(2.28)	(2.26)	(2.09)
Population density of		-1.885**	-0.772	-0.738	-1.450
counties along route		(-2.49)	(-0.93)	(-0.90)	(-1.47)
Farm output per capita of			0.104	0.101	0.0811
counties along route			(1.53)	(1.48)	(1.14)
Manufacturing output per			-0.0496	-0.0485	-0.0744*
capita of counties along route			(-1.29)	(-1.26)	(-1.71)
Drought measure of			0.170	0.141	0.108
counties along route			(0.97)	(0.73)	(0.58)
Observations	272	272	272	272	249
$Pseudo\ R^2$	0.0980	0.123	0.141	0.142	0.167

Marginal effects; t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 5. Determinants of railroad bond defaults (LPM)

	Dependent variable: Default indicator				
	(1)	(2)	(3)	(4)	(5)
Land grant railroad	0.225***	0.195**	0.198**	0.179*	
	(2.62)	(2.24)	(2.25)	(1.76)	
Western indicator				0.0407	
				(0.42)	
State aid indicator					-0.206***
					(-2.71)
Construction indicator	0.228***	0.206***	0.187**	0.182**	0.206**
	(3.19)	(2.84)	(2.54)	(2.42)	(2.59)
Bonded debt/capital	0.0287***	0.0276***	0.0268***	0.0261***	0.0251**
	(3.27)	(3.16)	(3.02)	(2.83)	(2.54)
Population density of		-0.701***	-0.136	-0.130	-0.348*
counties along route		(-3.51)	(-0.71)	(-0.69)	(-1.68)
Farm output per capita of			0.0770	0.0743	0.0541
counties along route			(1.39)	(1.35)	(0.93)
Manufacturing output per			-0.0596*	-0.0574*	-0.0959***
capita of counties along route			(-1.88)	(-1.78)	(-2.80)
Drought measure of			0.202	0.161	0.143
counties along route			(0.78)	(0.58)	(0.63)
Constant	0.184***	0.243***	0.139	0.138	0.486
	(6.19)	(6.16)	(0.45)	(0.45)	(1.46)
Observations	272	272	272	272	249
R^2	0.119	0.133	0.160	0.161	0.186

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

CHAPTER II

REGULATORY COMPETITION, STATE BANKING, AND ECONOMIC GROWTH IN THE NATIONAL BANKING PERIOD

2.1 Introduction

The National Banking Acts of 1863 and 1864 inadvertently gave birth to the dual banking system in the U.S., under which banks can be chartered by either state authorities or the federal government. The advent of this system gave rise to an environment of strong regulatory competition, as both levels of government strove to raise revenue through issuing bank charters. Although this system encouraged the undercutting of several safety requirements for banks, it also facilitated a huge expansion in banking and an increase in banking competition (White 1982). In this paper, I show that the free banking laws passed by various states in order to issue more bank charters decreased monopoly power and lowered returns in uncompetitive markets. Furthermore, I demonstrate that this expansion of state banking had a significant and positive impact on growth, particularly in the agricultural sector. The results highlight the beneficial nature of regulatory competition in the U.S. banking system.

These findings contribute to the growing empirical literature on the link between financial development and economic growth. Following from the early theoretical contributions of Goldsmith (1969) and McKinnon (1973), cross country studies such as King and Levine (1993) have established a robust link between measures of financial development and growth.[1] Looking specifically at the historical period after 1870, Rousseau and Wachtel (1998) find that the level of financial intermediation positively impacted growth for a set of countries including the U.S. However, the evidence for the positive impact of state-chartered banks during this

[1] See Levine (2005) for an overview of this literature.

period of U.S. history is less clear. Recent studies of nationally chartered banks (which tended to be larger and better capitalized than state banks) have generally found that they had positive impacts on growth. Jaremski (2014) finds that the entry of national banks immediately following the National Banking Acts furthered the growth of manufacturing capital and output, particularly in the Midwest. Fulford (2015), exploiting a discontinuity in bank entry from minimum capital requirements, finds that gaining a national bank resulted in an increase of county output per capita by around 10%. However, Jaremski and Rousseau (2013) find that banks chartered at the state level under free banking laws prior to the Civil War did not significantly contribute to growth. They conclude that because these banks were smaller and more likely to fail, they were not generally growth-promoting. Thus, it is not clear whether we would expect state banks, chartered under similar free banking laws during the National Banking period, to have significantly promoted growth. This paper provides evidence that they did, in fact, contribute to growth.

The literature on the impact of state banking on competition in the banking system is more clear. Early work by Davis (1965) documents large interregional differences in the rate of return to national banks following the Civil War, which gradually disappeared over the following half-century. This suggests an inefficient and poorly integrated financial system in the early years of the National Banking period, which gradually became more efficient and nationally integrated. Subsequent work by Sylla (1969) argues that this inefficiency was due to the monopolistic nature of banking markets in rural areas. At the time, national banks faced high minimum capital requirements which effectively established a lower bound for the size of a national bank, restricting bank entry into small communities and rural areas. James (1976) specifically highlights the role of state banking laws passed in the 1880s and 1890s in

empowering state-chartered banks to compete with national banks and drive down returns. Furthermore, recent work by Sullivan (2009) has reinforced the hypothesis of the uncompetitive nature of the banking system in its early years. However, this work has generally examined the level of banking competition and return differentials at the state level. The first task of this paper is to characterize the impact of state banking on the returns to national banks at a more disaggregated level. To this end, I use the location of all national and state banks decennially from 1870 to 1900 to characterize the competitiveness of banking markets at the level of the city or town. Using the individual balance sheets of national banks, I estimate banking returns at the town level. I use these estimated returns to demonstrate that the expansion of state banking into these markets was the primary factor in driving down banking returns.

Next, I quantify the role of free banking laws in facilitating the expansion of state banking. Prior to these laws, state banks were generally chartered by special legislative act or through general incorporation laws for all businesses. I quantify the impact of replacing these methods for chartering state banks with general free banking laws. Finally, I link this expansion of state banking to economic growth. To address the issue of simultaneity, I employ the strategy used in King and Levine (1993) and Bodenhorn (2000) and test the impact of initial financial variables on subsequent growth rates. I find that state banking had robust positive impacts on the growth of output and physical capital, particularly in the agricultural sector. The results of these regressions predict that there would have been about 1,400 fewer state banks in 1900 in the absence of state banking laws, and that this would have decreased agricultural output and capital by 1% in 1900. Thus, not only did regulatory competition decrease banking monopoly power, it had a significant impact on real economic activity.

The paper is organized as follows. Section 2.2 contains historical background on the dual banking system, the growth of state banking, and the free banking laws which enabled it. Section 2.3 describes the data used, and in particular the method I use for estimating national banking returns at the market level using state level earnings data. Section 2.4 examines the link between state banking and the returns to national banking at the market level. Section 2.5 quantifies the impact of free banking laws on the growth of state banking, and section 2.6 estimates the impact of this expansion on economic growth. Section 2.7 concludes.

2.2 Historical Background

Several aspects of the banking system during this period are significant for the analysis of this paper. In particular, the increasing role of state banks in the overall banking system during the 1880s and 1890s is central to my thesis. Prior to the Civil War, the primary business of banking had been to issue bank notes. Banks took deposits during this period, but the main source of revenue for banks was issuing notes which circulated as currency. The National Bank Acts of 1863 and 1864 created a national system for chartering banks and allowed all such banks to print interchangeable national bank notes. The goal was to create a uniform system of currency, rather than the patchwork of different bank notes of varying reliability that had existed previously. In order to ensure that state bank notes would no longer be used, Congress quickly imposed a 10% tax on the issuance of state bank notes. The result of this tax was the elimination of state bank notes, and nearly the elimination of state banks as well: fewer than 250 state banks existed 1868, compared to 1466 in 1863 (Grossman 2008). However, those state banks which did survive came to rely upon deposit banking as their main source of funds, and this business model coupled with certain competitive advantages over national banks led to a surge in state banking

in 1880s and 1890s. By 1900 the number of state-chartered banks exceeded that of national banks. Figure 1 shows a graph of the growth in both types of banks over this period.

The competitive advantage enjoyed by state banks originated in the looser restrictions that they faced under state laws, compared to the relatively strict national banking regulations. National banks were prohibited from using real estate as collateral for loans, while most states permitted their banks to do so. The ability to engage in mortgage lending was particularly beneficial for state banks in agricultural areas, where land was the major asset of most potential borrowers. As previously mentioned, national banks also had high minimum capital requirements which prevented them from operating in smaller communities. In nearly every state with a state banking law, the established capital requirement for small towns was below that of national banks. Table 1 shows all of the state banking laws with minimum capital requirements that were less restrictive than the $50,000 national bank requirement.[2] This list of free banking laws is compiled from information from Knox (1903), Barnett (1911), and various years of the *Rand McNally International Bankers' Directory*.

The driving force behind the passage of these laws was regulatory competition between state governments and the national banking system (White 1982). States derived a significant portion of their income from chartering and taxing their own banks, and thus had an incentive to adopt more liberal policies of bank chartering. Eventually, this led to the federal government responding in kind with the Gold Standard Act of 1900. This legislation lowered the minimum capital requirement for national banks in the smallest communities from $50,000 to $25,000. Several successive rounds of regulatory easing by both levels of government followed over the next several decades.

[2] Minimum capital requirements often varied by the size of the community, with towns with smaller populations being allowed to have smaller banks. Column 3 in table 1 displays the lowest minimum capital allowed in the smallest town.

Over the same period as this resurgence in state banks, regional banking markets became more integrated and a truly national capital market was formed (Davis 1965). Immediately following the Civil War, the rates of return for national banks varied significantly by region, with high returns in the west and relatively low returns in the well-developed eastern financial markets. Although these return differentials persisted for decades, by the end of the decade they had decreased significantly. Figure 2 shows a three-year moving average of the rate of net earnings on earning assets for national banks outside of reserve and central reserve cities. The trend over the period is clearly convergence in the earnings between national banks in different regions, along with a gradual fall in the average net earnings rate.

James (1976) argued that the increase in state banks noted in figure 1 played a key role in driving this convergence by eliminating monopoly power. In section 2.4, I provide additional evidence for this by looking at the relationship between monopoly and banking returns at the market level.

2.3 Data

Data on the location and balance sheet items of national banks comes from the Annual Reports of the Office of the Comptroller of the Currency, decennially from 1870 to 1900. Balance sheet variables for each bank are used to estimate net earnings at the bank level from similar data at the state and reserve city level, as described below. Data on the location and capital of state banks comes from the Merchants and bankers' almanac for 1870 and 1880, and the *Rand McNally International Bankers Directory* for 1890 and 1900. County-level variables, including data on economic growth and control variables used in the analysis, come from Haines (2004). In order to address the issue of changing county borders, counties are merged together if more than 15 square miles shifted from one county to another, using the county borders from

NHGIS. This ensures that the units in the 'county-level' analysis are consistent over time. Data on railroad, river, and canal access comes from the GIS databases created by Jeremy Atack (2015). Data on the population of individual cities or towns was collected from the U.S. Census for the years 1870-1900.

Data on the net earnings of national banks also comes from the Comptroller's Annual Reports. Unfortunately, they are only reported at the state or reserve city level in these reports. In order to estimate returns at the bank level, I need to accomplish two things. First, I construct an estimate of the average return to loans at the state or reserve city level using estimates of the return rates on all other earning assets held by national banks (this closely follows James' 1978 calculation of loan returns at the state/reserve city level). I then use these estimated rates of return for different types of earning assets in each state, along with individual bank balance sheet data on the holdings of different earning assets, to estimate returns at the bank level (and subsequently the market level). In doing so, I make various assumptions about the rates of return for different types of earning assets held by national banks, including government bonds, railroad bonds, and interbank balances.

First, I calculate the average return to loans at the state or reserve city level by subtracting the returns on other earning assets held by banks from total net earnings. The major earning assets of national banks were loans and discounts, bonds for circulation and deposit, other stocks and bonds, and interbank balances. Similarly to James (1978), I calculate the net return on loans for each state or reserve city as

$$r_{LDi} = \frac{NE_i - r_{US}(BC_i + BD_i) - r_{BB}DB_i - r_{RRB}OSB_i}{LD_i}$$

where i indexes states and reserve cities, r_{LDi} is the net return to loans and discounts, NE_i is the net rate of earnings (total net earnings divided by earning assets), BC_i and BD_i are bonds held for

circulation and bonds for deposit, DB_i is due from banks, OSB_i is other stocks and bonds (the primary component of which is assumed to be railroad bonds), and LD_i is total loans and discounts. r_{US} is the average interest rate on government bonds, $r_{BB}$is the average return on bankers' balances, and $r_{RRB}$is the interest rate on prime railroad bonds.[3] This gives me an estimate of the net return to loans and discounts for national banks at the state or reserve city level.

In order to approximate returns at the bank level, I use the average return to loans calculated above along with the returns to other earning assets to construct a weighted average of return to earning assets based on each individual bank's balance sheet. The formula for this is as follows:

$$r_j = \frac{r_{LDi}LD_j - r_{US}\left(BC_j + BD_j\right) - r_{BB}DB_j - r_{RRB}OSB_j}{EA_j}$$

where j now indexes individual banks, EA_j is the total earning assets of each bank, and the other variables are as above. This yields an individual return for each bank, based on an average rate of return for each type of earning asset along with the particular composition of earning assets held by each bank. In essence, I am using the composition of each bank's balance sheet along with the estimated return to loans in that bank's state, along with estimates of the return to the other earning assets, to approximate the earnings of that bank. I then aggregate these bank-level returns to the level of the market, in order to approximate returns in different banking markets.

Of course, this is far from a perfect estimate of individual bank returns. Most importantly, it is unable to capture much of the variation in the return to loans between different banking

[3] The interest rate on government bonds comes from a weighted average of the bonds held as security for circulation. This rate is applied to both bonds held for circulation and bonds held for deposit, as the latter constitutes a significantly smaller portion of the total. The interest rate on prime railroad bonds comes from FRED's series on railroad bond yields, 1857-1934. Following James (1976), I assume the average return on banker's balances during the period from 1888 to 1900 was 2%. James (1978) gives a figure of 3-4% for the early 1870s. Thus, I use a rate of 3.5% in 1870 and interpolate these values to get an interbank interest rate of 2.75% for 1880.

markets within the same state or reserve city. Most of the variation will come from the higher state-level loan returns in states where a higher percentage of national banks operate in a monopolistic environment. However, it is likely that banks in areas with higher loan returns skewed their balance sheets more towards loans, which are the highest return asset on average. This results in higher earnings for those banks relative to others within their state, even assuming the same rate of return on loans. Nevertheless, it is likely that my estimation understates the differences in returns between competitive and uncompetitive markets. If this is true, then my specification in the following section would provide a plausible lower bound on the importance of market structure, rather than an accurate point estimate.

2.4 State Banking Expansion and Banking Returns

The first task of this paper is to examine the role of state banking in equalizing banking returns across markets. I use the estimates of individual returns obtained above to look at the impact of monopoly power on banking returns in individual markets. Here, markets are defined as an independent census-enumerated city or town with at least one national bank. Table 2 shows the fraction of banking markets in each year in which only one national bank operated (national bank monopolies) and the fraction in which only one national bank operated and also no state banks were present (full monopolies). In the early years of the national banking period, the majority of banking markets were monopolies. Furthermore, nearly all bank markets which have only one national bank also have no state banks, meaning that almost all national banking monopolies were full monopolies in 1870. However, this situation changed significantly by the end of the century. At that point, only 29% of banking markets had only one national bank, and nearly half of these face competition from state banks. This decline in the prevalence of national

banking monopoly coincided with the convergence of banking returns in different regions over this period.

The regressions in tables 3 and 4 formally analyze the relationship between monopolistic banking markets and bank returns. Table 3 examines the impact of national bank monopoly and the presence of state banks on earnings with indicator variables. Alternately, table 4 includes measures of the number of national and state banks in each market. Each measure reflects a different view of competition in banking. If banks competed primarily on price, then even a market with relatively few banks could be reasonably competitive, and the indicator variable for a banking monopoly would be the more appropriate measure of market power. However, if banks competed primarily on quantity, then the total number of banks would be more informative. To account for each of these possibilities, I analyze both measures.

The baseline specification is as follows:

$$r_{i,t} = \alpha + \beta_i MonopolyMeasure_{i,t} + \beta_2 ReserveCityIndicator_{i,t} + \beta_3 X_{i,t} + \eta_S + \eta_t + \epsilon_{i,t}$$

where i indexes banking markets and $MonopolyMeasure_{i,t}$ is either an indicator variable for whether or not the market is a monopoly (in the first set of regressions) or a count variable for the number of banks in the market (in the second set). $ReserveCityIndicator_{i,t}$ is an indicator variable which takes a value of 1 when the market is a reserve city or a central reserve city and 0 otherwise. Banks in these markets were regulated differently than county banks. Most importantly, they faced different reserve requirements, and this could have impacted banking returns in these markets. Also, the earnings for these markets were reported separately from the states in which they existed in the Comptroller reports, so my estimates of the market-specific earnings will be more accurate for these cities. $X_{i,t}$ contains a number of control variables included in some of the specifications, most importantly the population of the particular city or

town. This is included to control for the overall size of the market. The percentage of output from the county that comes from farming (as opposed to manufacturing) and the urbanization rate in the county are also included as factors which may have determined the profitability of national banking activities in these markets. State-level fixed effects are included, as well as time fixed effects. The results are shown in tables 3 and 4 below.

The regressions in table 3 highlight the importance of competition from state banks in driving down banking returns. National bank monopolies do have higher returns in the first specification, but this relationship disappears when more control variables are added. However, when a national bank has a full monopoly, meaning that it also faces no competition from state banks, then the estimated returns are significantly higher for that bank regardless of the specification. These results strongly suggest that the expansion of state banking over this period mitigated the impact of national bank monopolies on returns. In particular, the entry of state banks into markets which otherwise were monopolies for the local national bank resulted in significantly lower returns in these markets. Returns are also significantly lower in reserve cities, as might be expected from the competitive nature of these cities. In the final two specifications, a number of other variables that could potentially affect the profitability of national banking are included. Larger markets, as proxied by the city/town population, generally had lower returns, as did markets in urban areas.

Table 4 uses the total number of banks to capture the competitiveness of the market, rather than a simple indicator variable. The results from using this measure are similar to those in table 3. State banks have a significant negative impact on the net returns to national banking in all specifications. In the first set of regressions, a higher number of national banks also drive

down banking returns, but this impact disappears when controlling for other aspects of the banking market.

These results strongly suggest that the expansion of state banking played a key role in driving down banking returns in high-return areas and thus contributed to the convergence of returns over this period. These findings reinforce previous work by James (1976), who used a state-level analysis to show that state banking expansion was the key factor in making markets more competitive and equalizing returns across regions. He argued that this occurred primarily because of the free banking laws passed by numerous states during this period. In the next section, I quantify the impact of these laws on state banking expansion.

2.5 State Banking Laws and the Growth of State Banking

The free banking laws documented in Table 1 standardized entry requirements and eased the process of forming a state bank. However, these laws were not the only way for state banks to be chartered during this period. States without a general incorporation law for banks would instead grant charters through individual legislative acts; alternatively, banks might be able to obtain charters through general business incorporation laws (James 1978). The process of obtaining special charters was cumbersome and easily influenced by existing banks wanting to maintain their market power. General business incorporation laws were not geared toward banks specifically and were generally unclear about regulations and restrictions. Thus, the replacement of these methods with state banking laws which specified particular entry requirements and a minimum amount of capital could have facilitated the expansion of state banking. In Table 5, I quantify the role of free banking laws in increasing the number and capital of state banks.

The main specification is as follows:

$$\% \Delta StateBanks_{i,t}$$

$$= \alpha + \beta_1 FreeBankingLaw_{i,t-1} + \beta_2 StateBanks_{i,t-1} + \beta_3 NationalBanks_{i,t-1} + \beta_4 X_{i,t-1}$$

$$+ \beta_5 Y_t + \eta_S + \epsilon_{i,t}$$

where i indexes county merge units, $FreeBankingLaw_{i,t-1}$ is an indicator variable which takes a value of 1 if the state has a free banking law at time t, $StateBanks_{i,t-1}$ and $NationalBanks_{i,t-1}$ control for the (log) initial level of banking, total national output Y_t controls for national economic fluctuations, and $X_{i,t-1}$ contains a number of county-level variables which could influence the rate of growth of state banking. Total population of the county controls for county size. Indicator variables for railroad and river access control for the influence of transportation.[4] The literacy rate in the county, defined as the percentage of the population able to read, proxies for human capital. Because this variable is unavailable in the census for later years, the value for 1870 is for all observations. Finally, the percentage of the population living in urban areas (defined as towns with a population above 2,500) is included to control for urbanization. The regressions also include state fixed effects.

One possible concern with this specification is whether or not the passage of a free banking law is in some other way correlated with the potential for state banking. It might have been the case that states with a larger potential for state banking would have been more likely to pass these laws. However, the data does not generally bear this out. For example, the prevalence of agriculture instead of manufacturing is a primary indicator of the competitive advantage of state banking. However, the indicator variable for the presence of a free banking law is not positively correlated with the percentage of county output which comes from farming; the two are in fact weakly negatively correlated (with a correlation coefficient of -.16). Furthermore, the

[4] Atack, Jaremski, and Rousseau (2014) demonstrate the importance of railroad access in furthering growth in banking.

likelihood of a particular state to pass such a law seems to depend on their past legislative history with regards to banking. For example, states which had free banking laws prior to the National Banking period either retained those laws or reinstituted them early in the period. By contrast, other states were prevented from doing so by the legislative environment (for example, Texas had a constitutional ban on all state banking until 1907). Tennessee established a state banking law with no minimum capital requirement early on, while neighboring (and economically similar) Kentucky never did. Although states had an incentive to issue as many bank charters as possible, the institutional restrictions facing them seem to have been the primary factor in determining whether or not a banking law was passed.

Table 5 shows the results of the above specification, and it indicates that free banking laws did indeed enable state banking to expand at a much more rapid rate than it otherwise would have done. The presence of a free banking law is associated with a nearly 50% higher rate of growth of state banking. The effect on state bank capital is even greater, with a growth rate over 100% higher in the presence of a free banking law. Clearly, the passage of free banking laws facilitated the immense expansion of state banking throughout this period. Although free banking laws do not explain all of the increase in state banking, they account for a significant portion of the expansion. The results of tables 3 and 4 indicate that this expansion of state banking was instrumental in decreasing monopoly returns to national banking, as James (1976) first argued. However, this does not resolve the question of whether or not the passage of these free banking laws actually impacted economic growth. It could have been the case that state banks provided additional competition to national banks but, much like the banks chartered under free banking laws before the Civil War, did not contribute to growth themselves. In the next section, I explore the link between state banking expansion and economic growth.

2.6 State Banking Expansion and Economic Growth

The main complication in an empirical study of the impact of banking on growth is the potential for growth to impact banking as well. Any empirical analysis must confront the possibility that banks chose to open in places that were already experiencing higher economic growth. This would lead a simple analysis to overstate the impact of banking on growth. In order to confront the issue of simultaneity, I take the approach used in King and Levine (1993) and Bodenhorn (2000) of using initial banking variables, rather than contemporaneous measures, to measure the impact on growth. Although this is far from a perfect method, it at least partially addresses the issue of simultaneity by using predetermined financial variables. I am also able to control for a number of independent factors which impact the growth prospects of the county, further reducing simultaneity bias. In the regressions below, I quantify the impact of state banking on output growth and the growth of physical capital. Following that, I use those results along with the results in table 5 to estimate the aggregate impact of regulatory competition via free banking laws on economic growth in this period. I find that free banking laws had a positive and significant impact on agricultural capital and output over this period.

In order to first examine the impact of initial banking variables on subsequent economic growth, I estimate the following pooled OLS regression:

$$\% \Delta Y_{i,t}$$

$$= \alpha + \beta_1 StateBankingVariable_{i,t-1} + \beta_2 NationalBankingVariable_{i,t-1} + \beta_3 Y_{i,t-1}$$

$$+ \beta_4 X_{i,t-1} + \beta_5 Y_t + \eta_S + \epsilon_{i,t}$$

where i indexes county merge units. $StateBankingVariable_{i,t-1}$

and $NationalBankingVariable_{i,t-1}$ capture either the initial number of banks or the initial amount of banking capital in each county merge unit. $Y_{i,t-1}$ is the initial value of either farming,

manufacturing, or total output in the county, and Y_t is the aggregate level of output for each respective variable. This latter variable captures aggregate fluctuations in either farming, manufacturing, or total output in order to account for national macroeconomic trends in output. η_S is a set of state fixed effects. $X_{i,t-1}$ contains the same county-level controls as before. Once again, total population controls for the overall size of the county, rail and river access control for transportation opportunities, the literacy rate proxies for human capital, and the urbanization rate controls for the urban composition of the county. The inclusion of these variables should at least partially account for the underlying growth prospects of the county. Standard errors are clustered at the county level.

Table 6 indicates that state banks had a significant impact on agricultural output. Doubling the number of banks increases the rate of growth of agricultural output by nearly 2% over the following decade. National banks are also positively related to agricultural growth, but the coefficient is not significant. National banks are clearly more important than state banks for manufacturing growth; while national banks are strongly related to manufacturing growth, state banks show no relationship whatsoever. The importance of state banks for agriculture but not for manufacturing makes sense given that one of the primary advantages of state banks was that they were allowed to issue loans using real estate as collateral. As land was relatively more important in agriculture than in manufacturing, this made state banks particularly suited to agricultural lending. The ultimate result of this is that both state and national banks have significant impacts on total output, but the impact of national banks is significantly higher.

The set of county-level control variables generally behave as expected. Larger counties grew more quickly, as did counties with rail access. River access and literacy both seem to matter for manufacturing growth but not farm growth, while more urban counties saw more

manufacturing growth but less farm growth. County-level output of all types is higher when national output is higher.

Table 7 uses total banking capital as an alternate measure of the quantity of banking services offered in each county, rather than simply the number of banks. This measure has the advantage of reflecting not only the raw number of banks, but also the average size of each bank as well. All other variables are the same as before.

Once again, state bank capital is important for agricultural growth, while national bank capital is primarily important for manufacturing growth. The coefficients are generally about half as large as those in table 6. This suggests that there might be a separate growth impact to having additional banks, perhaps due to increased competition, which does not come from simply increasing the total amount of banking capital in the area.

Table 8 quantifies the impact of state and national banks on physical capital rather than output. During this period, banks did not generally issue loans in order to fund long-term capital projects. Instead, banks generally adhered to the real bills doctrine, according to which loans should only be issued for short periods of time (a maximum of 6 months), and they should be self-liquidating (meaning that they are issued for a specific economic activity which provides the money to repay the loan upon completion). Under these banking practices, the state and national banks studied here likely only issued loans to fund short-term working capital. Thus, it is not obvious that banking would have a direct impact on capital. However, the short-term loans issued by banks may very well have increased the potential marginal productivity of capital in their local areas, leading to an increase in capital without directly funding it. I investigate this possibility using the following specification:

$$\% \Delta K_{i,t}$$

$$= \alpha + \beta_1 StateBanks_{i,t-1} + \beta_2 NationalBanks_{i,t-1} + \beta_3 K_{i,t-1} + \beta_4 X_{i,t-1} + \beta_5 Y_t + \eta_S + \epsilon_{i,t}$$

The three separate regressions separately investigate the impact of banking on agricultural capital, manufacturing capital, and total capital. Manufacturing capital comes directly from the census data in Haines (2004), while farming capital is the sum of the value of farmland, farm buildings, farm equipment, and livestock (buildings are not reported separately from farmland until the 1900 census). County-level and aggregate control variables are as before. Standard errors are clustered at the county level. The results in table 8 are similar to the previous two tables. However, in this case we can definitively say that national banks are important for the growth of agricultural capital as well as manufacturing capital.

The set of results in tables 6-8 establish the positive impact of state banking on economic output, in particular agricultural output. I can use these results to estimate a counterfactual in which there were no free banking laws passed at the state level at this time. This will yield a rough approximation of the positive impact that regulatory competition, in the form of the passage of free banking laws, had on real economic growth. This counterfactual does not capture the full effect of regulatory competition, because even states which did not pass free banking laws began to charter more banks in order to gain market share. However, it will give some idea of the aggregate impact of the laws themselves.

The first step is estimating the number of state banks which still would have existed, even without free banking laws. I calculate this for each county with the results in table 5, using the coefficient in column 1. In actuality, there were a little over 5,000 state banks in 1900. In a counterfactual where the state banking law indicator always takes a value of 0, the regression predicts about 3,600 total state banks in 1900. With the counterfactual number of state banks in

each county, I use the results in tables 6 and 8 to predict a counterfactual amount of agricultural output and capital for each county. The resulting prediction is that, in the absence of any free banking laws, both total agricultural output and total agricultural capital would have been about 1% lower in 1900. While not a huge figure by any means, this nevertheless demonstrates that regulatory competition in the form of state free banking laws had significant and measurable positive impacts on the economy by facilitating the growth of state banking.

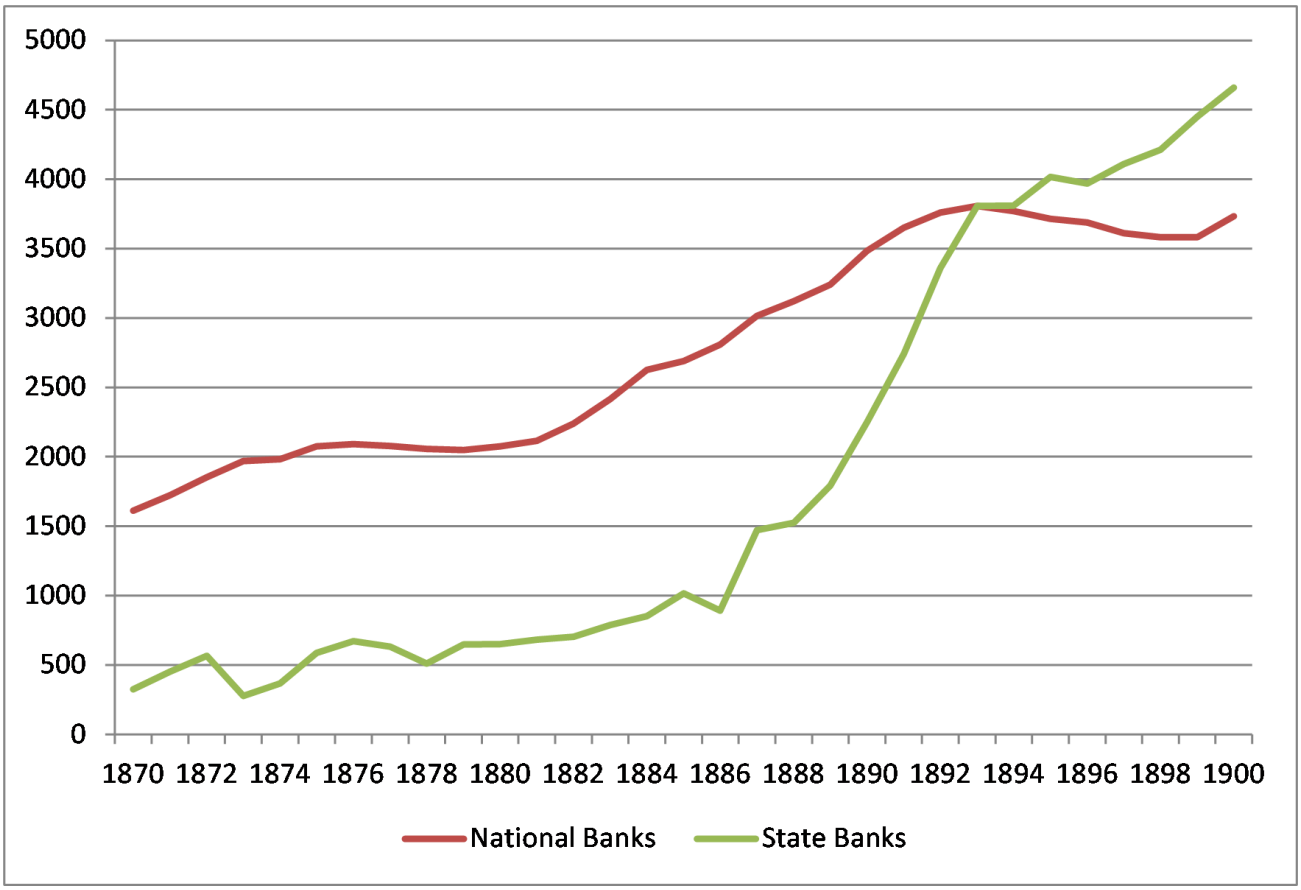
2.7 Conclusion

The evidence indicates that the free banking laws passed during this period had a significant positive impact on output. The high minimum capital requirements established under the National Banking Acts restricted the expansion of national banks into smaller markets, but also created a profit opportunity for states to increase the issuance of their own charters. Furthermore, more than just expanding banking services into smaller markets, these new states banks increased output growth, in particular in the agricultural sector. The dual banking system has long been credited with furthering the establishment of efficient legal rules and regulations in the 20th century (Scott 1977). Here I have demonstrated that from its inception, it has had positive impacts on banking and economic growth.

This study is limited to examining regulatory competition as embodied in state banking laws passed from 1870-1900. However, this was only the first form of regulatory competition under the dual system. In order to compete with the expanding state banks, in 1900 the federal government passed the Gold Standard Act to decrease the minimum capital requirements of national banks from $50,000 to $25,000 in small towns. As Sylla (1969) shows, the number of national banks nearly doubled in the decade following this new law, and nearly two-thirds of these new banks had a capital stock that was less than the previous $50,000 threshold. In

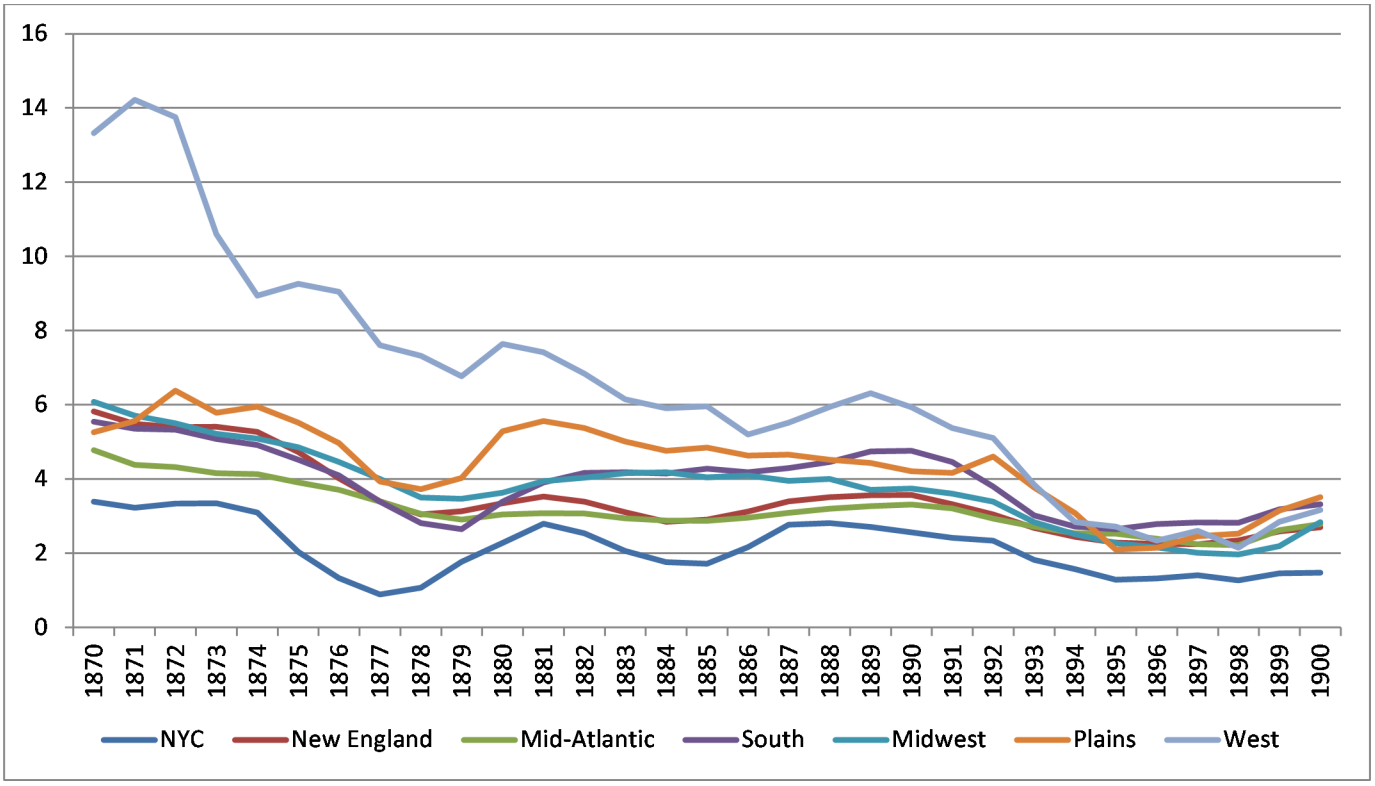
response, nearly every state which had a minimum capital requirement above the new $25,000 limit reduced them in order to remain competitive (White 1982). With the establishment of the Federal Reserve in 1913 reserve requirements were relaxed further, along with and restrictions on real estate lending, in order to entice banks to join the new system. By 1915, fifteen states had reduced their own reserve requirements in response.

In short, the pattern of competition between state and federal banking regulators extends significantly beyond the present study. Certainly, this progressive relaxation of restrictions likely had negative effects on the stability of the banking system, demonstrated in the banking troubles of the Great Depression. Yet it should not be forgotten that facilitating the expansion of the financial system has positive results for the provision of banking services and for economic growth itself.



Source: U.S. Department of the Treasury. Annual Report of the Comptroller of the Currency (1931), pp. 3, 5.

Figure 1. U.S. banking growth from 1870-1900



Source: Davis (1965), Appendix Table 4

Figure 2. Convergence of national banking returns, by region

Table 1: State Banking Laws and Minimum Capital Requirements

State	Year	Capital Requirement
Alabama	1886	50,000 (25,000 paid in)
Colorado	1876	30,000
Florida	1889	15,000
Georgia	1893	25,000
Iowa	1873	25,000
Illinois	1887	25,000
Indiana	1873	25,000
Kansas	1891	5,000
Louisiana	1892	10,000
Michigan	1871	15,000
Minnesota	1878	10,000
Missouri	1879	10,000
Montana	1889	20,000
North Dakota	1889	5,000
Nebraska	1870	5,000
New Mexico	1888	30,000
New York	1870	25,000
Ohio	1870	25,000
Oklahoma	1897	5,000
South Dakota	1891	5,000
Tennessee	1870	0
Utah	1895	25,000
Washington	1889	25,000
Wisconsin	1870	25,000
West Virginia	1872	25,000
Wyoming	1889	10,000

Sources: Barnett (1911), Knox (1903), Rand McNally International Bankers' Directory, various years.
Entered as 1870 if in effect prior to the current analysis.

Table 2: Fraction of Banking Markets in Monopoly

Year	National Bank Monopoly	Full Monopoly
1870	.65	.61
1880	.52	.43
1890	.36	.20
1900	.29	.15

Table 3: National Bank Earnings and Monopoly in National Bank Cities

	National Bank Earnings			
	(1)	(2)	(3)	(4)
National bank monopoly	0.0350**		-0.0176	
	(2.36)		(-1.01)	
Full monopoly		0.0993***		0.0622***
		(6.63)		(3.59)
Reserve city indicator	-0.825***	-0.808***	-0.673***	-0.705***
	(-11.56)	(-11.43)	(-8.94)	(-9.35)
ln(City population)			-0.0414***	-0.0224**
			(-4.36)	(-2.41)
Percent of county output from farming			-0.0933*	-0.0789
			(-1.72)	(-1.45)
Percent urban in county			-0.116**	-0.120**
			(-2.00)	(-2.07)
State fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Observations	6,409	6,409	6,028	6,028
R-squared	0.815	0.816	0.819	0.819

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 4: National Bank Earnings and the Number of Banks in National Bank Cities

	National Bank Earnings					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(State banks)	-0.0247***		-0.0231***	-0.0166***		-0.0166***
	(-7.50)		(-6.85)	(-4.50)		(-4.49)
ln(National banks)		-0.0519***	-0.0297**		0.00603	-0.000387
		(-3.66)	(-2.05)		(0.33)	(-0.02)
Reserve city indicator	-0.741***	-0.758***	-0.697***	-0.667***	-0.681***	-0.667***
	(-10.32)	(-10.15)	(-9.30)	(-8.89)	(-8.99)	(-8.82)
ln(City population)				-0.0223**	-0.0388***	-0.0221**
				(-2.48)	(-3.78)	(-2.03)
Percent of county				-0.0715	-0.0936*	-0.0715
output from farming				(-1.31)	(-1.72)	(-1.31)
Percent urban				-0.0999*	-0.118**	-0.1000*
in county				(-1.72)	(-2.04)	(-1.72)
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,409	6,409	6,409	6,028	6,028	6,028
R-squared	0.816	0.815	0.816	0.819	0.819	0.819

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 5: State Banking Laws and the Growth of State Banking

	Dependent Variable: Percent Change in State Banking Variable	
	(1)	(2)
	Number of State Banks	State Bank Capital
State banking law indicator	0.492***	1.235***
	(4.58)	(5.34)
ln(State banks)	-0.577***	
	(-41.63)	
ln(National banks)	0.0252*	
	(1.73)	
ln(State bank capital)		-0.589***
		(-43.00)
ln(National bank capital)		0.0192
		(1.42)
ln(Population)	0.592***	1.198***
	(16.18)	(15.32)
Rail access	0.512***	1.064***
	(6.31)	(6.08)
River access	0.0696	0.137
	(1.12)	(1.02)
Literacy rate	1.062***	1.970***
	(3.35)	(2.88)
Percent urban	0.392***	0.958***
	(3.49)	(3.96)
ln(Aggregate output)	1.409***	2.704***
	(11.03)	(10.02)
State fixed effects	Yes	Yes
Observations	5,916	5,916
R-squared	0.279	0.280

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 6: Pooled OLS: The Impact of Initial Banks on Output Growth, 1870-1900

	Dependent Variable: Percentage Change in Output		
	(1)	(2)	(3)
	Agricultural	Manufacturing	Total
ln(State banks)	0.0179***	0.00005	0.0217***
	(4.66)	(0.00)	(3.91)
ln(National banks)	0.0107	0.0563***	0.0327***
	(1.43)	(3.21)	(3.48)
ln(Initial level of)	-0.665***	-0.823***	-0.799***
dependent variable)	(-14.26)	(-36.58)	(-15.86)
ln(Population)	0.440***	0.845***	0.649***
	(7.44)	(13.08)	(10.78)
Rail access	0.195***	0.677***	0.195***
	(6.89)	(7.44)	(6.45)
River access	-0.0171	0.205***	0.0681***
	(-0.76)	(4.21)	(3.06)
Literacy rate	0.107	2.415***	0.414**
	(0.64)	(5.39)	(2.52)
Percent urban	-0.429**	0.957*	0.423
	(-1.98)	(1.84)	(1.54)
ln(Aggregate output)	1.741***	0.478***	0.304***
	(12.45)	(7.32)	(7.80)
State fixed effects	Yes	Yes	Yes
Observations	5,916	5,916	5,916
R-squared	0.580	0.511	0.534

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 7: Pooled OLS: The Impact of Initial Bank Capital on Output Growth, 1870-1900

	Dependent Variable: Percentage Change in Output		
	(1)	(2)	(3)
	Agricultural	Manufacturing	Total
ln(State bank capital)	0.00737***	0.00194	0.00992***
	(4.08)	(0.39)	(3.96)
ln(National bank capital)	0.00383	0.0240***	0.0131***
	(1.19)	(3.17)	(3.21)
ln(Initial level of	-0.666***	-0.823***	-0.798***
dependent variable)	(-14.30)	(-36.58)	(-15.78)
ln(Population)	0.446***	0.846***	0.652***
	(7.57)	(13.11)	(10.79)
Rail access	0.196***	0.673***	0.192***
	(6.91)	(7.37)	(6.31)
River access	-0.0165	0.204***	0.0689***
	(-0.74)	(4.20)	(3.09)
Literacy rate	0.114	2.412***	0.421**
	(0.68)	(5.39)	(2.55)
Percent urban	-0.423**	0.952*	0.428
	(-1.99)	(1.84)	(1.54)
ln(Aggregate output)	1.768***	0.474***	0.321***
	(12.75)	(7.78)	(8.79)
State fixed effects	Yes	Yes	Yes
Observations	5,916	5,916	5,916
R-squared	0.579	0.511	0.533

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 8: Pooled OLS: The Impact of Initial Banks on Capital Growth, 1870-1900

	Dependent Variable: Percentage Change in Physical Capital		
	(1)	(2)	(3)
	Agricultural	Manufacturing	Total
ln(State banks)	0.0165***	-0.00241	0.0267***
	(4.10)	(-0.21)	(6.65)
ln(National banks)	0.0233***	0.0567***	0.0286***
	(3.27)	(3.24)	(5.21)
ln(Initial level of	-0.648***	-0.787***	-0.801***
dependent variable)	(-14.00)	(-34.56)	(-16.67)
ln(Population)	0.369***	0.764***	0.584***
	(6.40)	(12.13)	(9.97)
Rail access	0.152***	0.688***	0.185***
	(4.61)	(7.62)	(5.90)
River access	-0.0151	0.198***	-0.00771
	(-0.66)	(4.07)	(-0.39)
Literacy rate	0.717***	2.107***	0.934***
	(3.39)	(4.97)	(4.77)
Percent urban	-0.307**	0.925*	-0.0306
	(-1.98)	(1.77)	(-0.49)
ln(Aggregate	-0.0807	0.691***	0.0991***
output)	(-0.66)	(10.22)	(3.29)
State fixed effects	Yes	Yes	Yes
Observations	5,916	5,916	5,916
R-squared	0.623	0.480	0.628

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

CHAPTER III

SILVER COINAGE AND NATIONAL BANK EXPANSION IN THE LATE 1800S

3.1 Introduction

Following the Civil War, the number of nationally chartered banks grew dramatically, increasing from 1,600 in 1866 to over 3,700 in 1900. This growth in national banking facilitated the expansion of manufacturing and spurred overall economic growth.[1] However, banking growth was limited by high capital and reserve requirements. The National Banking Act required national banks to have at minimum $50,000 in capital, and bank deposits had to be backed by legal tender reserves in amounts varying from 15% to 25%. Many studies of the national banking system have concluded that these capital and reserve requirements were binding and restricted the growth of national banking (e.g. Sylla 1969). The availability of gold specie to serve as high-powered money was an important but unappreciated factor in determining how restrictive these requirements truly were. For most of this time period, the stock of gold grew at a rapid pace, facilitating an increase in bank deposits and the number of banks. Yet in the mid-1880s, the growth rate of the gold stock fell to virtually zero, and stayed there for a decade. Instead, the growth of the high-powered money stock consisted primarily of the coinage of silver, which began with the Bland Allison Act in 1878 and lasted until 1893. In this paper, we demonstrate that the coinage of silver, and particularly its usage as lawful money after 1882 (money allowed to be used for bank deposits) facilitated the growth of national banking in the absence of an increasing gold stock. We show that the coinage of silver as lawful money was positively associated with the formation of new national banks, and that this effect was particularly strong for counties in close economic proximity to the mints in Philadelphia and New Orleans.

[1] See for example Jaremski (2014), Fulford (2015).

The most common view of silver coinage legislation among economic historians is not generally positive. Cagan (1963) points out that silver coinage legislation was the product of a political coalition between silver producers and agrarian farmers, the former wishing to increase the price of silver and the latter attempting to increase the money stock to cause inflation and diminish their debts in real terms. Rather than being sound economic policy, it was born of economic populism and industry lobbying. Friedman and Schwartz (1963) argue that silver coinage threatened the maintenance of the gold standard primarily by demonstrating the political power of the silver forces and decreasing the willingness of foreigners to hold dollars (over fears that free silver coinage might eventually return). In particular, the Sherman Silver Act of 1890 greatly accelerated the rate of silver coinage and was viewed by its proponents as a temporary stepping stone to the free coinage of silver. Calomiris (1992) maintains, however, that silver coinage did not seriously threaten the long-term maintenance of the gold standard. Rather, the source of financial instability in 1893 was concerns about the short-term convertibility of gold due to the depleted nature of the Treasury's gold stock. Regardless, economic literature pointing to any positive effects of silver coinage is scarce. The results of this paper point to such a positive outcome: it allowed the stock of high powered money to continue to expand and therefore facilitated the growth of the banking system.

We use data on the number and location of national banks from 1870 to 1900 in order to analyze the effect of silver coinage on the national banking system. We focus on national banks because the capital and reserve requirements were much higher for them than for most state banks, so we would expect them to be the most constrained by a lack of high-powered money. We first show that the aggregate impact of silver coinage on bank formation was positive over this period, and then we utilize county-level variation in economic proximity to the mints at

which silver was produced to further identify the impact of silver. Section 3.2 describes the historical context and particulars of silver coinage and the national banking system. Section 3.3 describes the data used. Section 3.4 tests the aggregate impact of silver coinage. Sections 3.5 and 3.6 use economic proximity to mints to identify the impact of silver coinage, first for each mint separately and then for the full set of counties. Section 3.7 concludes.

3.2 Historical Background of Silver Coinage

Although silver coinage was technically legal when the national banking system was founded, the market price of silver consistently exceeded its mint value. Because of this, coinage of silver was unprofitable and did not occur. In 1873, Congress officially discontinued the coinage of silver, in an act which would come to be called the "Crime of '73." Although the act was uncontroversial in 1873, shortly after it was passed major silver discoveries in the western U.S. led to a substantial fall in the market price of silver to below the old coinage value. Silver producers lobbied Congress to reinstate coinage in order to increase the value of silver. They were joined by large numbers of rural farmers, who were generally heavily in debt and were suffering greatly under the prevailing deflationary trend at the time. They clamored for silver coinage in order to increase the money supply and result in inflation, attempting to reduce their debt burden. The result was the Bland-Allison Act of 1878, which resulted in the U.S. Treasury purchasing 2 million dollars' worth of silver per month for the purposes of coinage.

Under this act, newly mined silver could be brought to any U.S. mint, and it would be bought and coined by the Treasury (up to the 2 million dollar monthly limit). Silver purchases at the mint under this act were generally made with silver money or silver certificates, which then made their way into circulation and the banking system relatively quickly (Taussig 1893). However, initially bankers were very hesitant to hold silver as high-powered money, instead

paying it immediately back to the Treasury in taxes. The primary reason for this was silver's uncertain status as lawful money. Silver was not clearly designated as lawful money until the Act of July 12, 1882 (Champ and Thompson 2006). From this point on, the amount of high powered money in the form of silver grew steadily. In 1890 Bland-Allison was replaced the Sherman Purchase Act, which increased the purchase of silver to 4.5 million dollars per month and introduced Treasury notes backed by silver.

This change in silver policy coincided with a stagnation in the growth rate of the gold stock. From gold resumption in 1879 up through the foundation of the Federal Reserve in 1913, the amount of high-powered money in the form of gold grew rapidly, at an average annual rate of 12.3%. However, in the mid-1880s, the growth in the gold stock fell to virtually zero, and remained there for nearly a decade. The amount of gold available as high-powered money in 1885 amounted to $421 million; ten years later, the stock was virtually unchanged at $439 million. During this same period, the amount of silver available as high powered money grew dramatically. Coinage began with the Bland-Allison Act of 1878. Following this law and the Sherman Purchase Act of 1890 (which increased the rate of silver purchases significantly), by 1892 the amount of high-powered money in the form of silver had reached $482 million, nearly equal to the amount of high powered gold money. The growth of gold and silver in the stock of high-powered money over this period is shown in Figure 1 below.

This growth in silver and relative to gold led to fears that the U.S. would abandon the gold standard. The U.S. saw extremely high gold outflows during this period, both from the Treasury and from the country as a whole. By 1893, gold reserves had fallen below $100 million, calling into question the ability of the Treasury to redeem legal tender notes with gold. The Panic of 1893 soon followed, and the Sherman Purchase Act was repealed that year. In 1900 the Gold

Standard Act reinforced the government's commitment to gold, officially bringing an end to the era of silver coinage. At the same time, major new gold discoveries (along with the discovery of the cyanide process for gold extraction) led to an expansion of the gold stock which would continue into the new century, ending the need for silver coinage permanently. However, over the period from 1882 to 1893, silver coinage was the source of the expansion of high-powered money needed to expand banking and bank deposits.

3.3 Data

The data used in this project come from a variety of sources. Data on the number and location of national banks was taken from various years of the *Merchants and Bankers' Directory*. This data begins in 1870 and continues yearly to 1900. This data includes, at the county level, the number of national banks in operation each year and the number of new banks chartered in a year. The data on silver and gold coinage comes from the *Reports of the Director of the Mint*, 1870 to 1900. We approximate silver coinage with the amount of silver deposited at the mint in a given year. These silver deposits were generally paid for with newly-created silver coins or certificates, meaning that silver intake led immediately to more silver-based money in circulation (Taussig 1893). Thus, these figures constitute an accurate estimate of the amount of new silver money put into circulation by each mint. We subtract redeposits (previously coined silver being recoined) from this figure to capture only the new silver entering circulation.

This paper focuses on the mints of Philadelphia, New Orleans, and San Francisco (we exclude the Carson City mint due to its small output and limited years of operation). The New Orleans mint is a particularly interesting case for this project, as it was opened in 1878 (the same year that Bland-Allison was passed) and was in existence almost exclusively to coin silver (the amount of gold it produced was insignificant). However, the majority of the silver coinage came

from the Philadelphia mint, particularly during the short time of the silver purchase act. Silver deposits at all three mints are shown in figure 2 below.

Most obvious is the immense amount of coinage in Philadelphia after the passage of the Sherman Purchase Act. Although the other two mints' productions were comparable to Philadelphia's through most of the period, they did not respond to the Sherman Purchase Act in the same way. Additionally, the San Francisco mint was unique in that its gold production was consistently higher than its silver production in every year. Thus, although the San Francisco mint did participate in silver coinage, silver was a secondary output for that mint. Due to the prevalence of gold on the west coast, most hand-to-hand transactions in that region were conducted with gold and gold certificates rather than national bank notes. Thus, gold played a uniquely important role in the economy around the San Francisco mint, and we show that the impact of silver in this region is not as clear as in other areas.

County-level data on population, urbanization rates, and physical capital comes from Haines (2004). One problem with using this data is that county borders shifted significantly over the period from 1870 to 1900. In order to ensure a consistent set of observations, we merge counties were more than 15 square miles moved from one county to another (using the NHGIS shapefiles for this period). Because the data from Haines is only available every 10 years, we use linear interpolation to obtain values for intervening years. Yearly data on industrial production comes from the Industrial Production Index in Davis (2004). This is used to control for aggregate fluctuations that may impact the rate of formation of national banks.

One important aspect of our identification strategy is to use transportation costs as a measure of economic proximity to the different mints, in order to differentiate the effects of silver coinage across counties. Data on the transportation network (including the railroad

network, rivers, and canals) comes from Atack (2015). This data allows us to capture the expansion of the railroad network occurring over this period to calculate time-varying transportation costs from all counties to the various mints. Figure 3 shows the transportation network as it existed in 1900, along with the location of the three mints. It also shows the results of the county merges conducted.

This transportation network data allows us to test for a differential impact of silver across counties. If silver output was important to the formation of national banks, it might be the case that this effect was strongest near the mints. We employ this strategy in section 3.6. The next section contains baseline regressions of the importance of aggregate silver coinage for banking.

3.4 Aggregate Silver Coinage and Banking Growth

The first test of our hypothesis that silver had a positive impact on national bank expansion is a simple set of panel data regressions linking national silver output to banking growth variables at the county level. The main specification is shown below:

$$NewNationalBanks_{i,t} = \alpha + \beta_1 SilverCoinage_{i,t} + \beta_2 X_{i,t} + \beta_2 Y_t + u_i + \epsilon_{i,t}$$

The variable of interest, $SilverCoinage_{i,t}$, captures the aggregate level of silver deposited at all mints during the current year and the previous two (excluding redeposits, as described in Section 3.3). Thus, it is a cumulative measure of silver intake over the previous 3 years. This formulation allows some flexibility in how long it might take for silver deposited at the mint to make an impact on the banking system (in robustness checks, we try several different plausible measures for silver, varying the timing of the expected impact). In the first regression, this simply includes all silver coined, but in the second column we only look at silver coinage which was actually legal tender. Given the uncertain status of silver money in the banking system prior to 1882, we might expect that the positive impact of silver only appears when silver

is actually designated as lawful money. Isolating the silver coinage during this period allows us to test this.

A number of other county level factors ($X_{i,t}$) are included to control for possible demand-side effects. The initial number of national banks is included to control for a possible convergence effect. Several census data variables are also included. The county population, the percentage of the population living in urban areas, farm capital per capita, and manufacturing capital per capita all control for various aspects of the demand for banking services in the county. Y_t contains the aggregate industrial production index from Davis (2004).[2] This variable is included to control for aggregate fluctuations which might have impacted the rate of bank formation independently of aggregate silver production. County fixed effects are also included (u_i). All variables (except for the urbanization rate) are in log form in all regressions.

Column 1 indicates that aggregate silver coinage on its own does not have a significant impact on the formation of national banks. However, when only the coinage of silver which was actually lawful money is included, the impact of silver on banking is larger and statistically significant. This result is consistent with the idea that silver coinage, during the period when silver was officially lawful money and could be used as reserves for bank deposits, had a positive impact on bank formation. The effects of control variables are generally intuitive. The initial value of national banks shows a convergence effect, industrial production is (weakly) positively associated with bank formation, and larger counties see more bank formation. The impact of the other variables is not statistically significant in this specification, however. Because the banking formation data is yearly and therefore highly variable, we see very low values of R^2 in both regressions.

[2] Although we cannot include time fixed effects along with an aggregate silver production measure, in section 3.6 we use an interaction with economic proximity to mints to eliminate all aggregate time trend variables, enabling us to include time fixed effects in that specification.

Broadly speaking, these results provide a prima facie reason for thinking that silver coinage (as lawful money) might have had a positive impact on banking. However, the varying behavior of the different mints gives us an additional tool with which to identify the impact of silver. For example, we would expect that the mint activity in New Orleans would be most important for counties near to that particular mint. In the next section, we examine each mint individually. We use the transportation network at the time to calculate a measure of economic proximity between all counties and each mint, which allows us to study the impact of each mint on local counties.

3.5 Economic Proximity to the Mints

In this section, we examine the local impact of silver coinage at each mint on national banking growth. In order to do so, we approximate the transportation cost between all counties (using the county centroid) and each of the three mints. This approximation uses the full transportation network shown in figure 3, including all railroads, rivers, and canals in existence.[3] For each mint, we set a maximum transportation cost of $10 per ton in 1870 in order to define the counties considered "close" to the mint (in order to consistently include the same set of counties, we do not allow this set of counties to change as transportation networks improve. The economic proximity measure used in the next section takes the expanding transportation network into account). This figure of $10 is chosen because it generally includes enough observations for a robust result while excluding a large portion of the country which is far removed from the mint (although, as we will see, the small number of distinct counties on the west coast limits the sample size around the San Francisco mint severely). Having restricted the sample around each

[3] Transportation costs per ton-mile are set to the values used in Fogel (1962) and Donaldson and Hornbeck (2016). Railroad transportation costs 0.63 cents per ton-mile, water transportation costs 0.49 cents per ton-mile, and wagon transportation (in the absence of any other transportation option) costs 23.1 cents per ton-mile.

mint, tables 2-4 shows a set of regressions which look separately at the silver coinage of each mint. In table 2, the specification is similar to that of the previous section, but $SilverCoinage_{i,t}$ now contains only the output of the Philadelphia mint. The sample contains only those counties within a transportation cost of $10 per ton to Philadelphia. The results are shown below.

As before, the coefficient on silver coinage is only positive and significant when only lawful money silver is included. The control variables generally behave as before. Farm capital is negatively related to national bank formation, likely reflecting the fact that state banks had a competitive advantage over national banks in lending to farmers (they were allowed to engage in mortgage lending, while national banks were not).

Table 3 shows similar results for the New Orleans mint. The sample size is again limited to counties within a transport cost of $10 per ton to the mint. The results are similar to those for Philadelphia. As previously mentioned, the New Orleans mint was founded the year after coinage began under Bland-Allison as the major mint to serve the interior of the country, and it exclusively produced silver over this period. Thus, it was in the best position to meet the demand for high-powered money in the interior portion of the country. Table 3 indicates that its activities of silver coinage did just this, allowing for the expansion of national banks over the period.

Table 4 shows the same specification for counties around San Francisco. The San Francisco mint was unique during this period for several reasons. Most importantly, it was the only mint producing a large amount of gold over this time. In fact, it produced significantly more gold than silver during every year of this period. Furthermore, because of the prevalence of gold in the west, it was often the case that gold and gold certificates would be used as currency instead of national bank notes. This practice set it apart from the rest of the country in terms of its likelihood to respond to silver coinage. Additionally, because of the lack of distinct county

units on the west coast, the sample size in the area around the mint is extremely small. For these reasons, the results in table 4 below are significantly different from the previous results.

Lawful silver no longer matters, and overall silver appears to have a negative impact on banking formation, rather than a positive impact. However, as mentioned, the sample size is incredibly small compared to the previous regressions, and a number of the control variables no longer matter or take the opposite sign of what would be expected (such as the urbanization rate and manufacturing capital per capita). Although it is hard to say anything about the counties near the San Francisco mint, the usage of gold as currency instead of national bank notes, along with the results in table 4 cast doubt on the relevance of our silver hypothesis for the west coast. Thus, in the regressions that follow, we exclude the (few) counties which are closer to San Francisco than any other mint.

3.6 Utilizing Economic Proximity

In the previous section, we showed that the particular coinage activities of the Philadelphia and New Orleans mints positively impacted counties close to those mints (in terms of economic proximity). We can also use economic proximity to mints more directly by including it in the regression to investigate whether or not silver coinage was more important for counties that were closer to the various mints. To estimate the economic proximity of county i to mint j in year t , we use the transportation cost between the two ($TransportationCost_{i,j,t}$) to calculate economic proximity as $Proximity_{i,j,t} = \frac{1}{TransportationCost_{i,j,t}}$. The network of railroads expanded significantly over the period from 1870 to 1900, and we are able to capture this expansion with railroad data from Atack (2015) in order to allow proximity to vary with time. Using this measure, we estimate the following specification:

$$NewNationalBanks_{i,t}$$

$$= \beta_1 Silver_{i,t} + \beta_2 Proximity_{i,t} + \beta_3 Silver_{i,t} * Proximity_{i,t} + \beta_4 X_{i,t} + \beta_5 Y_t + u_i + \epsilon_{i,t}$$

where $Proximity_{i,t}$ captures the economic proximity of county i to the nearest mint, and $Silver_{i,t}$ captures the output of that mint. This specification captures our intuition that the effect of silver coinage should be largest in counties that are most proximate to the mint. $X_{i,t}$ contains the same set of county controls as before, and Y_t is again the industrial production index which controls for aggregate economic conditions. u_i is the county fixed effect. The results of this specification are shown in table 5.

The impact of silver does indeed appear to be largest for counties close to either the Philadelphia or the New Orleans mint. Although the effect of silver coinage is significant for all counties regardless of location, counties nearest the mints see the biggest gains. These results provide perhaps the strongest evidence that silver coinage, when it was designated as official lawful money, aided the growth of the national banking system.

In all of the previous results, we have approximated the silver coinage of each mint with a cumulative measure of silver intake over a three year period. This assumption allows several years for silver to be coined and for its impact to be felt. However, we do not have reliable data on how quickly this silver was coined or made it into circulation. We test the importance of this assumption in a series of robustness checks in table 6, which uses two alternate assumptions about the timing of silver coinage and impact. In the first two columns, we use contemporaneous silver intake in each year as our approximation of silver output, and in the final two we instead lag silver intake by one year. The results are similar regardless of the assumptions made about the timing of the impact of silver coinage. National banking growth is higher when more lawful money silver is coined, and the effect is stronger closer to the mints in which it is being coined.

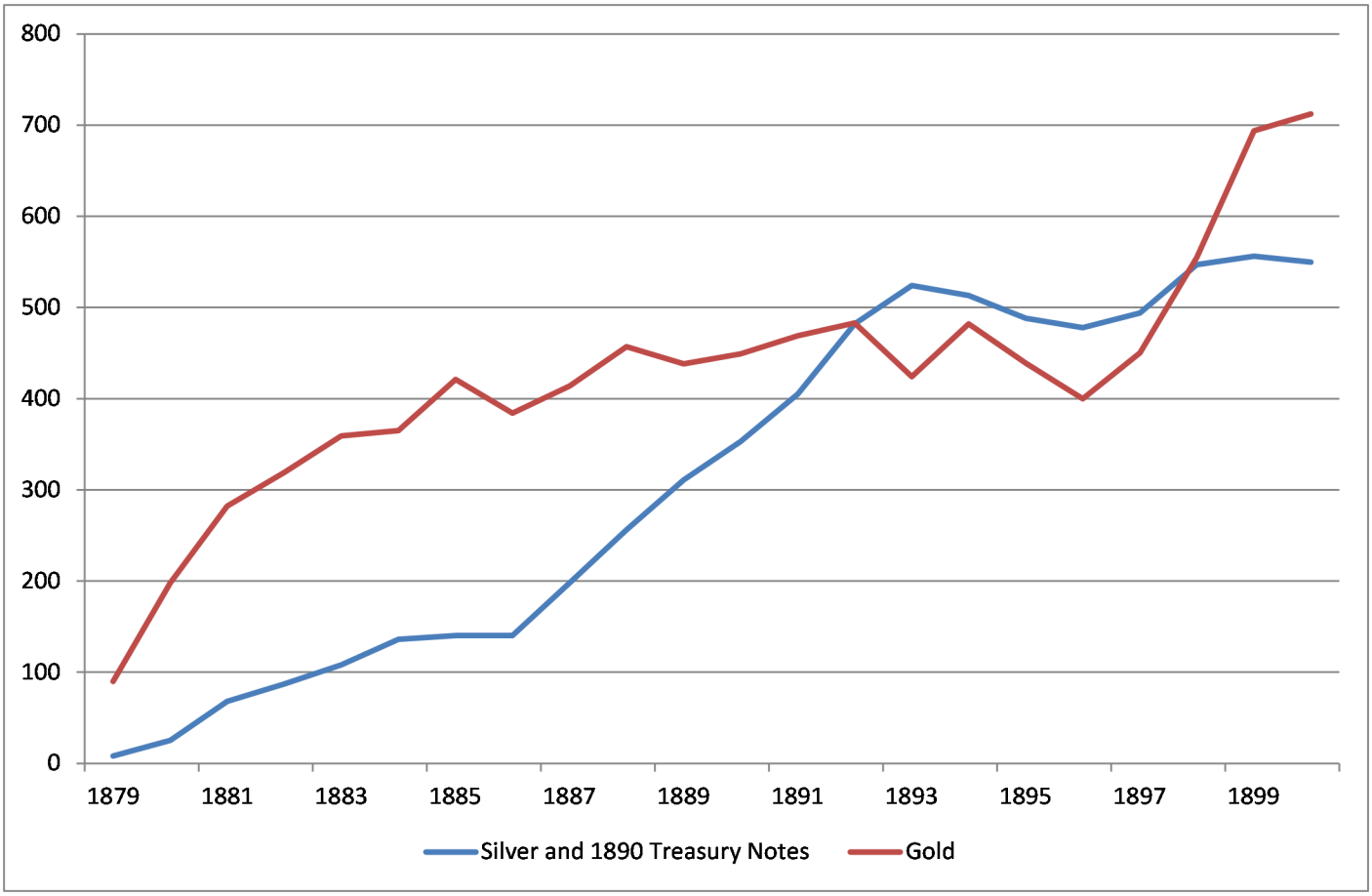
As a final check, if we drop the aggregate silver measure altogether and only include silver weighted by transport costs, we can include time fixed effects in the model. Although we have the industrial production index from Davis (2004) as a control for aggregate fluctuations in previous regressions, time fixed effects are an alternate way to control for aggregate effects. Table 7 shows the results without any aggregate time trends and with time fixed effects included. All three measures of the timing of the silver impact are shown.

Although the coefficients on silver coinage in this specification are about half as large as before, silver is still positively and significantly related to national banking growth. We conclude from this that our previous results are not driven simply by the choice of control for aggregate effects. Rather, silver coinage mattered, and it mattered most around the mints.

3.7 Conclusion

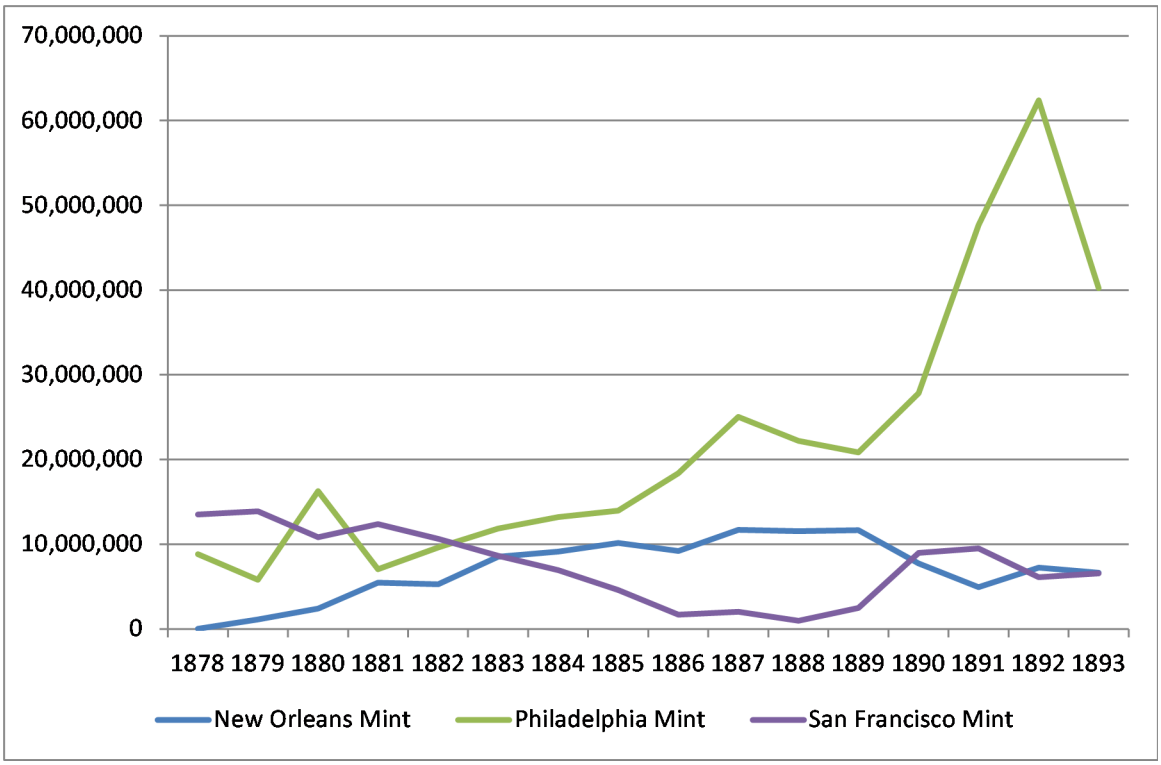
This paper has demonstrated the importance of silver coinage during the 1880s and early 1890s in supporting banking growth. More silver coinage is associated with a higher rate of national bank formation, and this effect is particularly important for counties close to the mints. The reason that silver coinage was particularly important at the time was the temporary halt in the expansion of the gold stock and the need for some form of high-powered money to serve as bank deposits. Taussig, a contemporary observer of the silver coinage period, argued that the issuance of silver under Bland-Allison appeared to be just the right amount to serve the increasing needs for currency by the public. He noted in 1893 that "It appears, then, that the issue under the act of 1878 was not on the whole excessive. By a lucky accident, it corresponded with sufficient closeness to what the community was in a position to use for its growing transactions." Although the legislation was driven by populism and industry lobbying rather than sound economic policy, it nevertheless met the currency needs at the time.

However, the increased rate of silver coinage under the Sherman Purchase Act undoubtedly stoked fears about the ability of the US to maintain gold convertibility. Calomiris (1992) argued that the true risk from the silver legislation was to threaten short-term convertibility into gold, and that this led to the run on the dollar in 1893 and contributed to the Panic which followed. Undoubtedly, the silver legislation ultimately had negative effects on the stability of the financial system near the turn of the century. Nevertheless, it did provide an additional source of high-powered money at a time when banking expansion might have been slowed without it.



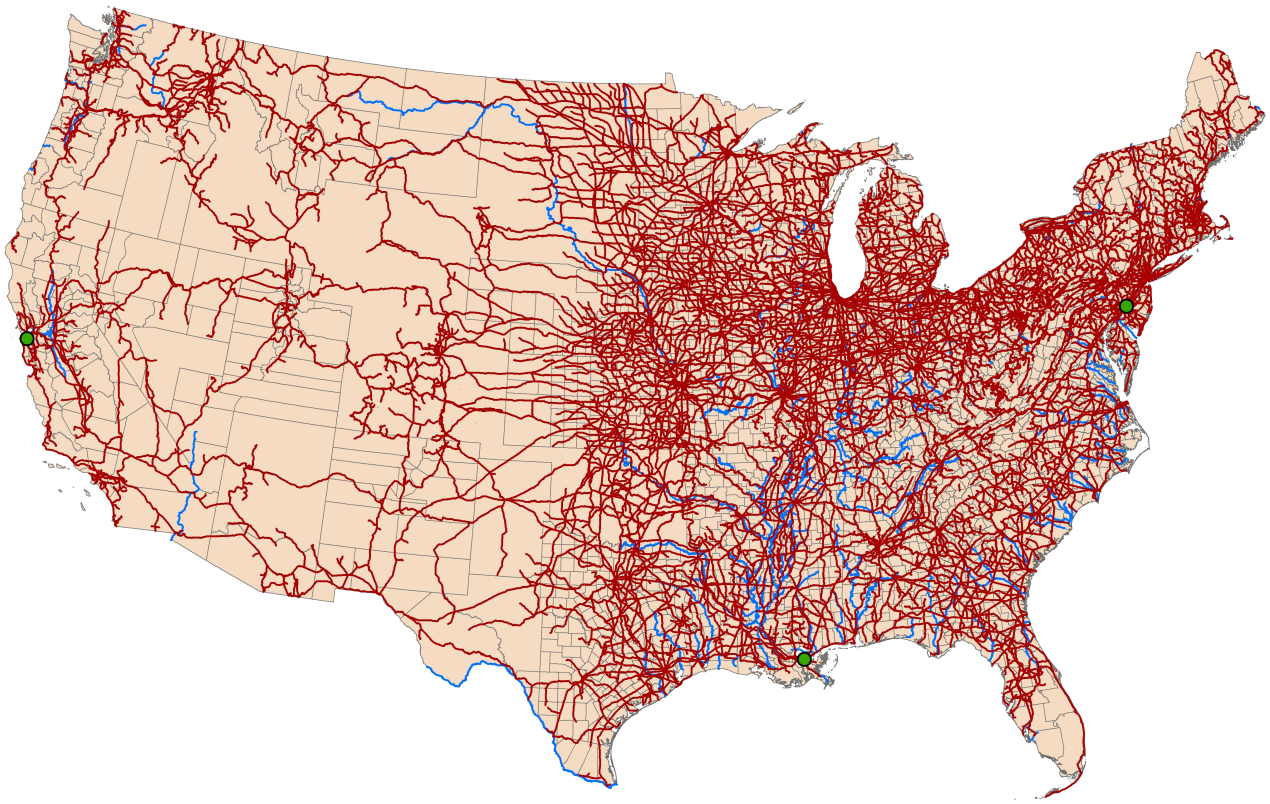
Source: Friedman and Schwartz (1963)

Figure 1. Composition of high-powered money following Resumption



Source: *Reports of the Director of the Mint*, various years.

Figure 2. Silver deposits by mint, 1878-1893



Railroad lines are shown in red, rivers and canals in blue. The location of the mints is shown by the green dots.
Source: Atack (2015)

Figure 3. Transportation Network

Table 1: The Impact of Silver Coinage on National Bank Formation

	(1) New National Banks	(2) New National Banks
All silver	0.0013	
	(1.27)	
Lawful money silver		0.0018***
		(14.40)
Initial national banks	-0.095***	-0.099***
	(-19.55)	(-20.32)
Industrial production index	0.0097	0.011*
	(1.48)	(1.68)
Population	0.12***	0.13***
	(12.88)	(13.11)
Percent urban	-0.016	-0.043
	(-0.56)	(-1.48)
Farm capital	-0.0052	0.0048
	(-0.76)	(0.71)
Manufacturing capital	-0.0015	0.00023
	(-0.48)	(0.07)
County fixed effects	Yes	Yes
Observations	33,360	33,360
R^2	0.015	0.021

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 2: The Impact of Philadelphia Silver Coinage on National Bank Formation

	(1) New National Banks	(2) New National Banks
All silver (Philadelphia only)	-0.0018	
	(-1.49)	
Lawful silver (Philadelphia only)		0.0011***
		(7.00)
Initial national banks	-0.12***	-0.12***
	(-18.50)	(-18.78)
Industrial production index	0.031***	0.027***
	(3.74)	(3.37)
Population	0.093***	0.088***
	(6.27)	(6.01)
Percent urban	-0.049	-0.058
	(-1.36)	(-1.61)
Farm capital	-0.041***	-0.031***
	(-4.12)	(-3.21)
Manufacturing capital	0.0052	0.0056
	(0.96)	(1.03)
County fixed effects	Yes	Yes
Observations	21,057	21,057
R^2	0.019	0.022

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 3: The Impact of New Orleans Silver Coinage on National Bank Formation

	(1) New National Banks	(2) New National Banks
All silver (New Orleans only)	-0.00026	
	(-0.95)	
Lawful silver (New Orleans only)		0.0015***
		(9.21)
Initial national banks	-0.11***	-0.11***
	(-18.46)	(-18.87)
Industrial production index	0.019**	0.015*
	(2.17)	(1.95)
Population	0.12***	0.11***
	(9.58)	(9.12)
Percent urban	-0.039	-0.056
	(-1.09)	(-1.55)
Farm capital	-0.030***	-0.020**
	(-3.55)	(-2.37)
Manufacturing capital	0.0020	0.0040
	(0.46)	(0.90)
County fixed effects	Yes	Yes
Observations	23,066	23,066
R^2	0.018	0.022

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 4: The Impact of San Francisco Silver Coinage on National Bank Formation

	(1) New National Banks	(2) New National Banks
All silver (San Francisco only)	-0.015**	
	(-1.97)	
Lawful silver (San Francisco only)		0.00058
		(0.69)
Initial national banks	-0.19***	-0.20***
	(-4.76)	(-4.98)
Industrial production index	0.0052	0.077
	(0.09)	(1.54)
Population	0.071	0.028
	(1.23)	(0.47)
Percent urban	-0.27	-0.31*
	(-1.56)	(-1.79)
Farm capital	0.040	0.030
	(1.52)	(1.08)
Manufacturing capital	-0.036*	-0.033
	(-1.74)	(-1.58)
County fixed effects	Yes	Yes
Observations	435	435
R^2	0.071	0.064

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 5: The Impact of Silver Coinage on National Bank Formation, by Proximity to Mint

	(1)	(2)
	New National Banks	New National Banks
Lawful silver (nearest mint only)	0.0018***	0.0014***
	(12.94)	(7.21)
Proximity to nearest mint	0.024	0.0050
	(0.66)	(0.14)
Lawful silver (nearest mint only) * proximity		0.0014***
		(3.02)
Initial national banks	-0.11***	-0.11***
	(-21.39)	(-21.36)
Industrial production index	0.017**	0.017**
	(2.51)	(2.49)
Population	0.12***	0.12***
	(11.12)	(11.09)
Percent urban	-0.052*	-0.050
	(-1.68)	(-1.64)
Farm capital	-0.0074	-0.0065
	(-1.02)	(-0.89)
Manufacturing capital	0.00058	0.00060
	(0.18)	(0.19)
County fixed effects	Yes	Yes
Observations	31,689	31,689
R^2	0.022	0.022

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 6: Alternate Specifications for the Timing of Silver Coinage

	Dependent Variable: New National Banks			
	(1)	(2)	(3)	(4)
	Current Year		One Year Lag	
Lawful silver	0.0019***	0.0015***	0.0019***	0.0015***
	(12.97)	(7.23)	(13.10)	(7.28)
Proximity to nearest mint	0.024	0.0049	0.019	0.00023
	(0.66)	(0.13)	(0.52)	(0.01)
Lawful silver * proximity		0.0015***		0.0015***
		(3.03)		(3.03)
Initial national banks	-0.11***	-0.11***	-0.11***	-0.11***
	(-21.38)	(-21.35)	(-21.35)	(-21.31)
Industrial production index	0.017**	0.017**	0.020***	0.020***
	(2.52)	(2.50)	(2.85)	(2.84)
Population	0.12***	0.12***	0.12***	0.12***
	(11.12)	(11.09)	(11.23)	(11.20)
Percent urban	-0.051*	-0.050	-0.077**	-0.076**
	(-1.68)	(-1.64)	(-2.46)	(-2.42)
Farm capital	-0.0073	-0.0063	-0.0063	-0.0056
	(-1.01)	(-0.88)	(-0.85)	(-0.75)
Manufacturing capital	0.00056	0.00058	0.0012	0.0012
	(0.17)	(0.18)	(0.37)	(0.38)
County fixed effects	Yes	Yes	Yes	Yes
Observations	31,689	31,689	31,163	31,163
R^2	0.022	0.022	0.022	0.022

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Table 7: Silver Coinage and Bank Formation with Time Fixed Effects

	Dependent Variable: New National Banks		
	(1)	(2)	(3)
	Cumulative	Current	One Year Lag
Lawful silver * proximity	0.00082**	0.00087**	0.00092**
	(1.97)	(1.98)	(2.05)
Initial national banks	-0.10***	-0.10***	-0.10***
	(-20.41)	(-20.40)	(-20.35)
Population	0.14***	0.14***	0.14***
	(10.35)	(10.35)	(10.27)
Percent urban	0.038	0.038	0.014
	(1.27)	(1.27)	(0.46)
Farm Capital	-0.0099	-0.0099	-0.0091
	(-1.41)	(-1.41)	(-1.27)
Manufacturing Capital	0.0054*	0.0054*	0.0062*
	(1.70)	(1.69)	(1.91)
County fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
Observations	32,591	32,591	32,061
R^2	0.045	0.045	0.045

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

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