The Effects of Banking Competition on Growth and Financial Stability: Evidence from the National Banking Era

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December 2, 2020

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Research question

What is the **causal** effect of **competition in banking** on

1. Credit provision?

2. Financial stability?

3. Real economic outcomes?

What do we know? (Theory)

- Theoretical predictions are ambiguous
- Equally plausible theories predict different outcomes

- Credit supply
  - Standard IO arguments: competition increases credit (Klein, 1971)
  - Relationships matter: competition decreases credit (Petersen and Rajan, 1995)

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  - Monopolist decreases risk to protect charter value
    (Keeley, 1990)
  - Monopolist increases rates and lending because more risky
    (Boyd and DeNicolo, 2005)

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- Synthesis
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What do we know? (Empirical evidence)

- **Identification challenge:** competition and concentration are not exogenous

- Most evidence based on lifting of branching restrictions

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  > (Jayaratne and Strahan, 1996, 1998, Black and Strahan, 2002; Cetorelli and Strahan, 2006; Dick and Lehnert, 2010; Jiang et al., 2016)
- Confounding factors:
  - Ability to diversify geographically
    > (Goetz et al., 2016)
  - Political economy of bank mergers
    > (Agarwal et al., 2012; Calomiris and Haber, 2014)

Why the National Banking Era? (1864–1913)

1. Little government interference
   - No deposit insurance
   - No bailouts or Too-Big-to-Fail terms
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3. Capital regulation gives rise to **exogenous variation in entry barriers**

Findings

1. Competition **increases credit provision**
   - Banks increase credit provision to **deter** potential entrants
   - Reminiscent of Goolsbee and Syverson (2008)

2. Competition increases risk taking
   - Higher leverage
   - Seize more collateral
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Causal evidence for a tradeoff: credit provision vs. financial stability
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Capital requirement during National Banking Era

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$$\text{"Capital stock paid in"} \geq \begin{cases} \$50,000 & \text{if population } \leq 6,000 \\ \$100,000 & \text{if population } \in (6,000, 50,000] \\ \$200,000 & \text{if population } > 50,000 \end{cases}$$

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- Capital requirements represent a barrier to entry
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- Leverage can be chosen freely (subject to market constraints)

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Identification

Two key details for the identification strategy:

1. Legal population according to last **census**
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1. Legal population according to last **census**
   ⇒ Publication of census induces change in the capital required for entrants

2. Change **does not apply to incumbent banks** ("grandfather clause")
   ⇒ Change incumbent behavior across markets can only stem from change in entry barriers

Data

OCC's annual "Call Reports"

- Data for **all** national banks from 1867 to 1904
- 112, 209 "Call Reports" for 7, 315 banks
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Other data sources:

- Decennial census
  - Population from Schmidt (2017)
  - Manufacturing outcomes from Haines (2004)
- Railroad connections from Atack (2013)
- Information on existence on non-federal chartered banks from Jaremski and Fishback (2018)

OCC's Annual Report to the Congress: Example

NEW YORK.

Chase National Bank, New York.

H. W. CANNON, *President.*   No. 2370.   J. T. MILLS, JR., *Cashier.*

| Resources.		Liabilities.	
Loans and discounts.............	$14,954,408.80	Capital stock paid in.............	$500,000.00
Overdrafts......................	4,683.41		
U. S. bonds to secure circulation...	50,000.00	Surplus fund.....................	1,000,000.00
U. S. bonds to secure deposits......	200,000.00	Undivided profits, less current	
U. S. bonds on hand.............	167,350.00	expenses and taxes paid........	284,769.70
Premiums on U. S. bonds.........	26,782.06	National-bank notes outstanding.	45,000.00
Stocks, securities, etc.............	2,882,266.11	State-bank notes outstanding.....	
Bank'g house, furniture, and fixtures	....		
Other real estate and mortg's owned	....	Due to other national banks......	9,309,113.60
Due from other national banks.....	759,750.57	Due to State banks and bankers..	9,312,523.30
Due from State banks and bankers.	239,149.84		
Due from approved reserve agents..	....	Dividends unpaid................	
Checks and other cash items.......	5,855.93	Individual deposits..............	4,641,779.71
Exchanges for clearing house.......	375,878.15	Certified checks	153,674.33
Bills of other national banks.......	45,250.00	United States deposits...........	
Fractional currency, nickels, cents.	262.13	Deposits of U.S. disbursing officers.	110,450.36
Specie.........................	739,586.00		
Legal-tender notes..............	883,838.00	Notes and bills rediscounted......	
U. S. certificates of deposit.......	4,020,000.00	Bills payable....................	
Redemption fund with Treas. U. S.	2,250.00		
Due from Treasurer U. S..........	....	Liabilities other than those above	
		stated	
Total	25,357,311.00	Total	25,357,311.00

The National Banking System in 1870
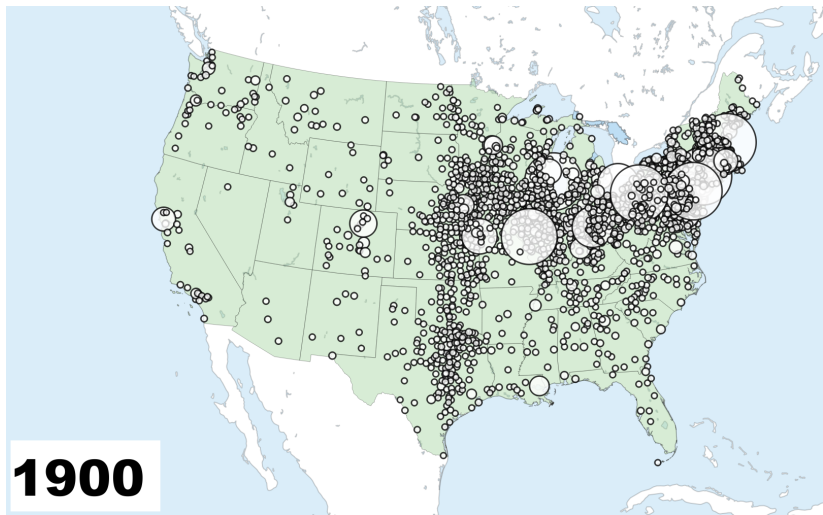

1870
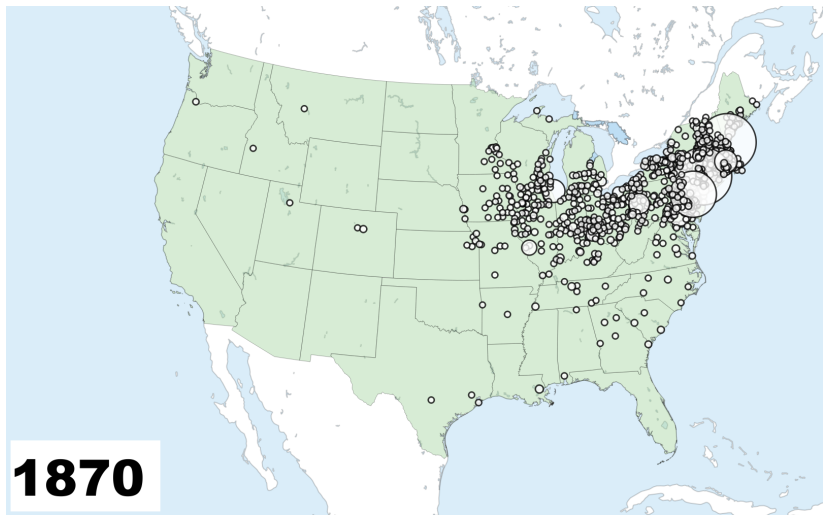
The National Banking System in 1880

1880
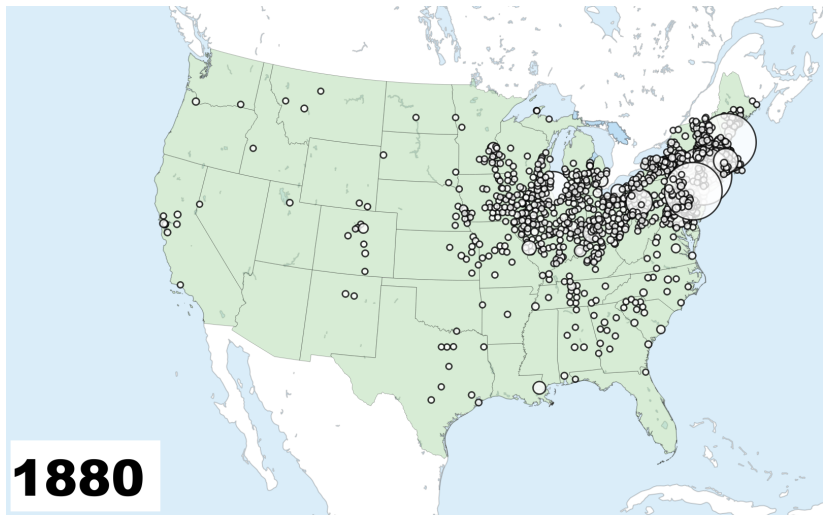
The National Banking System in 1890

1890
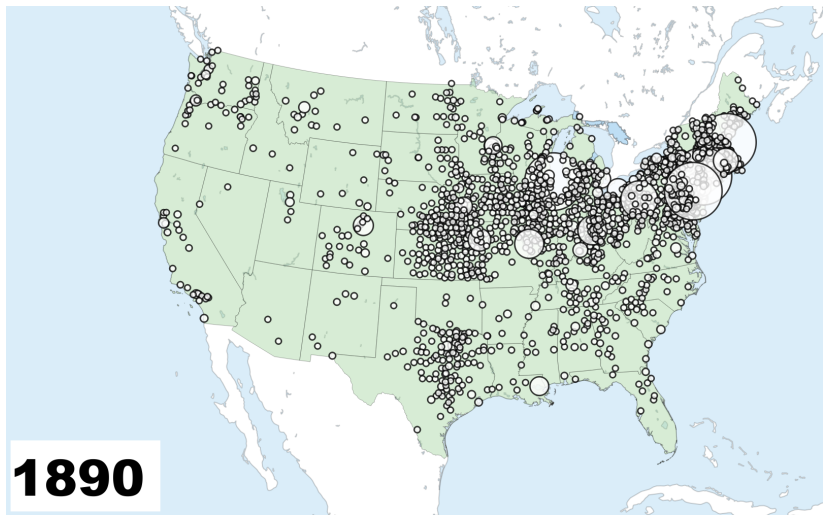
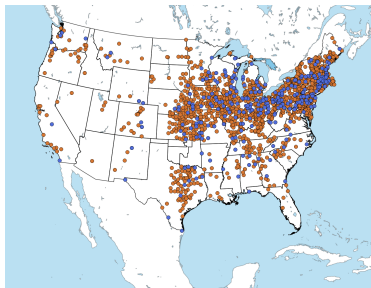# The National Banking System in 1900

1900

Sample

- Focus on towns that had less than 6,000 inhabitants as of the preceding census
  - More than 95% of considered markets have one or two national banks
  - → Margin of getting a second or third firm
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- Focus on behavior of incumbent banks
  - → Not directly affected by the change in required capital.

Sample

- 2,864 city-census year observations
- 1,700 unique cities with 285 cities treated
- 2,400 incumbent national banks, more than 400 in treated towns
  - approx. 50% of all national banks in each census year

Concern 1: Treated markets are larger and somehow different

Around the cutoff, towns are indistinguishable in population growth, industrialization, and banking history

	Population ≤ 6000			Population > 6000			Difference	
	Mean	Std	N	Mean	Std	N	Diff	t-stat
Population	5,471.7	275.5	197	6,439.1	295.8	121	967.4	29.553
Δ_{harm} Population	35.0	30.2	197	39.5	31.9	121	4.5	1.265
Bank entries in previous decade	0.8	0.8	197	0.8	0.9	121	-0.0	-0.172
Δ Loans during previous decade	44.3	48.1	105	45.3	57.6	73	1.0	0.126
Per capita bank capital	39.0	27.5	197	38.4	29.7	121	-0.6	-0.181
Per capita manufacturing capital	83.4	81.3	195	95.5	98.4	120	12.1	1.187
Per capita farm value	341.7	190.7	195	304.4	203.2	120	-37.3	-1.643

Empirical strategy:

- Identifying assumption: assignment of high and low entry barriers is quasi-random around cutoff

- Use tools developed for the analysis of regression discontinuity (RD) (Imbens and Lemieux, 2008; Lee and Lemieux, 2010; Cattaneo et al., 2019)

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# Concern 2: Results could be driven by substitution by state banking

Higher capital requirements for national banks make state banking more attractive

- Analyze whether this mattered in two ways

1. Test for state bank entry
2. Exploit variation in state bank entry requirements
   - Identify set of state in which state bank entry is at discretion of local bank regulator

     (White, 1983)
   - Arguably, this makes entry as state bank prohibitively costly

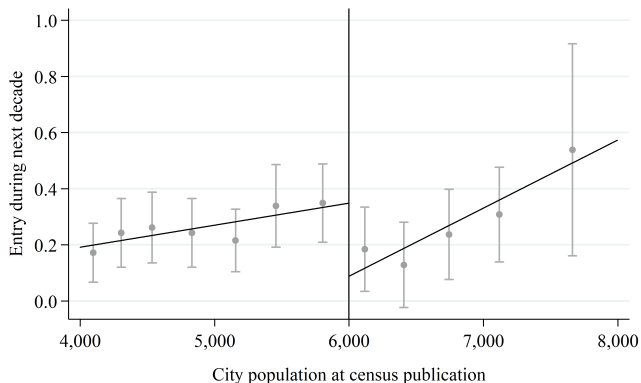   (Schwartz, 1947)

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Capital paid-in of newly founded banks

Regulatory capital of newyl founded banks (1871-1899)
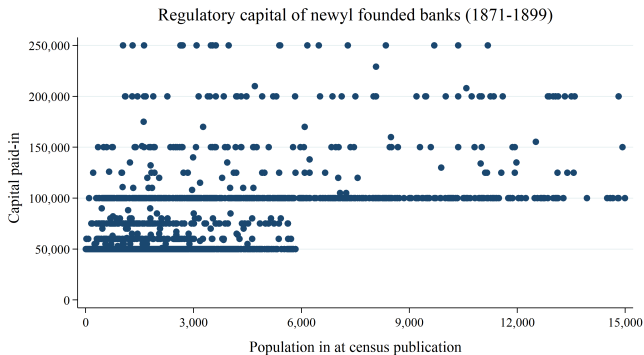
- All newly founded banks between 1871 and 1899 fulfill the capital regulation.
- Around 2/3 of the times the constraint is binding

Does an increase in required capital predict entry?

- Quantile-spaced, data-driven bin selection

  (Calonico et al. 2017)

Do barriers to entry predict entry?

Estimate local linear regressions

$$y_{ct} = \alpha + \beta_1 \cdot \mathbb{1}_{ct}^{\text{pop}>6,000} + \beta_2 \cdot (\text{pop}_{ct} - 6,000) + \beta_3 \cdot \mathbb{1}_{ct}^{\text{pop}>6,000} \cdot (\text{pop}_{ct} - 6,000) + \varepsilon_{ct},$$

- where y_{ct} is the number of entries in the decade following a publication

$$\mathbb{1}_{ct}^{\text{pop}>6,000} = \begin{cases} 1 & \text{if } \text{pop}_{ct} > 6,000 \\ 0 & \text{if } \text{pop}_{ct} \leq 6,000 \end{cases}.$$

- Census from year $t \in \{1870, 1880, 1890\}$
- Non-parametric estimation
  - (Hahn et al., 2001; Calonico et al. 2014)
- MSE-optimal bandwidth selection
  - (Imbens and Kalyanaraman, 2011; Calonico et al. 2017)

Dependent Variable	EntriesNB			EntriesSB
	(1)	(2)	(3)	(4)
Conventional	-0.21**	-0.22**	-0.25**	0.06
	[0.09]	[0.10]	[0.11]	[0.20]
Bias-corrected	-0.22***	-0.22**	-0.27**	0.02
	[0.09]	[0.10]	[0.11]	[0.20]
Robust	-0.22**	-0.22**	-0.27**	0.02
	[0.10]	[0.11]	[0.12]	[0.23]
BW Type	MSE Two	MSE Common	MSE Two	MSE Two
Kernel Type	Epanechnikov	Epanechnikov	Epanechnikov	Epanechnikov
Order Loc. Poly. (p)	1	1	2	1
Order Bias (q)	2	2	3	2
Mean dep. var.	0.21	0.21	0.21	0.18
Num. counties	1,045	1,045	1,045	490
Num. cities	1,721	1,721	1,721	863
Observations	2,891	2,891	2,891	1,892
Obs. left of cutoff	2,592	2,592	2,592	1,752
Obs. right of cutoff	299	299	299	140
Left main bandwidth (h)	2,446	1,619	2,621	2,249
Right main bandwidth (h)	1,825	1,619	3,137	1,499
Effective obs. (left)	616	340	683	426
Effective obs. (right)	183	176	237	93

Permutation tests

- We estimate a set of permutation tests:

$$y_{ct} = \alpha + \beta_1 \times \mathbb{1}_{ct}^{\text{pop}>X} + \beta_2 \times (\text{pop}_{ct} - X) + \beta_3 \times \mathbb{1}_{ct}^{\text{pop}>X} \times (\text{pop} - X) + \varepsilon_c$$

- $X \in \{3,000, ..., 9,000\}$

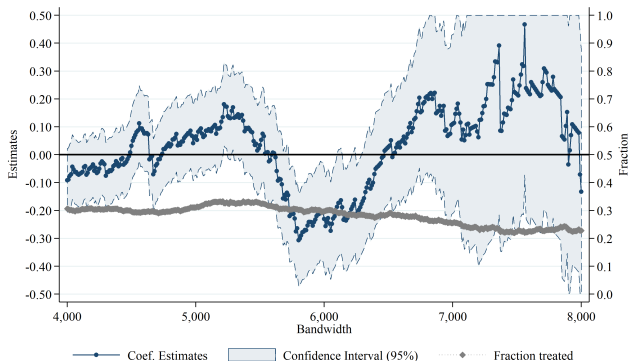# Table of contents

How do incumbents react?

We start out estimating:

$$y_{bt} = \alpha + \beta_1 \cdot \mathbb{1}_{ct}^{\text{pop}>6,000} + \beta_2 \cdot (\text{pop}_{ct} - 6,000) + \beta_3 \cdot \mathbb{1}_{ct}^{\text{pop}>6,000} \cdot (\text{pop}_{ct} - 6,000) + \varepsilon_{bt}$$

- y_{bt} is a banks growth in loans in the ten years following a census publication

Dependent Variable	Δ Loans			
Sample	All cities		No new entrants	
	(1)	(2)	(3)	(4)
Conventional	-11.94*	-15.02**	-16.00**	-13.93**
	[6.23]	[6.72]	[7.12]	[6.59]
Bias-corrected	-14.59**	-17.01**	-17.51**	-14.57**
	[6.23]	[6.72]	[7.12]	[6.59]
Robust	-14.59**	-17.01**	-17.51**	-14.57*
	[7.05]	[7.79]	[8.30]	[7.59]
BW Type	MSE Two	MSE Common	MSE Two	MSE Common
Kernel Type	Epanechnikov	Epanechnikov	Epanechnikov	Epanechnikov
Order Loc. Poly. (p)	1	1	1	1
Order Bias (q)	2	2	2	2
Mean dep. var.	27.06	27.06	23.87	23.87
Num. counties	1,045	1,045	797	797
Num. cities	1,706	1,706	1,307	1,307
Num. banks	2,396	2,396	1,745	1,745
Observations	3,108	3,108	2,494	2,494
Obs. left of cutoff	2,674	2,674	2,206	2,206
Obs. right of cutoff	434	434	288	288
Left main bandwidth (h)	1,934	1,721	1,877	2,166
Right main bandwidth (h)	2,210	1,721	1,550	2,166
Effective obs. (left)	545	466	416	511
Effective obs. (right)	280	250	184	208

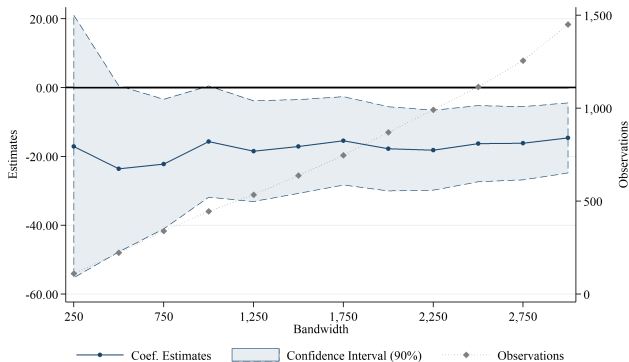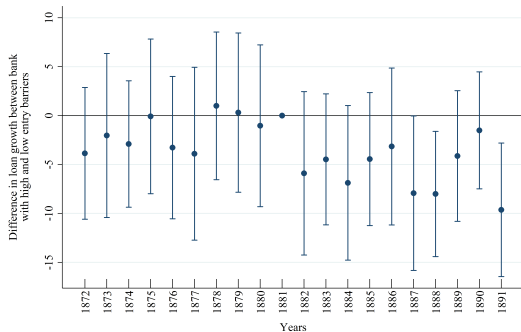# Varying population bandwidth: ΔLoans

Figure: Sensitivity of main of the coefficient for $\mathbb{1}_{ct}^{\text{pop} > 6,000}$ for varying restrictions on the population bandwidth. Average marginal effects reported and 99% confidence bands.

Dynamics of ΔLoans

$$y_{bt} = \tau_t + \beta_t \times \tau_t \times \mathbb{1}_{ct}^{\text{pop}>6,000} + \delta X_{bt} + \varepsilon_{bt}$$
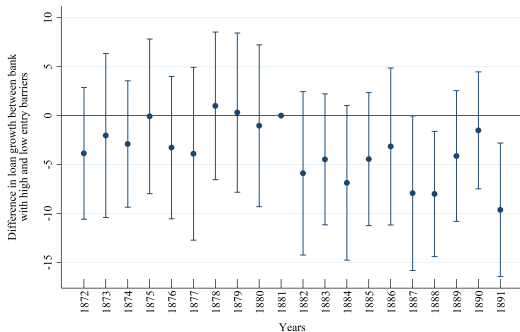
Dynamics of ΔLoans

$$y_{bt} = \tau_t + \beta_t \times \tau_t \times \mathbb{1}_{ct}^{\text{pop}>6,000} + \delta X_{bt} + \varepsilon_{bt}$$

- Lending contracts immediately after census publication
- Evidence in line with entry deterrence (Goolsbee and Syverson, 2008)

Risk Taking I

Formally, we estimate

$$y_{bt} = \alpha + \beta_1 \cdot \mathbb{1}_{ct}^{\text{pop}>6,000} + \beta_2 \cdot (\text{pop}_{ct} - 6,000) + \beta_3 \cdot \mathbb{1}_{ct}^{\text{pop}>6,000} \cdot (\text{pop}_{ct} - 6,000) + \varepsilon_{bt}$$

where y_{bt} can be

- Leverage
- Collateral seized (Other real estate owned, OREO)
- Default

Dependent Variable	$\frac{\text{Equity}}{\text{Assets}}$	$\frac{\text{Equity}}{\text{Loans}}$	OREO	Default
	(1)	(2)	(3)	(4)
Conventional	4.19**	11.76**	-0.07*	-0.06***
	[2.13]	[5.40]	[0.04]	[0.02]
Bias-corrected	4.96**	13.86**	-0.07*	-0.06***
	[2.13]	[5.40]	[0.04]	[0.02]
Robust	4.96**	13.86**	-0.07	-0.06***
	[2.47]	[6.17]	[0.05]	[0.02]
BW Type	MSE Two	MSE Two	MSE Two	MSE Two
Kernel Type	Epanechnikov	Epanechnikov	Epanechnikov	Epanechnikov
Order Loc. Poly. (p)	1	1	1	1
Order Bias (q)	2	2	2	2
Mean dep. var.	36.01	60.85	0.07	0.03
Num. counties	1,045	1,045	1,045	1,045
Num. cities	1,714	1,714	1,714	1,714
Num. banks	2,412	2,412	2,412	2,412
Observations	3,201	3,201	2,578	3,740
Obs. left of cutoff	2,750	2,750	2,210	3,202
Obs. right of cutoff	451	451	368	538
Left main bandwidth (h)	1,595	1,689	1,760	2,479
Right main bandwidth (h)	2,698	2,554	2,020	1,002
Effective obs. (left)	444	477	378	901
Effective obs. (right)	320	309	231	203

Does an increase in required capital predict default?
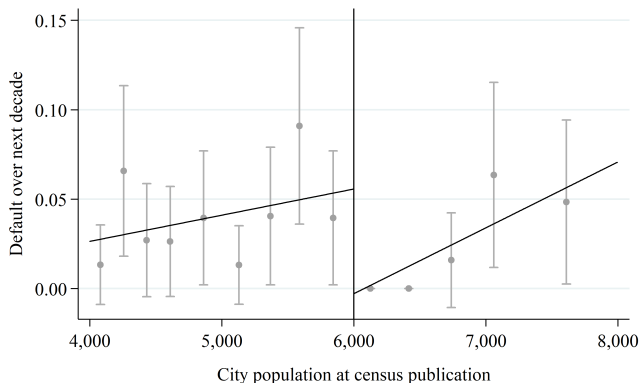
- Quantile-spaced, data-driven bin selection
  (Calonico et al. 2017)

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Dependent Variable	Farm Value	Farm Output	Number of Farms
	(1)	(2)	(3)
Conventional	-71.98*	-13.22**	-13.80**
	[41.80]	[5.96]	[6.00]
Bias-corrected	-89.11**	-15.32**	-15.91***
	[41.80]	[5.96]	[6.00]
Robust	-89.11*	-15.32**	-15.91**
	[46.49]	[6.75]	[6.66]
BW Type	MSE Two	MSE Two	MSE Two
Kernel Type	Epanechnikov	Epanechnikov	Epanechnikov
Order Loc. Poly. (p)	1	1	1
Order Bias (q)	2	2	2
Mean dep. var.	400.18	62.89	86.61
Num. counties	1,045	1,045	1,045
Num. cities	1,720	1,720	1,720
Observations	2,865	2,867	2,867
Obs. left of cutoff	2,570	2,572	2,572
Obs. right of cutoff	295	295	295
Left main bandwidth (h)	1,514	1,447	1,471
Right main bandwidth (h)	3,049	2,783	2,441
Effective obs. (left)	302	282	285
Effective obs. (right)	233	225	215

# Does an increase in required capital predict real growth?
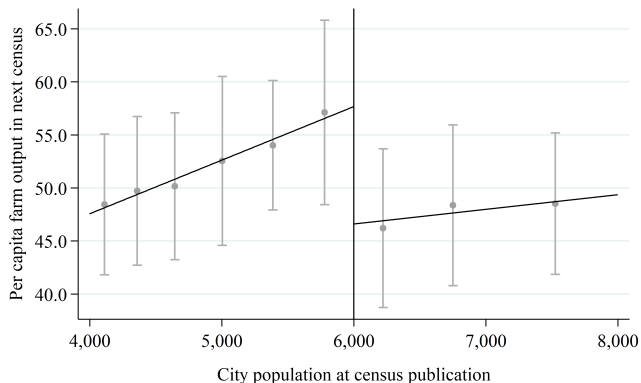
- Quantile-spaced, data-driven bin selection
 (Calonico et al. 2017)

Summary

- Identifying **causal effects of banking competition** is extremely challenging
  - National Banking Era is a "close to ideal" laboratory
- **Findings:**
  - Competition causes credit growth and economic growth
  - Competition causes additional risk taking
- **Implications:**
  - Trade-off between credit growth and financial stability
  - Increased charter values could depress credit but increase stability
 - Especially relevant in lightly regulated parts of financial sector

|	Population ≤ 6000			Population > 6000			Difference	
	Mean	Std	N	Mean	Std	N	Diff	t-stat
Population	5,471.7	275.5	197	6,439.1	295.8	121	967.4	29.553
Δ Population during previous decade	57.8	95.1	197	68.8	116.8	121	10.9	0.913
Δ_{harm} Population	35.0	30.2	197	39.5	31.9	121	4.5	1.265
Number of National banks	1.6	0.7	197	1.7	0.7	121	0.1	0.893
Bank entries in previous decade	0.8	0.8	197	0.8	0.9	121	-0.0	-0.172
Δ Capital during previous decade	15.7	42.1	105	15.5	54.5	73	-0.2	-0.030
Δ Loans during previous decade	44.3	48.1	105	45.3	56.8	73	1.0	0.126
Δ Assets during previous decade	24.6	40.9	105	28.7	46.8	73	4.1	0.620
Per capita bank capital	39.0	27.5	197	38.4	29.7	121	-0.6	-0.181
Per capita bank loans	63.8	48.5	197	63.0	44.8	121	-0.8	-0.145
Per capita bank assets	119.3	78.6	197	117.1	74.3	121	-2.2	-0.246
Number of manufacturing est.	393.8	538.6	195	489.7	844.7	120	96.0	1.232
Per capita manufacturing capital	83.4	81.3	195	95.5	98.4	120	12.1	1.187
Per capita farm value	341.7	190.7	195	304.4	203.2	120	-37.3	-1.643
Number of farms	3,021.2	1,440.3	195	2,661.7	1,462.1	120	-359.5	-2.139
Years of railroad access	28.3	13.1	197	28.4	14.0	121	0.2	0.106
Railroad access	1.0	0.2	197	1.0	0.1	121	0.0	0.768
Number of railroad connections	6.0	4.3	196	6.3	4.2	121	0.3	0.643
Distance to New York City (in km)	849.7	702.9	197	853.1	682.3	121	3.4	0.042
Distance to next big city	92.5	77.0	197	100.8	98.2	121	8.3	0.841
Distance to next populated location	9.7	9.4	197	11.1	9.5	121	1.5	1.344
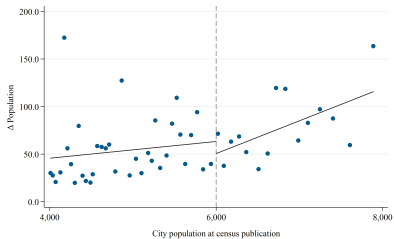
(a) Population growth
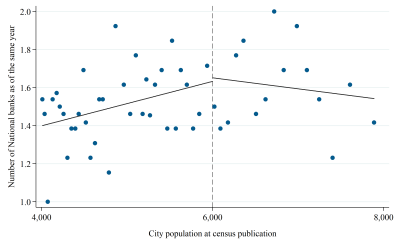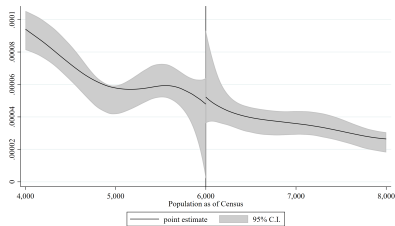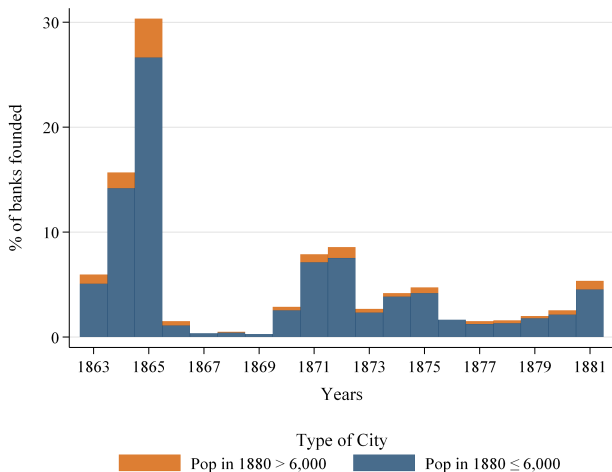
(b) Number of banks
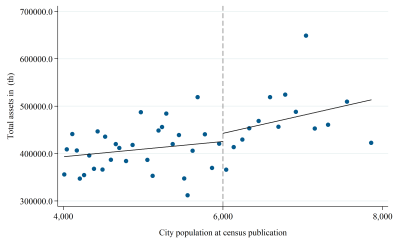
(c) Assets
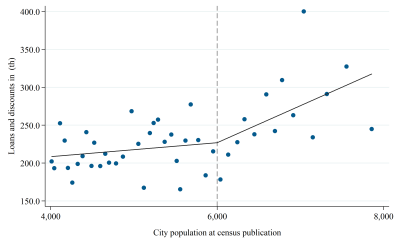
(d) Loans
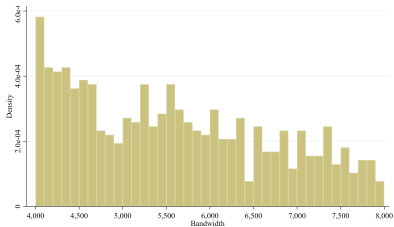
(e) **Histogram of town population.**

(f) **Manipulation test.**

Pre-emptive Entry

- Most banks in sample are founded before 1867. Little evidence of pre-emptive entry.

"Pratt's Digest of the National Bank Act and Other Laws Relating to National Banks from the Revised Statutes of the United States":

*"**The population of a place in the United States is legally determined by the last previous census**. Thus a bank organized at any time between 1880 and 1890 would generally be bound by the census of 1880. Exceptions might of course arise, as, for instance, where new towns are started in the interval, and other proof of population might then be accepted by the Comptroller. Small variations in population between censuses, would not be regarded. **A bank organized with $50,000 capital in a small place might continue with that capital if the population should increase to any number.** It thus sometimes happens that we find banks in some towns and cities that appear to have less than the minimum capital required by law. They were either organized when the places were smaller, or were organized in villages absorbed by cities lying near."* (page 12)

Capital requirement as barriers to entry

- Argument brought forward by Jay Knox, Comptroller of the Currency, in 1876 against reducing capital requirements:

  *[...] The organization of **small institutions in the large cities** has a tendency to **weaken those already organized**, and to so divide the business as to make them all more or less **unprofitable to the shareholders.** [...]*