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

Mark Carlson,[1] Sergio Correia,[2] and Stephan Luck[3]

Views do not necessarily represent views of the Federal Reserve System

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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 argument: competition increases credit (Klein, 1971)
  - Relationships matter: competition decreases credit (Petersen and Rajan, 1995)

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    (Keeley, 1990)
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- Synthesis
  - Depends on stage of development of economy
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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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Two key details for the identification strategy:

1. Legal population according to last **census**
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2. Change does not apply to incumbent banks ("grandfather clause")
   $\Rightarrow$ Change incumbent behavior across markets can only stem from change in entry barriers

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Data

OCC's annual "Call Reports"

- Data for **all** national banks from 1867 to 1904
- $112,209$ "Call Reports" for $7,315$ banks
- Developed new Optical Character Recognition (OCR) techniques to extract information from the reports

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)

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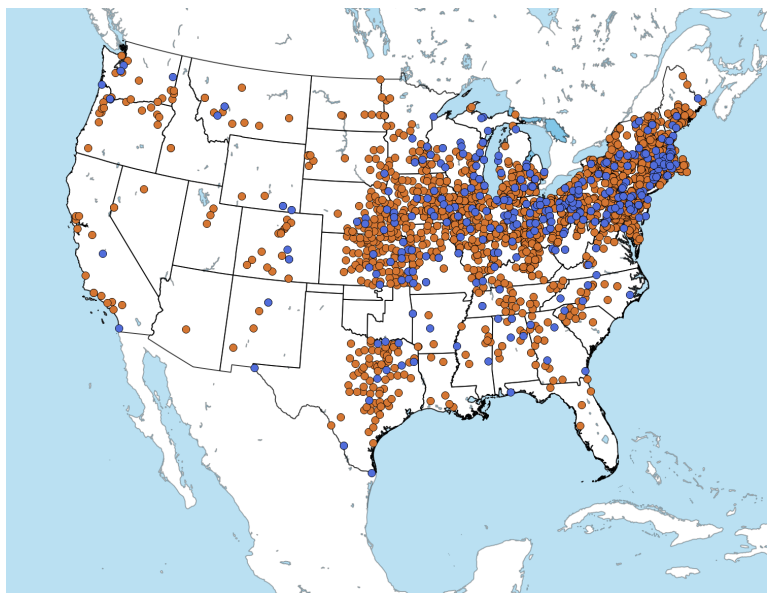
Sample

- 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: Differences in towns

Treated markets **are larger** and **grew faster** in the past

- Around the cutoff, towns are indistinguishable
  - Similar past population growth
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- Empirical strategy:
  - Identifying assumption: assignment of high and low entry barriers is quasi-random around cutoff
  - Use tools developed tools developed for the analysis of regression discontinuity (RD) designs

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Concern 2: State banks

Results could be driven by substitution by state banking

- Higher capital requirements for national banks make state banking more attractive

1. Test for state bank entry
2. Exploit variation in state bank entry requirements (White, 1983)
   - Identify set of state in which state bank entry is at discretion of local bank regulator
   - Arguably, this makes entry as state bank prohibitively costly (Schwartz, 1947)

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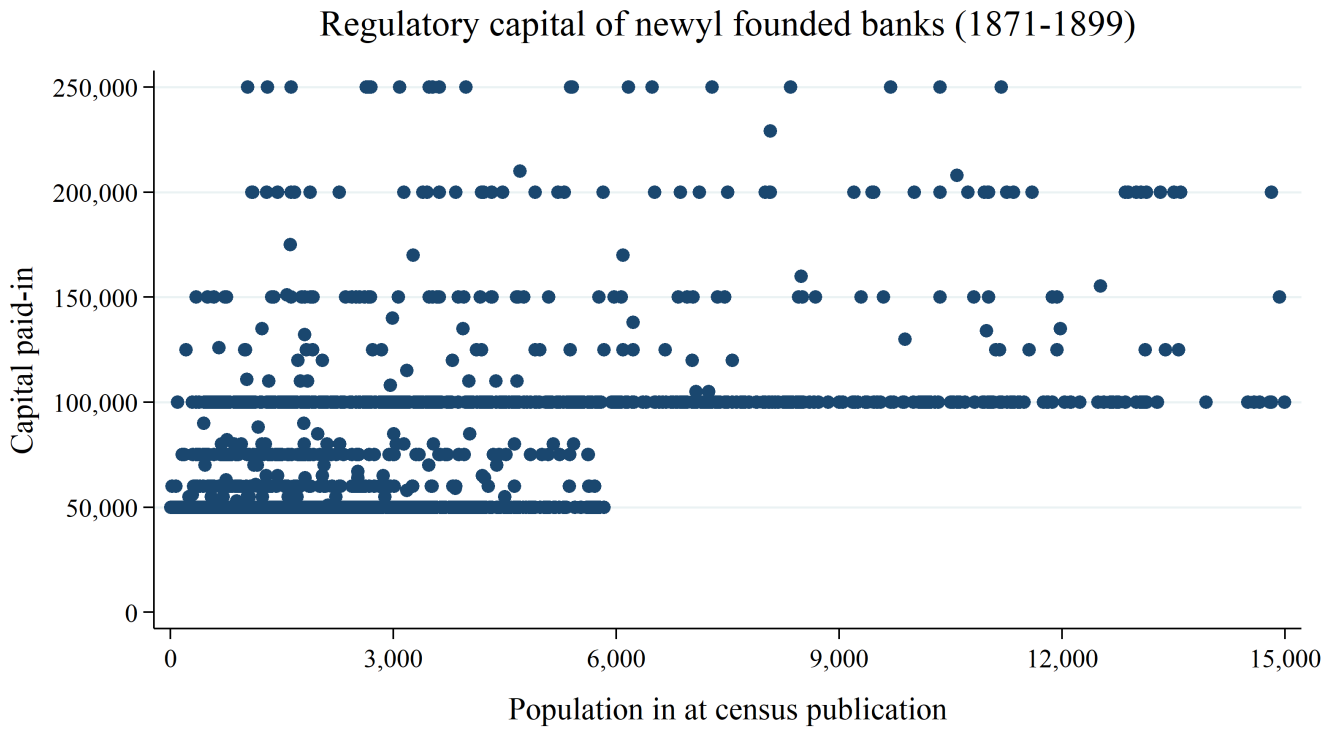
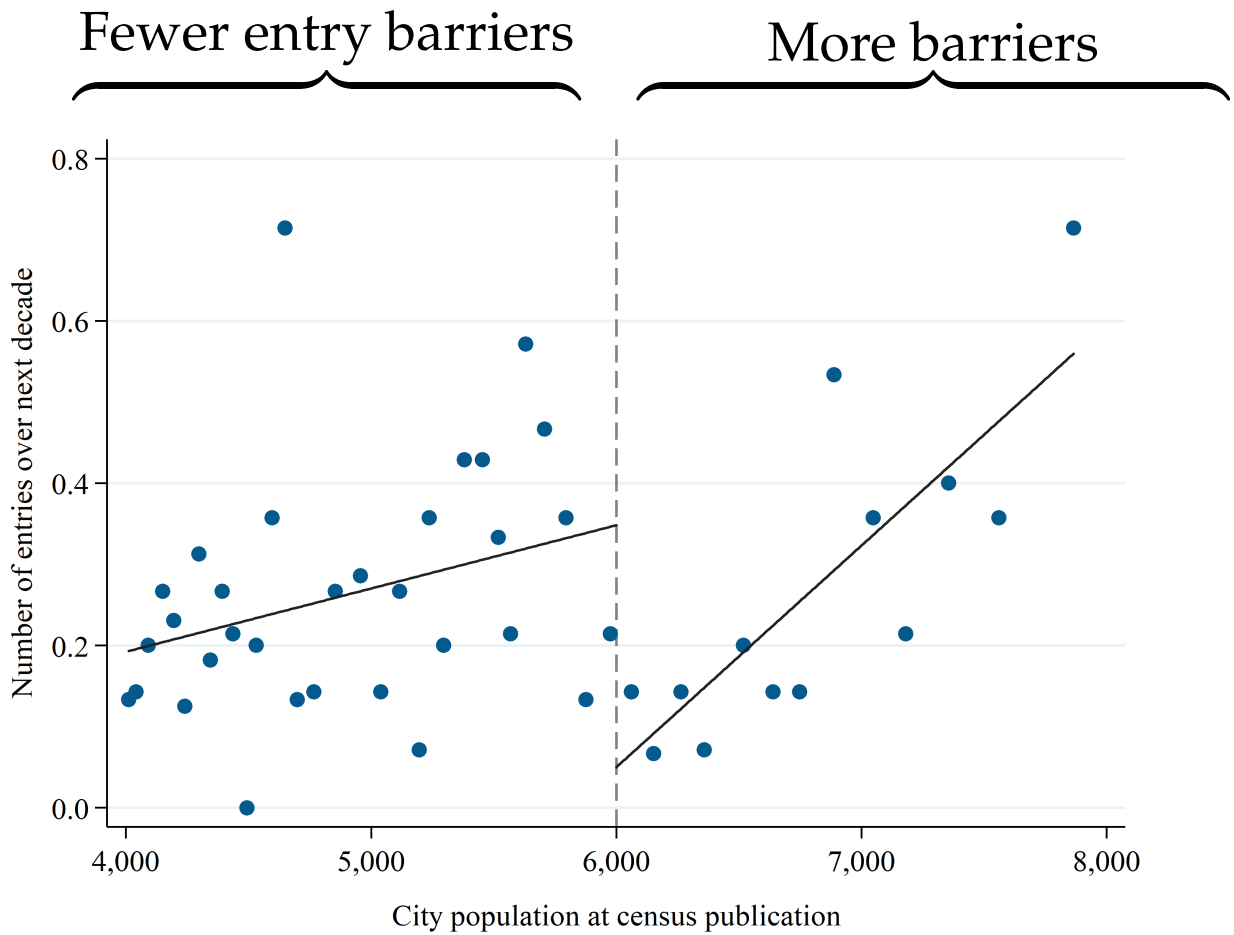
Capital paid-in of newly founded banks



- 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?



- Binned scatterplot with an average binsize of 15
- After 10 years, about 0.3 fewer banks in towns that cross the threshold

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	-0.26***	-0.26***	-0.29***	0.13
	[0.08]	[0.09]	[0.11]	[0.20]
Bias-corrected	-0.28***	-0.28***	-0.30***	0.10
	[0.08]	[0.09]	[0.11]	[0.20]
Robust	-0.28***	-0.28***	-0.30**	0.10
	[0.10]	[0.10]	[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	0.19
Num. counties	1,040	1,040	1,040	486
Num. cities	1,696	1,696	1,696	849
Observations	2,864	2,864	2,864	1,862
Obs. left of cutoff	2,579	2,579	2,579	1,727
Obs. right of cutoff	285	285	285	135
Left main bandwidth (h)	2,468	1,821	2,606	2,306
Right main bandwidth (h)	1,433	1,821	3,083	1,453
Effective obs. (left)	616	392	675	433
Effective obs. (right)	155	174	226	86

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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	-10.10	-13.35**	-15.89**	-13.00**
	[6.27]	[6.76]	[7.18]	[6.58]
Bias-corrected	-12.70**	-15.31**	-17.81**	-14.17**
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Robust	-12.70*	-15.31*	-17.81**	-14.17*
	[7.11]	[7.83]	[8.35]	[7.46]
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.	27.02	27.02	23.82	23.82
Num. counties	1,043	1,043	797	797
Num. cities	1,703	1,703	1,305	1,305
Num. banks	2,391	2,391	1,741	1,741
Observations	3,104	3,104	2,494	2,494
Obs. left of cutoff	2,670	2,670	2,206	2,206
Obs. right of cutoff	434	434	288	288
Left main bandwidth (h)	1,912	1,741	1,877	2,193
Right main bandwidth (h)	2,209	1,741	1,525	2,193
Effective obs. (left)	537	471	415	520
Effective obs. (right)	285	256	189	213

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Varying population bandwidth: ΔLoans

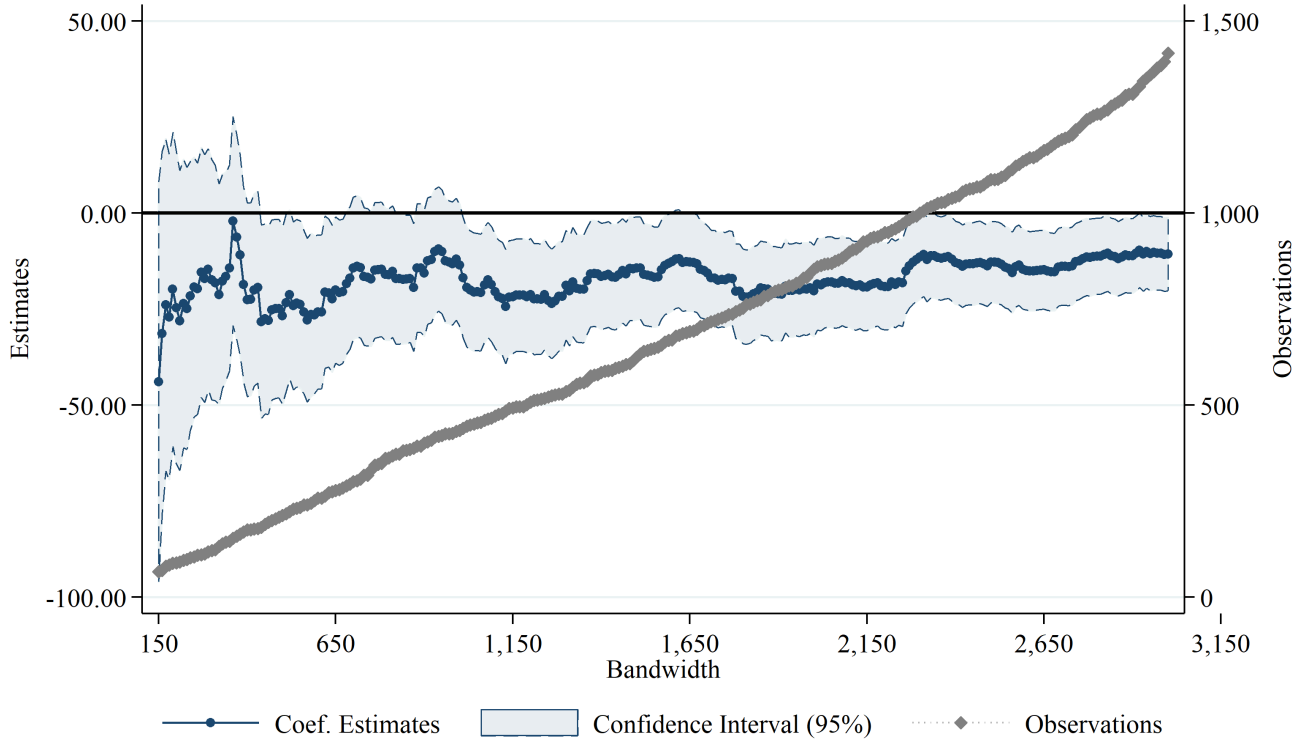
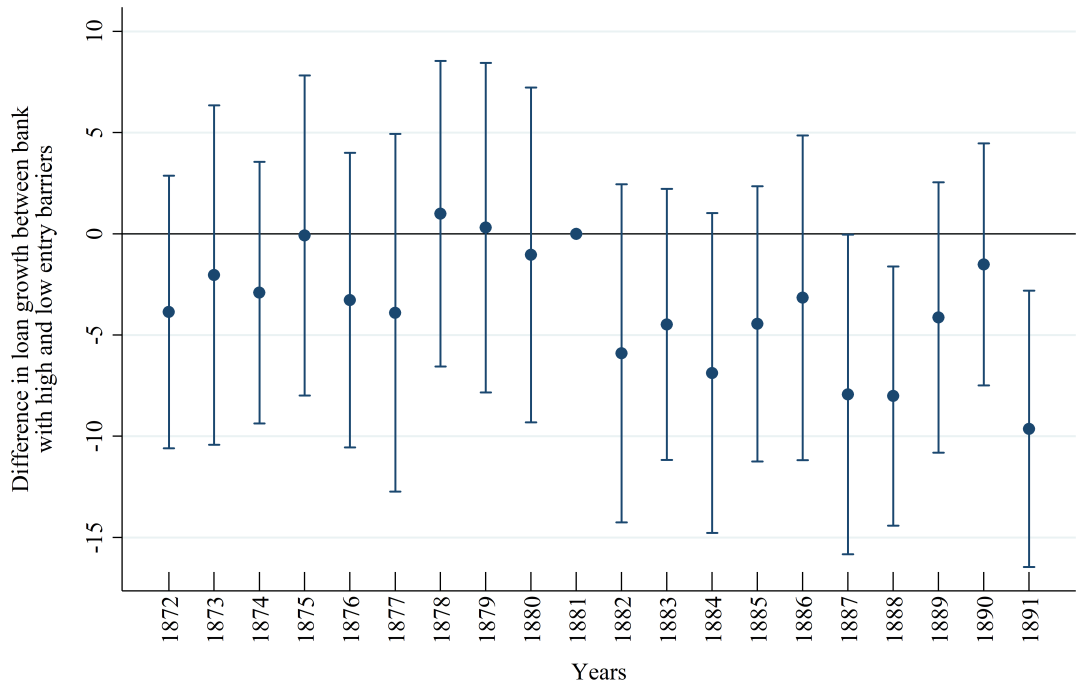


Figure: Sensitivity of main of the coefficient for $\mathbb{1}_{ct}^{\text{pop}>6,000}$ for varying restrictions on the population bandwidth. Average marginal effects reported and 99% confidence bands.

Dynamics of ΔLoans

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



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- Evidence in line with entry deterrence (Goolsbee and Syverson, 2008)

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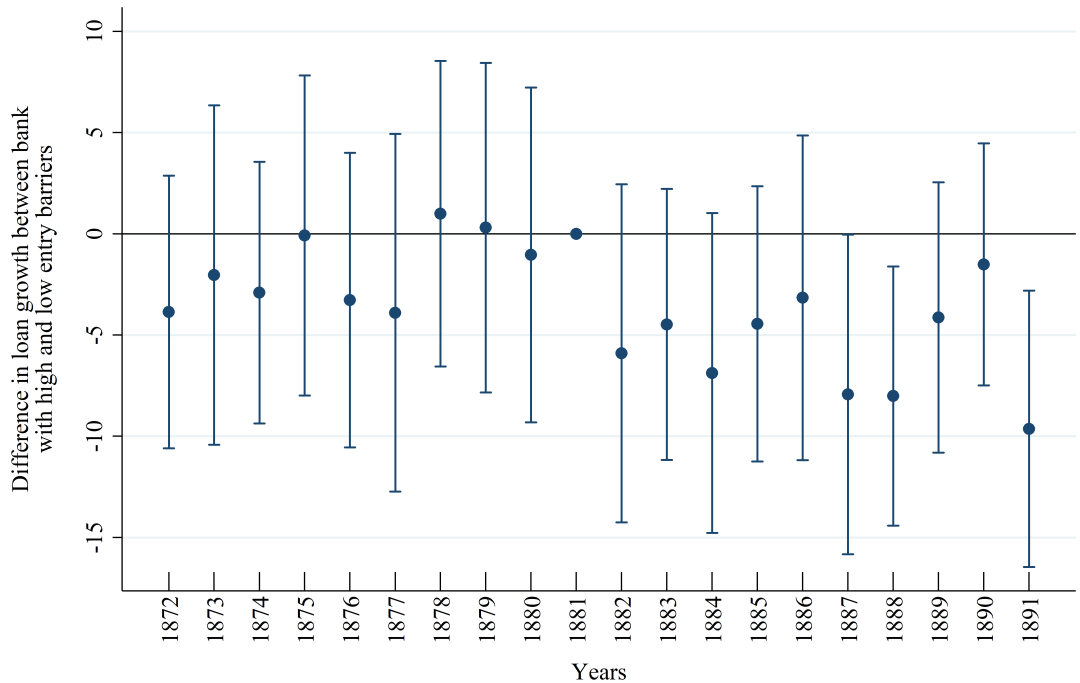

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Risk Taking I

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	4.20*	11.86**	-0.07*	-0.05***
	[2.16]	[5.52]	[0.04]	[0.02]
Bias-corrected	4.95**	14.01**	-0.07*	-0.05***
	[2.16]	[5.52]	[0.04]	[0.02]
Robust	4.95**	14.01**	-0.07	-0.05***
	[2.51]	[6.33]	[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.	36.02	60.87	0.07	0.03
Num. counties	1,043	1,043	1,043	1,043
Num. cities	1,709	1,709	1,709	1,709
Num. banks	2,401	2,401	2,401	2,401
Observations	3,188	3,188	2,568	3,723
Obs. left of cutoff	2,745	2,745	2,206	3,197
Obs. right of cutoff	443	443	362	526
Left main bandwidth (h)	1,595	1,660	1,728	2,468
Right main bandwidth (h)	2,694	2,563	1,975	998
Effective obs. (left)	442	465	368	895
Effective obs. (right)	315	306	224	197

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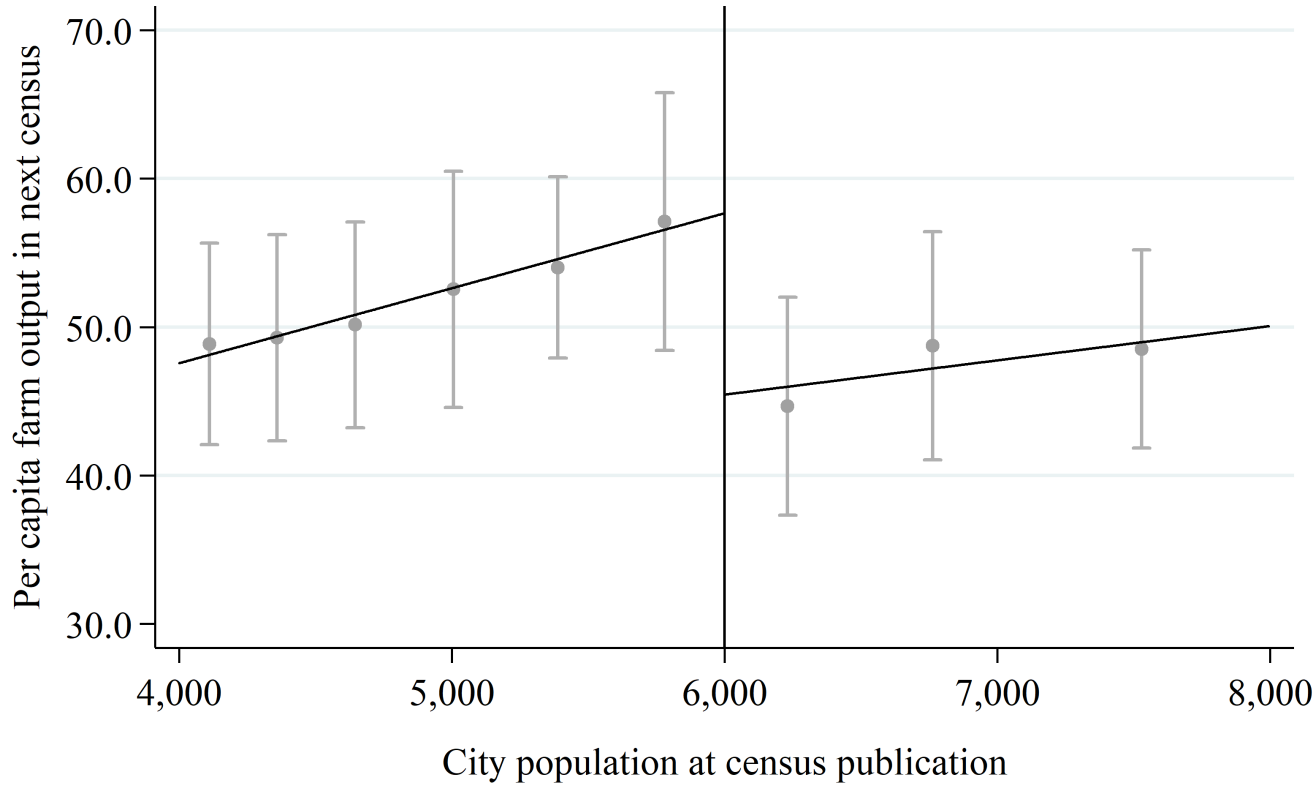
Dependent Variable	Farm Value	Farm Output	Number of Farms
	(1)	(2)	(3)
Conventional	-78.59*	-13.45**	-0.01**
	[41.90]	[6.08]	[0.01]
Bias-corrected	-96.44**	-15.55**	-0.02***
	[41.90]	[6.08]	[0.01]
Robust	-96.44**	-15.55**	-0.02**
	[46.66]	[6.86]	[0.01]
BW Type	MSE Two	MSE Two	MSE Two
Kernel Type	Epanechnikov	Epanechnikov	Epanechnikov
Order Loc. Poly. (p)	1	1	1
Order Bias (q)	2	2	2
Mean dep. var.	399.81	62.86	0.09
Num. counties	1,043	1,043	1,043
Num. cities	1,716	1,716	1,716
Observations	2,857	2,859	2,859
Obs. left of cutoff	2,567	2,569	2,569
Obs. right of cutoff	290	290	290
Left main bandwidth (h)	1,518	1,436	1,460
Right main bandwidth (h)	2,922	2,640	2,411
Effective obs. (left)	304	277	283
Effective obs. (right)	226	216	210

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