National Banks and the Local Economy

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NBER SI Development of the American Economy

Motivation

1. **Economic activity does not exist in autarky**
   - Physical infrastructure and market integration/development: Donaldson (2018), Donaldson Hornbeck (2016), Banerjee Duflo Chan (2012), Storeygard (2016), Jaworski Kitchens (2019), Donaldson Rotemberg (2020)
   - Non-physical trade costs: Anderson Van Wincoop (2004), Hanson (1996), Redding Sturm (2008), Steinwender (2018), Kisling Meissner Xu (2020)
2. **Financial markets lowering trade costs**
   - Direct financing channel: Manova (2008, 2013), Xu (2019)

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2. **Financial markets lowering trade costs**

   - Direct financing channel: Manova (2008, 2013), Xu (2019)

This paper: additional indirect channel of financial intermediaries as source of **liquidity creation** (Gorton Pennacchi 1990)

content…

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- Redeemable at any other national bank

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Question: What is the causal effect of banks supplying riskless liabilities to local economic activity?

Preview

Identification:

- Instrument for bank entry using exogenous variation in regulatory capital requirements based on town population cut-offs
- Focus on entry from 1870s to 1880s and compare outcomes in subsequent decades

Results: Towns that gained a national bank experienced more growth in tradables:

- Agriculture: substitution to traded crops
- Labor: more commission merchants
- Manufacturing: higher production & inputs per capita; no change in capital stock
  - Persistence: 20+ years of higher manufacturing sector output
- Innovation: more patenting activity

Related Literature

Cash in the economy: (Theory) Lucas (1982), Lucas and Stokey (1987), Woodford (2003), Williamson Wright (2010), Rogoff You (2019); (Empirics) Chodorow-Reich Gopinath Mishra Narayanan (2019), Alvarez Argente (2019); (Crypto-currency) Yermack (2014), Gans Halaburda (2015)

$\Rightarrow$ Financial intermediaries as the creator of money

Financial development and growth: Smith (1776), Gerschenkron (1962), Jayaratne & Strahan (1996), Rajan & Zingales (1998), Levine & Zervos (1998), Rousseau & Sylla (1999)

$\Rightarrow$ Focus on liabilities rather than standard assets/bank-lending channel

US banking before the Federal Reserve: Friedman Schwartz (1963), Sylla (1969), White (1982), Rolnick Weber (1983), Ng (1988), Tallman Moen (1998), Grossman (1993), Jaremski (2013), Fulford (2015), Gou (2016), Carlson et al. (2018)

$\Rightarrow$ Real impact of monetary frictions

Outline

Historical Context

Empirical Strategy & Data

Effects on Real Economy

- Agriculture
- Labor
- Manufacturing

Innovation

Historical Context

State vs national banks

	State Banks "Free Banking Era"
Regulation	state legislation
Liabilities	currency only redeemable at originating bank
Capital	varying: often none
Assets	few restrictions on lending

State bank currency was illiquid

Examples of state bank notes

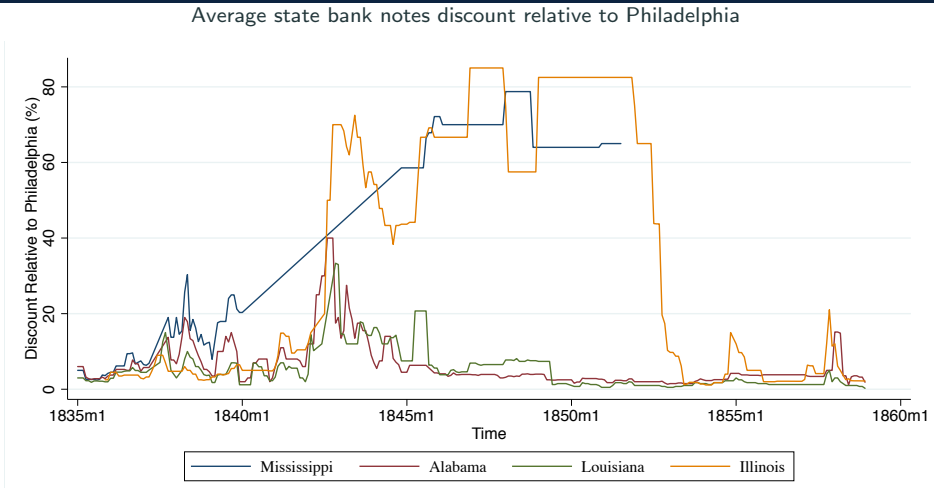




- **Counterfeiting friction:** 7000+ varieties in color and design, hard to verify legitimacy, often rejected by merchants
- **Exchange friction:** example from one traveler's diary in the 1850s:

  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. [...]

State bank currency even more difficult to use in non-local transactions



- Costly redemption friction: transportation costs to originating bank generated large interbank discounts (Gorton, 1999)

National Banking Act: introducing a uniform currency

> *This currency will be* **uniform** *[...] so that a bank bill issued in the State of Maine will be current in California [...] There is* **no limit to its convertibility**. *It will be of uniform value throughout the United States.*

Senator John Sherman of Ohio, 1863

New national bank currency was **liquid**:

- Backed 110% by federal bonds $\Rightarrow$ no default risk
- Redeemable at any national bank $\Rightarrow$ national network

Regulated at the national level by the Comptroller of the Currency

State banks vs national banks

	State Banks "Free Banking Era"	**National Banks** "National Banking Era"
Oversight	state legislation	federal legislation
Liabilities	bank notes only redeemable at originating bank; not obligated to redeem NB notes	bank notes redeemable at any NB & backed 110% in federal bonds
Capital	varying: often none	
Assets	few restrictions on lending	

Real effects of having a national bank

Mechanism: liquidity improves "market access"

- Supply channel: local currency supply $\Uparrow$
- Network channel: usefulness compounded by other national banks in the country

  $\Rightarrow$ improved liquidity matters for non-local (long-distance) transactions

Real effects of having a national bank

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Exogeneity: banks do not appear randomly

- Regulatory capital requirements based on town populations

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Focusing on the liabilities side:

- Agricultural sector not eligible for loans
- Trade & innovation outcomes

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Liabilities	bank notes only redeemable at originating bank; not obligated to redeem NB notes	bank notes redeemable at any NB & backed 110% in federal bonds
Capital	varying: often none	high: based on town population
Assets	few restrictions on lending	no land as collateral

Empirical Strategy & Data

Instrument for national bank entry

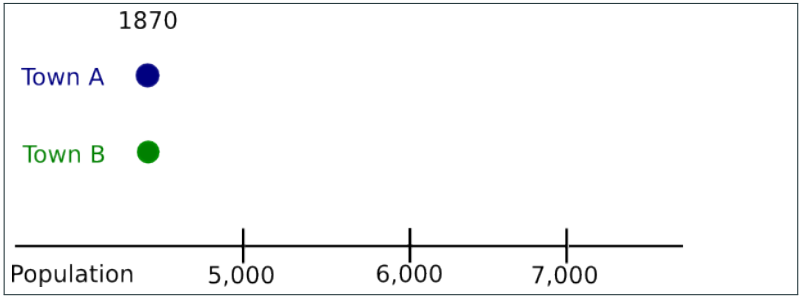
Regulatory capital requirement for national banks were based on the **population** of town published in most recent decennial census:

$$\text{Capital stock paid in} \geq \begin{cases} \$50,000 & \text{if population} \leq 6{,}000 \\ \$100,000 & \text{if } 6{,}000 < \text{population} \leq 50{,}000 \\ \$250,000 & \text{if population} > 50{,}000 \end{cases}$$

Binding constraint for local national bank entry:

- no-branching rule
- residency & investment requirements for directors
- \$50,000 $\approx$ 140 times annual manufacturing wage

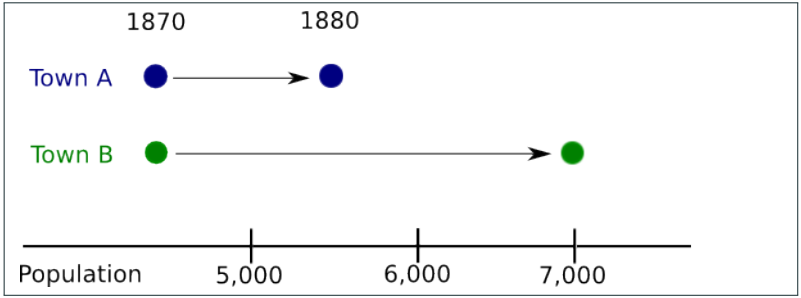
Sample selection



1870 census:

1. Population: cities and towns with population $<$ 6,000 people $\Rightarrow$ face same low capital requirement
2. National banks: none as of 1875 $\Rightarrow$ focus on impact of *first* NB

Sample selection



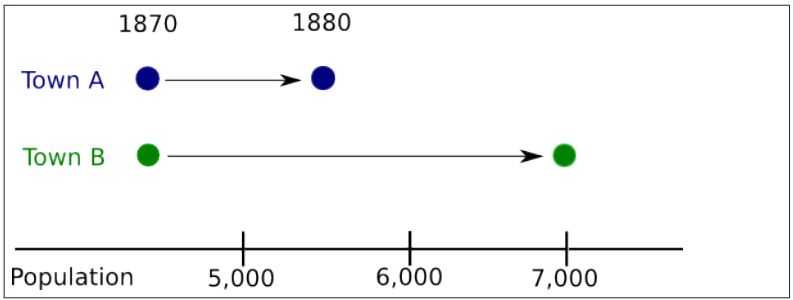
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1880 census:

3. Population between 4,000 and 8,000 $\Rightarrow$ narrow bandwidth to keep towns comparable

Instrument for gaining national bank



- Crossing the 6,000 population threshold $\Rightarrow$ **exogenously higher entry costs**
  - Control for unobserved differences in growth trajectory with population change from 1870–1880 (Carlson et al., 2018)
- **Identifying assumption:** no concurrent shock to $\leq$ 6000 pop towns in 1880

Town population data source: original census publications

Excerpt from the Decennial Census (1880)

MINOR CIVIL DIVISIONS.	1880.	1870.	REMARKS.
PLYMOUTH—continued.			
Marshfield town	1,781	1,659	
Middleborough town	5,237	4,087	
Pembroke town	1,405	1,447	
Plymouth town	7,093	6,238	
Plympton town	604	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. pts. 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	1,665	1,803	

National banks data source: annual call reports

Excerpt from the *Annual Report of the OCC* (1875)

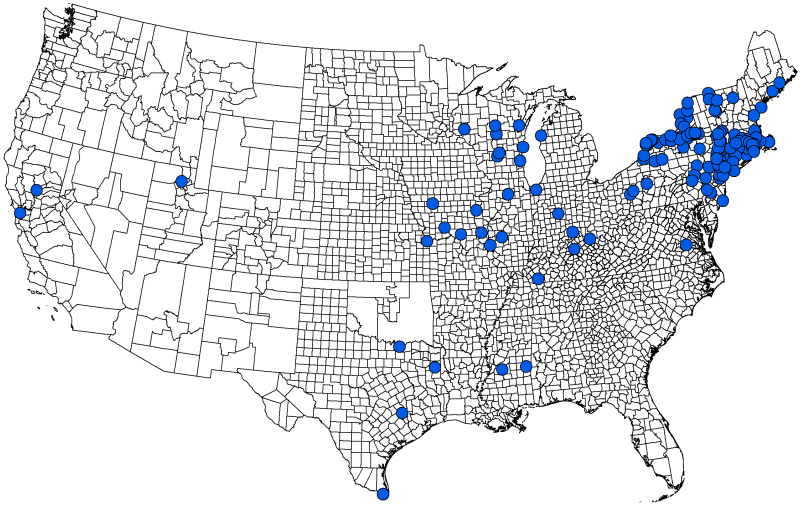
MASSACHUSETTS.

Neponset National Bank, Canton.

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

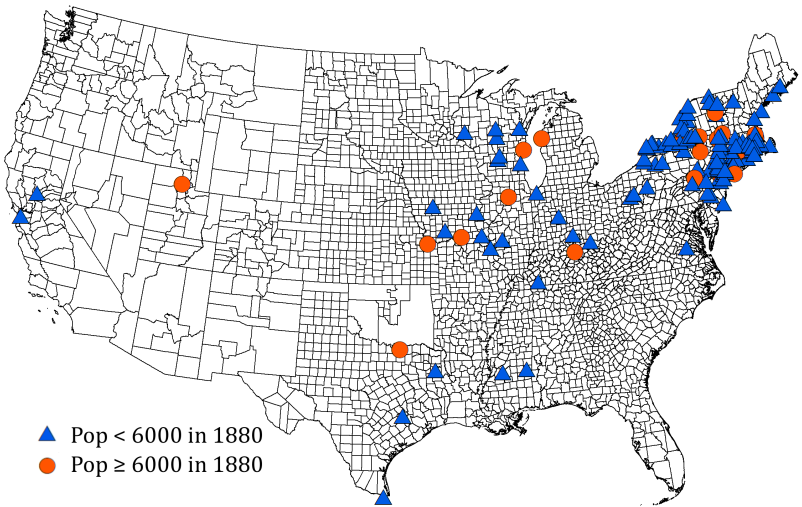
Resources.		Liabilities.	
Loans and discounts	$375,351 71	Capital stock paid in	$250,000 00
Overdrafts	501 43		
U. S. bonds to secure circulation	250,000 00	Surplus fund	35,991 05
U. S. bonds to secure deposits		Other undivided profits	51,823 64
U. S. bonds on hand			
Other stocks, bonds, and mortgages		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	84,223 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

Towns in our sample

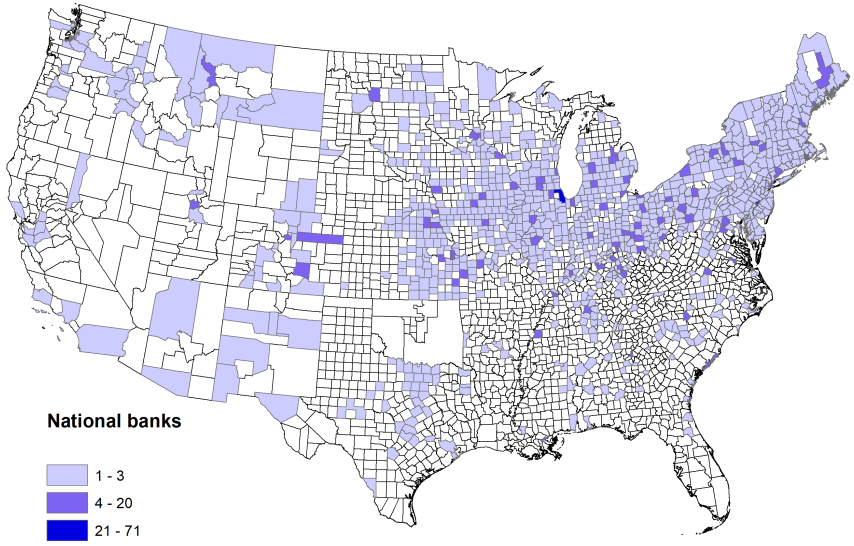


Towns in our sample

Towns in orange crossed the population threshold

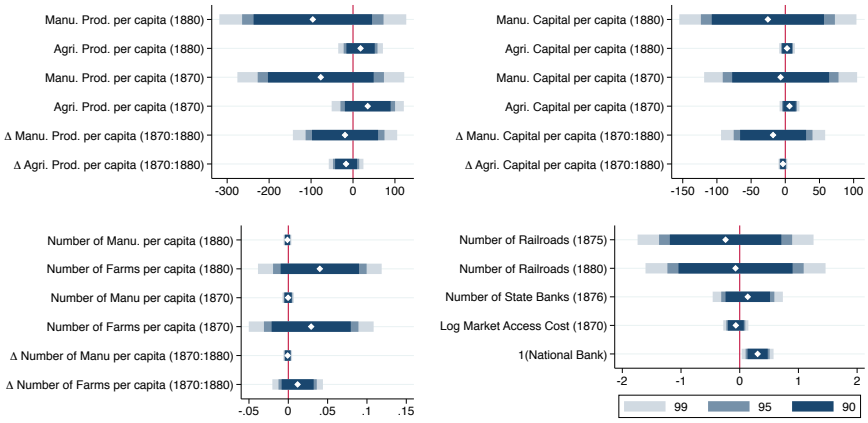


All National Banks in 1885



Pre-period balance: 1870 and 1880

$$Y_{i,s} = \beta \mathbb{I}(\text{Pop1880}_{i,s} < 6000) + \gamma \Delta Pop_{i,s} + \eta_s + \varepsilon_{i,s}$$



First stage: does a town have a NB by 1885?

$$\mathbb{I}(\text{National Bank})_{i,s} = \beta \mathbb{I}(\text{Pop1880}_{i,s} < 6000) + \Gamma' X_{i,s} + \eta_s + \varepsilon_{is}$$

	$\mathbb{I}$(National Bank)	
	(1)	(2)
$\mathbb{I}$(pop<6k)	**0.305*** **	**0.286*** **
	(0.104)	(0.0997)
ΔPop(1870:1880)	0.000135***	0.000133***
	(0.0000354)	(0.0000341)
No. railroads (1875)		-0.00349
		(0.0159)
No. state banks (1876)		0.137***
		(0.0398)
State FE	Y	Y
Adj. R^2	0.229	0.289
N	148	148

First stage falsification tests: placebo population cut-offs

$$\mathbb{I}(\text{National Bank})_{i,s} = \beta \mathbb{I}(\text{Pop1880}_{i,s} < \text{placebo cutoff}) + \Delta Pop_{i,s} + \eta_s + \varepsilon_{i,s}$$

	(1) 5000	(2) 5500	(3) 6000	(4) 6500	(5) 7000
Population Cutoff	0.0646	0.103	**0.305*** **	0.219*	0.209
	(0.0729)	(0.0922)	(0.104)	(0.113)	(0.147)
State FE	Y	Y	Y	Y	Y
Δ Pop control	Y	Y	Y	Y	Y
Adj. R^2	0.180	0.183	0.229	0.199	0.188
N	148	148	148	148	148

Recap

Policy shock:

- Federal government created new class of National Banks with more liquid liabilities

Instrument:

- Regulatory capital requirements for establishing a National Bank are plausibly exogenous source of variation in entry costs
- Balance on observable pre-period characteristics
- Strong first stage, robust to placebo cut-offs

Effects on Real Economy

Data for outcomes

- **Agriculture:** Census of Agriculture (1880 & 1890)
- **Labor market:** Zell's Classified United States Business Directory (1875 & 1887)
- **Manufacturing:** Census of Manufacturers (1880 & 1890)
- **Innovation:** historical patent data (1850-1900) from Petralia et al. (2016)

No change in agricultural production per capita

$$\Delta Y_{i,s} = \beta \hat{\mathbb{I}}(\text{National Bank}) + \Gamma' X_{i,s} + \eta_s + \varepsilon_{i,s}$$

	OLS		RF		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{I}$(National Bank)	-11.36	-3.316			-9.331	3.708
	(7.140)	(7.816)			(19.33)	(24.90)
$\mathbb{I}$(pop<6k)			-4.097	1.253		
			(9.396)	(9.280)		
State FE	Y	Y	Y	Y	Y	Y
Controls	N	Y	N	Y	N	Y
Mean of Dep. Var.	-25.48	-25.48	-25.48	-25.48	-25.48	-25.48
Std. Dev. of Dep. Var.	33.54	33.54	33.54	33.54	33.54	33.54
N	148	148	148	148	148	148
KP F-stat					15.74	10.68

- Null results consistent with limited long-term lending by national banks to the agricultural sector

No change in land and fixtures value per capita

$$\Delta Y_{i,s} = \beta \hat{\mathbb{I}}(\text{National Bank}) + \Gamma' X_{i,s} + \eta_s + \varepsilon_{i,s}$$

	OLS		RF		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{I}$(National Bank)	12.46	-4.666			37.25	32.21
	(32.40)	(35.33)			(87.91)	(112.7)
$\mathbb{I}$(pop<6k)			16.36	10.89		
			(42.25)	(41.91)		
State FE	Y	Y	Y	Y	Y	Y
Controls	N	Y	N	Y	N	Y
Mean of Dep. Var.	-130.0	-130.0	-130.0	-130.0	-130.0	-130.0
Std. Dev. of Dep. Var.	205.9	205.9	205.9	205.9	205.9	205.9
N	148	148	148	148	148	148
KP F-stat					15.74	10.68

- Null results consistent with limited long-term lending by national banks to the agricultural sector

Shift toward traded agricultural products

$$\Delta\text{Non-tradeable share}_{i,s} = \beta\hat{\mathbb{I}}(\text{National Bank}) + \Gamma' X_{i,s} + \eta_s + \varepsilon_{i,s}$$

	OLS		RF		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{I}$(National Bank)	-0.0167*	-0.0247**			**-0.0710*** **	**-0.102*** **
	(0.00856)	(0.00949)			(0.0267)	(0.0375)
$\mathbb{I}$(pop<6k)			-0.0312***	-0.0345***		
			(0.0110)	(0.0111)		
State FE	Y	Y	Y	Y	Y	Y
Controls	N	Y	N	Y	N	Y
Mean of Fractions in 1880	0.0943	0.0943	0.0943	0.0943	0.0943	0.0943
N	148	148	148	148	148	148
KP F-stat					15.74	10.68

- Traded products on Chicago Board of Trade: corn, wheat, oats
- Non-traded products: barley, rye

Evidence from prices of traded vs nontraded goods

$$P_{it} = \alpha + \beta \mathbb{I}(\text{National Bank})_{it} + \gamma_t + \varepsilon_{it}$$

	(1) Price of Tea	(2) Price of Molasses	(3) Price of Starch
$\mathbb{I}$(National Bank)	**-0.294*** **	**-0.250*** **	-0.0105
	(0.0844)	(0.0651)	(0.00775)
Year FE	Y	Y	Y
Pre-NB Mean	1.238	1.120	0.120
N	115	105	117
Adj. R^2	0.229	0.350	0.147

- Data: price series for 9 towns from 1864 to 1880
- First year of having a national bank: between 1866 and 1878
- Goods:
  - Traded: tea & molasses
  - Nontraded: starch

Recap

Policy shock:

- Federal government created new class of National Banks with more liquid liabilities

Instrument:

- Regulatory capital requirements for establishing a National Bank are plausibly exogenous source of variation in entry costs
- Strong first stage, robust to placebo and observable pre-period characteristics are balanced

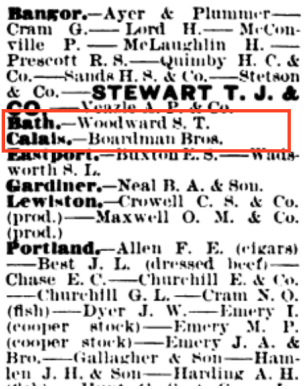
Real economic effects:

- Agriculture: composition of goods produced shifts towards *tradeables*

Labor effects: town-level evidence

- Proxy for transactions-intensity with trade-related professions
- Data source: Zell's Classified United States Business Directory (1887 and 1875)

Example from Zell's Business Directory (1887)



MAINE.

Bangor.—Ayer & Plummer——Cram G.——Lord H.——McConville P.——McLaughlin H.——Prescott R. S.——Quimby H. C. & Co.——Sands H. S. & Co.——Stetson & Co.——**STEWART T. J. & CO.**——Veazie A. P. & Co.

Bath.—Woodward S. T.

Calais.—Boardman Bros.

Eastport.—Buxton E. S.——Wadsworth S. L.

Gardiner.—Neal B. A. & Son.

Lewiston.—Crowell C. S. & Co. (prod.)——Maxwell O. M. & Co. (prod.)

Portland.—Allen F. E. (cigars)——Best J. L. (dressed beef)——Chase E. C.——Churchill E. & Co.——Churchill G. L.——Cram N. O. (fish)——Dyer J. W.——Emery I. (cooper stock)——Emery M. P. (cooper stock)——Emery J. A. & Bro.——Gallagher & Son——Hamlen J. H. & Son——Harding A. H.

Increase in trade-related professions

$$\Delta\#\text{Commission Merchants}_{i,s} = \beta\hat{\mathbb{1}}(\text{National Bank}) + \Gamma' X_{i,s} + \eta_s + \varepsilon_{i,s}$$

	OLS		RF		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}$(National Bank)	0.0624	0.189			**1.278****	**1.447****
	(0.137)	(0.141)			(0.624)	(0.650)
$\mathbb{1}$(pop<6k)			0.390**	0.413***		
			(0.159)	(0.156)		
State FE	Y	Y	Y	Y	Y	Y
Controls	N	Y	N	Y	N	Y
Average No. in 1875	0.135	0.135	0.135	0.135	0.135	0.135
N	148	148	148	148	148	148
KP F-stat					8.676	8.212

Similar evidence for "buyers & shippers" at county-level in Census of Population

Placebo: little change in professions not related to trade

$$\Delta\#\text{Architects}_{i,s} = \beta\hat{\mathbb{I}}(\text{National Bank}) + \Gamma' X_{i,s} + \eta_s + \varepsilon_{i,s}$$

	OLS		RF		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{I}$(National Bank)	0.0126	0.0302			0.193	0.201
	(0.119)	(0.125)			(0.427)	(0.453)
$\mathbb{I}$(pop<6k)			0.0590	0.0573		
			(0.142)	(0.142)		
State FE	Y	Y	Y	Y	Y	Y
Controls	N	Y	N	Y	N	Y
Average No. in 1875	0.00676	0.00676	0.00676	0.00676	0.00676	0.00676
N	148	148	148	148	148	148
KP F-stat					8.676	8.212

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- Labor: increase in trade-related occupations

Increase in manufacturing production per capita

$$\Delta Y_{i,s} = \beta \hat{\mathbb{I}}(\text{National Bank}) + \Gamma' X_{i,s} + \eta_s + \varepsilon_{i,s}$$

	OLS		RF		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{I}$(National Bank)	39.87	57.43			**228.5****	**310.0****
	(32.97)	(36.16)			(100.4)	(136.0)
$\mathbb{I}$(pop<6k)			100.4**	104.8**		
			(42.28)	(42.29)		
State FE	Y	Y	Y	Y	Y	Y
Controls	N	Y	N	Y	N	Y
Mean of Dep. Var.	82.21	82.21	82.21	82.21	82.21	82.21
Std. Dev. of Dep. Var.	251.2	251.2	251.2	251.2	251.2	251.2
N	148	148	148	148	148	148
KP F-stat					15.74	10.68

Mean of production per capita in 1880: \$625.

No change in manufacturing capital per capita

$$\Delta Y_{i,s} = \beta \hat{\mathbb{I}}(\text{National Bank}) + \Gamma' X_{i,s} + \eta_s + \varepsilon_{i,s}$$

	OLS		RF		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{I}$(National Bank)	2.508	44.01			55.86	132.0
	(37.18)	(41.16)			(101.5)	(133.1)
$\mathbb{I}$(pop<6k)			24.53	44.62		
			(48.42)	(48.90)		
State FE	Y	Y	Y	Y	Y	Y
Controls	N	Y	N	Y	N	Y
Mean of Dep. Var.	218.0	218.0	218.0	218.0	218.0	218.0
Std. Dev. of Dep. Var.	204.7	204.7	204.7	204.7	204.7	204.7
N	148	148	148	148	148	148
KP F-stat					15.74	10.68

- No result with manufacturing capital: National Bank regulations limited long-term lending

Increase in manufacturing inputs per capita

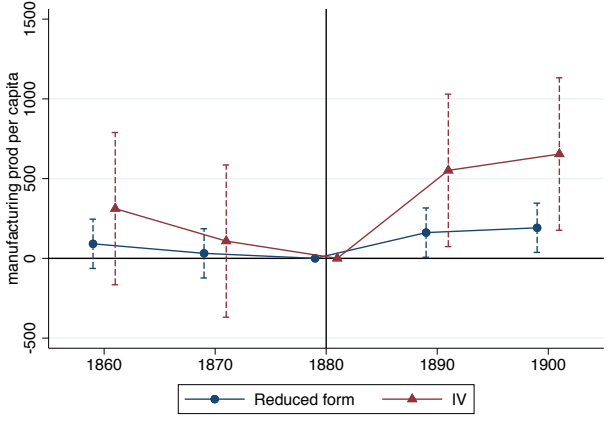
$$\Delta Y_{i,s} = \beta \hat{\mathbb{I}}(\text{National Bank}) + \Gamma' X_{i,s} + \eta_s + \varepsilon_{i,s}$$

	OLS		RF		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{I}$(National Bank)	27.01	34.75*			**153.5*** **	**205.4** **
	(18.41)	(20.53)			(58.61)	(81.69)
$\mathbb{I}$(pop<6k)			67.40***	69.40***		
			(23.43)	(23.83)		
State FE	Y	Y	Y	Y	Y	Y
Controls	N	Y	N	Y	N	Y
Mean of Dep. Var.	9.643	9.643	9.643	9.643	9.643	9.643
Std. Dev. of Dep. Var.	193.3	193.3	193.3	193.3	193.3	193.3
N	148	148	148	148	148	148
KP F-stat					15.74	10.68

Mean of inputs per capita in 1880 and 1890: $380 and $390.

Persistent effects: Manufacturing production per capita

$$Y_{ist} = \sum_k \beta_k \widetilde{1}(\text{National Bank}) \times 1_{\{year=k\}} + \sum_k \gamma_k \Gamma' \times 1_{\{year=k\}} + \eta_{st} + \alpha_i + \varepsilon_{it}$$



N = 733

Recap

Policy shock:

- Federal government created new class of National Banks with more liquid liabilities

Instrument:

- Regulatory capital requirements for establishing a National Bank are plausibly exogenous source of variation in entry costs
- Strong first stage, robust to placebo and observable pre-period characteristics are balanced

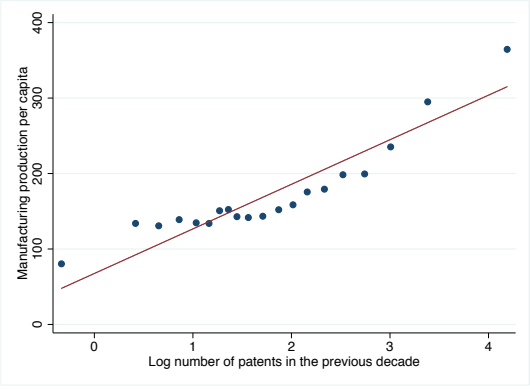
Real economic effects:

- Agriculture: composition of goods produced shifts towards *tradeables*
- Labor: increase in trade-related occupations
- Manufacturing: increase in inputs & outputs, but not capital stock
  - Persistent for two decades

Innovation

Local innovation activity

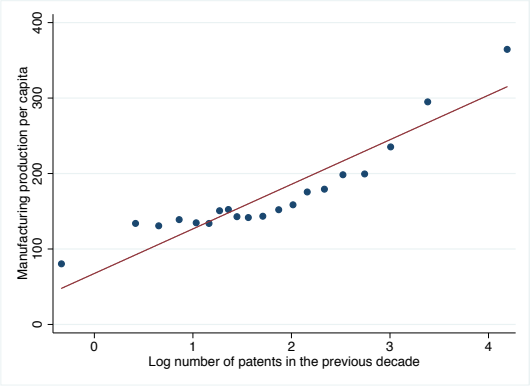
- Innovation significantly correlated with manufacturing output



County-level data, 1850-1900 (Petralia et al., 2016)

Local innovation activity

- Innovation significantly correlated with manufacturing output



County-level data, 1850-1900 (Petralia et al., 2016)

Does market access spur innovation?

Local innovation activity

Dependent variable: $\frac{\text{No. of Patents (1881-1890)}}{\text{No. of Patents (1871-1880)}} - 1$

	OLS		RF		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{I}$(National Bank)	0.350*	0.422**			**1.049****	**1.393****
	(0.180)	(0.203)			(0.516)	(0.702)
$\mathbb{I}$(pop<6k)			0.461*	0.471*		
			(0.235)	(0.241)		
State FE	Y	Y	Y	Y	Y	Y
Controls	N	Y	N	Y	N	Y
Mean of Dep. Var.	0.640	0.640	0.640	0.640	0.640	0.640
Std. Dev. of Dep. Var.	1.379	1.379	1.379	1.379	1.379	1.379
N	148	148	148	148	148	148
KP F-stat					15.74	10.68

- Trade and innovation may help explain the large effects on manufacturing sector growth

Conclusion

- We study the real economic effect of altering the liabilities side of bank balance sheets
  - National Banking Act creates a unique laboratory for studying liquidity creation via financial intermediaries
  - Instrument for the likelihood of National Bank entry with regulatory capital requirements based on population cutoffs
  - Smaller towns below the cutoff had access to more liquid transactions medium
- Main results: a stable medium of exchange has large (and persistent) output effects, consistent with monetary non-neutrality
- Implications for policy: imperfect money-like substitutes will likely have real output costs

Thank you!

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