DISCUSSION PAPER SERIES

DP17164
(v.3)

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ECONOMIC HISTORY, FINANCIAL ECONOMICS AND INTERNATIONAL TRADE AND REGIONAL ECONOMICS

CEPR

ISSN 0265-8003

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Discussion Paper -3
Published 10 May 2022
Submitted 22 September 2022

Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
www.cepr.org

This Discussion Paper is issued under the auspices of the Centre's research programmes:

- Economic History
- Financial Economics
- International Trade and Regional Economics

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Abstract

Privately issued money usually bears devaluation risk that lowers its liquidity and usefulness as a medium of exchange. We evaluate the real economic consequences of eliminating devaluation risk and increasing the safety of private monies in the historical context of the National Banking Act of 1864 in the United States. The Act introduced a new type of federally-regulated bank that supplied safe currency to the local economy as an alternative to the previously existing varieties of unsecured notes. Towns faced a discontinuous cost in creating these banks, which we leverage as a source of exogenous variation in the change in their monetary transaction costs. We estimate the effects of gaining access to safe private money using a market access approach derived from general equilibrium trade theory, and we find that lowering monetary transaction costs increased production of traded goods overall, increased the production share of trade-cost sensitive goods, and spurred structural transformation with more manufacturing output, manufacturing employment, and urban population. Moreover, the growth in manufacturing output overall appears driven by employment and inputs rather than capital investment. These effects indicate that supplying safer money that lowered overall trade costs had a causal impact on US economic development.

JEL Classification: E42, E51, N11, N21

Keywords: Monetary, Banking, Structural transformation

Chenzi Xu - chenzi.xu@gmail.com
Stanford University and CEPR

He Yang - heyang@fas.harvard.edu
Harvard

Real effects of supplying safe private money*

Chenzi Xu† He Yang‡

September 2022

Abstract

Privately issued money often bears devaluation risk that create monetary transaction frictions. We evaluate the real effects of supplying a new type of safe money in the historical context of the US in 1863. We instrument for the change in monetary frictions locally using regulatory capital requirements and measure the degree safe money access with a market access approach derived from general equilibrium trade theory. Lowering monetary transaction costs increased traded goods production and spurred structural transformation with more manufacturing output, employment, and urban population. The growth in manufacturing was driven by employment and inputs rather than capital investment.

JEL classification: E42, E51, N11, N21.

*First version: November, 2018. Previously circulated as "National banks and the local economy." The authors thank Adrien Matray for numerous discussions. Philip Ager, Rick Hornbeck, and Martin Rotemberg generously shared data. We also thank Anat Admati, Brian Beach, Asaf Bernstein, Michael Bordo, John Campbell, Lauren Cohen, William Diamond, James Feigenbaum, Carola Frydman, Andrew Garin, Michela Giorcelli, Claudia Goldin, Gary Gorton, Walker Hanlon, Arvind Krishnamurthy, Christopher M. Meissner, Nathan Nunn, Siddharth George, Robin Greenwood, Alberto Manconi, Santiago Perez, Sarah Quincy, Tzachi Raz, Hugh Rockoff, Amit Seru, Jann Spiess, Jeremy Stein, Adi Sunderam, as well as participants at Harvard, Yale, UC Davis, Einaudi Institute, HKUST, NBER DAE, EHA, the AEAs, and Stanford SITE for helpful comments. Jiayi Cheng, William Halverson, Peilin Yang, and Wenyi Yin provided excellent research assistance. We are grateful for financial support from The Lab for Economic Applications and Policy (LEAP) at Harvard, the Harvard Department of Economics Summer Research Fellowship, and the King Center Junior Faculty Research Grant at the Stanford.

†Stanford GSB, CEPR, and NBER. Email: **chenzixu@stanford.edu**.

‡Amazon. Email: **heyang.um@gmail.com**.

1 Introduction

> *A predominance of private monies may introduce consumer protection and financial stability risks because of their potential volatility and the risk of run-like behavior. Indeed, the period in the nineteenth century when there was active competition among issuers of private paper banknotes in the United States is now notorious for inefficiency, fraud, and instability in the payments system.*
> –Lael Brainerd, Member of the Federal Reserve Board of Governors (2021)

All forms of money are a liability of the issuer, and their usefulness as mediums of exchange depends on either the confidence users have in the value of the assets backing the liability or the willingness of others to accept the liability as payment.[1] Privately created monies often vary in their safety and can be prone to large devaluations when users lose confidence in (or receive better information about) the value of the underlying assets. In contrast, "safe" monies have no devaluation risk and maintain their liquidity in all states of the world. There are no transaction frictions associated with using them, and in fact, their liquidity can cost users a "convenience" yield (Krishnamurthy and Vissing-Jorgensen, 2012). While private money can provide liquidity in certain markets and generate significant seignorage profits for issuers and early adopters, lack of total safety leads to transaction frictions, and there is little empirical evidence on their real costs to the economy.

In this paper, we study how introducing and supplying a new form of safe money with no transaction frictions affected local economic development and structural transformation in the historical context of the United States from 1870 to 1890. The lack of a sufficiently large supply of safe monies that could sustain the transactional needs of the economy was a prominent feature of the US prior to the creation of the Federal Reserve system in 1913. For much of its history, the US, unlike other early industrial nations such as the UK, France, and Germany, operated under a fragmented monetary system without a central bank responsible for maintaining a common, uniform currency. The qualitative costs of this fragmented monetary system have been remarked upon by both contemporaries and historians, but quantitatively, little is known about how this system affected economic growth and development.

The passage of the National Banking Act of 1864 introduced a new safe alternative source of private money to the economy. While the Act itself was enacted at the federal level, there was significant geographic variation in the local supply of these safe notes, implying

[1] We focus on the balance sheet of the issuer and therefore refer to anything that acts as money as a liability of its issuer. Money is also an asset for households and firms that hold and use it, but we will refer to monetary instruments as liabilities.

that locations experienced different changes in their transaction frictions. This geographical variation allows us to estimate the effect of reducing transaction frictions from the introduction of safe money. We measure county-level changes in transaction frictions from 1870 to 1880, and we estimate the impact of those changes on the evolution of real outcomes from 1880 to 1890. Our empirical analysis focuses on a sample of locations where we can instrument for these changes to provide causal empirical evidence on these effects.

Prior to the National Banking Act, the money supply consisted of bank notes issued by thousands of local private banks. These note liabilities were backed by bank asset portfolios with little or no regulatory oversight and had low recovery rates following bank failures. They were not legal tender and were only convertible into specie at the issuing location. As a result, there was significant uncertainty over their value, and transaction frictions manifested in the way they traded at discounts across town borders (Gorton, 1996, 1999). Their illiquidity made them particularly costly to use in long-distance trade transactions where information frictions about banks' insolvency risks were higher.

The National Banking Act introduced national bank notes that were stable, liquid, and information-insensitive liabilities like Federal Reserve notes today. These notes were supplied by federally regulated "national banks" that operated alongside previously existing "state banks."[2] These notes were different on several dimensions. First, these notes were completely safe. The Act severed the link between a bank's credit risk and the real value of its notes, thereby eliminating transaction frictions arising from asymmetric information (Dang, Gorton, Holmström and Ordonez, 2017). It did so by mandating that all national bank notes had to be backed 110% in federal government bonds, and it established structured procedures for insolvency and receivership that were designed to prioritize note holders against any losses, which eliminated the risk of bank runs on notes.

Second, national bank notes circulated discount-free within the network of national banks around the country. This was due to a requirement for all national banks to fully redeem the notes of any other national bank, making national bank notes particularly liquid for long-distance transactions. Places with a local national bank could transact within the network without any monetary transaction costs. Transactions outside of the network may have needed to rely on less liquid alternative payments such as specie that was costly to ship and insure, unsafe private notes at a discount, or informationally-sensitive checks.

We structure our analysis of the effect of better access to the supply of safe notes by

[2]State banks were chartered by state governments. Some states did not have a chartering system and therefore operated under a "free banking" regime. For simplicity, all types of banks that existed alongside national banks are called state banks.

embedding monetary transaction costs into a model of multiregional trade. This model allows us to derive a sufficient statistic expression for the overall trade intensity of a location known as its "market access." The market access measurement approach does not require observing the actual volumes of bilateral trade (data on which unfortunately do not exist within the US during this period) while providing predictions for the evolution of the real economy in general equilibrium from changes in trade costs. We augment the standard measure of market access with monetary transaction frictions to create our measure of "monetary" market access (MMA) for each location. Intuitively, MMA is high for places that have low transaction costs with their trade partners, particularly if those partners are larger.

We estimate the model in the data by relating how changes in MMA from 1870 to 1880 impact economic development and structural change. Changes in MMA can come from two sources: either because a location gains a national bank directly and becomes part of the frictionless national bank network, or because distant trade partners elsewhere become better connected. While the changes in distant parts of the national bank network are arguably exogenous to a location's own growth trajectory, the direct change from gaining a local national bank is potentially endogenous to unobserved future growth potential.

We therefore provide causal evidence on the impact of raising monetary market access through stable money by combining our theoretically derived MMA approach with an instrument that generates plausibly exogenous variation in the likelihood of directly gaining a national bank. The instrument comes from the regulatory capital requirements in the National Banking Act that were based on town population cut-offs. Banks established in towns with fewer than 6,000 people needed to raise $50,000 of equity capital while banks in towns with more than 6,000 (and fewer than 50,000) people were required to raise twice as much. These town population requirements were binding since banks were not allowed to branch, and there were strict residency requirements for bank directors. The discontinuous jump in the implied equity capital per capita in the population distribution meant that towns just below the population cut-off faced significantly lower entry costs per capita for establishing a national bank and directly raising their MMA.

In order to implement the instrumental variable approach, our empirical analysis focuses on towns within a narrow population bandwidth around the 6,000 population threshold that could gain a national bank for the first time. We begin by constructing a sample of towns that we follow for several decades. The first filter we impose is that towns have fewer than 6,000 people in 1870 (the first decadal census after the passage of the Act) so that they all face the same low capital requirement initially. Second, we require that they did not

have a national bank as of 1875 and therefore no prior direct access to a local supply of safe bank notes.[3] Third, we require that their populations were between 4,000 and 8,000 in 1880. Choosing a small population bandwidth of 4,000 to 8,000 in the subsequent decade allows us to limit our sample to towns that are likely to be similar in both observable and unobservable characteristics. Within this set of towns, some crossed the 6,000 population cutoff in the 1880 census, which doubled the entry cost for a national bank. We use crossing this threshold as an exogenous shifter for the change in monetary market access due to national bank entry into the town. The identifying assumption is that there were no concurrent shocks to places just below the cut-off that would have caused their outcomes to be systematically different after 1880.

To strengthen the empirical strategy, we control for the growth trajectory with the population change from 1870 to 1880 and for a town's financial development and physical trade costs in the pre-period. We also show that pre-period observable characteristics were not significantly different between the towns with a population above 6,000 versus those below 6,000 population in 1880, both conditionally and unconditionally.

We find a strong first stage: having fewer than 6,000 people in 1880 is associated with a 62% increase in monetary market access (F-stat of 9.6) by the middle of the decade. We show that our instrument also predicts a 52% increase in the direct likelihood of gaining a national bank locally, and we also provide several other robustness checks for the validity of the instrument.

Having established that lower regulatory capital requirements increased monetary market access, we estimate the real economic effects in the subsequent decade using difference-in-differences regressions instrumenting for the change in monetary market access. Market access encompasses two forces: (i) producer market access, which is the extent a location's goods are exported and consumed elsewhere, and (ii) consumer market access, which is the extent that a location consumes goods produced elsewhere. Our framework for multiregional trade based on Fajgelbaum and Redding (2022) generates predictions for how changes in traded sector production and consumption impact the rest of the economy, which we examine in turn.

First, we find evidence of production growth in the traded sector from the reduction in monetary transaction costs that raises market access. We estimate these effects using the overall change in agricultural and manufacturing goods output and find an increase of 2.9%

[3]The analysis is not sensitive to choosing 1875 as the first year we calculate whether a town has a national bank. We show robustness to other years in the appendix.

relative to the pre-shock mean from a 10% increase in MMA.

While all goods can be traded, they differ in the extent to which changes in trade costs impact the price producers receive and therefore the incentives to produce them. Commodities exhibit the highest sensitivity since they trade in national markets with a national price and therefore fully pass on price reductions to producers. Within the agricultural sector, we are able to disaggregate production across products and find a 5 pp increase in the share of production of commodity goods for a 10% increase in MMA.

Second, we find that growth in the traded sector also spurs structural transformation, in line with our theoretical framework. Intuitively, the mechanism is that the growth in trade activity, especially in the trade-cost sensitive sector (agriculture) bids up the value of the immobile factor (land) relative to the value of the mobile factor (labor).[4] The reduction in wages relative to land induces entry into manufacturing and services, which is observable through a growth in employment and the urban share of population. We find a 6% increase in the share of manufacturing employment relative to the pre-shock mean, and a 4% increase in urban population.

Third, we decompose the impacts of monetary market access on the manufacturing sector, which allows us to estimate the changes in imported goods through the use of inputs. Reducing frictions for sourcing inputs can increase the quantity of inputs and also allow firms to source them more broadly and therefore likely improved the match quality of the inputs they used. This "input sourcing" channel can raise output without requiring credit expansion as importing better inputs makes firms more productive (Goldberg, Khandelwal, Pavcnik and Topalova, 2010). We find that the growth in employment combined with an increase in inputs appear to drive the results while there is no change in capital.

While we are not able to fully rule out the possibility that our results are driven by the standard bank credit channel in trade (e.g., Paravisini, Rappoport, Schnabl and Wolfenzon, 2015; Xu, 2022), we can directly control for the amount of lending from national banks and show that they do not significantly change the estimated coefficients. To the extent that observable lending captures the credit channel, our effects stem from access to safe money.

Lastly, we complement our results on the immediate effects with long-run dynamic difference-in-differences estimations from 1870 to 1900, the longest consecutive series of decades for which we can measure our results. These estimations provide graphical evidence of no differential pre-trends and show that the elevated levels of manufacturing production

[4]Unfortunately the wages paid in the agricultural sector were only collected in 1870, and therefore it is not possible to explicitly test this prediction.

persisted until at least 1900.[5] The urban agglomeration that we document in conjunction with the growth in the traded sector is a potential source of the persistence.

Our paper primarily relates to the theoretical and empirical work relating changes in physical trade costs to the spatial distribution of economic growth, especially in the US. We follow Donaldson and Hornbeck (2016) and Hornbeck and Rotemberg (2021) in conceptualizing and estimating these effects through a market access approach with a similar focus on the late 19th century. Our theoretical framework draws on Fajgelbaum and Redding (2022) and we also study urbanization rates as in Michaels, Rauch and Redding (2012).

More generally, this paper adds to the literature on the historical determinants of economic growth in the United States, and in particular contributes to the better understanding of how the banking sector has shaped the geography of economic activities in the late 19th century (Friedman and Schwartz, 1965; Rousseau and Wachtel, 1998; Rousseau and Sylla, 2005; Landon-Lane and Rockoff, 2007). Our results are consistent with Sylla (1969, 1982), which argue that the National Banking Act's high regulatory capital requirements held back economic development by failing to expand the bank note supply sufficiently, and Cagan (1963) that attributes economic growth in the late 19th century to currency stability.

In addition, our paper relates to the recent empirical and theoretical work on the optimal design and regulation of digital private monies, much of which has drawn comparisons between stablecoin design and traditional banking (Eichengreen, 2019; Catalini and de Gortari, 2021; Catalini and Shah, 2021; Gorton and Zhang, 2021; Gorton, Ross and Ross, 2022). These papers highlight various mechanisms by which pegged private digital currencies (stablecoins) can achieve their eponymous stability, most of which involve maintaining sufficient liquid reserves, like US Treasuries, as the backing asset. To the best of our knowledge, this paper is the first to provide empirical evidence that improving the safety of privately issued money, in this case by regulating the quantity and quality of the assets backing the monetary liability, positively affects real economic activity.

Private bank notes are only one form of short-term bank debt, and while the large literature on bank debt illiquidity has mostly focused on their fire-sale externalities and their role in increasing financial fragility (Diamond and Dybvig, 1983; Stein, 2012; Admati and Hellwig, 2014), this paper studies a context in which the regulatory environment ensures that they are truly safe with full liquidity coverage, which creates a Gorton and Pennacchi (1990)-type transactions medium. The national bank notes that are fully backed by government

[5]The county-level data on manufacturing do not exist for 1910, and the levels are no longer significantly different by 1920. Given the large amount of changes that likely occurred in WWI and after the establishment of the Federal Reserve system, we stop our analysis on the long-term effect at 1900.

debt in our context take the form of the optimal contract that removes any discount from the debt's face value, thereby making transactions efficient (Dang, Gorton, Holmström and Ordonez, 2017). In that sense, we provide evidence for a sub-national monetary channel in the tradition of Friedman and Schwartz (1965); Romer and Romer (1989).

Finally, the literature on the bank credit channel has demonstrated the importance of credit supply for the traded sector (e.g., Amiti and Weinstein, 2011; Paravisini, Rappoport, Schnabl and Wolfenzon, 2015; Paravisini, Rappoport and Schnabl, 2015; Xu, 2022) in both modern and historical contexts. While this literature focuses on international trade patterns, we link the changes in the traded sector to domestic economic development. In this way, our paper relates to work documenting that the presence of local banks impacts growth and labor market outcomes in modern developing countries (Fonseca and Matray, 2022).

The rest of the paper is organized as follows. Section 2 discusses the historical context around the time period studied and institutional details of the banking sector and monetary system. Section 3 describes the data, and section 4 presents the conceptual framework with monetary market access. Section 5 explains the sample construction, measurement, and empirical strategy. Section 6 presents the empirical results on the effect of national bank entry on real economic outcomes, and Section 7 concludes.

2 Historical Context

2.1 The Free Banking Era

Between the expiration of the charter of the Second Bank of the United States in 1836 and the establishment of the Federal Reserve system in 1913, there was no unified banking system in the United States.[6] The first half of this period was known as the Free Banking Era during which there was free entry into banking in most states, and regulatory oversight was generally weak. Banks were prevented from branching so they had concentrated geographic exposure. Under this unit banking structure, local shocks could easily lead to bank failures (Bordo, 1998). There was neither a formal system of interbank lending nor a lender of last resort, so bank runs and failures were frequent (Grada and White, 2003). These features of a fragmented and loosely regulated antebellum banking system exposed local economies to the conditions of their local banks.[7]

During this period, the money supply consisted of the bank notes of thousands of

[6] See Appendix B for more historical background on the First and Second National Bank before the Free Banking Era.

[7] See Rockoff (1991) for a comprehensive review of the key characteristics of the Free Banking Era.

individual banks and coin. The federal government did not issue its own paper currency, and there were no federally regulated banks. The bank notes were only redeemable at face value in specie at the originating bank's office. In 1860 on the eve of the Civil War, there were almost 1,600 state banks, each issuing its own notes. In large cities, the notes from hundreds of banks circulated together.

The lack of regulation over these notes made them risky in several ways that reduced their liquidity and caused their market values to be lower than their face values. First, the fact that there were so many bank notes of different designs meant that they were hard to verify and subject to counterfeit. As a result, most merchants did not accept non-local notes, and only local currency could be used for consumption. Specialized note brokers used publications such as the "Bank Note Reporters and Counterfeit Detectors" to ascertain the authenticity of unfamiliar notes, which was a costly and information-intensive task (Appleton, 1831).[8] The note brokers specializing in this activity operated on commission and accounted for part of the face value discount that using non-local notes entailed.

A second source of discounts was the physical transportation costs of taking a note back to its source since they could only be redeemed at their originating locations (Gorton, 1999; Ales, Carapella, Maziero and Weber, 2008). The discounts were on average larger for more distant banks as physical trade costs increased and it became more costly to verify the operational status of those banks. Figure 1 plots average discounts of state bank notes in several states relative to banks in Philadelphia. While the states in the northeast closer to Philadelphia (Figure 1a) had discounts up to 10%, the ones farther away from Philadelphia (Figure 1b) had discounts as high as 80%.

Third, lack of regulatory oversight from state legislation meant that banks often issued notes beyond their redemption capabilities, which made the note liabilities risky in the same way deposit liabilities were risky prior to deposit insurance.[9] Depending on the state's regulations, notes in this era were either backed by state bonds, publicly traded equities, or by the bank's portfolio of loans. A significant drop in the value of the collateral could lead to bank note redemption runs during which notes were heavily discounted (Rolnick and Weber, 1982). The volatility in the discounts plotted in Figure 1 in part reflects significant

[8]Figure A.1a displays an example of a private bank note from Massachusetts with face value $20 where the name and location of the issuing bank is prominently displayed. Figure A.1b shows the written description for the same bank's notes in a printed "counterfeit detector," where the $20 bill is described in the bottom left corner.

[9]Milton Friedman referred to the phenomenon of banks over-inflating their currency to the point of not being able to meet redemption as "wildcat banking," a term that is now frequently applied to the antebellum period in American banking.

underlying time-varying idiosyncratic bank risks. For example, Illinois banks committed over 5 million dollars between 1836 and 1842 to building a canal that would connect the Illinois River and Lake Michigan, hoping to reduce transportation cost to a larger market. However, this investment completely drained state funds and caused a wave of state bank failures in Illinois. As a result, the relative discount of Illinois state bank notes averaged at around 70% in 1842, compared to about 15% in the previous year. Rockoff (1975) estimates that losses on notes due to bank failures in other contexts ranged from 7% in Indiana to 63% in Minnesota.

These characteristics of state bank notes made them "information-sensitive" (Dang, Gorton, Holmström and Ordonez, 2017) and unsafe, reducing their liquidity as information frictions increased, and increasing the transactions costs associated with their usage. Despite these costs, bank notes survived and were used because specie and coins were not a viable alternative. Payment in specie was costly because of physical transportation and insurance costs. Coins were scarce, primarily Spanish and US silver dollars, both of which were subject to debasement and deterioration, and in an array of unwieldy denominations (Greenfield and Rockoff, 1995; Ware, 1990; Gorton, Ross and Ross, 2022). While the US Mint produced more uniform coins, these were primarily used in international trade rather than domestically (Carothers, 1930).

The limited supply of a safe medium of exchange created large transaction frictions in exchange and trade, and these costs drew the attention of policymakers.[10] In 1863, Senator John Sherman from Ohio cited the uncertain values in bank notes as costly for every citizen. In Congress, he argued for the passage of the National Banking Act explicitly in terms of securing a safer medium of exchange:

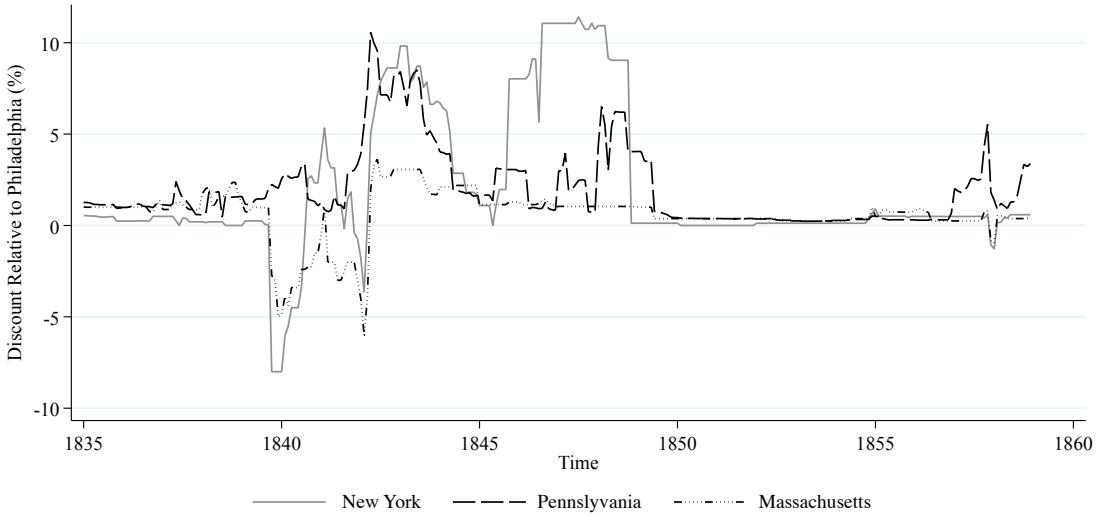
> This currency will be uniform. It will be printed by the United States. It will be of uniform size, shape, and form; so that a bank bill issued in the State of Maine will be current in California; a bank bill issued in Ohio will be current wherever our Government currency goes at all; and a bank bill issued in the State of Connecticut will be freely taken in Iowa or anywhere else. There is *no limit to its convertibility*. It will be of uniform value throughout the United States. I have no doubt these United States notes will, in the end, be taken as the Bank of England note now is all over the world, as a medium, and a standard medium of exchange [...] They will be safe; they will be uniform; they will be convertible. Those are all the requisites that are necessary for any system of currency or exchange.[11]

[10] See Appendix B for contemporary examples of how the uncertain value of state bank notes led to legal disputes and inconvenience in exchange.

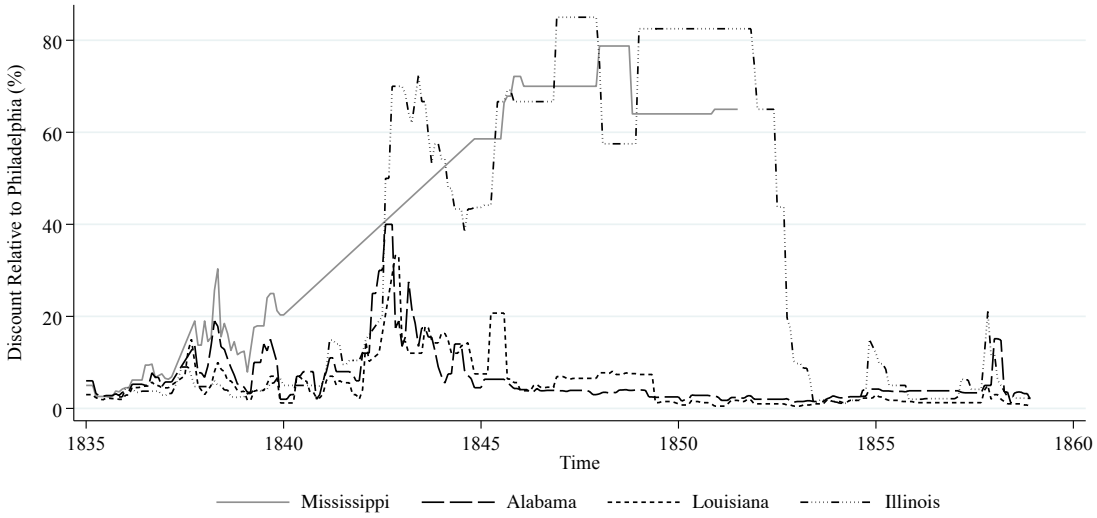
[11] Senate floor, February 10, 1863; http://www.yamaguchy.com/library/spaulding/sherman63.html

Figure 1: Discounts on state bank notes relative to Philadelphia

(a) Regions close to Philadelphia



(b) Regions far from Philadelphia



Notes: Figure 1 plots the monthly average discounts on state bank notes from each listed state relative to banks in Philadelphia (Ales, Carapella, Maziero and Weber, 2008). States are split by region with the Northeast categorized as "Close" (Figure 1a) and the remainder in the South and Midwest as "Far" (Figure 1b). The original source is *Van Court's Bank Note Reporter and Counterfeit Detector* published monthly in Philadelphia between February 1839 and December 1858.

The cost of illiquidity of state bank notes, together with the need to raise money for the federal government during the Civil War, eventually led to the passage of the National Banking Act.

2.2 The National Banking Era

The National Banking Act that initially passed in 1863 aimed to stabilize the banking system and to create a network of national banks that were subject to federal regulations. The newly introduced national banks differed from state banks in many important ways in this dual-banking system.

First, while national bank notes continued to be privately issued by individual banks, they differed from the pre-existing state bank notes by being required by law to have uniform value and be redeemable at all other national banks. These bank notes were backed 110% by U.S. Treasury bonds, and losses in the collateral's face value had to be supplemented with additional bonds.[12] In the case of a national bank failure, the Office of the Comptroller of the Currency (newly created to regulate national banks) oversaw the liquidation process and prioritized note holders from losses. Unlike state bank notes that bore discounts coming from physical redemption costs and banks' credit and liquidity risk, the full backing and convertibility of national bank notes made these liabilities completely safe.

Second, both capital and loans faced stricter regulations, which were designed to prevent runs and improve financial stability. Capital requirements were much higher than the ones for state banks, which were often zero, so national banks were less levered. In addition, 75% of the directors raising the capital had to reside locally. To limit risk-taking, national banks faced limits on the long-term loans they could make, were not allowed to take land as collateral, and were subject to detailed supervision. These restrictions limited capital accumulation that required long-term credit, and they restricted credit to the agricultural sector where collateral most often took the form of farmland. In contrast, state banks were often encouraged to extend credit to the agricultural sector, and in fact, some states even required a minimum fraction of loans to farmers (Knox, 1900). Table A.1 provides a summary of the key distinctions between national and state banks.

The restrictions in banking business and more rigorous oversight resulted in greater stability in national banks. Between 1875 and 1890, the average national bank failure rate was about 0.25%, compared to 2.5% of state banks. The significantly higher state bank

[12] This form of narrow banking was designed in part to create a demand for US Treasury debt that also helped to finance the federal government (Gorton, Laarits and Muir, 2022). The full text of the original legislation related to each of these legislations is in Appendix B.

failure rate further contributed to the riskiness of state bank notes during this time period.

2.3 Supply of national bank notes

Our empirical analysis requires that there is geographical variation in the reduction in transaction costs from the introduction of national banks. There are several strands of evidence that the new national bank notes did not uniformly dominate the money supply around the country despite their superior safety and liquidity. Instead, this period was characterized by significant differences in the local availability of national bank notes that were able to meet payments demands.

First, there was a well-documented shortage of national bank notes that has been recognized by both contemporaries and more recent scholars (e.g., Bell, 1912; Friedman and Schwartz, 1965; Gorton, Laarits and Muir, 2022).[13] In addition, there were explicit references to the different volumes of national bank notes circulating around the country: in 1869, the per capita amount of bank notes in Boston was $97.86 while it was $1.31 in the southern states (Bensel, 1990, 271).

Second, the remaining alternative forms of payments including checks, specie, and greenbacks, were all less liquid than national bank notes or similarly in lower supply. State banks gradually adopted checking accounts, an alternative form of bank liability, as a means of payment that was not taxed; however, checks were sensitive to individual depositors' idiosyncratic risks and even more information-sensitive.[14] Specie was costly to transport and insure, and there was little circulating specie in the payments system.[15] Greenbacks were an unbacked fiat currency that traded at a discount for much of this period and also

[13] Gorton, Laarits and Muir (2022) provide an explanation for the "underissuance puzzle," arguing that the scarcity in national bank notes ultimately arose from a scarcity in the US Treasury bonds needed to back the notes. Since Treasury bonds can be used in other ways (as shown by their convenience yield), purchasing them to back bank notes was an expensive endeavor, and raising bank capital for this purpose was costly. Banks issued more deposit liabilities to compensate for the lack of note liabilities, which shifted the source of financial fragility from runs on notes to runs on deposits.

[14] Checks could only be cleared when both the status of the bank and of the personal account could be verified, and banks were only obligated to redeem checks at par when they were presented at the originating bank's office. In addition, banks lost reserves as soon as a check cleared, whereas notes could be used to settle transactions without immediate demand for reserve (Briones and Rockoff, n.d.). As such, checks were at least as illiquid at long distances as state bank notes and were not a superior alternative. Empirically, they only became common in long-distance wholesale trade at the turn of the twentieth century (Kinley, 1910; Preston, 1920; James and Weiman, 2010).

[15] Corroborating evidence on the lack of gold in circulation comes from the national "gold" banks that could issue notes redeemable in gold. All of these, except for a few in California, failed because they could not obtain the gold to back their notes (Greenfield and Rockoff, 1990). The lack of gold in the US during this period was also the subject of William Jenning Bryan's "Cross of Gold" speech in 1896.

in limited supply.[16] In conjunction, the evidence from historical records indicates that there were not sufficient national bank notes to meet the payments demands of the country, and that alternative options were either less liquid or similarly constrained.

The scarcity of national bank notes and alternative forms of payments helps to explain why state bank notes continued to circulate for decades despite being subject to discounts and being taxed by the federal government. These state bank notes remained prevalent enough that even in the early 1880s, many national banks report state bank notes on their balance sheets.

In addition to the historical evidence for variation in the supply of notes, this condition can be generated by combining one parsimonious assumption about how money circulates with historical legislation on bank note issuance. Assuming that there is a reasonable probability that a bank note is deposited after a transaction because individuals have a savings motive, notes cannot circulate indefinitely without entering as an asset on bank balance sheets.[17] However, banks could only issue their own note liabilities, so "foreign" note deposits were transformed into "local" notes by the local bank. Therefore, notes were in more abundant supply near their bank of issuance, and there is a negative relationship between the supply of notes from a bank and the distance to that bank.[18]

The entry of a national bank into a local area therefore directly reduced monetary transactions frictions in three ways. First, it increased the supply of safe bank notes circulating locally, which reduced the reliance on less liquid alternatives for long distance payments. Second, a local national bank could redeem the notes of any other national bank in the country, which allowed the town to join the network of frictionless payments. Third, national banks had a more integrated interbank system of reserves that gave them an advantage in clearing checks as well.

2.4 Period of study

We study the impact of the introduction of national bank notes into local economies in the 1880s relative to the 1870s, and we examine outcomes in the 1890s relative to the 1880s.

[16] Greenbacks were issued by the federal government in 1862 after suspending specie redemption for bank notes in 1861. In a demonstration of Gresham's Law, greenbacks immediately pushed specie out of circulation, and gold did not return to circulation in the United States outside of California (Mitchell, 1903; Greenfield and Rockoff, 1995). Only after the US retired a large fraction of greenbacks and returned to the gold standard in 1878 did greenbacks trade at par with their face value.

[17] This assumption is also reinforced by national banks' balance sheets that list bank notes by other banks as an asset class.

[18] Another bank's notes were non-interest bearing assets that were not allowed to back new note issuances, so banks had incentive to redeem the notes on their balance sheets at the issuing bank.

We focus on these decades for two reasons. First, our interest is on the impact of introducing a safer medium of exchange before it became the dominant currency. At the very beginning of this period, there were large changes in the banking sector overall (appendix Figure A.3 shows the evolution of the number and total assets of national banks and state banks from 1863 to 1900), but the decades from 1870 to 1890 feature a relatively steady proportion of state and national banks without large changes in their relative composition (Jaremski, 2014). Second, the US monetary system underwent many adjustments in the decade after the Civil War, including the demonetization of silver in 1873 and a significant amendment to the National Banking Act in 1874. We therefore focus on changes in the national bank network beginning in 1875.

3 Data

We combine several newly collected and digitized historical datasets. Table 1 reports summary statistics in the 1870s.

Town populations: We manually collect town and city populations from the original reports of the 10th and 11th Decennial Censuses of Population that report information covering the decades 1860 to 1880 (Figure A.2a). These original PDFs allow us to locate towns with population below 2,500 people, which are not in the digitized censuses.

Bank characteristics: We collect and digitize the balance sheets for all national banks from 1870 to 1890 from the Annual Report of the Comptroller of the Currency (Figure A.2b). These balance sheets report locations as well as the main asset and liabilities components such as their loans bank note circulation and bank note circulation. We collect the locations of non-national banks (state and private bankers) from *The Banker's Almanac and Register* of 1876 and 1885 (Figure A.2c).

Physical trade costs: We measure counties' physical trade costs with railroad access in 1875 and 1880 (Atack, 2016) and market access in 1870 and 1880 (Donaldson and Hornbeck, 2016; Hornbeck and Rotemberg, 2021).

County outcomes: Our outcomes are from the Censuses of Agriculture and Manufacturing from 1870 to 1900.[19] These Censuses provide us with total and urban population

[19]The 1890 Census of Population was lost to a fire so we are not able to use population-based data such as employment in different occupations in our analyses.

measures, and inputs, capital, and production for both sectors in each county. For manufacturing, we are also able to observe employment, and in agriculture, we observe disaggregated production by crops. These censuses also report county-level populations by gender and age group.

Table 1: Summary statistics

	Mean	Med.	St. Dev.	N
Population 1870	3,968.62	4,096.00	1,098.78	147
Population 1880	5,059.28	4,866.00	927.76	147
Railroads	4.35	4.00	2.69	147
Monetary market access (log)	15.13	15.45	0.79	147
Transport market access (log)	15.83	16.00	0.49	147
State banks	0.65	0.00	0.96	147
Tradeables production	893.18	808.28	453.28	147
Ag. production	230.45	224.36	133.67	147
Manu. production	662.73	492.02	500.87	147
Manu. capital	347.38	278.88	273.70	147
Manu. estab	0.03	0.03	0.01	147
Manu. inputs	399.47	289.39	325.56	147
Manu. employment	0.33	0.26	0.23	147

Notes: Table 1 reports the mean, median, and standard deviation of each location characteristics in the pre-entry period. The populations in 1870 and 1880 are at the town level, which is the relevant population for our instrument. The other measures are taken at the county level. The measure of railroads is from Atack (2016) and measured in 1876. State and other non-national bank financial institutions are obtained from the *Banker's Almanac and Register* of 1876, and the locations of national banks are from the *Annual Report of the Comptroller of the Currency* in 1874. We calculate monetary and transport market access using bilateral transport costs and monetary costs in 1870 and 1875, respectively. Manufacturing and agricultural production are from their respective censuses of 1870.

4 Conceptual Framework

4.1 Market access with monetary transaction frictions

Our baseline framework is a model of multiregional trade with trade costs that generates a gravity equation for bilateral trade and allows us to measure the "market access" of each location. Locations are denoted by o and d depending on whether they are the origin or destination of a good. Locations produce differentiated goods j that agents consume with a CES utility function with elasticity of substitution σ. Bilateral trade costs are defined in an "iceberg" way such that the final price of a good j that is traded from o to d has the following price: $p_{od}(j) = \tau_{od} p_{oo}(j)$ where p_{oo} refers to a non-traded good that is produced

and consumed locally and $\tau_{od} \geq 1$ incorporates all bilateral trade costs.[20]

This model delivers a standard gravity equation for the patterns of trade across locations. The bilateral gravity equation can be transformed into a location-level "market access" measure that is a reduced-form expression capturing a location's overall propensity to trade, both as a consumer and a producer.[21] It is related to the bilateral trade costs of a location to all its potential trade partners and the size of those partners. Intuitively, a location's market access decreases with trade costs and increases with the size of its trade partners. Changes in market access summarize the total direct and indirect effects on each location from changes in the bilateral matrix of trade costs.

We augment the standard measures of bilateral trade costs so that it combines physical trade costs ϕ_{od} with monetary transaction frictions μ_{od}. Physical trade costs ϕ are calculated by finding the lowest cost routes between any two locations from existing road, railroad, and waterway networks at each decade, which we take from Donaldson and Hornbeck (2016) and Hornbeck and Rotemberg (2021).

We similarly construct μ to calculate the shortest *monetary* distance between two locations based on two assumptions. First, we assume that trade must occur in a common currency, which can be national bank notes or the local currency of one party. Second, we assume that the lowest cost common currency for transactions is national bank notes and that the supply of national bank notes locally is decreasing in the distance to the nearest national bank.

These two assumptions combined imply that locations o and d that both have a national bank are inside the national bank network and therefore face no monetary transaction costs ($\mu_{od} = 1$). Outside of the network, the common currency is not locally supplied to both the buyer and the seller so it must be obtained in a costly manner ($\mu_{od} > 1$).[22] Locations can obtain the bank notes circulating in any other location at a cost that scales with physical transport costs. Specifically, we find the shortest cost route for both trading partners to obtain a common currency, which can be national bank notes (where one or both parties travels to the nearest national bank) or one of the local currencies (where one

[20] Iceberg trade costs assume that a fraction $\tau - 1$ of goods goes towards the delivery cost. In order to receive one unit of a good, τ units must be shipped.

[21] Measuring the exact measure of market access in each location requires simultaneously solving a system of equations such that all prices clear all markets. However, Donaldson and Hornbeck (2016) shows that a reduced form approximation has a 99.99% correlation with the analytical solution. As a result, we also rely on the approximation.

[22] Trade costs act as a non-revenue generating tax, and in our framework, it does not matter which party nominally pays the tax.

party covers the distance to access the other). Scaling by physical transport costs captures a variety of frictions such as the cost of physically obtaining notes, the discount of converting non-local notes (which itself is a function of distance), and the information frictions from using alternative payment methods like checks or specie.[23]

4.2 Measuring monetary market access

These components of physical and monetary trade costs generate a bilateral matrix of trade costs between all *od* pairs of locations in the country and allow us to calculate monetary market access, which we define as:

$$\text{MMA}_o = \sum_d \mu_{od} \phi_{od,1870}^{-\theta} N_d \tag{1}$$

where θ is the trade elasticity and N is the size of the destination trade partner.

We calculate MMA_o in two decades, the 1870s and 1880s. For the 1870s, we use the national bank network as of 1875, which we map in Figure 2a, and the railroad network and populations as of 1870. For the 1880s, we use the national bank network in 1885 but hold fixed the railroad network to its 1870 appearance (denoted by $\phi_{od,1870}$).[24] Doing so ensures that the changes in MMA across decades come from changes in the locations of national banks rather than the expansion of the physical railroad network. In our baseline, we choose a trade elasticity of $\theta = 4$ as it is in the middle of recent estimates used in the literature, but we provide robustness checks based on a range of θ values.[25]

We map our calculated measure of monetary market access in 1875 in Figure 2b. As expected, monetary market access is highest in the northeast region where the national banking network is densest. It is also higher in areas with lower physical transport costs, such as those near major waterworks and railways.

In order to estimate the impact of increasing the supply of safe money, we calculate

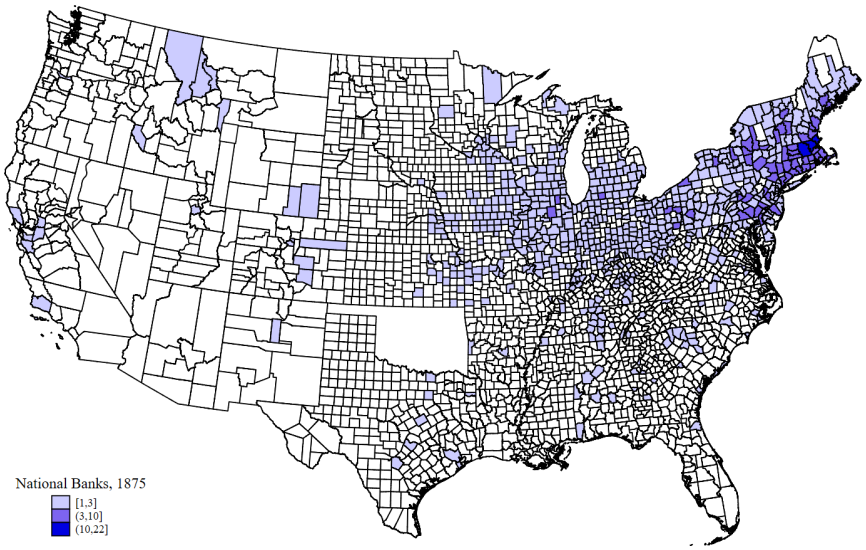
[23] Note that even if physical money is not transported in these transactions, and that for instance, other payment mediums like checks are used instead, the relative magnitudes of the frictions between being in the network versus outside of it would still hold because national bank notes were still superior to alternatives like checks.

[24] We map the locations of national banks in 1885 in appendix Figure A.5. Measures of MMA are very similar using 1870 and 1880 national bank locations instead of our mid-decade networks. MMA_{1880} is also very similar holding populations fixed to 1870 levels instead of using 1880 levels.

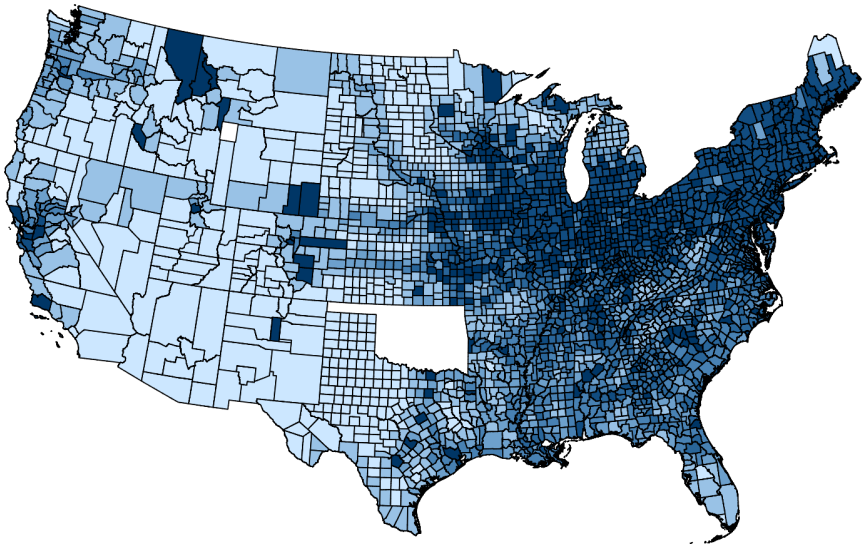
[25] The value of θ will directly impact the value of MMA, and therefore the magnitudes of the estimated effects will also vary. We therefore provide a range of estimates including $\theta = 1$ from recent quasi-experimental empirical work by Boehm, Levchenko and Pandalai-Nayar (2020), $\theta = 2$ from Hornbeck and Rotemberg (2021), and $\theta = 8$ from Donaldson and Hornbeck (2016).

Figure 2: Geographical distribution of national banks and monetary market access

(a) National banks in 1875



(b) MMA in 1875



Notes: Figure 2a plots the density of the national banking network at the county level using the *Annual Report of the Comptroller of the Currency* published in 1875. Figure 2b plots our calculated measure of MMA from Equation 1. Darker shading reflects higher levels of MMA split into seven equally sized bins. Oklahoma was an unincorporated territory that did not have the legal status to allow for national banks and so we do not include it in our data, but distances are calculated allowing for travel through Oklahoma.

the change in monetary market access (ΔMMA) from 1875 to 1885. A location's MMA can increase because of a *direct* reduction in monetary transaction frictions in a location or because of an *indirect* change elsewhere in the network. These two components do not combine linearly since they depend on prices and market sizes that evolve jointly in general equilibrium, but they have a straightforward qualitative explanation. Directly gaining a national bank and joining the national network of frictionless monetary transactions lowers trade costs with all other locations that have a national bank and raises MMA. Indirectly,, places that do not gain a national bank themselves can also experience a positive change in their MMA when *other* locations receive a national bank because those banks can still indirectly lower monetary transaction costs for some transactions.

4.3 Impact of change in monetary market access

The framework of multiregional trade that we use to derive market access also generates predictions for the impact of changes in monetary market access on real economic outcomes. Market access theoretically encompasses both producer market access, which is the extent a location's goods are exported and consumed elsewhere, and consumer market access, which is the extent that a location consumes goods produced elsewhere. Higher market access leads to both more consumption of inputs and production of outputs.

We adapt Fajgelbaum and Redding (2022) to include a single tradables sector with both manufacturing and agricultural goods, which we allow to have different sensitivities to trade costs. Consumption of final goods can only inelastically be substituted between agricultural and manufacturing goods. All production requires labor as an input, but agriculture also requires land. Agriculture is assumed to be rural while manufacturing is urban.

In this framework, a reduction in trade costs that raises a location's market access will increase the size of the traded sector. Goods with the highest sensitivity to trade costs are commodity goods that trade at a national price. As such, any change in trade costs will be fully passed on to the producer, leading to the largest change in incentives to produce the good. We assume that the agricultural sector is more commodities-intensive than the manufacturing sector, which will lead to a relative increase in the return to the fixed factor producing agricultural goods (land) relative to the mobile factor (labor). The relative reduction in wages to rental rates will lead to additional employment in the manufacturing sector, which will also be observable as an increase in urban population. This last effect is a form of structural transformation arising from the reduction in monetary transaction costs.

We would expect that the growth in manufacturing sector employment impacts man-

ufacturing production. In addition, the change in consumption market access can manifest in the use of inputs in this sector.

5 Empirical strategy

5.1 Instrument for changes in monetary market access

Our measure of the change in monetary market access includes two components: the direct component due to a location gaining a national bank and joining the network and the indirect component from changes elsewhere in the network. The latter is unlikely to be endogenous to unobserved expected changes in a location's future outcomes, but the former can potentially be biased by unobserved characteristics that are correlated with future growth and national bank entry.

It is worth noting that the direction of the bias in the OLS is not obvious. For example, assume that larger places have better growth potential and are more likely to be able to generate bank equity. This force makes it more likely that a location joins the national bank network and has higher monetary market access. However, the higher equity capital cost is a force acting in the opposite direction that reduces the likelihood of creating a bank and directly raising MMA. In this case, the OLS will be downward biased.

In addition, while banks are generally expected to enter in areas that they expect to do well, locations could choose between establishing a national bank or a state bank. Both types of banks had costs, and the correlation between future growth potential and the relative costs and benefits of each type of bank is not clear. State banks were costly because their bank notes were taxed, but national banks faced higher capital regulations and heavier regulations on their asset side, such as not being able to extend credit to the agricultural sector. In addition, they were politically unpopular in "silver" areas, which further restricted their adoption.[26] Therefore, while we can expect a positive correlation between the *overall number* of banks and future growth, the correlation between the *composition* of these banks and future growth is a priori unsigned.

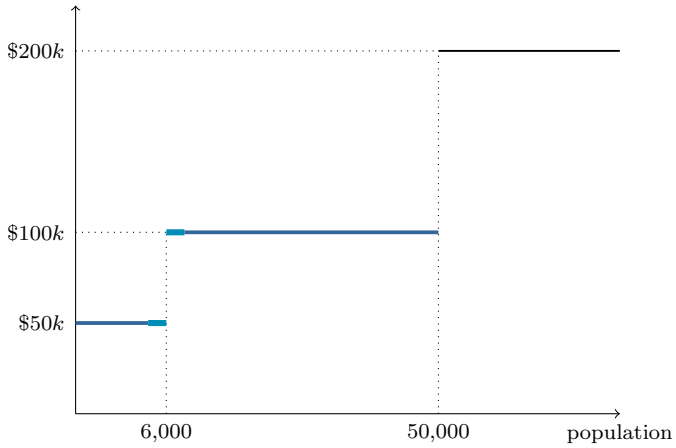
We solve this endogeneity problem by using regulatory capital requirement for creating a national bank as an instrument for the change in monetary market access. The capital requirement was based on the size of the town in which the bank was chartered to operate, and it doubled at each population threshold, shown in Figure 3. Towns with population

[26] Specifically, national banks could not take land as collateral, which was the main asset in the agricultural sector. National banks were also part of the postbellum debate on whether to return to a bimetallic standard or to adopt a pure gold standard. "Silver" interests, which were primarily rural and agricultural, eventually lost while urban areas and financiers (including national banks) were seen as winners.

less than 6,000 people faced a capital requirement of $50,000 while those between 6,000 and 50,000 faced double the requirement of $100,000, and locations with more than 50,000 people faced a $200,000 capital requirement.

Our instrument for national bank entry in 1885 is an indicator variable of a town being below the 6,000 population cut-off in 1880. We focus on the first threshold at the 6,000 population mark because cities near the 50,000 population mark all founded national banks immediately after the passage of the Act.[27] The validity of the instrument relies on the premise that national bank entry is impacted by the threshold, but that the threshold was not chosen based on the size of towns that demanded national banks in the 1880s. Given that the legislation was written almost two decades prior to the entry period we study, and that we focus on a small bandwidth around the threshold, we consider it unlikely that policymakers could have so accurately predicted and targeted this demand. In addition, we control for population growth in the pre-period to capture potential differences in demand.

Figure 3: National Banking Act regulatory capital requirements by population



Notes: Figure 3 plots the capital that national banks incorporated in towns within each population bracket had to raise in order to obtain a charter. We focus on the first threshold around 6,000 (in dark blue), and in particular on towns within a narrow population bandwidth around the threshold (light blue).

In order to implement the instrument, we restrict ourselves to relevant locations by

[27] Banks in large cities had sufficient capital to immediately convert to a national charter, and so the capital requirements did not bind for them. Larger cities also had less than a quarter of the entry costs per capita compared to those around the 6,000 mark, so the barriers were also lower in real terms. The real magnitudes of the $50,000 difference in required capital at the 6,000 mark was approximately 140 times the average manufacturing wage in 1880.

constructing our sample the following way. First, we select towns with fewer than 6,000 residents in 1870 that did not have a national bank by 1875. These towns all faced the same lower entry cost initially but did not have a national bank and lacked a local supply of liquid bank notes. Second, we require that towns did not grow or shrink beyond a population range of 4,000 to 8,000 in 1880 in order to eliminate outliers that are unlikely to be similar in observable and unobservable ways. We also control for the population change from 1870 to 1880 in order to account for differences in the demand for a bank. Figure 4 maps the change in monetary market access that we instrument where we highlight the counties that we include in our sample based on this selection method.

Within this sample, some towns crossed the 6,000 threshold in 1880 and faced double the capital requirement while the rest did not. Remaining below the threshold is our instrument for positive direct changes in MMA. As an example, consider Towns A and B, each with 4,000 residents as of the 1870 census. In 1880, Town A grew to a population of 5,000, whereas Town B grew to 7,000 people. Without the capital requirement, the towns are close enough in size that they are similarly able to support a bank. However, the discontinuity in the requirement makes raises the entry costs significantly for Town B relative to A, thereby reducing the probability that it founds a national bank and directly raises its monetary market access.

We use the instrumental approach as opposed to a regression discontinuity design because of the lack of density in the population distribution immediately around the cutoff.[28] Our approach of including towns within a certain bandwidth maintains the spirit of the discontinuity design while allowing us to increase our sample.[29] Our identification strategy follows a number of papers studying bank behavior in the postbellum United States, and in particular those that use the National Banking Act's regulatory capital requirements based on population as a source of exogenous variation (Fulford, 2015; Gou, 2016; Carlson, Correia and Luck, 2022).[30] We combine this identification strategy with the empirical estimations

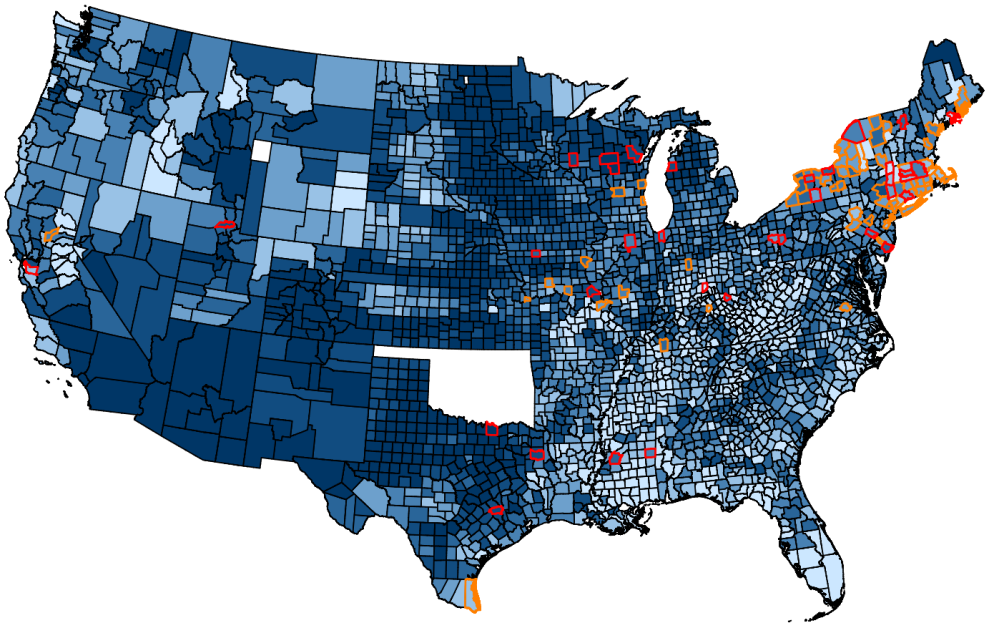
[28] Figure A.4 shows the distribution of town size for all towns with between 2,000 and 10,000 population in 1880, represented by the uncolored bars. The colored bars represent all towns with fewer than 6,000 people in 1870 that did not have a national bank as of 1875. which is the relevant subsample of towns for our analysis. The black bars represent the towns that we include in our main sample.

[29] More specifically, since our design is focusing on the change in monetary frictions that comes from the change in a town population's relationship to the population threshold and we already restrict ourselves to a sample of similar locations in 1870, the change in population from 1870 to 1880 is our running variable. Including higher order polynomials of our running variable in the empirical results leads to very similar magnitudes and statistical significance for our main outcomes, which we show in appendix Table A.12.

[30] Gou (2016) uses the introduction of a new population cutoff in the early 20th century to study the effect of capital requirements on bank stability. Similarly to Fulford (2015) and Carlson, Correia and Luck (2022), we focus on the 6,000 cutoff in the 1880 census, and we also control for the change in town population following

based on changes in monetary market access.

Figure 4: Map of ΔMMA



Notes: Figure 4 maps the change in MMA between 1875 and 1885 where we calculate MMA in each decade holding the transportation network fixed to its 1870 appearance. Bilateral physical transport costs in 1870 are from Donaldson and Hornbeck (2016). The data for the locations of national banks each year are from the *Annual Reports of the Comptroller of the Currency*. Counties outlined in red and orange are those within our sample. Orange reflects locations that gained a national bank in 1885 relative to the previous decade and red reflects locations that did not.

5.2 First stage

We estimate the following first stage regression:

$$\Delta \text{MMA}_{i,s} = \beta \mathbb{I}(\text{Pop1880} < 6000)_{i,s} + \Gamma' X_{i,s} + \eta_s + \varepsilon_{i,s} \tag{2}$$

for town i in state s. $\Delta \text{MMA}_{i,s}$ is the log change in monetary market access in 1885 relative to 1875, and $\mathbb{I}(\text{Pop1880} < 6000)_{i,s}$ is an indicator variable for having a town population below the 6,000 threshold in 1880 census. $X_{i,s}$ is a vector of control variables such as the population change between 1870 and 1880, the number of railroads in 1875, the number of state banks in 1876, and the change in transportation market access between periods.[31] η_s

the previous census as a proxy for a town's overall growth trajectory. The concurrent work by Carlson, Correia and Luck (2022) focuses on the role of bank competition on lending and thereby requires a different sample of towns where there was at least one national bank in the initial period.

[31] We calculate transportation market access as: $\text{tMA}_o = \sum_d \phi_{od}^{-\theta} N_d$.

denotes state fixed effects, which limits the estimation to using within-state variation and accounts for unobserved state-level differences such as regulatory changes between decades.

β is our coefficient of interest, which captures the relationship between being below the population threshold in 1880 and the change in MMA between 1875 and 1885. Table 2 presents the first stage relationship as we add control variables. The point estimate in column 6 indicates that being below the population threshold in 1880 is associated with a 62% increase in MMA in 1885 relative to 1875. This positive relationship is robust to including a variety of control variables. Controlling for the population trajectory (comparing column 1 to column 2) improves the precision of the estimate and raises the first stage KP F-stat from 3.3 to 7.4. Comparing the results also shows that the specification that does not include the population control likely suffers from omitted variable bias: places that grow more are likely both to have higher demand for a national bank and to be above the population threshold, which downward biases the effect of the capital constraint. Including the population trajectory improves the comparability of locations in the sample along this observable dimension. We therefore include the change in population in all of our baseline specifications.

Table 2: First stage relationship between population threshold and ΔMMA

	ΔMMA				
	(1)	(2)	(3)	(4)	(5)
𝕀(pop<6k)	0.406*	0.715***	0.634***	0.640***	0.619***
	(0.223)	(0.264)	(0.207)	(0.207)	(0.200)
Δ Pop		Y	Y	Y	Y
tMA (1870)			Y	Y	Y
Railroads (1875)				Y	Y
State banks (1876)					Y
State FE	Y	Y	Y	Y	Y
F-stat	3.296	7.353	9.413	9.565	9.583
N	147	147	147	147	147

Notes: Table 2 estimates the first stage relationship: $\Delta\text{MMA} = \beta\mathbb{I}(\text{Pop1880} < 6000)_{i,s} + \Gamma' X_{i,s} + \eta_s + \varepsilon_{i,s}$. ΔMMA is the log difference in monetary market access between 1885 and 1875, calculated according to Equation 1. ΔPop refers to the population change from 1870 to 1880. The log of transport market access cost (tMA) is calculated in 1870, and the number of railroads and state banks are measured in 1875 and 1876, respectively. Regressions are weighted by the share of the town population that is within our relevant sample for the instrument within each county. The F-stat is the first stage KP F. State FEs are included in all specifications, and standard errors are clustered by county. * p<0.1, ** p<0.05, *** p<0.01.

We provide several robustness checks for the instrument. First, we show that the instrument also predicts obtaining a national bank directly (appendix Table A.2). Second, we show the effects for a range of θ parameters including $\theta = 1$, $\theta = 2$, and $\theta = 8$ (appendix

Table A.3). The magnitudes of the estimates range from 0.57 to 0.62, which are very similar to our baseline with $\theta = 4$. Third, we provide the first stage relationship for the change in MMA where we allow the railroad network to change and we calculate MMA in 1885 using the 1880 physical transportation costs, which we denote as $\Delta\text{MMA}_{rail80}$ (appendix Table A.4). This first stage relationship has slightly larger magnitudes and an F-stat of 15.7.

5.3 Specification to estimate real effects

After instrumenting for the change in MMA between decades, we estimate the impact of entry on real outcomes using difference-in-differences that absorb time trends between periods and location-average differences. Our baseline regressions take the following form:

$$\Delta Y_{i,s} = \beta \widehat{\Delta\text{MMA}}_{i,s} + \Gamma' X_{i,s} + \eta_s + \varepsilon_{i,s} \tag{3}$$

where $\Delta Y_{i,s}$ is the change in an outcome in town i in state s in 1890 relative to 1880. $\widehat{\Delta\text{MMA}}_{i,s}$ is the predicted change in monetary market access from the instrument. β is the main coefficient of interest, which measures the change of the output response to having a national bank. X_{is} is a vector of control variables, and η_s denotes state fixed effects. Time-invariant characteristics of the locations are subsumed by the differences, and standard errors are clustered by county.

Since national banks are established in towns within counties but our outcomes are at the county level, we weight our regressions with the share of county population within the town. The statistical significance of our results is not sensitive to the weighting, which we show in robustness tables in the appendix. However, we maintain the weighted version as our baseline because it produces more conservative magnitudes.

We also provide specifications to address the possibility that our results are being driven by changes in physical transport costs.[32] First, our baseline measure of MMA holds transportation costs fixed to 1870 values so that monetary market access can only vary due to changes in μ (monetary frictions) across decades. Appendix Table A.4 presents the first stage results for an alternative measure of the change in market access that allows the transport network to change. Second, we also control for differences in ex-ante levels of physical trade costs, such as the density of the railroad network in a location and the transport market access in 1870.

The identifying assumption for our empirical analysis of real effects is that towns above

[32]The railroad network is growing during this period, and the decline in physical transportation costs independently impacts the real economy (Donaldson and Hornbeck, 2016; Hornbeck and Rotemberg, 2021).

and below the threshold did not experience a simultaneous shock in 1880 that would have impacted their real outcomes afterward. We consider this unlikely for several reasons. First, there is no evidence of any other regulation at the 6,000 population threshold introduced around this period.[33] Second, focusing on a relatively narrow population bandwidth around the 6,000 cutoff increases the likelihood that towns were comparable in both observable and unobservable ways. Third, we provide evidence that towns in our sample are not observably different during the pre-period.

Figure 5 provides the coefficients and confidence intervals for both conditional and unconditional covariate balance tests where we regress each characteristic on an indicator variable for being below the 6,000 population threshold in 1880. Each regression is individually estimated, and we normalize all dependent variables so that the magnitudes can be interpreted as standard deviations from the mean. All variables are measured in the decade before national bank entry unless otherwise noted. The "Unconditional" regressions are estimated without controls, and the "Conditional" regressions include state fixed effects and the population change from 1870 to 1880. In terms of population, places that are below the threshold in 1880 are slightly smaller in 1870, unconditionally. After controlling for the population change, they are significantly smaller, as expected.

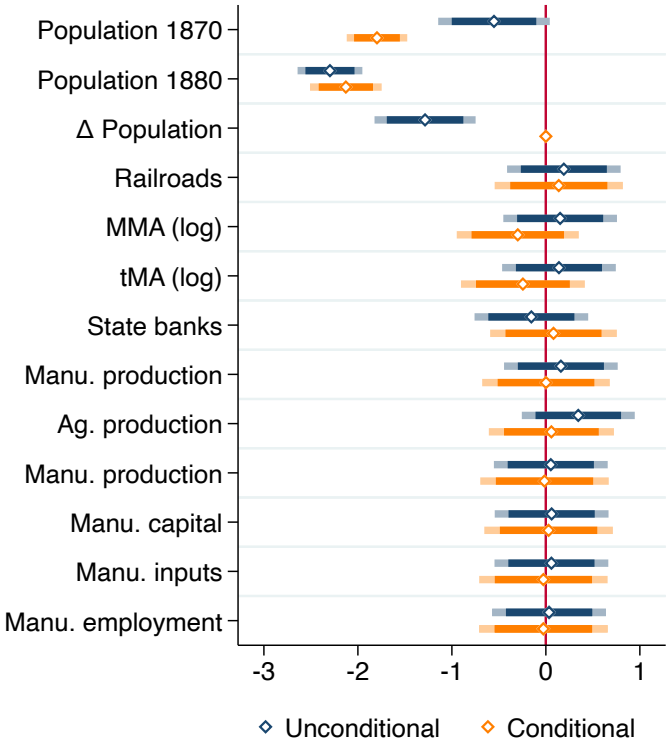
It is unsurprising that towns that did not cross the population threshold in 1880 had lower population changes. These differences could potentially bias the results if they are correlated with a town's real outcomes through non-bank channels. For example, places that rapidly expanded in the previous decade could continue to grow faster due to agglomeration effects. We therefore control for population changes between 1870 and 1880 to account for a town's overall growth trajectory that could persist into subsequent decades. Although all other characteristics are balanced, we also include differences in physical trade costs and overall financial development as part of our standard set of controls.

6 Results

In this section, we present the results on how access to national banks impacted the local economy, first in overall traded output, and then in the composition of output and the sources of growth.

[33]The federal government was much more limited in this period and very few federal regulations existed. State-level regulation changes are absorbed by the fixed effects in the specifications.

Figure 5: Covariate balance



Notes: Figure 5 plots the coefficients and 95% (in dark bands) and 99% (in light bands) confidence intervals of individually estimated and normalized regressions of: $X_{i,s} = \beta \mathbb{I}(\text{Pop1880} < 6k) + \eta_s + \varepsilon_{i,s}$ where X_i is a location-level characteristic and η_s are state fixed effects. All variables are normalized to have mean zero and standard deviation of one. Population is measured at the town level and all other outcomes are at the county level. The conditional regressions include state fixed effects and the population change from 1870 to 1880 as well. Railroads are from Atack (2016) and measured in 1876. State and other non-national bank financial institutions are obtained from the *Banker's Almanac and Register* of 1876. Monetary market access is calculated in 1875 using the physical transport network in 1870, and transport market access (tMA) is calculated in 1870. Manufacturing and agricultural measures are from their respective censuses of 1870. Standard errors are clustered by county.

6.1 Tradables production

We begin by examining the impact of higher monetary market access on real activity in the traded sector (agricultural and manufacturing output). First, we calculate the total value of traded output per capita in each county in order to capture the growth beyond what is predicted from population growth. Table 3 presents our result for both the OLS and the second stage of the IV. Columns 1 to 3 present the results for total production per capita.[34] Column 1 only includes the baseline controls of the pre-period population change and state FEs. Column 2 also controls for pre-period financial development (non-national

[34] We use the number of men above the age of 21 as our baseline per capita measure, but the results are robust to other measures.

banks), physical trade costs (railroads), and the level of physical MA in 1870. Column 3 adds a control for the total amount of lending by national banks in each location in 1885.

In panel 2, our instrumented second stage effects for ΔMMA are positive and statistically significant at the 1% level in our preferred specifications with controls. Compared to the pre-period mean values of $775.6, the estimated coefficient of $223.1 implies that a 10% increase in market access raises production by 2.9%.

The estimated magnitudes range from 219.1 (2.8%) when we set $\theta = 1$ to 252.0 (3.2%) when we set $\theta = 8$ (appendix Table A.5 columns 1 to 4). In the unweighted regression with standard errors clustered at the county level, the estimated coefficient is 439.7 with p-value of 0.03 (appendix Table A.5 column 5). These magnitudes are almost double the baseline magnitudes for the weighted regression since they do not adjust for the share of the county that is in the treated town. We also estimate the second stage effects when we calculate ΔMMA allowing for physical transport costs to change between decades, and the effects are also statistically significant at the 0.04 level (appendix Table A.5 column 6).

In addition, in every specification we also provide 95% confidence intervals from the Moreira (2003) conditional likelihood ratio (CLR) test with the p-value of significance in italicized parentheses below. These confidence intervals are constructed from unweighted regressions to also address inference concerns from low first stage F-stats. These confidence intervals imply a p-value of 0.04 in all specifications.

Our second set of results measures the change in the intensity of tradables goods production using the share of production in commodities goods. Commodities are defined as those listed on the Chicago Board of Trade, which were grains including wheat, oats, buckwheat, and corn.[35] Table 3 columns 4 to 6 present the results for both the OLS and for the second stage of the IV. The magnitude of the instrumented effects with controls in column 6 (0.048) relative to the pre-entry mean of 0.91 indicates that a 10% increase in monetary market access increased the share of traded crop production by approximately 0.5%. As in the case for overall tradables production, the effects are similarly statistically significant for different values of θ, the unweighted regression, and the alternative measure of change in MMA (appendix Table A.6).

[35]The census does not record the values of production in each good, but only the volumes and acres of land used. We calculate the share of acres for these products in total agricultural land.

Table 3: Traded output (1880 – 1890)

	Tradeables production			Commodities share		
	(1)	(2)	(3)	(4)	(5)	(6)
OLS						
$\Delta\widehat{\text{MMA}}$	113.4**	124.1***	171.3***	0.0361***	0.0383***	0.0444***
	(45.07)	(45.82)	(46.12)	(0.0111)	(0.0115)	(0.0131)
IV: Second Stage						
$\Delta\widehat{\text{MMA}}$	148.2	149.4*	223.1**	0.0350**	0.0392***	0.0476**
	(101.4)	(84.01)	(113.4)	(0.0140)	(0.0146)	(0.0186)
State FE	Y	Y	Y	Y	Y	Y
Controls		Y	Y		Y	Y
Loans			Y			Y
Mean of Dep. Var.	775.6	775.6	775.6	0.905	0.905	0.905
N	147	147	147	147	147	147

Notes: Table 3 presents the OLS (panel 1) and instrumented second stage of the regression in Equation 3 (panel 2). The independent variable $\Delta\widehat{\text{MMA}}$ is the log change in MMA from 1875 to 1885, calculated according to Equation 1. The inputs to MMA are bilateral transport costs measured in 1870 using the measures from Donaldson and Hornbeck (2016), populations in 1870 and 1880 from the respective censuses of population, and the locations of national banks in 1885 from the *Annual Reports of the Comptroller of the Currency*. There are no national banks in the locations in our sample in 1875 by construction. We use $\theta = 4$ in our baseline measure. All regressions include state fixed effects. The vector of control variables includes the number of railroads and state banks measured in 1875 and 1876, respectively, and the log value of transport market access in 1870. The control variable for "Loans" is the log value of lending by national banks in 1885. The dependent variable in columns 1 to 3 is the change in per capita (male population over age 21) value of total manufacturing and agricultural production from 1880 to 1890. The dependent variable in columns 4 to 6 is the share of agricultural production in commodity goods measured in terms of acreage of farmland used. We report the mean of the dependent variable measured in 1880. Regressions are weighted by the share of town population within a county, and standard errors are clustered at the county level. * p<0.1, ** p<0.05, *** p<0.01.

6.2 Structural transformation

Having shown that national bank entry led to overall growth and more specialization in trade-cost sensitive goods, we next turn to the effect of national banks on manufacturing sector growth. In our framework, manufacturing benefits from the relative decline in labor costs relative to land rental rates. While we lack the data on wages to test this channel directly, we are able to observe the changes in manufacturing employment as a share of total population, and in urban population overall.

Table 4 shows that there is an increase in the share of manufacturing employment in a county. In our preferred specification with the full set of controls, a 10% increase in monetary market access leads to a 2 pp increase in the share of manufacturing (equivalent to 6.2% of the pre-shock mean). We corroborate these employment results with measures of the

change in urban population, which is defined in the census as towns with population above 2,500. We find that there is a 4% increase in urban population following a 10% increase in monetary market access. These two results show that the change in monetary market access had a significant impact on local economic growth, and especially on the process of structural transformation.

Appendix tables A.7 and A.8 present the robustness checks for different values of θ, the unweighted versions of the regressions, and the change in MMA allowing for growth in the physical transport network. Coefficients are very similar across the specifications and are larger in the unweighted specification. The CLR confidence intervals for manufacturing employment are slightly larger with p-values of significance at 0.08 while they are significant at 0.02 for urban population.

Table 4: Structural transformation (1880 – 1890)

	Manu employment share			Urban population		
	(1)	(2)	(3)	(4)	(5)	(6)
OLS						
$\Delta\widehat{\text{MMA}}$	0.0826***	0.0839***	0.110***	0.0725	0.102*	0.0609
	(0.0174)	(0.0176)	(0.0204)	(0.0639)	(0.0610)	(0.0721)
IV: Second Stage						
$\Delta\widehat{\text{MMA}}$	0.140***	0.141***	0.203***	0.292**	0.196	0.402**
	(0.0353)	(0.0366)	(0.0538)	(0.139)	(0.133)	(0.203)
State FE	Y	Y	Y	Y	Y	Y
Controls		Y	Y		Y	Y
Loans			Y			Y
Mean of Dep. Var.	0.329	0.329	0.329	47.29	47.29	47.29
N	147	147	147	147	147	147

Notes: Table 4 presents the OLS (panel 1) and instrumented second stage of the regression in Equation 3 (panel 2). The independent variable $\Delta\widehat{\text{MMA}}$ is the log change in MMA from 1875 to 1885, calculated according to Equation 1. The inputs to MMA are bilateral transport costs measured in 1870 using the measures from Donaldson and Hornbeck (2016), populations in 1870 and 1880 from the respective censuses of population, and the locations of national banks in 1885 from the *Annual Reports of the Comptroller of the Currency*. There are no national banks in the locations in our sample in 1875 by construction. We use $\theta = 4$ in our baseline measure. All regressions include state fixed effects. The vector of control variables includes the number of railroads and state banks measured in 1875 and 1876, respectively, and the log value of transport market access in 1870. The control variable for "Loans" is the log value of lending by national banks in 1885. The dependent variable in columns 1 to 3 is the change in the share of employment in the manufacturing sector (calculated as manufacturing employment divided by male population over age 21) from 1880 to 1890. The dependent variable in columns 4 to 6 is the change in log urban population from 1880 to 1890. We report the mean of the dependent variable (urban population is given in thousands instead of logs) measured in 1880. Regressions are weighted by the share of town population within a county, and standard errors are clustered at the county level. * p<0.1, ** p<0.05, *** p<0.01.

6.3 Decomposing growth in the manufacturing sector

The growth in manufacturing labor and urban population also leads to overall manufacturing growth, which we show in columns 1 to 3 in Table 5. We find a statistically significant increase of 3.8% higher manufacturing production per capita from a 10% increase in monetary market access. While our framework predicts the growth in manufacturing from labor entering into the sector, a different channel through which manufacturing can benefit from higher monetary market access is through the consumer market access channel where locations are able to import more goods. In particular, manufacturing is dependent on the price, quantity, and quality of inputs, and higher MMA allows local manufacturers to import more and better inputs in addition to exporting more transformed goods (e.g., Goldberg, Khandelwal, Pavcnik and Topalova, 2010).

Table 5: Manufacturing sector production (1880 – 1890)

	Manu production			Manu inputs			Manu capital		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
OLS									
$\Delta\widehat{\text{MMA}}$	113.5***	121.2***	172.6***	66.22***	69.23***	92.96***	160.6***	178.8***	207.9***
	(39.74)	(39.78)	(41.74)	(22.79)	(23.02)	(25.07)	(48.17)	(47.02)	(49.90)
IV: Second Stage									
$\Delta\widehat{\text{MMA}}$	161.7	154.7**	238.1**	103.3**	100.5***	147.0***	12.80	44.42	13.10
	(98.56)	(77.63)	(107.9)	(47.25)	(38.53)	(55.07)	(112.3)	(102.9)	(145.4)
State FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Controls		Y	Y		Y	Y		Y	Y
Loans			Y			Y			Y
Mean of Dep. Var.	626.4	626.4	626.4	380.9	380.9	380.9	373.2	373.2	373.2
N	147	147	147	147	147	147	147	147	147

Notes: Table 5 presents the OLS (panel 1) and instrumented second stage of the regression in Equation 3 (panel 2). The independent variable $\Delta\widehat{\text{MMA}}$ is the log change in MMA from 1875 to 1885, calculated according to Equation 1. The inputs to MMA are bilateral transport costs measured in 1870 using the measures from Donaldson and Hornbeck (2016), populations in 1870 and 1880 from the respective censuses of population, and the locations of national banks in 1885 from the *Annual Reports of the Comptroller of the Currency*. There are no national banks in the locations in our sample in 1875 by construction. We use $\theta = 4$ in our baseline measure. All regressions include state fixed effects. The vector of control variables includes the number of railroads and state banks measured in 1875 and 1876, respectively, and the log value of transport market access in 1870. The control variable for "Loans" is the log value of lending by national banks in 1885. The dependent variable is the change in per capita (male population over age 21) manufacturing production (columns 1 to 3), manufacturing inputs (columns 4 to 6), and manufacturing capital (columns 7 to 9). We report the mean of the dependent variable measured in 1880. Regressions are weighted by the share of town population within a county, and standard errors are clustered at the county level. * p<0.1, ** p<0.05, *** p<0.01.

In columns 4 to 9 of Table 5 we decompose manufacturing growth into its inputs and capital. We find that there is a statistically significant increase in manufacturing inputs

per capita of 3.9% increase for 10% higher MMA. In contrast, the magnitudes of the effects for manufacturing capital are an order of magnitude smaller (0.3%) and not statistically significant.

Appendix Tables A.9 to A.11 show that these results are robust to different values of θ, to being unweighted, and to the alternative measure of MMA that allows for changes in physical trade costs. As before, the other parameterizations of θ are very similar, and the effects are larger in magnitude in the unweighted regressions. In all specifications, the CLR CI imply a p-value significance of 0.02 for total production and inputs while they are not significant for capital.

6.3.1 Discussion on the role of direct investment

Our results indicate that a change in market access expands the traded sector overall and the manufacturing sector in particular. While it is ultimately not possible to eliminate the possibility that some of these effects are due to a direct increase in credit supply from national banks, we have several reasons for believing this is unlikely the case.

First, in all of our specifications, directly controlling for the amount of lending locally does not change our results. Second, within the manufacturing sector, our results are not driven by changes to capital investment.

There are several possible explanations for the null effect on capital. First, regulations encouraged national banks to make short-term loans rather than long-term loans (White, 1998). These loans provided working capital to meet short-term liquidity needs rather than long-term investment demands. The short-term credit may have also facilitated inputs sourcing, and the lack of long-term credit provision limited manufacturers' ability to acquire physical capital. Second, since the national banks were unit banks, their ability to diversify their loan portfolio with borrowers across different places was limited, which could discourage them from expanding their balance sheets. Third, large values of firm investment could not be easily accommodated as a national bank could lend no more than 10% of its capital stock to one entity.[36] These numerous requirements could impede long-term investment in the manufacturing sector even while it directly benefited from lower monetary transaction frictions.

[36] That is to say, a bank with $50,000 of capital stock could lend no more than $5,000 to a firm. Source: National Banking Act of 64, Sec. 29

6.4 Long-term effects

The growth in the manufacturing sector along with higher urban population is a potential driver for agglomeration economies in manufacturing that persist over time (Kline and Moretti, 2014). To measure the long-term effects of national banks, we estimate a dynamic differences-in-differences model from 1870 to 1900. This estimation makes it possible to show a lack of differential pre-trends and estimate the persistence of the effects of the shock after 1890. Specifically, we estimate the following:

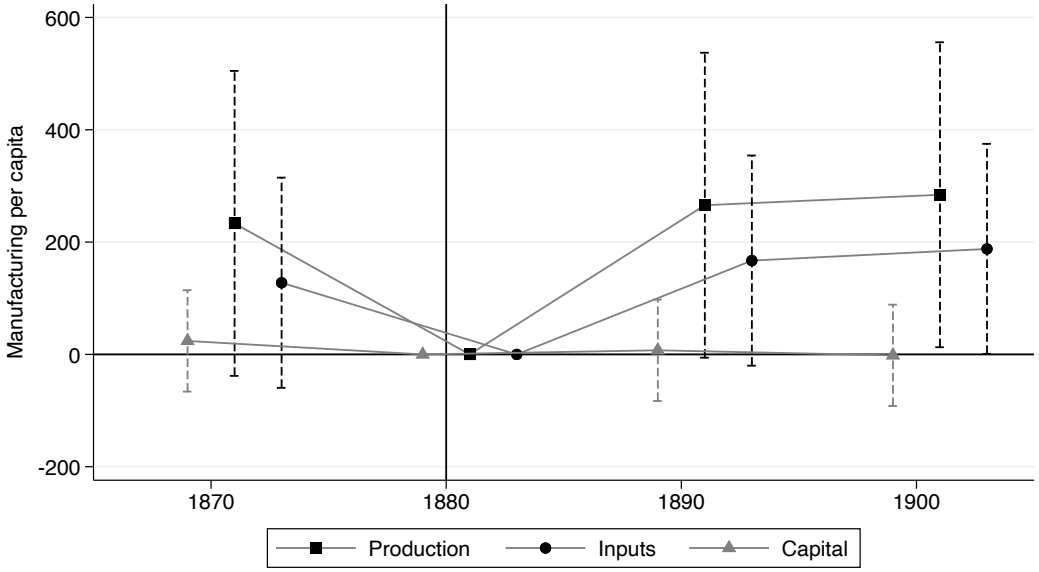
$$Y_{ist} = \sum_k \beta_k \Delta\widehat{\text{MMA}}_{is} \times \mathbb{I}_{\{year=k\}} + \sum_k \gamma_k X' \times \mathbb{I}_{\{year=k\}} + \eta_{st} + \alpha_i + \varepsilon_{ist}, \tag{4}$$

where Y_{ist} is the outcome in town i in state s at year t. We include leads and lags before and after 1880 and interact all of these decadal indicator variables with every variable in our estimation. We omit 1880 so that all outcomes are relative to the treatment period. β_k is the coefficient of interest, and it measures the elasticity of the output response to gaining a national bank in each of the lead and lag years. $\Delta\widehat{\text{MMA}}_{is}$ is the instrumented variable. The vector of control variables X' are measured in 1870 and also interacted with each decadal indicator variable. η_{st} are state-year fixed effects so that we compare outcomes within states and years, and α_i are location fixed effects that control for time-invariant characteristics such as geographical location and land quality. Regressions are weighted by the share of the town population within the county in 1880, and standard errors are clustered at the county level.

We plot the magnitudes and 95% confidence intervals for full IV dynamic difference-in-difference coefficients for manufacturing production and its components in Figure 6. It shows that the positive effect of the change in monetary market access on manufacturing production between 1880 and 1890 persisted beyond a decade into 1890s as well. As in the short-run results, these effects are predominantly due to growth in inputs rather than capital. The figure also indicates that there were no differential pre-trends between the places that received national banks versus those that did not.[37] Data from the 1910 Census of Manufacturers is not available, so we stop our analysis before 1920 given the disruptions due to WWI and the establishment of the Federal Reserve System.

[37] We only show 2 pre-shock period coefficients here, but including the 1840 and 1850 census does not change the flat patterns of the pre-shock trend.

Figure 6: Persistent positive effect on manufacturing outcomes



Notes: Figure 6 shows the dynamic diff-in-diff coefficients for the second stage IV estimates of the effect of ΔMMA on county-level manufacturing production value, inputs, and capital per capita (male population over age 21). The inputs to MMA are bilateral transport costs measured in 1870 using the measures from Donaldson and Hornbeck (2016), populations in 1870 and 1880 from the respective censuses of population, and the locations of national banks in 1885 from the *Annual Reports of the Comptroller of the Currency*. There are no national banks in the locations in our sample in 1875 by construction. We use $\theta = 4$ in our baseline measure. All regressions include state-year fixed effects and town fixed effects. The vector of control variables includes the number of railroads and state banks measured in 1875 and 1876, respectively, the log value of transport market access in 1870, and the log value of lending by national banks in 1885, all interacted with indicator variables for the decade. Regressions are weighted by the share of town population within a county measured in 1880, and standard errors are clustered at the county level. 1880 is the omitted year, and the vertical bars represent the 95% confidence intervals.

7 Conclusion

This paper studies the late 19th century United States after the passage of the National Bank Act of 1864 by using the population-based capital requirement of national banks to provide empirical evidence on the importance of stability in the value of currency used for payments in the real economy.

We establish that a lower regulatory capital requirement defined discretely by town population strongly and robustly predicts a higher growth in monetary market access. Using a framework derived from general equilibrium trade theory, we predict that change in MMA should lead to a larger traded sector and structural transformation. We find evidence of these effects using county-level measures of outcomes in the decade after the change in MMA. Higher MMA leads to more production of traded goods, a shift in production towards the most trade-cost sensitive goods, and more urban density.

We also find that there was significant and persistent greater increase in manufacturing production per capita from higher inputs sourcing while capital did not significantly scale up. The results indicate that national banks extended limited long-term credit for capital acquisition, and the effect of higher MMA on manufacturing sector growth likely comes from the monetary transaction cost channel. This change in the composition of economic activity through non-credit channels provides evidence that raising the safety and liquidity of private money was a source of economic growth in the US during this period.

Overall, our results indicate that stabilizing the value of privately created money was economically beneficial, especially for sectors that were likely more exposed to payments frictions. As financial technology progresses and new digital currencies present alternative payment methods, these lessons from the national banking era can provide policymakers additional guidance on the costs of transactions frictions arising from reducing the liquidity of monetary instruments.

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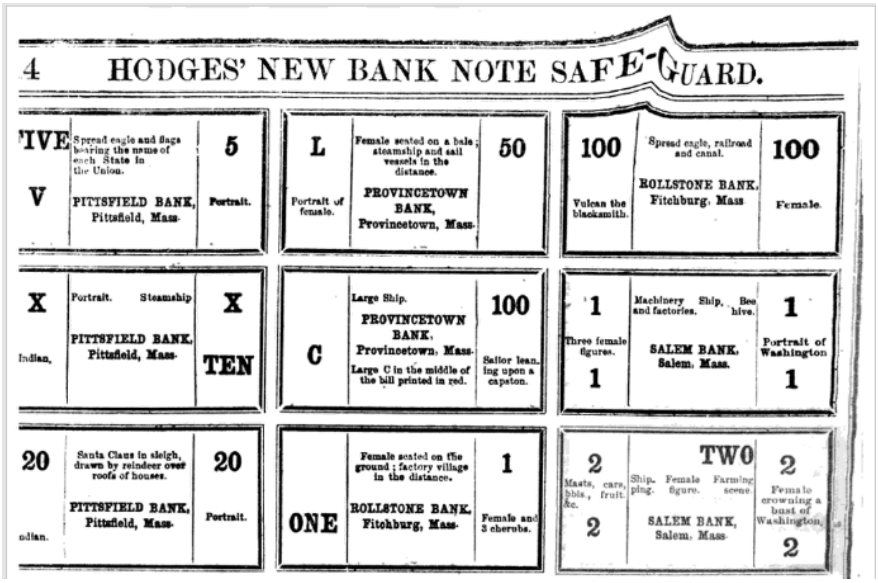
A Additional Figures and Tables

Figure A.1: Bank note from the Pittsfield Bank in Massachusetts

(a) Bank note from the Pittsfield Bank in Massachusetts

(b) Page from *Hodges' New Bank Note Safe-Guard*



Notes: Figure A.1a gives an example of a private banknote that was printed in 1853. The note is for twenty dollars, redeemable for specie at the Pittsfield bank. Figure A.1b displays a page from the *Hodges' New Bank Note Safe-Guard*, first published in 1859. It is an example of one of the many publications dedicated in helping merchants and brokers to detect counterfeit bank notes. It describes the physical appearance of over 10,000 bank notes, "embracing every genuine note issued in the United States and Canada." The description for the Pittsfield bank $20 note from figure A.1a is shown in the bottom row of the first column and accurately describes the note.

Figure A.2: Exhibits of data sources

(a) Decennial Census: 1880 and 1890

MINOR CIVIL DIVISIONS.	1880.	1870.	REMARKS.
PLYMOUTH—continued.			
Marshfield town	1,781	1,659	
Mattapoisett town	1,365	1,361	
Middleborough town	5,237	4,687	
Pembroke town	1,405	1,447	
Plymouth town	7,093	6,238	
Plympton town	694	804	
Rochester town	1,043	1,024	
Rockland town	4,553	.....	In 1874, from part of Abington.
Scituate town	2,466	2,350	
South Abington town	3,024	.....	In 1875, fr. prs. of Abington, East Bridgewater, and Brockton, and part to Brockton.
South Scituate town	1,820	1,661	
Wareham town	2,896	3,098	
West Bridgewater town	1,005	1,803	

(b) Annual Report of the Comptroller of Currency (1875)

MASSACHUSETTS.

Neponset National Bank, Canton.

CHAS. H. FRENCH, *President.* No. 663. F. W. DEANE, *Cashier.*

Resources.		Liabilities.	
Loans and discounts	$375,351 71	Capital stock paid in	$250,000 00
Overdrafts	501 43		
U. S. bonds to secure circulation	250,000 00	Surplus fund	35,991 05
U. S. bonds to secure deposits	.....	Other undivided profits	51,823 64
U. S. bonds on hand	.....		
Other stocks, bonds, and mortgages	.....	National bank notes outstanding	218,400 00
		State bank notes outstanding	.....
Due from approved reserve agents	5,363 50		
Due from other banks and bankers	.....	Dividends unpaid	11,275 68
Real estate, furniture, and fixtures	3,200 00		
Current expenses and taxes paid	38 00	Individual deposits	84,222 74
Premiums paid	.....	United States deposits	.....
		Deposits of U. S. disbursing officers	.....
Checks and other cash items	386 78		
Exchanges for clearing house	.....		
Bills of other national banks	3,118 00	Due to other national banks	.....
Fractional currency	312 69	Due to State banks and bankers	.....
Specie	.....		
Legal tender notes	2,191 00	Notes and bills re-discounted	.....
U. S. certificates of deposit	.....	Bills payable	.....
Redemption fund with U. S. Treasurer	11,250 00		
Total	651,713 11	Total	651,713 11

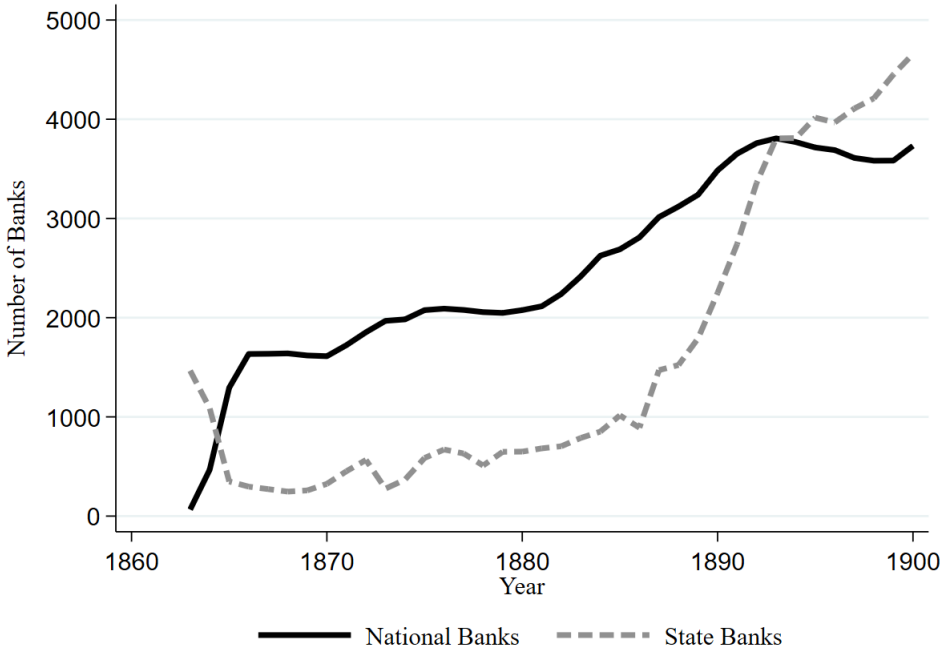
(c) The Banker's Almanac and Register (1885)

Place.	*County.*	*Name.*	*No.*
Mount Pulaski	Logan	Scroggin & Son	
Mount Sterling	Brown	First National Bank	(2402)
"	"	Glass, J. B.	
Mount Vernon	Jefferson	Mt. Vernon National Bank	(1996)
"	"	Evans, Wilbanks & Co.	
Moweaqua	Shelby	Snyder & Co., V	
Murphysboro'	Jackson	Miners' Savings Bank	
Naperville	Du Page	Scott & Co., Willard	
Nashville	Washington	Washington County Bank	
Nat'l Stock Yard	St. Clair	Stock Yard Bank	
Neoga	Cumberland	Cumberland Co. Bank. (Wilson,	
Neponset	Bureau	Exchange Bank	
"	"	Russell, J. A.	
Newark	Kendall	Coy, John A.	
New Berlin	Sangamon	Warren, W. M.	
New Boston	Mercer	Gore, George	

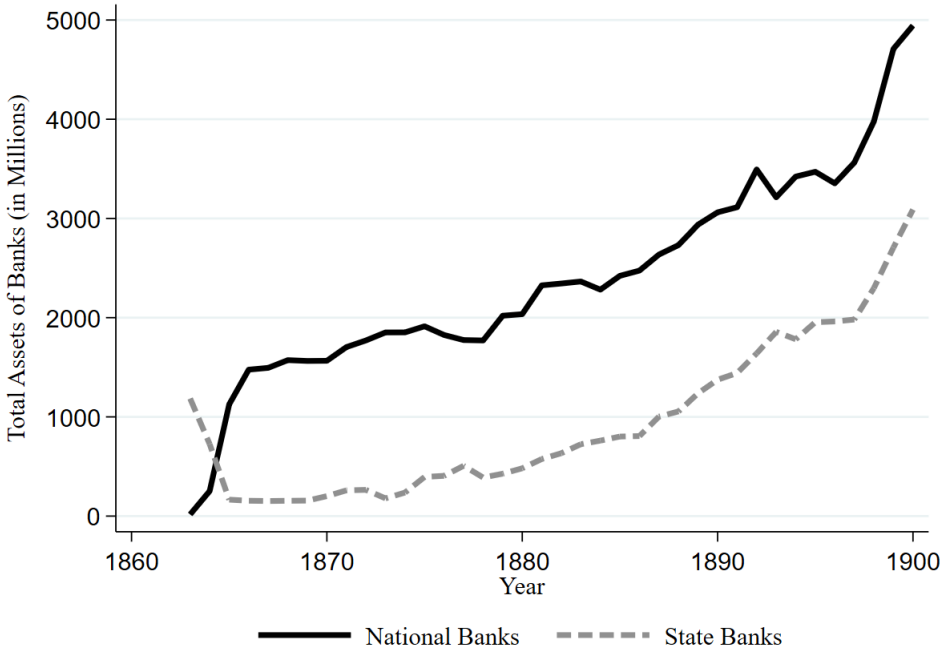
Notes: Figure A.2 displays screenshots of data sources that require hand-digitization used in this study. Figure A.2a shows the town-level population data source, A.2b shows an example from the 1875 Annual Report of the Comptroller of the Currency, where banks reported their location and balance sheet conditions. A.2c shows bank location information from the *Banker's Almanac and Register* in 1885.

Figure A.3: National and State Banks: (1863-1900)

(A): Number of banks

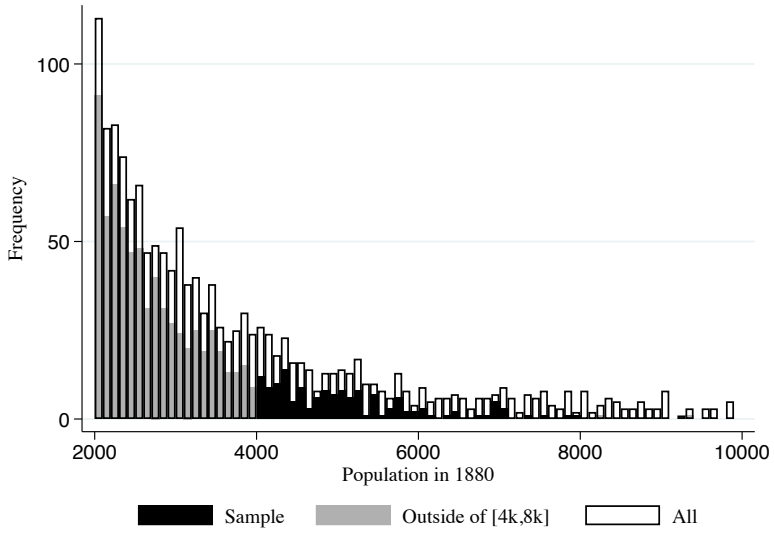


(B): Total assets by bank type



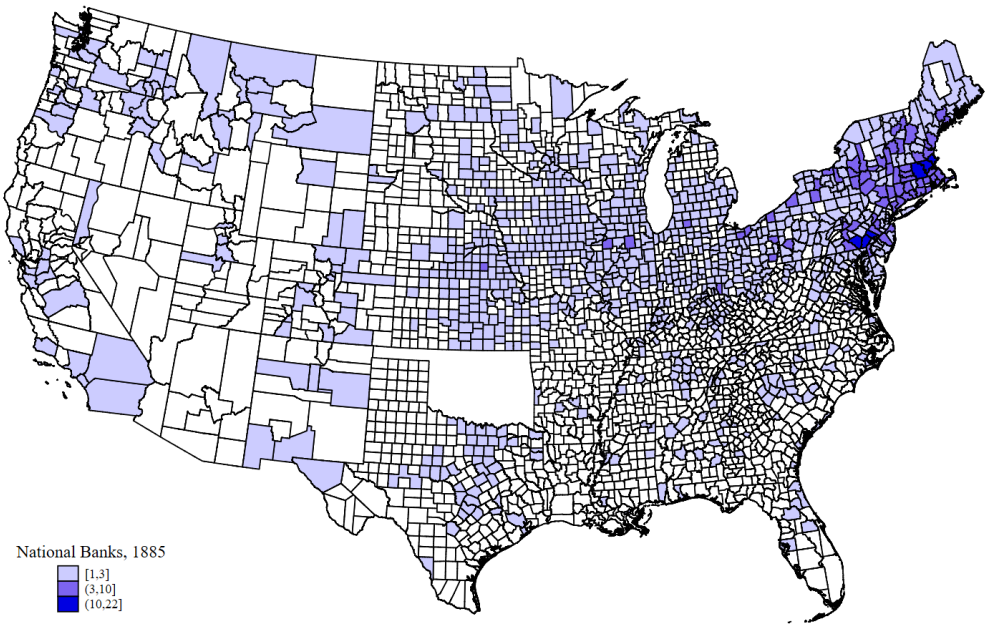
Notes: Figure A.3 plots the total numbers and assets of national and state banks in the United States between 1863 and 1900. Data is obtained from EH.net operated by the Economic History Association.

Figure A.4: Distribution of town population in 1880



Notes: Figure A.4 plots the frequency of all towns with 2,000 to 10,000 population in 1880 census (labeled "All"), as well as after restricting the sample to having below 6,000 population in 1870 and not having a national bank in 1875 (black and gray). The final sample (black bars) consists of the subset that have population between 4,000 and 8,000 people in 1880.

Figure A.5: Distribution of national banks in 1885



Notes: Figure A.5 plots the density of the national banking network at the county level using the *Annual Report of the Comptroller of the Currency* published in 1886.

Table A.1: Comparison of national banks and state banks

	State banks	National banks
Bank notes	various backing	backed 110% by federal bonds → uniform value
Capital requirement	low	high → more costly to establish
Monitoring	2 reports/year to state	5 reports/year to OCC → more oversight
Stability	2.5% failure rate	0.25% failure rate → more stable
Lending	no restrictions	high restrictions → less lending to farms

Notes: Table A.1 lists key distinctions between national banks and state banks. Bank failure rates are calculated for the period between 1875 and 1890.

Table A.2: First stage relationship for gaining a national bank directly

	𝕀(National Bank)				
	(1)	(2)	(3)	(4)	(5)
𝕀(pop<6k)	0.340*	0.573***	0.530***	0.536***	0.519***
	(0.177)	(0.212)	(0.177)	(0.177)	(0.172)
Δ Pop		Y	Y	Y	Y
tMA (1870)			Y	Y	Y
Railroads (1875)				Y	Y
State banks (1876)					Y
State FE	Y	Y	Y	Y	Y
F-stat	3.672	7.347	8.998	9.208	9.106
N	147	147	147	147	147

Notes: Table A.2 estimates the first stage relationship: $\mathbb{I}(Nationalbank_{i,s}) = \beta\mathbb{I}(\text{Pop1880} < 6000)_{i,s} + \Gamma' X_{i,s} + \eta_s + \varepsilon_{i,s}$ where the dependent variable is an indicator for the presence of a national bank in 1885. ΔPop refers to the population change from 1870 to 1880. The log of transport market access cost (tMA) is calculated in 1870, and the number of railroads and state banks are measured in 1875 and 1876, respectively. Regressions are weighted by the share of the town population that is within our relevant sample for the instrument within each county. The F-stat is the first stage KP F. State FEs are included in all specifications, and standard errors are clustered by county. * p<0.1, ** p<0.05, *** p<0.01.

Table A.3: First stage relationship for different values of θ

	ΔMMA ($\theta = 4$)		ΔMMA ($\theta = 1$)		ΔMMA ($\theta = 2$)		ΔMMA ($\theta = 8$)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\mathbb{I}$(pop<6k)	0.715***	0.619***	0.717***	0.622***	0.720***	0.624***	0.684**	0.575***
	(0.264)	(0.200)	(0.258)	(0.199)	(0.260)	(0.200)	(0.272)	(0.194)
Δ Pop	Y	Y	Y	Y	Y	Y	Y	Y
Controls		Y		Y		Y		Y
State FE	Y	Y	Y	Y	Y	Y	Y	Y
F-stat	7.353	9.583	7.738	9.808	7.650	9.780	6.309	8.815
N	147	147	147	147	147	147	147	147

Notes: Table A.3 estimates the first stage relationship: $\Delta\text{MMA} = \beta\mathbb{I}(\text{Pop1880} < 6000)_{i,s} + \Gamma' X_{i,s} + \eta_s + \varepsilon_{i,s}$. ΔMMA is the log difference in monetary market access between 1885 and 1875, calculated according to Equation 1. Column headers denote the parameterization of θ that we use to calculate MMA in 1875 and 1885. ΔPop refers to the population change from 1870 to 1880. The vector of control variables includes the log of transport market access cost (tMA) is calculated in 1870, and the number of railroads and state banks are measured in 1875 and 1876, respectively. Regressions are weighted by the share of the town population that is within our relevant sample for the instrument within each county. The F-stat is the first stage KP F. State FEs are included in all specifications, and standard errors are clustered by county. * p<0.1, ** p<0.05, *** p<0.01.

Table A.4: First stage relationship for $\Delta\text{MMA}_{rail80}$

	ΔMMA				
	(1)	(2)	(3)	(4)	(5)
$\mathbb{I}$(pop<6k)	0.585	1.359***	1.104***	1.109***	0.978***
	(0.375)	(0.422)	(0.288)	(0.288)	(0.247)
Δ Pop		Y	Y	Y	Y
tMA (1870)			Y	Y	Y
Railroads (1875)				Y	Y
State banks (1876)					Y
State FE	Y	Y	Y	Y	Y
F-stat	2.425	10.39	14.73	14.80	15.74
N	147	147	147	147	147

Notes: Table A.4 estimates the first stage relationship: $\Delta\text{MMA} = \beta\mathbb{I}(\text{Pop1880} < 6000)_{i,s} + \Gamma' X_{i,s} + \eta_s + \varepsilon_{i,s}$. ΔMMA is the log difference in monetary market access between 1885 and 1875, calculated according to Equation 1 where we allow physical transport costs to vary at each decade instead of holding it fixed to the 1870 levels. ΔPop refers to the population change from 1870 to 1880. The log of transport market access cost (tMA) is calculated in 1870, and the number of railroads and state banks are measured in 1875 and 1876, respectively. Regressions are weighted by the share of the town population that is within our relevant sample for the instrument within each county. The F-stat is the first stage KP F. State FEs are included in all specifications, and standard errors are clustered by county. * p<0.1, ** p<0.05, *** p<0.01.

Table A.5: Robustness for tradables output

	$\theta = 1$	$\theta = 2$	$\theta = 4$	$\theta = 8$	Unweighted	$\Delta\widehat{\text{MMA}}_{rail80}$
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\widehat{\text{MMA}}$	219.1***	218.7***	223.1***	252.0***	439.7**	126.9**
	(82.62)	(82.32)	(83.62)	(93.07)	(211.3)	(54.93)
CLR [95% CI]	[30.94, 1390.41]	[30.85, 1388.27]	[31.40, 1451.52]	[35.37, 1843.65]	[31.40, 1451.52]	[13.64, 650.40]
(p-value)	(*0.04*)	(*0.04*)	(*0.04*)	(*0.04*)	(*0.04*)	(*0.04*)
State FE	Y	Y	Y	Y	Y	Y
ΔPop	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y
Loans	Y	Y	Y	Y	Y	Y
Mean of Dep. Var.	775.6	775.6	775.6	775.6	775.6	775.6
N	147	147	147	147	147	147

Notes: Table A.5 presents the instrumented second stage of the regression in Equation 3 where the dependent variable is the change in per capita (male population over age 21) value of total manufacturing and agricultural production from 1880 to 1890. The vector of control variables includes the number of railroads and state banks measured in 1875 and 1876, respectively, and the log value of transport market access in 1870. The control variable for "Loans" is the log value of lending by national banks in 1885. ΔPop refers to the population change from 1870 to 1880. $\Delta\widehat{\text{MMA}}$ is the log change in MMA from 1875 to 1885, calculated according to Equation 1 where we parameterize θ to values of 1 (column 1), 2 (column 2), 4 (column 3), and 8 (column 4). Regressions are weighted by the share of town population within a county in all columns except 5. In column 5, we present the unweighted regression. In column 6, $\Delta\text{MMA}_{rail80}$ is the log difference in monetary market access between 1885 and 1875, calculated according to Equation 1 where we allow physical transport costs to vary at each decade instead of holding it fixed to the 1870 levels. We also calculate CLR confidence intervals from Moreira (2003), which we report at the 95% level in brackets along with their *p*-value of significance in italicized parentheses. All specifications include state fixed effects, and standard errors in parentheses below the coefficients are clustered by county. * p<0.1, ** p<0.05, *** p<0.01.

Table A.6: Robustness for commodities share

	$\theta = 1$	$\theta = 2$	$\theta = 4$	$\theta = 8$	Unweighted	$\Delta\widehat{\text{MMA}}_{rail80}$
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\widehat{\text{MMA}}$	0.0467**	0.0466**	0.0476**	0.0537***	0.0884**	0.0271**
	(0.0189)	(0.0187)	(0.0186)	(0.0190)	(0.0432)	(0.0138)
CLR [95% CI]	[0.00, 0.27]	[0.00, 0.27]	[0.00, 0.28]	[0.00, 0.36]	[0.00, 0.28]	[0.00, 0.13]
(p-value)	(*0.05*)	(*0.05*)	(*0.05*)	(*0.05*)	(*0.05*)	(*0.05*)
State FE	Y	Y	Y	Y	Y	Y
ΔPop	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y
Loans	Y	Y	Y	Y	Y	Y
Mean of Dep. Var.	0.905	0.905	0.905	0.905	0.905	0.905
N	147	147	147	147	147	147

Notes: Table A.6 presents the instrumented second stage of the regression in Equation 3 where the dependent variable is the share of commodities production from 1880 to 1890. The vector of control variables includes the number of railroads and state banks measured in 1875 and 1876, respectively, and the log value of transport market access in 1870. The control variable for "Loans" is the log value of lending by national banks in 1885. ΔPop refers to the population change from 1870 to 1880. $\Delta\widehat{\text{MMA}}$ is the log change in MMA from 1875 to 1885, calculated according to Equation 1 where we parameterize θ to values of 1 (column 1), 2 (column 2), 4 (column 3), and 8 (column 4). Regressions are weighted by the share of town population within a county in all columns except 5. In column 5, we present the unweighted regression. In column 6, $\Delta\text{MMA}_{rail80}$ is the log difference in monetary market access between 1885 and 1875, calculated according to Equation 1 where we allow physical transport costs to vary at each decade instead of holding it fixed to the 1870 levels. We also calculate CLR confidence intervals from Moreira (2003), which we report at the 95% level in brackets along with their *p*-value of significance in italicized parentheses. All specifications include state fixed effects, and standard errors in parentheses below the coefficients are clustered by county. * p<0.1, ** p<0.05, *** p<0.01.

Table A.7: Robustness for manufacturing employment

	$\theta = 1$	$\theta = 2$	$\theta = 4$	$\theta = 8$	Unweighted	$\Delta\widehat{\text{MMA}}_{rail80}$
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\widehat{\text{MMA}}$	0.199***	0.199***	0.203***	0.229***	0.221*	0.115***
	(0.0675)	(0.0671)	(0.0681)	(0.0763)	(0.114)	(0.0428)
CLR [95% CI]	[-0.04, 0.70]	[-0.04, 0.69]	[-0.04, 0.72]	[-0.04, 0.91]	[-0.04, 0.72]	[-0.02, 0.31]
(p-value)	(*0.08*)	(*0.08*)	(*0.08*)	(*0.08*)	(*0.08*)	(*0.08*)
State FE	Y	Y	Y	Y	Y	Y
ΔPop	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y
Loans	Y	Y	Y	Y	Y	Y
Mean of Dep. Var.	0.329	0.329	0.329	0.329	0.329	0.329
N	147	147	147	147	147	147

Notes: Table A.7 presents the instrumented second stage of the regression in Equation 3 where the dependent variable is the change in the manufacturing share of employment (calculated as the share of manufacturing employment in male population over age 21) from 1880 to 1890. The vector of control variables includes the number of railroads and state banks measured in 1875 and 1876, respectively, and the log value of transport market access in 1870. The control variable for "Loans" is the log value of lending by national banks in 1885. ΔPop refers to the population change from 1870 to 1880. $\Delta\widehat{\text{MMA}}$ is the log change in MMA from 1875 to 1885, calculated according to Equation 1 where we parameterize θ to values of 1 (column 1), 2 (column 2), 4 (column 3), and 8 (column 4). Regressions are weighted by the share of town population within a county in all columns except 5. In column 5, we present the unweighted regression. In column 6, $\Delta\text{MMA}_{rail80}$ is the log difference in monetary market access between 1885 and 1875, calculated according to Equation 1 where we allow physical transport costs to vary at each decade instead of holding it fixed to the 1870 levels. We also calculate CLR confidence intervals from Moreira (2003), which we report at the 95% level in brackets along with their p-value of significance in italicized parentheses. All specifications include state fixed effects, and standard errors in parentheses below the coefficients are clustered by county. * p<0.1, ** p<0.05, *** p<0.01.

Table A.8: Robustness for urban population

	$\theta = 1$	$\theta = 2$	$\theta = 4$	$\theta = 8$	Unweighted	$\Delta\widehat{\text{MMA}}_{rail80}$
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\widehat{\text{MMA}}$	0.395**	0.395**	0.402**	0.455*	0.703*	0.229**
	(0.199)	(0.199)	(0.203)	(0.234)	(0.363)	(0.108)
CLR [95% CI]	[0.11, 2.64]	[0.11, 2.64]	[0.11, 2.77]	[0.12, 3.61]	[0.11, 2.77]	[0.06, 1.03]
(p-value)	(*0.02*)	(*0.02*)	(*0.02*)	(*0.02*)	(*0.02*)	(*0.02*)
State FE	Y	Y	Y	Y	Y	Y
ΔPop	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y
Loans	Y	Y	Y	Y	Y	Y
Mean of Dep. Var.	47.29	47.29	47.29	47.29	47.29	47.29
N	147	147	147	147	147	147

Notes: Table A.8 presents the instrumented second stage of the regression in Equation 3 where the dependent variable is the change in log urban population from 1880 to 1890. The vector of control variables includes the number of railroads and state banks measured in 1875 and 1876, respectively, and the log value of transport market access in 1870. The control variable for "Loans" is the log value of lending by national banks in 1885. ΔPop refers to the population change from 1870 to 1880. $\Delta\widehat{\text{MMA}}$ is the log change in MMA from 1875 to 1885, calculated according to Equation 1 where we parameterize θ to values of 1 (column 1), 2 (column 2), 4 (column 3), and 8 (column 4). Regressions are weighted by the share of town population within a county in all columns except 5. In column 5, we present the unweighted regression. In column 6, $\Delta\text{MMA}_{rail80}$ is the log difference in monetary market access between 1885 and 1875, calculated according to Equation 1 where we allow physical transport costs to vary at each decade instead of holding it fixed to the 1870 levels. We also calculate CLR confidence intervals from Moreira (2003), which we report at the 95% level in brackets along with their p-value of significance in italicized parentheses. All specifications include state fixed effects, and standard errors in parentheses below the coefficients are clustered by county. * p<0.1, ** p<0.05, *** p<0.01.

Table A.9: Robustness for manufacturing production

	$\theta = 1$	$\theta = 2$	$\theta = 4$	$\theta = 8$	Unweighted	$\Delta\widehat{\text{MMA}}_{rail80}$
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\widehat{\text{MMA}}$	233.8**	233.4**	238.1**	268.9**	487.8**	135.4*
	(107.0)	(106.5)	(107.9)	(118.8)	(208.3)	(75.58)
CLR [95% CI]	[77.85, 1527.52]	[77.57, 1526.19]	[78.66, 1601.74]	[87.40, 2062.66]	[78.66, 1601.74]	[34.96, 701.41]
(p-value)	(*0.02*)	(*0.02*)	(*0.02*)	(*0.02*)	(*0.02*)	(*0.02*)
State FE	Y	Y	Y	Y	Y	Y
ΔPop	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y
Loans	Y	Y	Y	Y	Y	Y
Mean of Dep. Var.	626.4	626.4	626.4	626.4	626.4	626.4
N	147	147	147	147	147	147

Notes: Table A.9 presents the instrumented second stage of the regression in Equation 3 where the dependent variable is the change in per capita (male population over age 21) manufacturing production from 1880 to 1890. The vector of control variables includes the number of railroads and state banks measured in 1875 and 1876, respectively, and the log value of transport market access in 1870. The control variable for "Loans" is the log value of lending by national banks in 1885. ΔPop refers to the population change from 1870 to 1880. $\Delta\widehat{\text{MMA}}$ is the log change in MMA from 1875 to 1885, calculated according to Equation 1 where we parameterize θ to values of 1 (column 1), 2 (column 2), 4 (column 3), and 8 (column 4). Regressions are weighted by the share of town population within a county in all columns except 5. In column 5, we present the unweighted regression. In column 6, $\Delta\text{MMA}_{rail80}$ is the log difference in monetary market access between 1885 and 1875, calculated according to Equation 1 where we allow physical transport costs to vary at each decade instead of holding it fixed to the 1870 levels. We also calculate CLR confidence intervals from Moreira (2003), which we report at the 95% level in brackets along with their *p*-value of significance in italicized parentheses. All specifications include state fixed effects, and standard errors in parentheses below the coefficients are clustered by county. * p<0.1, ** p<0.05, *** p<0.01.

Table A.10: Robustness for manufacturing inputs

	$\theta = 1$	$\theta = 2$	$\theta = 4$	$\theta = 8$	Unweighted	$\Delta\widehat{\text{MMA}}_{rail80}$
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\widehat{\text{MMA}}$	144.3***	144.1***	147.0***	166.0***	281.5**	83.59**
	(54.60)	(54.36)	(55.07)	(60.89)	(124.7)	(39.41)
CLR [95% CI]	[37.47, 893.01]	[37.32, 892.66]	[37.78, 938.52]	[41.78, 1214.10]	[37.78, 938.52]	[17.00, 405.99]
(p-value)	(*0.03*)	(*0.03*)	(*0.03*)	(*0.03*)	(*0.03*)	(*0.03*)
State FE	Y	Y	Y	Y	Y	Y
ΔPop	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y
Loans	Y	Y	Y	Y	Y	Y
Mean of Dep. Var.	380.9	380.9	380.9	380.9	380.9	380.9
N	147	147	147	147	147	147

Notes: Table A.10 presents the instrumented second stage of the regression in Equation 3 where the dependent variable is the change in per capita (male population over age 21) manufacturing inputs usage from 1880 to 1890. The vector of control variables includes the number of railroads and state banks measured in 1875 and 1876, respectively, and the log value of transport market access in 1870. The control variable for "Loans" is the log value of lending by national banks in 1885. ΔPop refers to the population change from 1870 to 1880. $\Delta\widehat{\text{MMA}}$ is the log change in MMA from 1875 to 1885, calculated according to Equation 1 where we parameterize θ to values of 1 (column 1), 2 (column 2), 4 (column 3), and 8 (column 4). Regressions are weighted by the share of town population within a county in all columns except 5. In column 5, we present the unweighted regression. In column 6, $\Delta\text{MMA}_{rail80}$ is the log difference in monetary market access between 1885 and 1875, calculated according to Equation 1 where we allow physical transport costs to vary at each decade instead of holding it fixed to the 1870 levels. We also calculate CLR confidence intervals from Moreira (2003), which we report at the 95% level in brackets along with their *p*-value of significance in italicized parentheses. All specifications include state fixed effects, and standard errors in parentheses below the coefficients are clustered by county. * p<0.1, ** p<0.05, *** p<0.01.

Table A.11: Robustness for manufacturing capital

	$\theta = 1$	$\theta = 2$	$\theta = 4$	$\theta = 8$	Unweighted	$\Delta\widehat{\text{MMA}}_{rail80}$
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta\widehat{\text{MMA}}$	12.86	12.84	13.10	14.80	37.94	7.450
	(142.8)	(142.6)	(145.4)	(163.9)	(237.7)	(83.38)
CLR [95% CI]	[-658.19, 492.13]	[-658.29, 489.83]	[-687.30, 499.34]	[-875.68, 560.76]	[-687.30, 499.34]	[-252.30, 264.75]
(p-value)	(*0.86*)	(*0.86*)	(*0.86*)	(*0.86*)	(*0.86*)	(*0.86*)
State FE	Y	Y	Y	Y	Y	Y
ΔPop	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y
Loans	Y	Y	Y	Y	Y	Y
Mean of Dep. Var.	373.2	373.2	373.2	373.2	373.2	373.2
N	147	147	147	147	147	147

Notes: Table A.11 presents the instrumented second stage of the regression in Equation 3 where the dependent variable is the change in per capita (male population over age 21) manufacturing capital from 1880 to 1890. The vector of control variables includes the number of railroads and state banks measured in 1875 and 1876, respectively, and the log value of transport market access in 1870. The control variable for "Loans" is the log value of lending by national banks in 1885. ΔPop refers to the population change from 1870 to 1880. $\Delta\widehat{\text{MMA}}$ is the log change in MMA from 1875 to 1885, calculated according to Equation 1 where we parameterize θ to values of 1 (column 1), 2 (column 2), 4 (column 3), and 8 (column 4). Regressions are weighted by the share of town population within a county in all columns except 5. In column 5, we present the unweighted regression. In column 6, $\Delta\text{MMA}_{rail80}$ is the log difference in monetary market access between 1885 and 1875, calculated according to Equation 1 where we allow physical transport costs to vary at each decade instead of holding it fixed to the 1870 levels. We also calculate CLR confidence intervals from Moreira (2003), which we report at the 95% level in brackets along with their *p*-value of significance in italicized parentheses. All specifications include state fixed effects, and standard errors in parentheses below the coefficients are clustered by county. * p<0.1, ** p<0.05, *** p<0.01.

Table A.12: Robustness: higher order polynomial controls for change in population

	Tradeables production		Commodities share		Manu employ		Manu prod		Manu inputs	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
OLS										
$\Delta\widehat{\text{MMA}}$	174.9***	175.5***	0.0452***	0.0451***	0.115***	0.117***	176.3***	178.9***	95.52***	97.91***
	(44.72)	(45.34)	(0.0128)	(0.0131)	(0.0256)	(0.0250)	(39.45)	(38.18)	(23.44)	(22.37)
IV: Second Stage										
$\Delta\widehat{\text{MMA}}$	215.7**	212.3**	0.0461***	0.0465***	0.192***	0.183***	230.3**	220.1**	141.4***	132.0***
	(108.7)	(102.3)	(0.0179)	(0.0171)	(0.0632)	(0.0583)	(103.0)	(95.89)	(52.66)	(48.68)
State FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Loans	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Polynomial order	2nd	3rd	2nd	3rd	2nd	3rd	2nd	3rd	2nd	3rd
Mean of Dep. Var.	775.6	775.6	0.905	0.905	0.329	0.329	626.4	626.4	380.9	380.9
N	147	147	147	147	147	147	147	147	147	147

Notes: Table A.12 presents the OLS (panel 1) and instrumented second stage of the regression in Equation 3 (panel 2) controlling for higher degree polynomials of the population change from 1870 to 1880. Odd numbered columns control for second-order polynomials and even numbered columns control for third-order polynomials. The independent variable $\Delta\widehat{\text{MMA}}$ is the log change in MMA from 1875 to 1885, calculated according to Equation 1. The inputs to MMA are bilateral transport costs measured in 1870 using the measures from Donaldson and Hornbeck (2016), populations in 1870 and 1880 from the respective censuses of population, and the locations of national banks in 1885 from the *Annual Reports of the Comptroller of the Currency*. There are no national banks in the locations in our sample in 1875 by construction. We use $\theta = 4$ in our baseline measure. All regressions include state fixed effects. The vector of control variables includes the number of railroads and state banks measured in 1875 and 1876, respectively, and the log value of transport market access in 1870. The control variable for "Loans" is the log value of lending by national banks in 1885. The dependent variable in columns 1 and 2 is the change in per capita (male population over age 21) value of total manufacturing and agricultural production from 1880 to 1890 is the change in per capita (male population over age 21) manufacturing production; in columns 3 and 4 it is the share of agricultural production in commodity goods measured in terms of acreage of farmland used. The dependent variable is manufacturing employment (columns 5 and 6), manufacturing production (columns 7 and 8), and manufacturing inputs (columns 9 and 10) per capita (male population over age 21). We report the mean of the dependent variable measured in 1880. Regressions are weighted by the share of town population within a county, and standard errors are clustered at the county level. * p<0.1, ** p<0.05, *** p<0.01.

B Additional historical context

B.1 Banking system before the National Banking Act

The idea of establishing a unified banking system across the United States was several decades earlier than the passage of the National Banking Act. The First Bank of the United States, charted for a term of twenty years by the Congress on February, 1791, operated in Philadelphia and was the nation's *de facto* central bank. Alexander Hamilton, the first Secretary of the Treasury, believed a national bank was necessary to stabilize and improve the nation's credit, and proposed federal mint as common currency. However, the bank faced widespread resistance due to concerns of expanding federal power, which was famously led by the Secretary of State Thomas Jefferson. The bank charter was not renewed and expired in 1811.

In 1816, the Second National Bank started operation with similar functions as the First Bank of the United States. As of 1832, the Second National Bank operated more than 30 branches nationwide. During this period, the paper money circulation was comprised of private bank notes issued by state-regulated banks, plus the notes of the Bank of the United States. While the state banks were formally regulated by their individual state governments, the national network of the Bank of the United States could better enforce those regulations. In particular, the Bank of the United States could return notes to issuing banks and demand specie, which it did for any notes that traded at a discount. Therefore the presence of this pseudo central bank prevented the competing private monies of this period from exhibiting the instability of the Free Banking Era.

However, this system with its centralized control of the banking system, was unpopular with many bankers, and there were many objections to it. The end of the Second Bank of the United States occurred when President Andrew Jackson failed to renew the bank's charter in 1836, which marked the beginning of the Free Banking Era.

B.2 Additional evidence of bank debt illiquidity in the Free Banking Era

The large number of floating exchange rates created inconvenience in economic activity. For example, a case record compilation of the United States supreme court between 1843 and 1846 (Stephen K. Williams, 1901) contains a case regarding the value of a loan, and how its value had changed over time:

> [...] the defendant did [...] receive the amount of said loans from the plaintiffs in the bank notes of Virginia and of other States, which, [...] were depreciated considerably below the current value of the bank notes of this district [...]

The frictions stemmed from state bank notes illiquidity was especially detrimental to inter-state transactions. As a contemporary traveler illustrated the magnitude of the cost in his diary (Dewey, 1910):

> Started from Virginia with Virginia money; reached the Ohio River; exchanged $20 Virginia note for shinplasters and a $3 note of the Bank of West Union
>
> [...] At Maysville wanted Virginia money; couldn't get it.

> [...] reached Fredericktown; there neither Virginia nor Kentucky money current; paid a $5 Wheeling note for breakfast and dinner; received in change two $1 notes of some Pennsylvania bank, $1 Baltimore and Ohio Railroad, and balance in Good Intent shinplasters; 100 yards from the tavern door all notes refused. [...]

Monetary frictions were also present in coins, which made them an unsuitable substitute for payments (Ware, 1990):

> In routine business transactions Americans had to calculate in three currencies: one decimal; another based on halves, quarters, and eighths; and another on twelfths and twentieths.

B National Banking Act legislation

B.1 Bank note issuance

Bank notes have uniform value, redeemable at all national banks

- Act June 3, 1864 Sec. 5182: For what demands national-bank notes may be received.

  > After any association receiving circulating notes under this Title has caused its promise to pay such notes on demand to be signed by the president or vice-president and cashier thereof, in such manner as to make them obligatory promissory notes, payable on demand at its place of business, such association may issue and circulate **the same as money**. And the same shall be **received at par in all parts of the United States** in payment of taxes, excises, public lands, and all other dues to the United States, except duties on imports; and also for all salaries and other debts and demands owing by the United States to individuals, corporations, and associations within the United States, except interest on the public debt, and in redemption of the national currency.

- Act June 3, 1864 Sec. 5196: National banks to take notes of other national banks at par.

  > Every national banking association formed or existing under this Title, **shall take and receive at par**, for any debt or liability to it, any and all notes or bills issued by **any lawfully organized national banking association**. But this provision shall not apply to any association organized for the purpose of issuing notes payable in gold.

Bank notes backed 110 percent by US Treasury Bonds

- Act July 12, 1882 Sec. 8: Amount of bonds required to be on deposit; reduction of amount or retirement in full of circulating notes.

  > That national banks now organized or here-after organized, having a capital of **one hundred and fifty thousand dollars, or less**, shall not be required to keep on deposit or deposit with the Treasurer of the United States United States **bonds in excess of one-fourth of their capital stock as security** for their circulating notes; but such banks shall keep on deposit or deposit with the Treasurer of the

United States the amount of bonds as herein required. And such of those banks having on deposit bonds in excess of that amount are authorized to reduce their circulation by the de-posit of lawful money as provided by law ; [provided, **that the amount of such circulating notes shall not in any case exceed ninety per centum of the par value of the bonds deposited as herein provided**:] Provided further, That the national banks which shall hereafter make deposits of lawful money for the retirement in full of their circulation shall at the time of their deposit be assessed for the **cost of transporting and redeeming their notes then outstanding**, a sum equal to the average cost of the redemption of national-hank notes during the pre-ceding year, and shall thereupon pay such assessment. And all national banks which have heretofore made or shall hereafter make deposits of lawful money for the reduction of their circulation shall be assessed and shall pay an assessment in the manner specified in section three of the act approved June 20, 1874, for the cost of transporting and redeeming their notes redeemed from such deposits subsequently to June 30, 1881.

- Act June 3, 1864 Sec. 5153: National banking associations to be depositaries of public moneys.

  All national banking associations, designated for that purpose by the Secre-tary of the Treasury, shall be **depositaries of public money**, under such regulations as may be prescribed by the Secretary ; and they may also be employed as **financial agents of the Government**; and they shall perform all such reasonable duties, as depositaries of public money and financial agents of the Government, as may be required of them. The Secretary of the Treasury shall require the associations thus designated to give **satisfactory security, by the deposit of United States bonds and otherwise, for the safe-keeping and prompt payment of the public money deposited with them**, and for the faith-ful performance of their duties as financial agents of the Government: Provided, That the Secretary. shall, on or before the first of January of each year, make a public statement of the securities required during that year for such deposits. And every association so designated as receiver or depositary of the public money shall **take and receive at par all of the national currency bills, by what-ever association issued**, which have been paid into the Government for internal revenue, or for loans or stocks: Provided, That the Secretary of the Treasury shall dis-tribute the deposits herein provided for, as far as prac-ticable, equitably between the different States and sections.

- Act June 3, 1864 Sec. 5159: Deposit of bonds required before issue of circulating notes.

  Every association, after having complied with the provisions of this Title, pre-liminary to the commencement of the banking business, and before it shall be authorized to commence banking business under this Title, shall transfer and de-liver to the Treasurer of the United States any United States registered bonds, bearing interest, [**to an amount not less than thirty thou-sand dollars and not less than one- third of the capital stock paid in**.] Such bonds shall be received by the Treasurer upon deposit and shall be by him safely kept in his

office, until they shall be otherwise disposed of, in pursuance of the provisions of this Title. NOTE.—The italicized words are held to he modified by the acts of June 20, 1874, and July 12, 1882. Section 4, act of June 20, 1874, which follows section 5167, provides in part that **the amount of bonds on deposit for circulation shall not be reduced below 50,000** dollars. This determines the amount of bonds required to be de-posited by banks organizing with capital stock over 150,000 dollars. Banks having a capital of 150,000 dollars, or less, are not required to keep on deposit **bonds in excess of one-fourth of the capital stock** as security for their circulating notes, by act July 12, 1882, chapter 290, section 8. This act follows section 5167, Revised Statutes.

Losses in face value supplemented with additional bonds

- Act June 3, 1864 Sec. 5167: General provisions respecting bonds.

  The bonds transferred to and deposited with the Treasurer of the United States, by any associa-tion, for the security of its circulating notes, shall be held **exclusively for that purpose**, until such notes are re-deemed, except as provided in this Title. The Comp-troller of the Currency shall give to any such association powers of attorney to receive and appropriate to its own use the interest on the bonds which it has so transferred to the Treasurer; but such powers shall become **inopera-tive whenever such association fails to redeem its circu-lating notes**. Whenever the market or cash value of any bonds thus deposited with the Treasurer is **reduced below the amount of the circulation issued** for the same, **the Comptroller may demand and receive the amount of such depreciation in other United States bonds at cash value, or in money, from the association, to be deposited with the Treasurer as long as such depreciation continues**. And the Comptroller, upon the terms prescribed by the Secretary of the Treasury, may permit an **exchange to be made of any of the bonds deposited with the Treasurer by any association for other bonds of the United States authorized to be received as security for circulating notes**, if he is of opinion that such an exchange can be made without prejudice to the United States; and he may di-rect the **return of any bonds to the association which transferred the same, in sums of not less than one thou-sand dollars, upon the surrender to him and the cancellation of a proportionate amount of such circulating notes** : Provided, That the remaining bonds which shall have been transferred by the association offering to surrender circulating notes are equal to the amount required for the circulating notes not surrendered by such association, and that the amount of bonds in the hands of the Treasurer is not diminished below the amount required to be kept on deposit with him, and that there has been no failure by the association to redeem its circulating notes, nor any other violation by it of the provisions of this Title, and that the market or cash value of the remaining bonds is not below the amount required for the circulation issued for the same.

OCC regulates national banks

- Act June 3, 1864 Sec. 324: Bureau of the Comptroller of the Currency.

There shall be in the Department of the Treasury a Bureau charged with the execution of all laws passed by Congress relating to the **issue and regulation of a national currency secured by United States bonds**, the chief officer of which Bureau shall be called the **Comptroller of the Currency**, and shall perform his duties under the general direction of the Secretary of the Treasury.

- Act June 3, 1864 Sec. 5168: Comptroller to determine if association can commence business.

  Whenever a certificate is transmitted to the Comptroller of the Currency, as provided in this Title, and the association transmitting the same notifies the Comptroller that **at least fifty per centum of its capital stock has been duly paid in**, and that such association has complied with all the provisions of this Title required to be complied with before an association shall be author-ized to commence the business of banking, **the Comp-troller shall examine into the condition of such associa-tion**, ascertain especially the amount of money paid in on account of its capital, the name and place of residence of each of its directors, and the amount of the capital stock of which each is the owner in good faith, and generally whether such association has complied with all the pro-visions of this Title required to entitle it to engage in the business of banking; and shall cause to be made and attested by the oaths of a majority of the directors, and by the President or cashier of the association, a statement of all the facts neces-sary to **enable the Comptroller to determine whether the association is lawfully entitled to commence the business of banking**.

OCC oversees liquidation process for failure & prioritizes note holders from losses for failure

- Act Mar. 3, 1878 Sec. 5205: Assessment for failure to pay up capital stock or for impairment of capital.

  Every association which shall have **failed to pay up its capital stock**, as required by law, and every association whose capital stock shall have become impaired by losses or otherwise, shall, **within three months after receiving notice thereof from the Comptroller of the Currency, pay the deficiency in the capital stock**, by assessment upon the shareholders pro rata for the amount of capital stock held by each: and the Treasurer of the United States shall **withhold the interest upon all bonds held by him in trust for any such association**, upon notification from the Comptroller of the Currency, until otherwise notified by him. If any such association shall fail to pay up its capital stock. and shall refuse to go into liquidation, as provided by law, for three months after receiving notice from the Comp-troller, **a receiver may be appointed to close up the busi-ness of the association**, according to the provisions of section fifty-two hundred and thirty-four : And provided, That if any shareholder or shareholders of such bank shall neglect or refuse, after three months' notice, to pay the assessment, as provided in this section, **it shall be the duty of the board of directors to cause a sufficient amount of the capital stock of such shareholder or shareholders to be sold at public auction** (after thirty

days' notice shall be given by posting such notice of sale in the office of the bank, and by publishing such notice in a newspa-per of the city or town in which the bank is located, or in a newspaper published nearest thereto) **to make good the deficiency**, and the balance, if any, shall be returned to such delinquent shareholder or shareholders.

- Act June 3, 1864 Sec. 5224: Reassignment of bonds and redemption of notes of liquidating banks.

  Whenever a sufficient deposit of lawful money to redeem the outstanding circulation of an association proposing to close its business has been made, the bonds deposited by the association to secure payment of its notes shall be reassigned to it, in the manner prescribed by section fifty-one hundred and sixty-two. And thereafter the association and its shareholders shall stand discharged from all liabilities upon the circulating notes, and **those notes shall be re-deemed at the Treasury of the United States**. And if any such bank shall fail to make the deposit and take up its bonds thirty days after the expiration of the time specified, **the Comptroller of the Currency shall have power to sell the bonds pledged for the circulation of said bank, at public auction in New York City**, and, after providing for the redemption and cancellation of said cir-culation, and the necessary expenses of the sale, to pay over any balance remaining to the bank or its legal repre-sentatives.

B.2 Capital requirements

- Act June 3, 1864 Sec. 5138: Requisite amount of capital.

  No association shall be organized with **a less capital than one hundred thousand dollars**, except that banks with a **capital of not less than fifty thousand dollars** may, with the approval of the Secretary of the Treasury, be organized in any place the population of which does not exceed **six thousand inhabitants**, and except that banks with a capital of not less than **twenty-five thousand dollars** may, with the sanction of the Secretary of the Treasury, be organized in any place the population of which does not exceed **three thousand inhabitants**. No association shall be organized in a city the population of which exceeds **fifty thousand persons** with a capital of less than **two hundred thousand dollars**.

75 percent of directors have to reside locally

- Act June 3, 1864 Sec. 5146: Requisite qualification of directors.

  Every director must, during his whole term of service, be a **citizen of the United States**, and at least **three fourths of the directors must have resided in the State, Territory, or District in which the association is located for at least one year immediately preceding their election and must be residents therein during their continuance in office**. Every director must own in his own right **at least ten shares of the capital stock** of the association

of which he is a director, unless the capital of the bank shall not exceed **twenty-five thousand dollars**, in which case he must own in his own right **at least five shares of such capital stock**. Any director who ceases to be the owner of the required number of shares of the stock, or who becomes in any other manner disqualified, shall thereby vacate his place.

B.3 Loan restrictions

Not allowed to take land as collateral

- Act June 3, 1864 Sec. 5137: Power to hold real property.

  A national banking association may **purchase, hold, and convey real estate for the following purposes, and for no others**: First. Such as shall be necessary for its **immediate accommodation** in the transaction of its business. Second. Such as shall be **mortgaged to it in good faith by way of security for debts previously contracted**. Third. Such as shall be conveyed to it in **satisfaction of debts previously contracted** in the course of its dealings. Fourth. Such as it shall **purchase at sales under judgments, decrees, or mortgages** held by the association, or shall purchase to secure debts due to it. But no such association shall hold the possession of any real estate under mortgage, or the title and possession of any real estate purchased to secure any debts due to it, **for a longer period than five years**.

10 percent tax on state bank notes

- Act Feb. 5, 1875 Sec. 19: Tax on circulation of banks other than national banks.

  That every person, firm, association, **other than national-bank associations**, and every corporation, State bank, or State banking association **shall pay a tax of ten per centum on the amount of their own notes** used for circulation and paid out by them.

Conversions from state banks

- Act Mar. 3, 1865 Sec. 5155: State banks having branches.

  It shall be lawful for **any bank or banking association organized under State laws**, and having branches, the capital being joint and assigned to and used by the mother-bank and branches in definite proportions, to **become a national banking association** in conformity with existing laws, and to retain and keep in operation its branches, or such one or more of them as it may elect to retain; the amount of the circulation redeemable at the mother-bank, and each branch, to be regulated by the amount of capital assigned to and used by each.

- Act March 3, 1865 Sec. 3416: State banks converted into national banks; returns, how made.

  Whenever any State bank or banking association has been converted into a national banking association, and such national banking association has **assumed**

the liabilities of such State bank or banking association, including the redemption of its bills, by any agreement or understanding whatever with the representatives of such State bank or banking association, s**uch national banking association shall be held to make the required return and payment on the circulation outstanding**, so long as such circulation shall **exceed five per centum of the capital** before such conversion of such State bank or banking association.