Should Monetary Policy Lean against the Wind?

Quasi-Experimental Evidence from Federal Reserve Policies in 1920-21

Kilian Rieder

Oesterreichische Nationalbank (Eurosystem)*

NBER SI DAE Workshop

6 July 2020

*This presentation does not necessarily reflect the views of the OeNB, the ECB or the Eurosystem.

This paper

Credit booms gone "bad" fuel **financial crises** which in turn can have large **real economic costs**:
→ rationale for financial stability policies

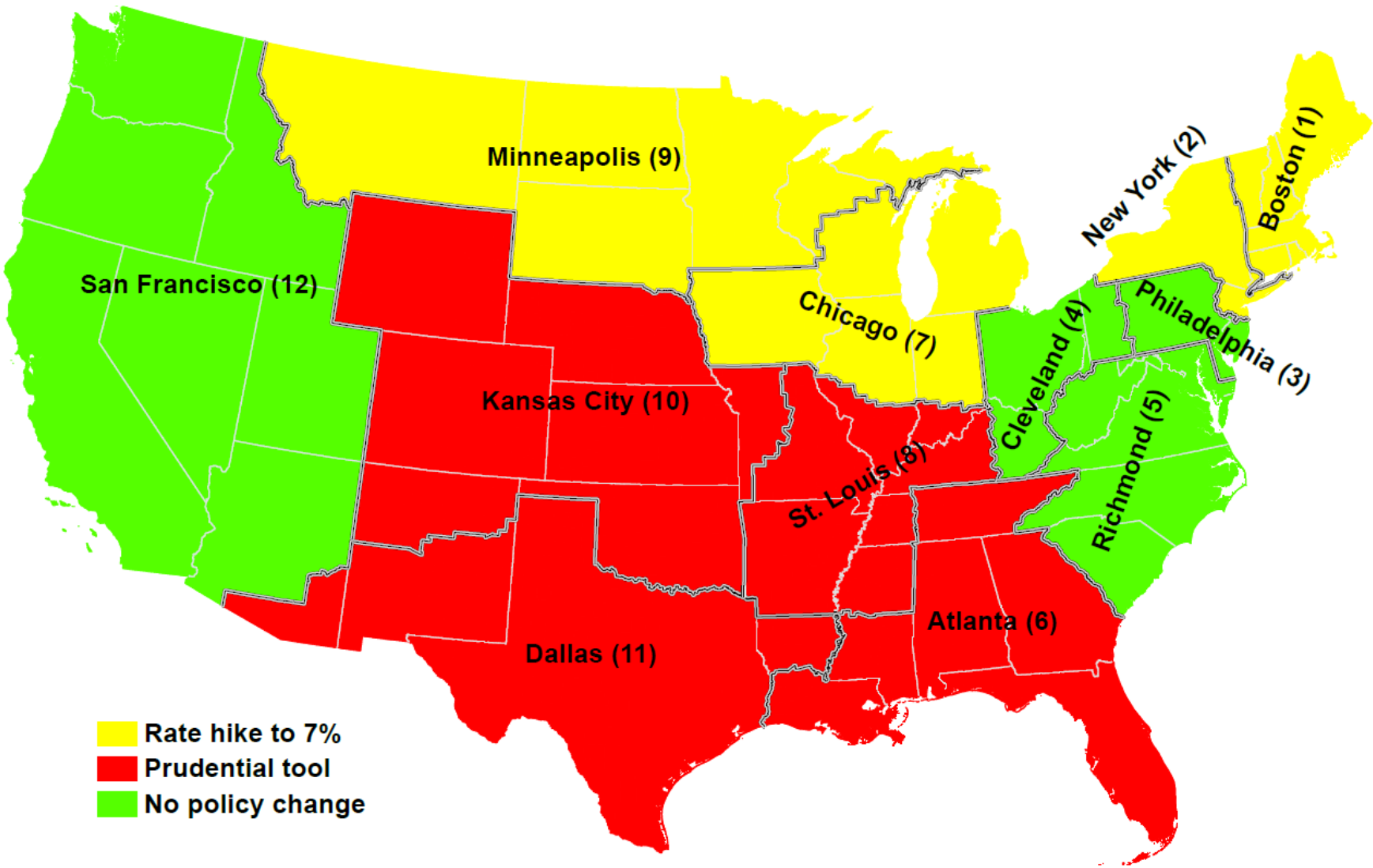
Ongoing debate about which policies to use to stop credit booms:

- **Lean against the wind** (LAW): conventional interest rate ↑
- **Macroprudential policy**: targeted measures (e.g. LTV)

Empirical research *on relative effectiveness elusive.*

I estimate comparative causal effects of monetary policy **leaning against the wind** (LAW) and **macroprudential policy** on bank-level credit and leverage by exploiting a single natural experiment.

The experiment: policy variation across Federal Reserve districts in spring 1920



Financial stability concerns

- Fed's main preoccupation of Fed: "preventing financial panic"
- Post-WWI: land and commodity price boom
- Banks: strong credit growth, ↑ leverage

Which macroprudential tool, and why?

> *[In these districts] some banks were greatly extended [...]. Some banks were only slightly extended [...]. Other banks were not extended at all [...].*
>
> ***– Joint Commission of Agricultural Enquiry (1922)***

- Phelan Act of 1920: **progressive discount rate**
  → basic line $= f(capital, surplus, reserves)$
  → borrowing $>$ basic line $= +$ 0.5% for every 25% in excess

Identification strategy ▸ Tests

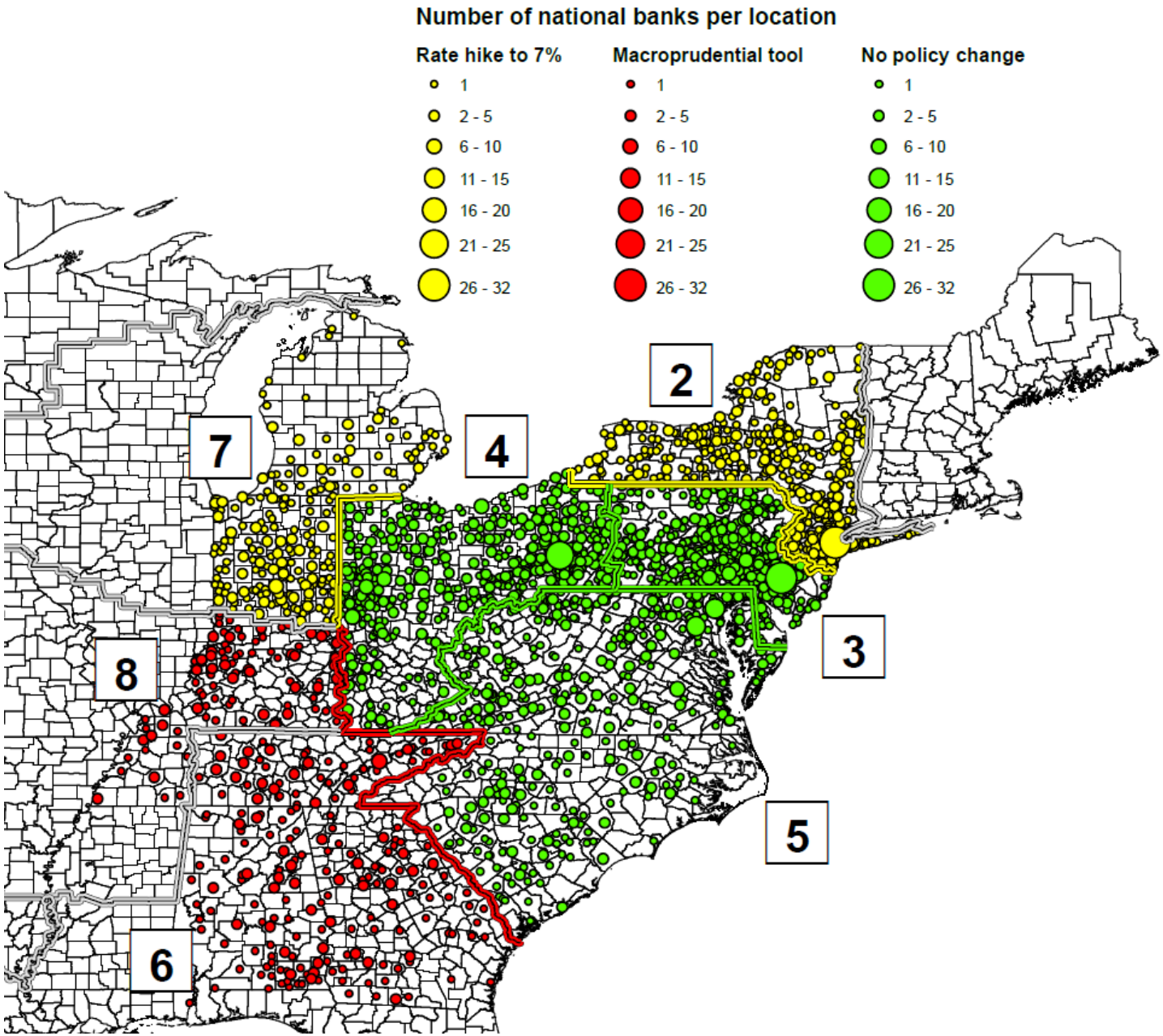
1. Exploiting border discontinuities locally (<25km)
   → **continuity** in baseline $\mathbf{X}'$
   ✓credit **supply** vs credit **demand** response
   ✓address policy **endogeneity**

2. Uniform regulation (and economic policies)
   ✓avoid **spurious** discontinuities

3. Combination of *de jure* and *de facto* financial segmentation
   → **branches** forbidden, interbank links **fenced in** by districts
   → no sorting of banks
   ✓limit **contagion** bias in treatment effect estimation

4. "Horse race" fixing time & environment
   ✓policies considered **substitutes** rather than complements

Full sample of national banks



Baseline specification and results

$$\underbrace{Y_{i,t}}_{Outcome} = \underbrace{\delta Post_t \times T_i}_{Treatment\ effect} + \underbrace{\mathbf{\Psi}'\mathbf{X}_{i,t}}_{Bank\ controls} + \underbrace{\phi_b}_{Bank\ FE} + \underbrace{\gamma_t}_{Time\ FE} + \underbrace{u_{i,t}}_{Error}$$

Panel A. Loan growth

	PDR policy <25km	**LAW policy (west)** <25km	**LAW policy (east)** <25km
Treatment effect	**-0.11**	**-0.02**	**0.08**
	[0.06]*	[0.05]	[0.03]**
	{0.05}**	{0.04}	{0.03}***
R-squared	0.35	0.18	0.25

Panel B. Leverage ratio

	PDR policy <25km	**LAW policy (west)** <25km	**LAW policy (east)** <25km
Treatment effect	**-0.11**	**-0.00**	**0.09**
	[0.06]*	[0.05]	[0.03]***
	{0.05}**	{0.03}	{0.03}***
R-squared	0.43	0.38	0.19
Observations	262	312	735

Clustered and Conley standard errors from top to bottom.
All regressions with bank FE, time FE and bank-level $\mathbf{X}'$.
*** p<0.01, ** p<0.05, * p<0.1

Evidence from split states ▸ Maps and results

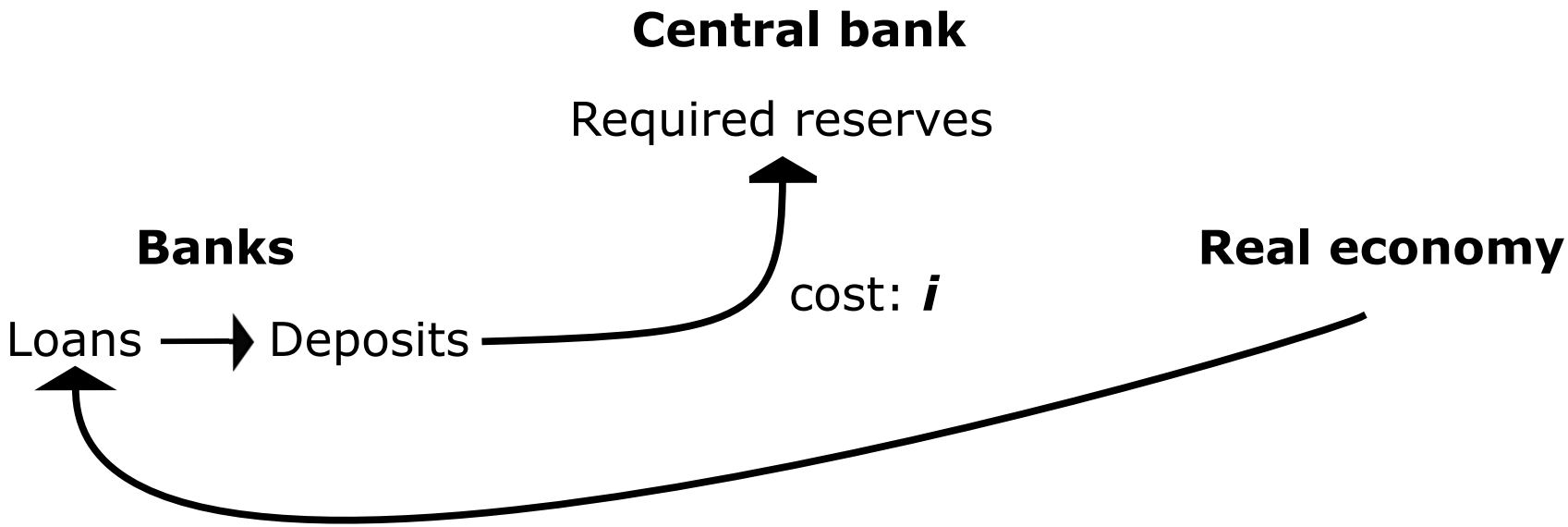
Placebo test (I): pre-treatment effects ▸ Results

Placebo test (II): post-treatment effects ▸ Results

Placebo test (III): non-policy borders ▸ Results

Geographic regression discontinuity design ▸ Figures and results

Mechanism: PDR & "reserves channel" of monetary policy

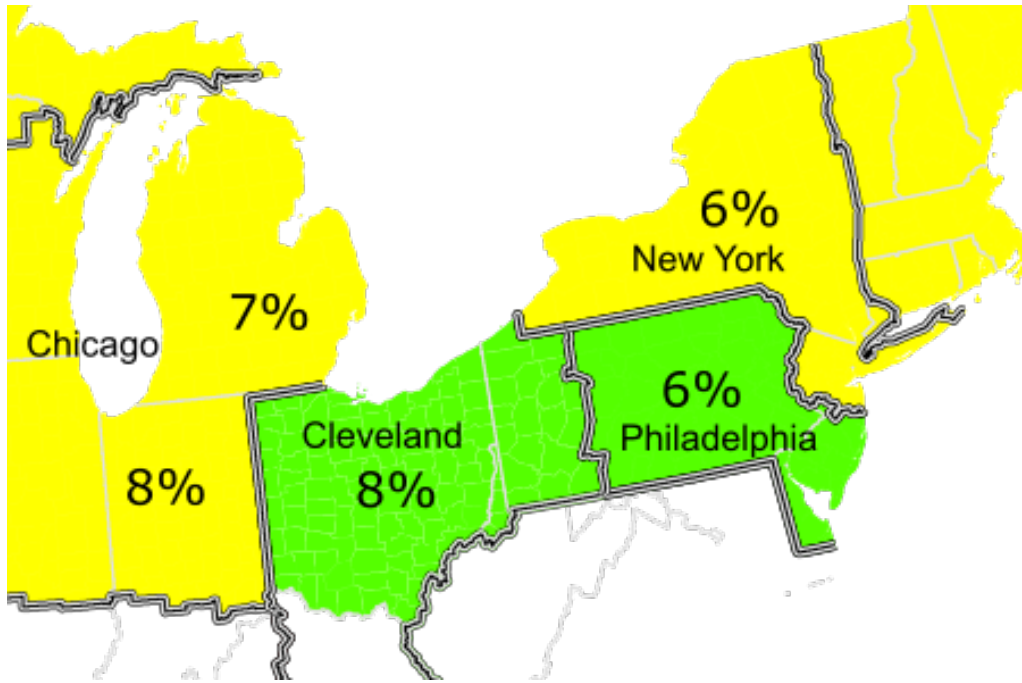


- Leaning against the wind: flat increase in i
- Macroprudential tool: **progressive discount rate**
  $\rightarrow i = f(\text{CB borrowing relative to basic line}) \approx f(\text{leverage})$
  $\rightarrow$ **channel**: price discrimination against over-leveraged banks

▸ More details

Mechanism: LAW & the role of usury rates

- Usury rates: **credit friction** inhibiting adequate pricing of risk
  $\rightarrow$ riskier projects get **rationed** ($\sim$ Stiglitz and Weiss, 1981)



With **binding usury rates**, LAW incentivizes alternative lending.
$\rightarrow$ **call loans exempt from usury laws**: $\uparrow$ credit ▸ Results and more details

Why history matters (for this paper)

- Laboratory to identify and compare treatment effects ...
- ... but context crucial to understand mechanisms at play.

Relevance of the PDR experiment

- Reserve requirements in emerging markets
- CCyB, systemic risk buffers

Central banks would never ... oh, wait.

- Bank of England *routinely* charged **different rates** in 19C
- Deposit facility rate **tiering**: New Zealand, Japan
- **Eurosystem**: "mitigating measures" as per 31 Oct 2019

APPENDIX

1. Experiment validity
2. Identification strategy
3. More on mechanisms
4. Robustness
5. Additional results

Experiment validity

Back

Dis-aggregating the Reserve System's reaction

Back

- **Reserve ratios** → uniform rate increase to 6% in Jan 1920
- Late spring 1920: 2nd wave → policy variation in this paper → driven by financial stability concerns

> *The main preoccupation of the Federal Reserve System was the preservation of the integrity of the banking system and the prevention of a financial panic.* – **Joint Commission of Agricultural Enquiry (1922)**

> *Ordinary prudence dictated plainly that not only should speculation in corporate stocks and securities be restricted but that further expansion of banking credits made against goods and commodities in storage should be checked.* – **Federal Reserve Board Annual Report for 1920**

> *Loans were expanded in many cases far beyond the limits of safety which the amount of capital invested in industries warranted. A 2nd general increase in rates was therefore put into effect on June 4."*
>
> – **Federal Reserve Bank of Boston Annual Report for 1920**

"More smoking guns" Back

The situation [...] which seems to be disquieting, is the expansion that has taken place in the last 12 or 14 months. From the 1st of April, 1919, to the 1st of April, 1920, the ***expansion of bank credit*** *was about 25 per cent [...] in spite of the very large reduction of the amount of Government obligations outstanding.*

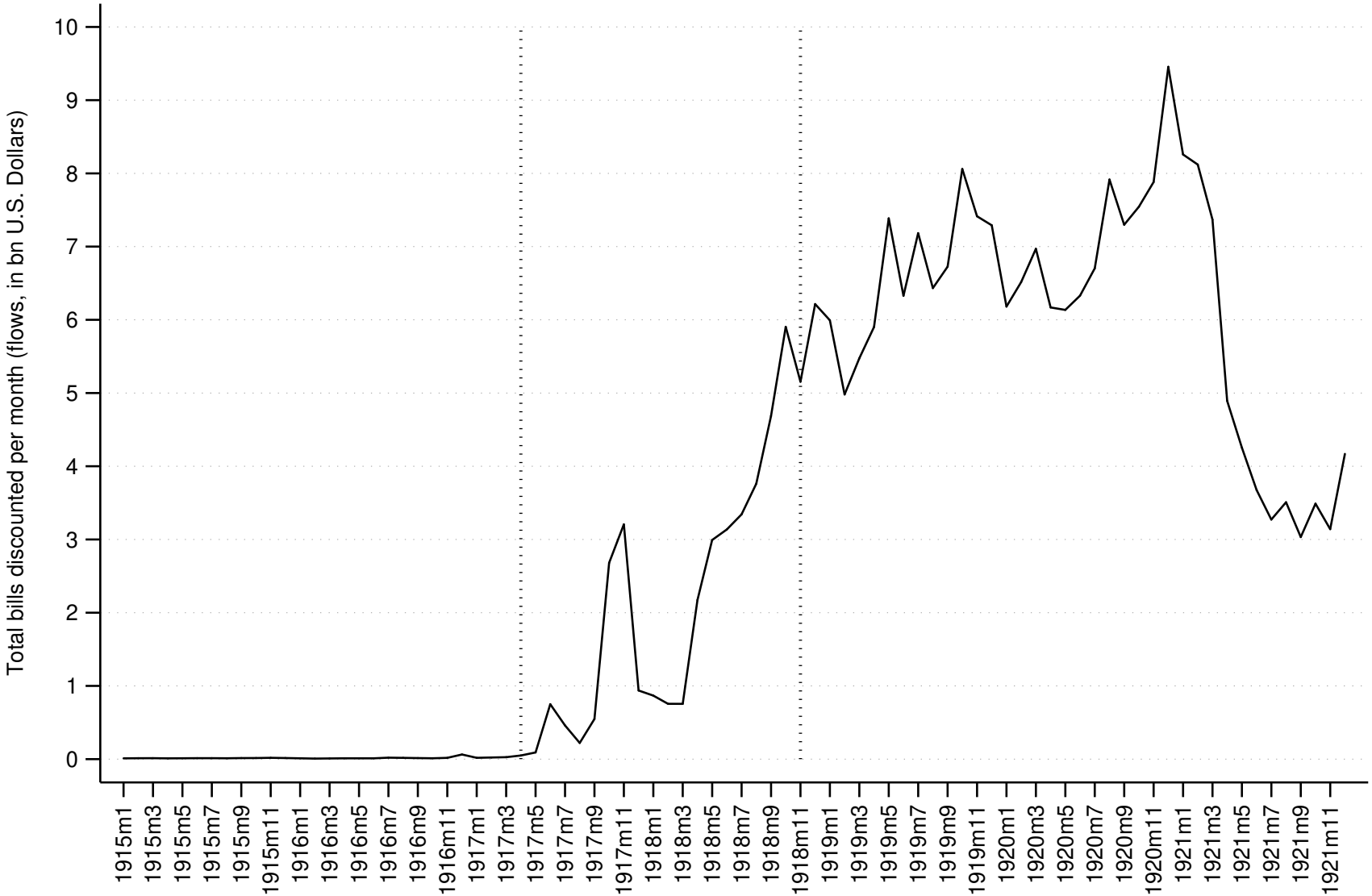
The trouble [...] is the disruption of the ***proper proportion or relationship between the volume of credit and the volume of goods****.*

When a banker understands, just as he did in the old days before we had the Federal reserve banks, that there is a limit to his borrowing [...], when a banker realizes that if he wants to expand his business he must do it more and more out of his own resources and not lean so heavily upon the Federal reserve bank, when he understands that ***limitations and penalties may be imposed upon his borrowings****, then if I know anything about the psychology of banking I know that the banker may be depended upon to use a* ***wiser discretion in the matter of granting credit****.*

Governor Harding, FRB Conference May 18 1920

Monthly flows of bills discounted by the Federal Reserve System

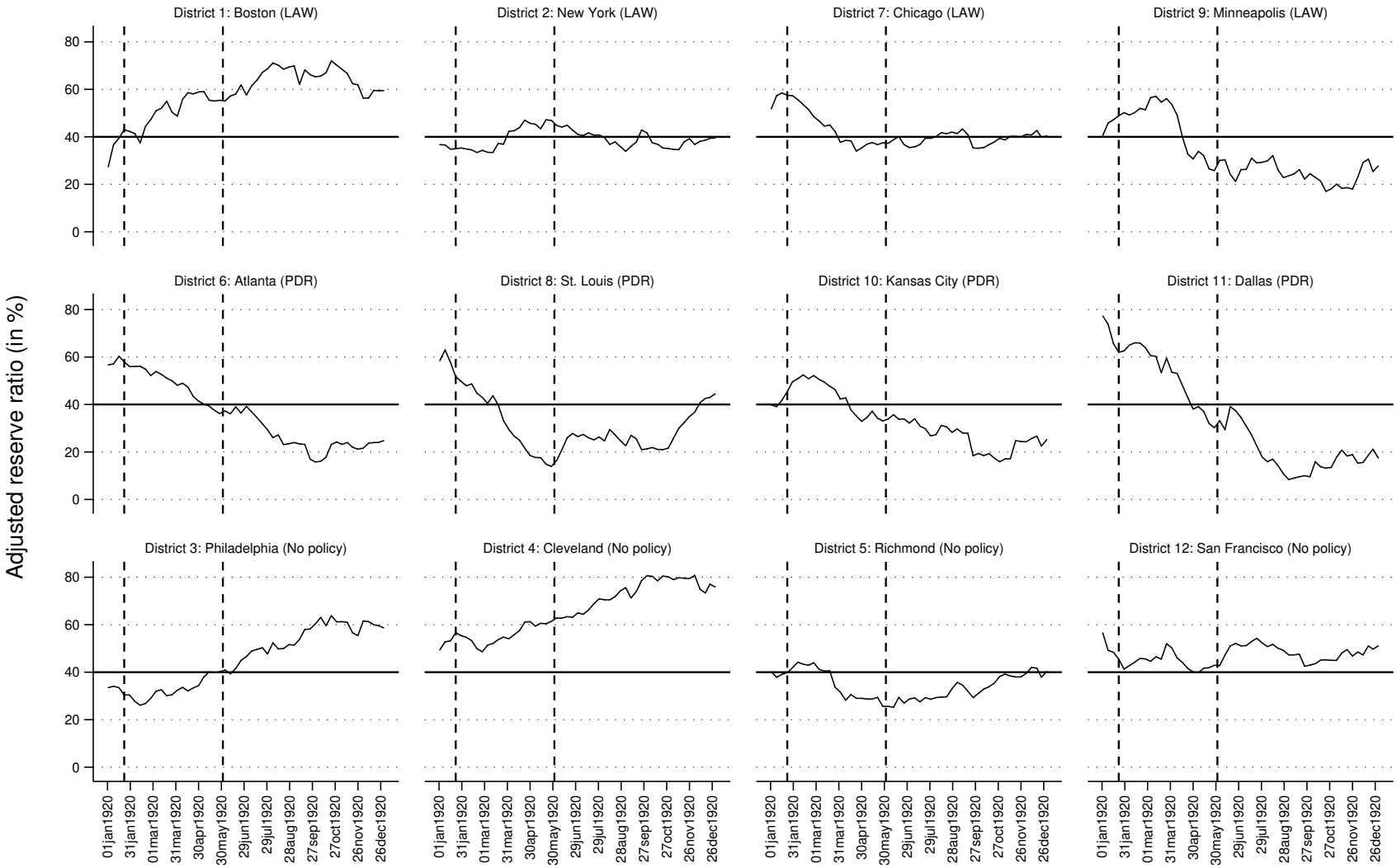
Back



Source: Annual Report of the Federal Reserve Board (1916–1922)

Adjusted gold reserve ratio by Federal Reserve district

Back

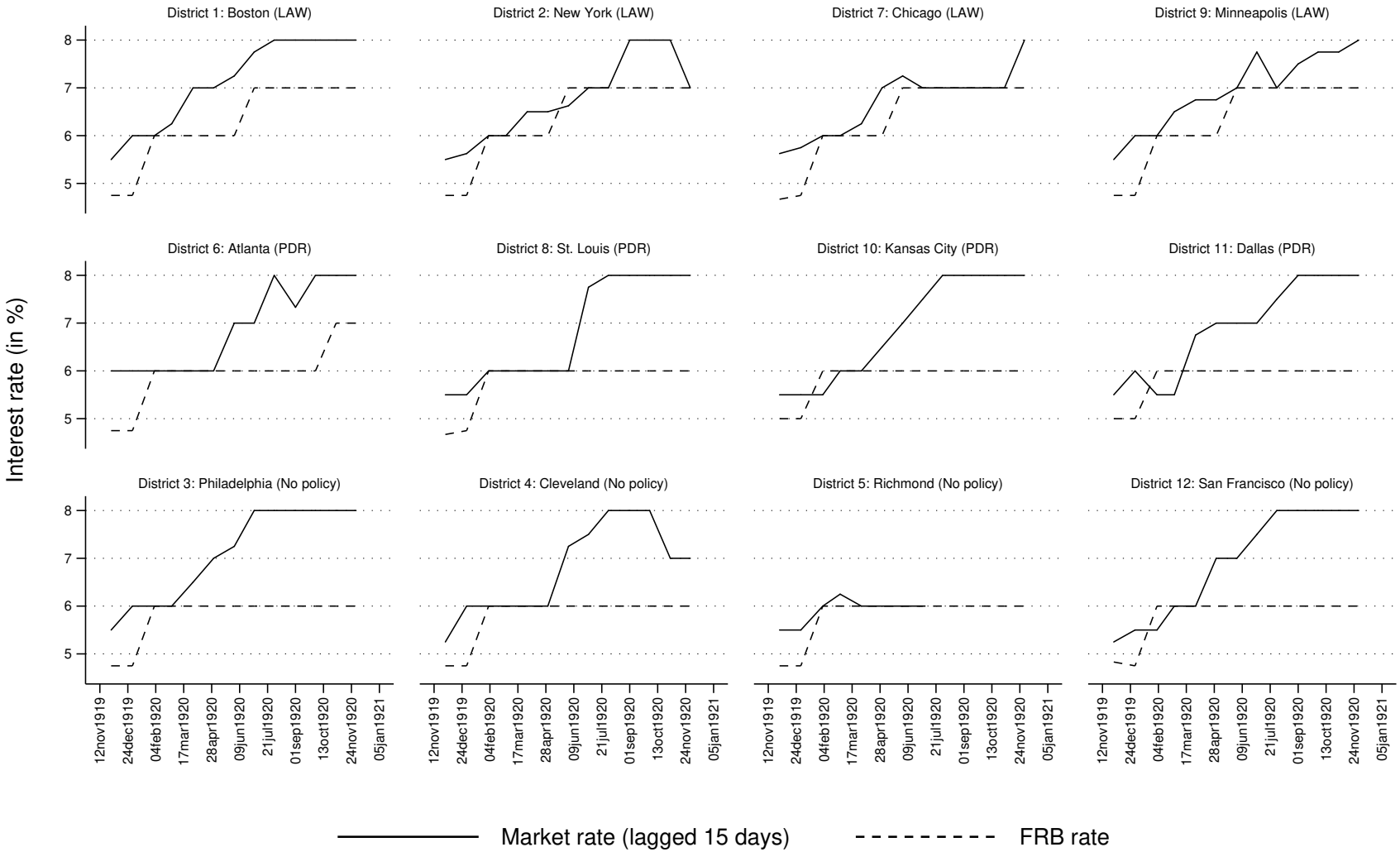


Source: Annual Report of the Federal Reserve Board (1920)

Vertical lines correspond to 23 January and 1 June 1920.

Market rates and official discount rates by Federal Reserve district

Back

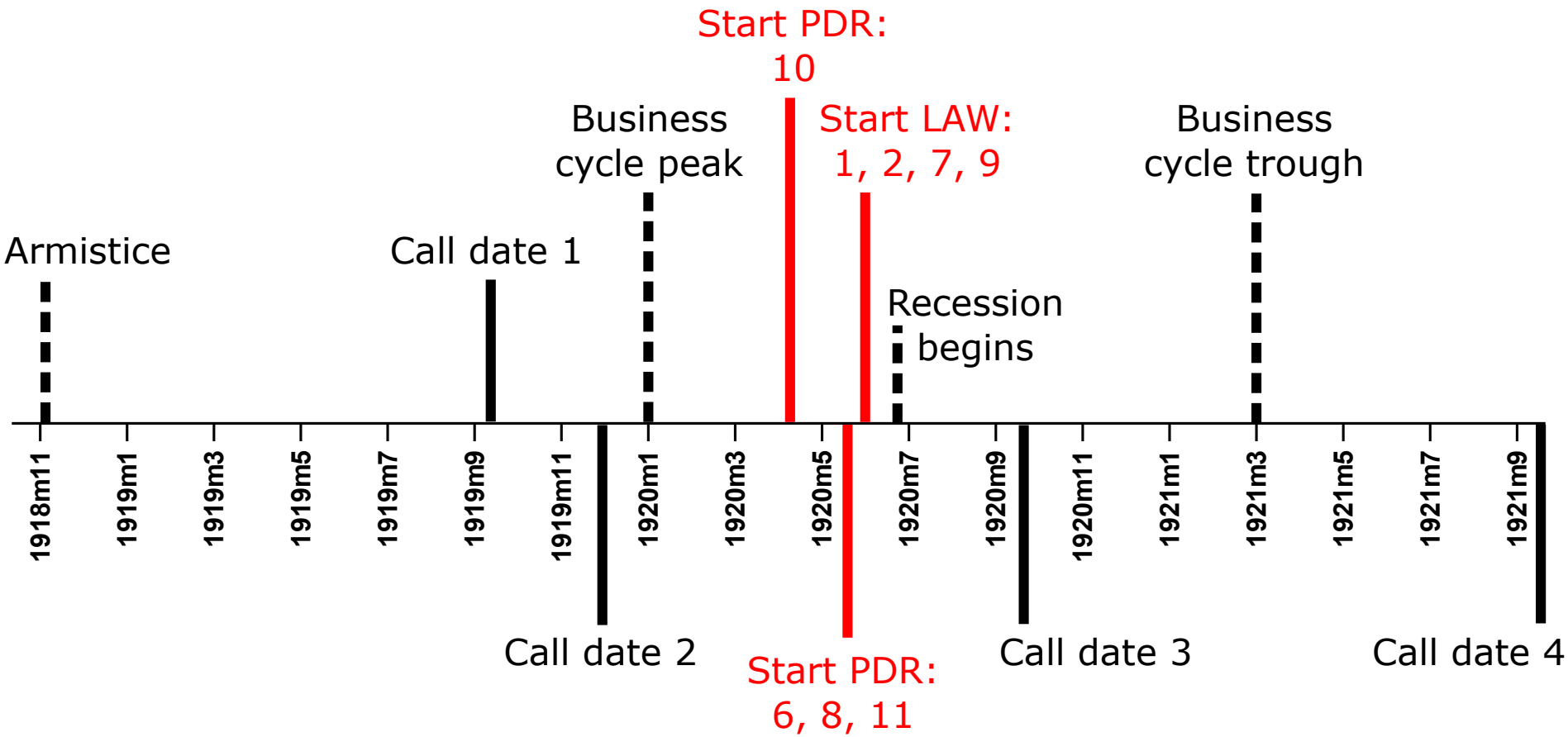


Source: Federal Reserve Bulletin (various issues)

* No market rates available for district 5 after 1 July 1920.

Timeline

Back



Source: Federal Reserve Board Annual Reports, NBER Macrohistory Database

Identification strategy

Back

Pre-trends (Sep 1919 - Jan 1920) ▸ Back

Panel A. Leaning against the wind borders

	Lending	Leverage	Deposits	Equity
Treatment effect	0.01	0.01	-0.02	0.00
(full sample)	(0.01)	(0.01)	(0.01)*	(0.01)
Observations	5,217	5,217	5,218	5,245
Treatment effect	0.03	0.02	0.02	0.01
(25km)	(0.03)	(0.02)	(0.03)	(0.01)
Observations	517	517	517	519

Panel B. Macroprudential policy borders

	Lending	Leverage	Deposits	Equity
Treatment effect	-0.04	-0.04	0.04	-0.00
(full sample)	(0.02)**	(0.02)**	(0.02)*	(0.01)
Observations	2,553	2,553	2,554	2,567
Treatment effect	0.00	-0.01	0.05	0.01
(25km)	(0.05)	(0.05)	(0.08)	(0.01)
Observations	129	129	129	129

For model used see slide 6 of presentation.

*** p<0.01, ** p<0.05, * p<0.1

Local continuity in baseline characteristics (AgCensus 1920)

Back

	LAW borders		PDR borders	
	Full sample	25km	Full Sample	25km
Total population	0.05	-0.25	-0.29	-0.08
	(0.20)	(0.23)	(0.10)***	(0.16)
Farms/inhabitant	0.00	0.01	0.03	0.00
	(0.01)	(0.01)	(0.01)***	(0.01)
Farms/acre	-0.01	-0.00	0.00	0.00
	(0.00)***	(0.00)	(0.00)**	(0.00)
Improv. farm land/farm land	-0.00	-0.01	-0.04	-0.01
	(0.02)	(0.04)	(0.02)***	(0.05)
Avg. farm value	4,969.56	797.31	-3,936.00	-1,160.91
	(1,812.29)***	(1,099.54)	(475.81)***	(1,256.09)
Avg. share mortgaged	0.10	0.04	-0.01	0.00
	(0.01)***	(0.02)*	(0.01)	(0.02)
Avg. debt to value ratio	0.56	0.52	2.40	1.21
	(1.30)	(1.23)	(0.61)***	(1.56)
Avg. mortgage rate	-0.18	-0.04	0.74	0.15
	(0.19)	(0.08)	(0.08)***	(0.15)
Traded crop exposure	-0.03	-0.08	0.02	-0.03
	(0.02)	(0.06)	(0.02)	(0.04)
Observations	515	60	542	43

Coefficients obtained by simple regression on treatment dummy.
County-level data weighted by number of banks in count.
*** p<0.01, ** p<0.05, * p<0.1

Agricultural boom intensity (Changes AgCensus 1910-1920)

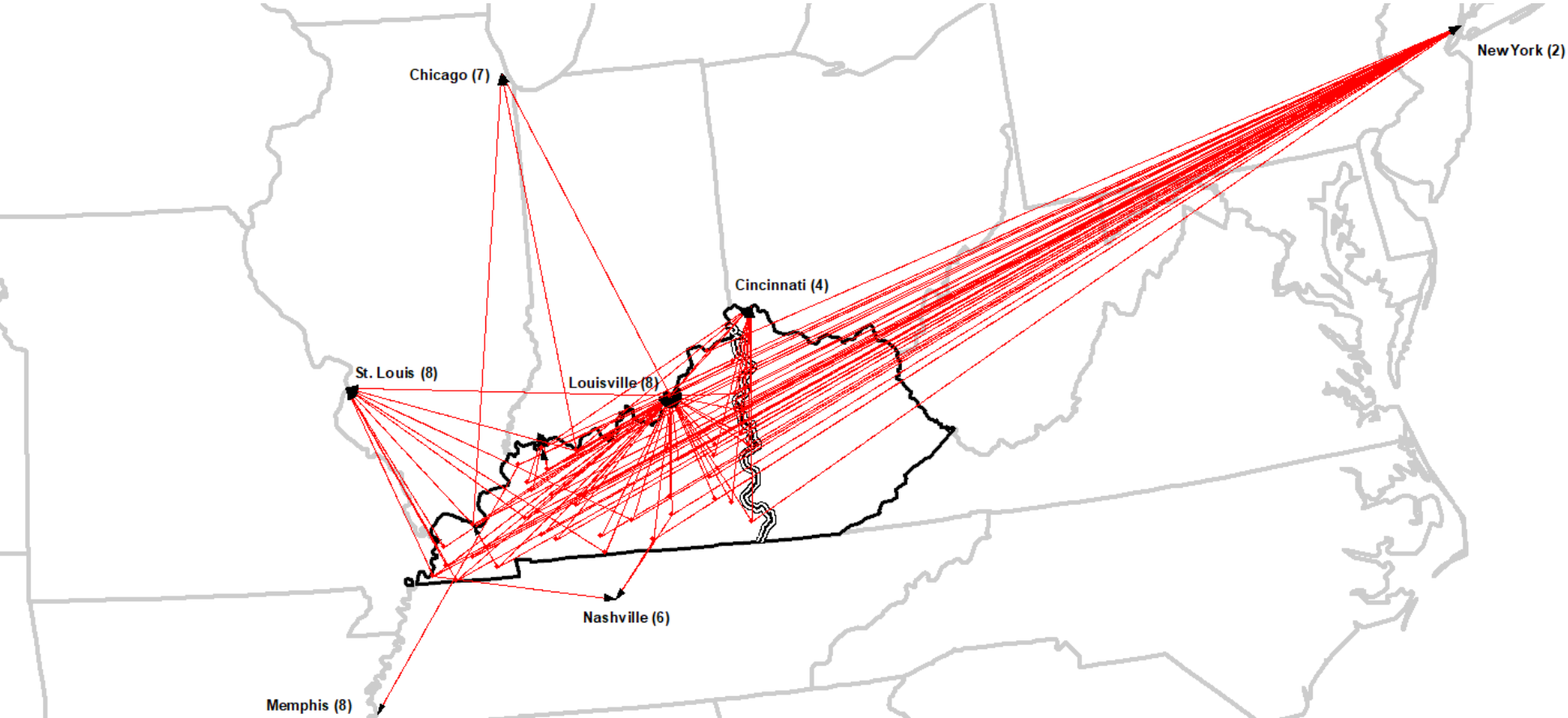
Back

	LAW borders		PDR borders	
	Full sample	25km	Full Sample	25km
Δ Total population	-0.03	-0.02	-0.05	0.07
	(0.02)	(0.04)	(0.01)***	(0.03)**
Δ Farms/inhabitant	0.00	0.00	0.00	0.01
	(0.00)***	(0.00)	(0.00)**	(0.00)**
Δ Farms/acre	-0.00	-0.00	0.00	-0.00
	(0.00)***	(0.00)	(0.00)***	(0.00)
Δ Improv. farm land/farm land	-0.01	-0.02	0.03	-0.02
	(0.00)	(0.01)***	(0.00)***	(0.02)
Δ Avg. farm value	1,433.50	66.53	-798.53	-685.53
	(774.99)*	(501.76)	(797.58)	(628.45)
Observations	512	60	542	43

Coefficients obtained by simple regression on treatment dummy.
County-level data weighted by number of banks in count.
*** p<0.01, ** p<0.05, * p<0.1

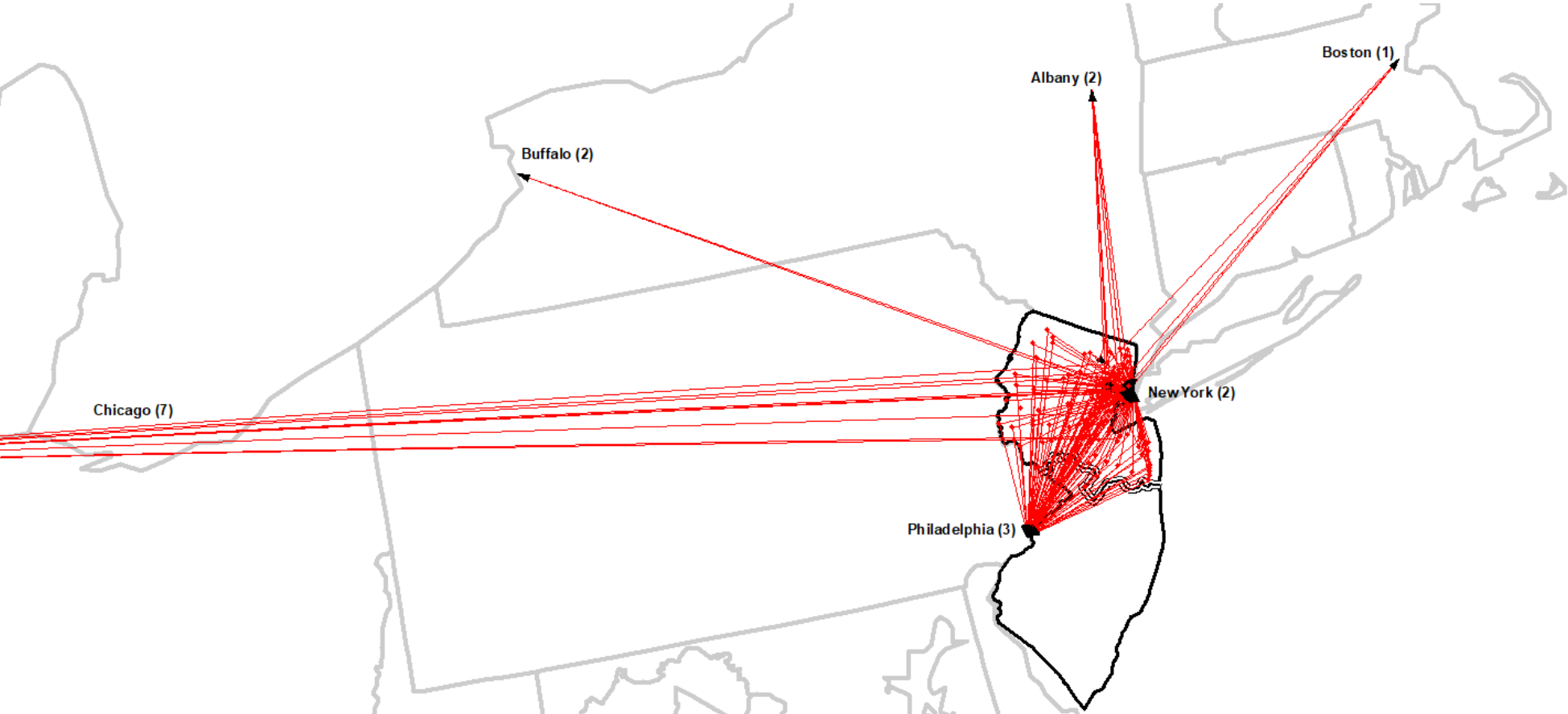
Outgoing interbank links: treated Kentucky national banks

Back



Outgoing interbank links: treated New Jersey national banks

Back



Prohibition to lend on real estate outside district

Back

Schedule No. 10.—Schedule of all loans secured by real estate mortgage or deed of trust giving details provided for in pro forma schedule attached. In column 8 of the schedule indicate whether secured by improved farm land (I. F.), improved city property (I. C.), or unimproved real estate (unimp.). If mortgage was taken to secure a debt previously contracted in good faith this fact should be indicated by "D. P. C.". Also indicate in column 8 on past due items whether interest is payable semiannually (S. A.), quarterly (Q.), or monthly (M.) and date to which interest has been paid. (Property is within legal boundary if located in Federal reserve district.)

Schedule No. 11.—Schedule all bonds, warrants, and other securities, showing par value, name, maturity, book value, and interest rate.

See specimen schedules attached for your guidance.

Yours very truly,

_____, _____,

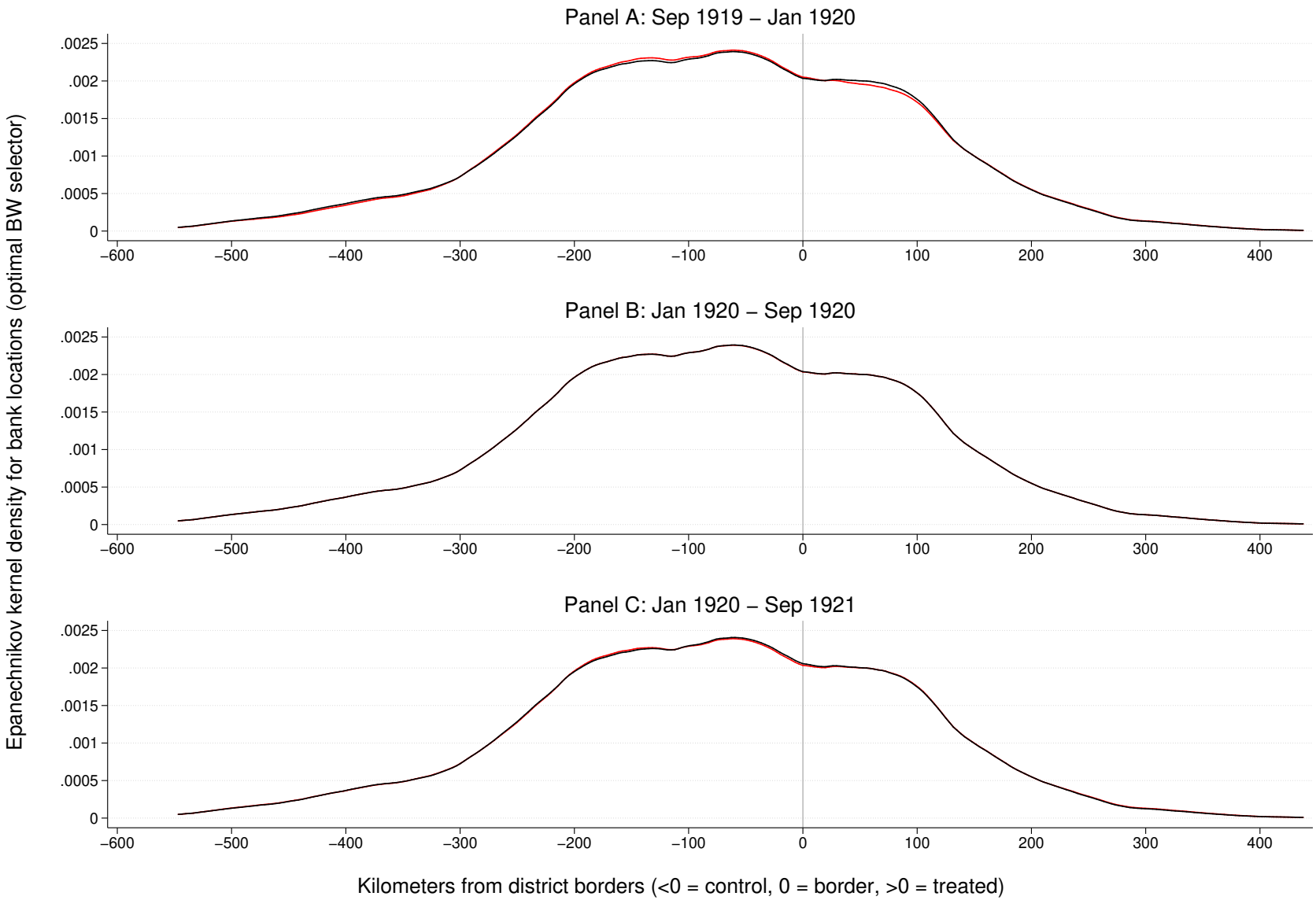
Chief National Bank Examiner,
Federal Reserve District.

Hearings before the Committee on Banking and Currency

71st Congress, 2nd session, House of Representatives (1930, p.138)

No sorting (leaning against the wind)

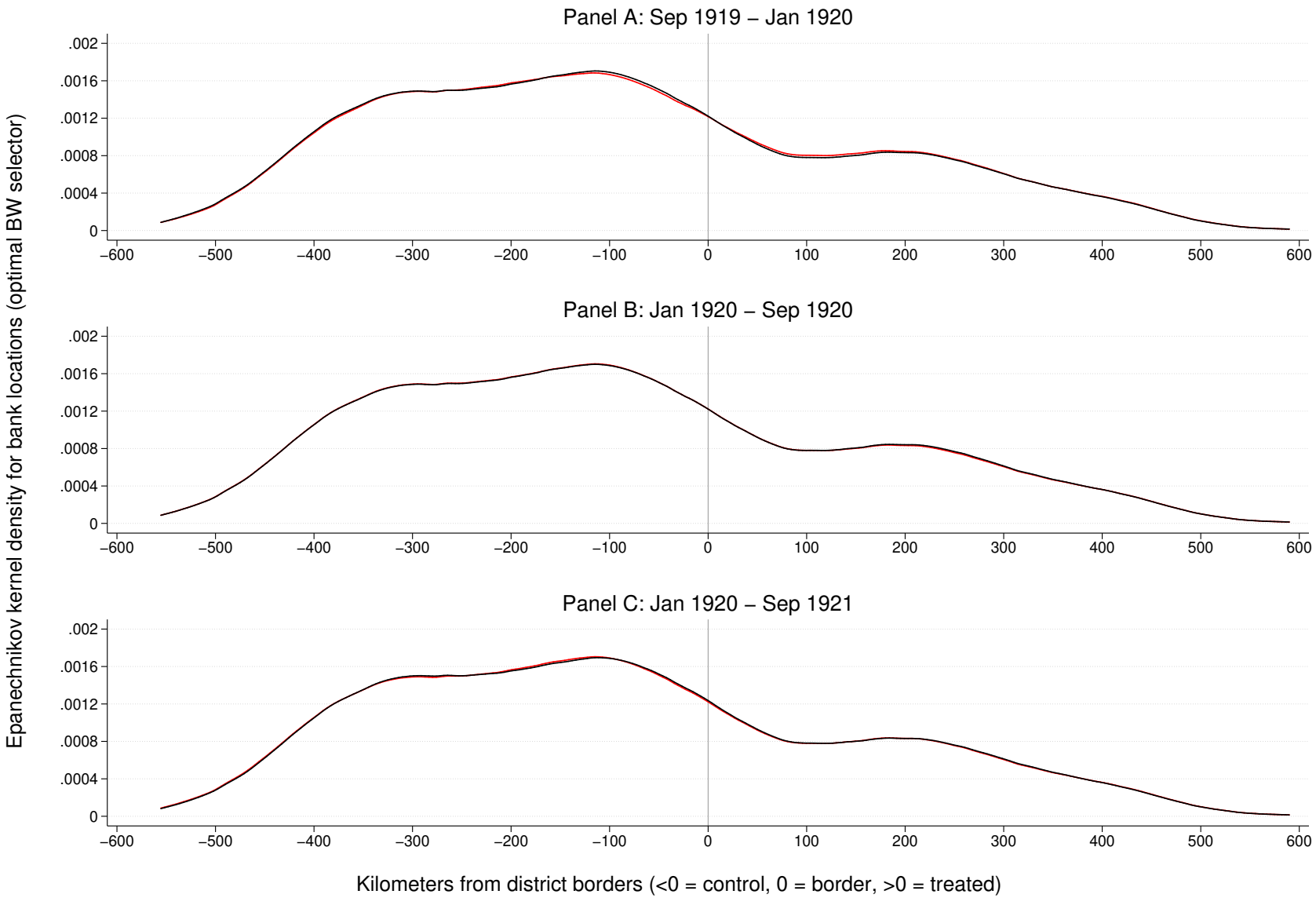
Back



Source: Annual Report of the Comptroller of the Currency (1919–1921) and Rand McNally bankers directory (Jan 1920); own calculations

No sorting (macroprudential regulation)

Back



Source: Annual Report of the Comptroller of the Currency (1919–1921) and Rand McNally bankers directory (Jan 1920); own calculations

More on mechanisms

Back

Computation formula for the basic line

Back

$$BL = 2.5[0.65R + 0.03(C + S)]^1$$

where BL stands for the basic line,
R represents lawful reserves held with the Federal Reserve System,
C is the bank's paid-up capital and S its surplus.

[1] The exact rationale for this formula is explained in the final report of the Joint Comission of Agricultural Enquiry (1922): 65% of R equals the member bank's reserve deposit minus the reserve which the Federal Reserve Bank is required to hold against this deposit. 3% of $C + S$ is the amount each member bank had to contribute to the Federal Reserve Bank's capital. Finally, the factor of 2.5 derives from the Federal Reserve Bank's 40% gold reserve requirement.

1. Targeting alone is an insufficient explanation.

2. Basic line usage must have been high.

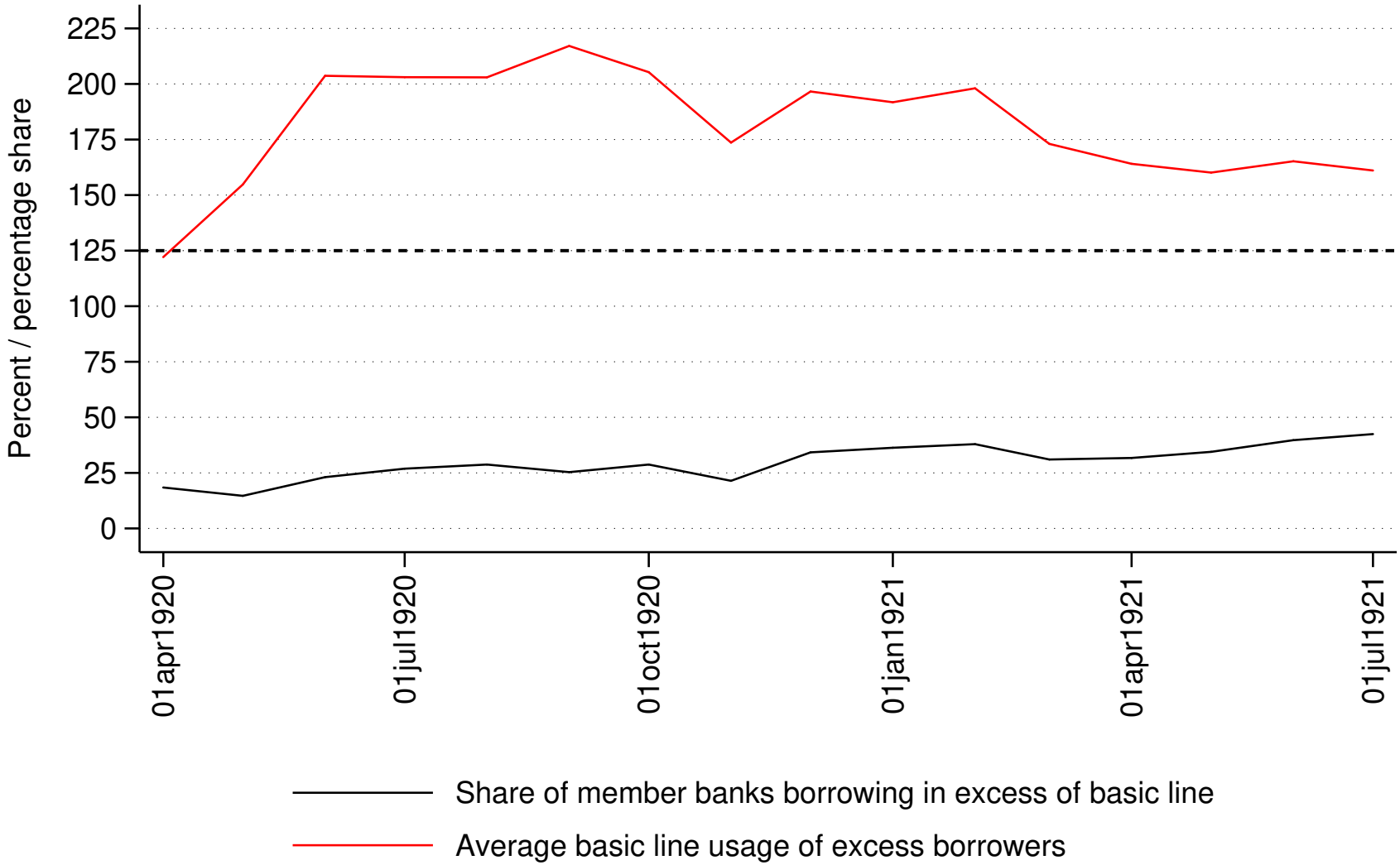
- No bank-level data on basic line usage (FOIA does not apply)

3. Funding difficulties make PDR more binding.

- Funding shocks induce dynamics:
  - Borrowing (much) larger
  - Withdrawal of deposits $\rightarrow$ basic line falls
- (Expected) funding difficulties thwart arbitrage possibilities:
  - Correspondents' willingness to supply funds $\downarrow$

Colorado: aggregate data on basic line usage

Back

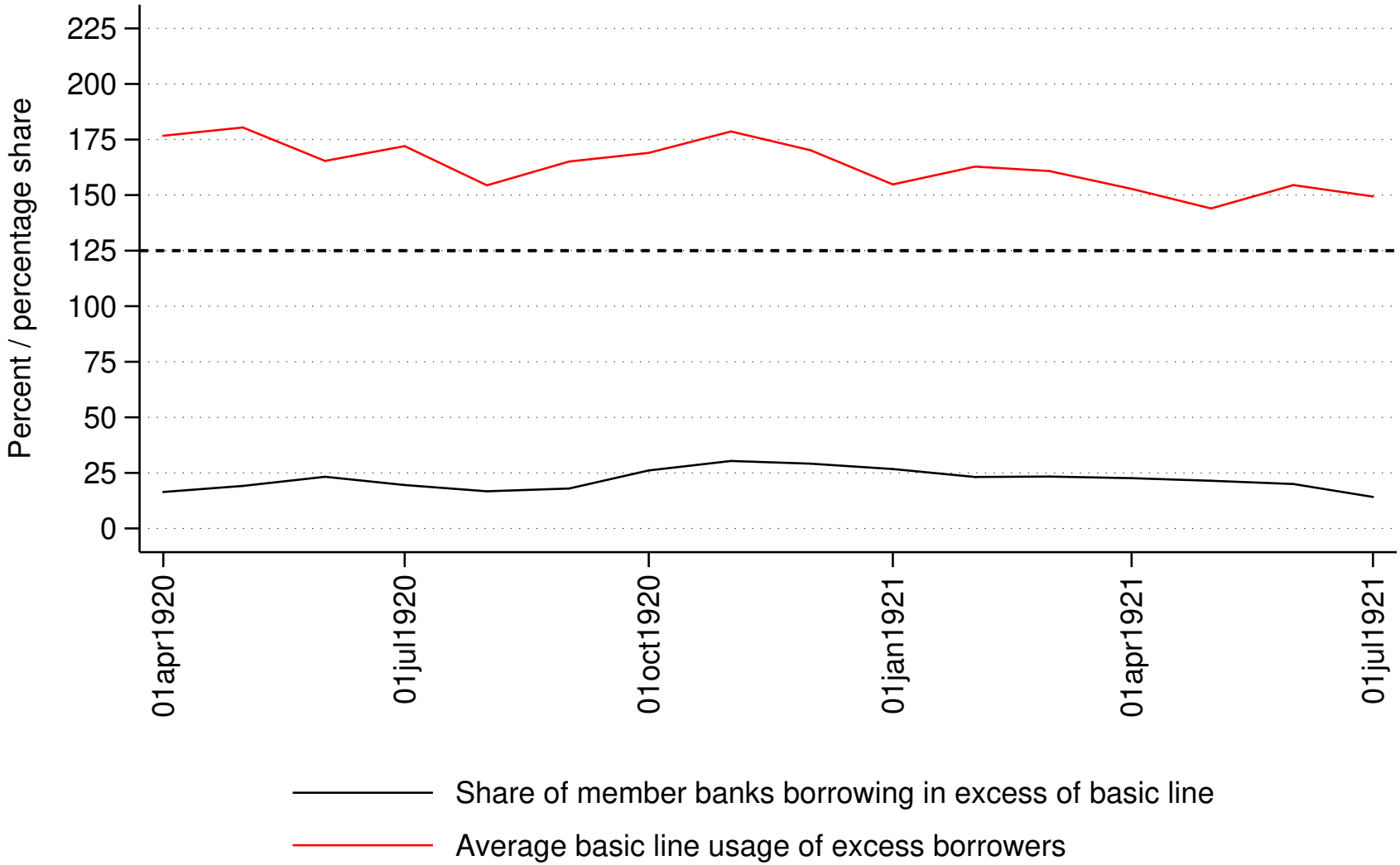


Source: Joint Commission of Agricultural Inquiry

Horizontal dashed line corresponds to 125% BL usage.

Kansas: aggregate data on basic line usage

Back

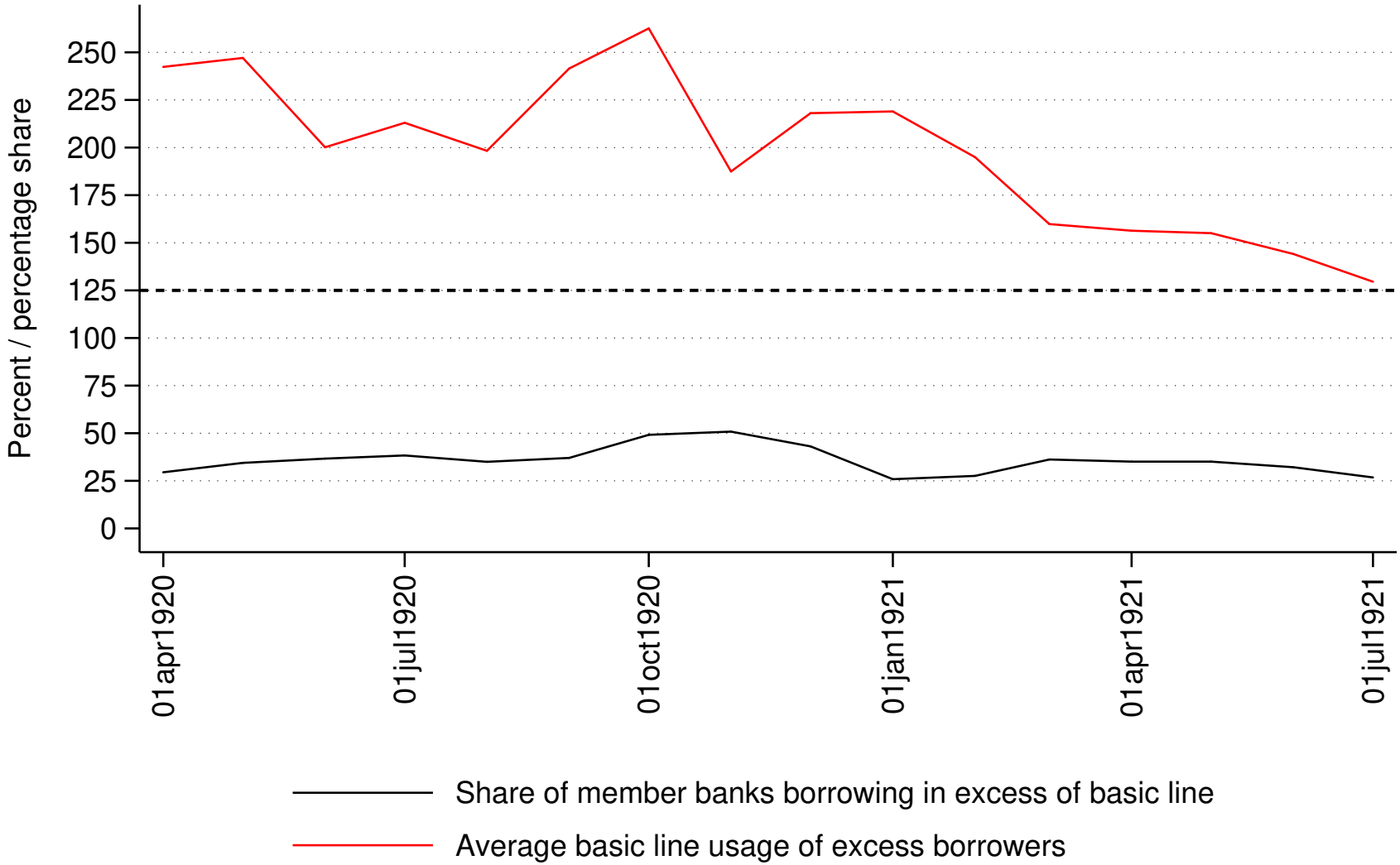


Source: Joint Commission of Agricultural Inquiry

Horizontal dashed line corresponds to 125% BL usage.

Missouri: aggregate data on basic line usage

Back

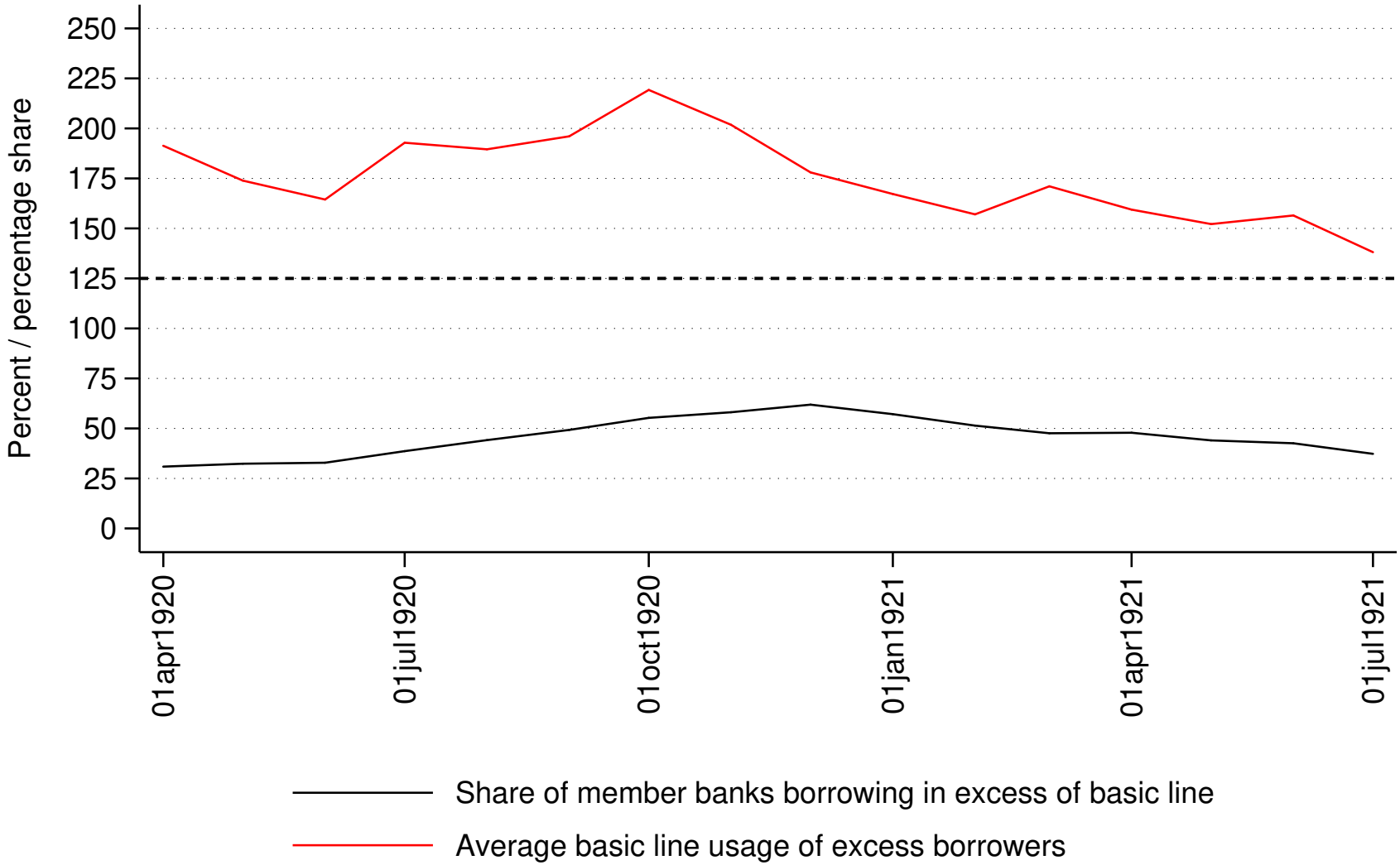


Source: Joint Commission of Agricultural Inquiry

Horizontal dashed line corresponds to 125% BL usage.

Nebraska: aggregate data on basic line usage

Back

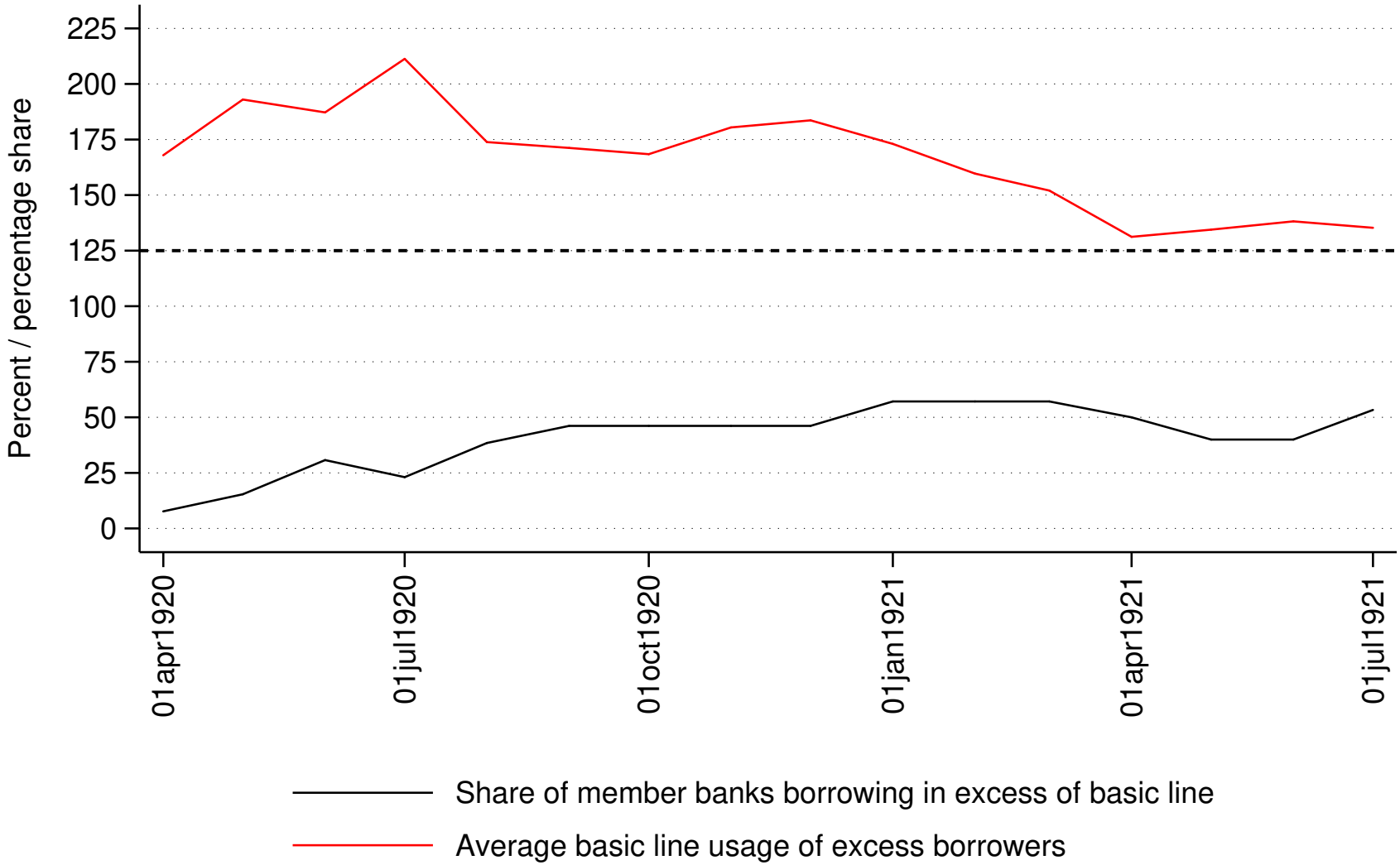


Source: Joint Commission of Agricultural Inquiry

Horizontal dashed line corresponds to 125% BL usage.

New Mexico: aggregate data on basic line usage

Back

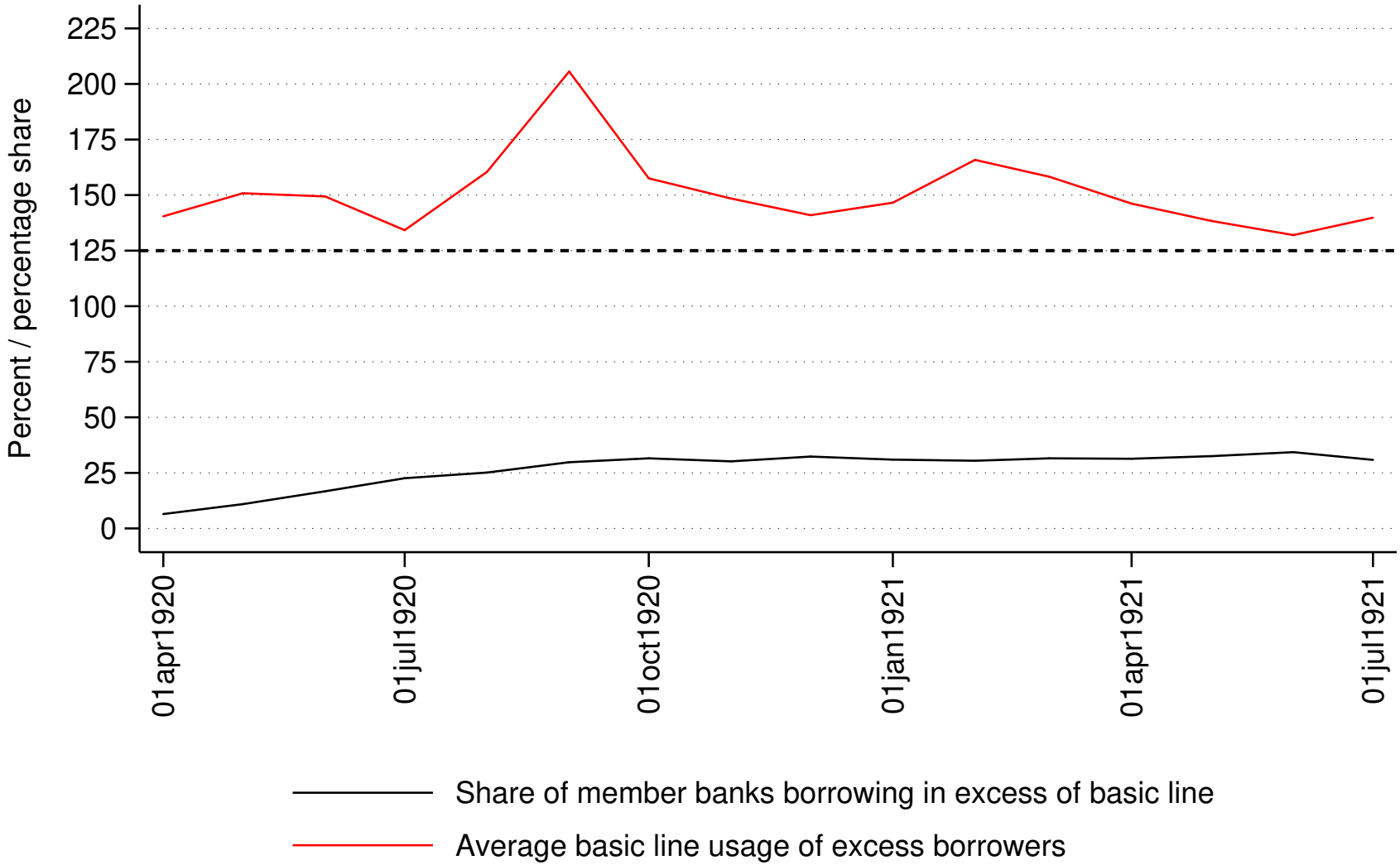


Source: Joint Commission of Agricultural Inquiry

Horizontal dashed line corresponds to 125% BL usage.

Oklahoma: aggregate data on basic line usage

Back

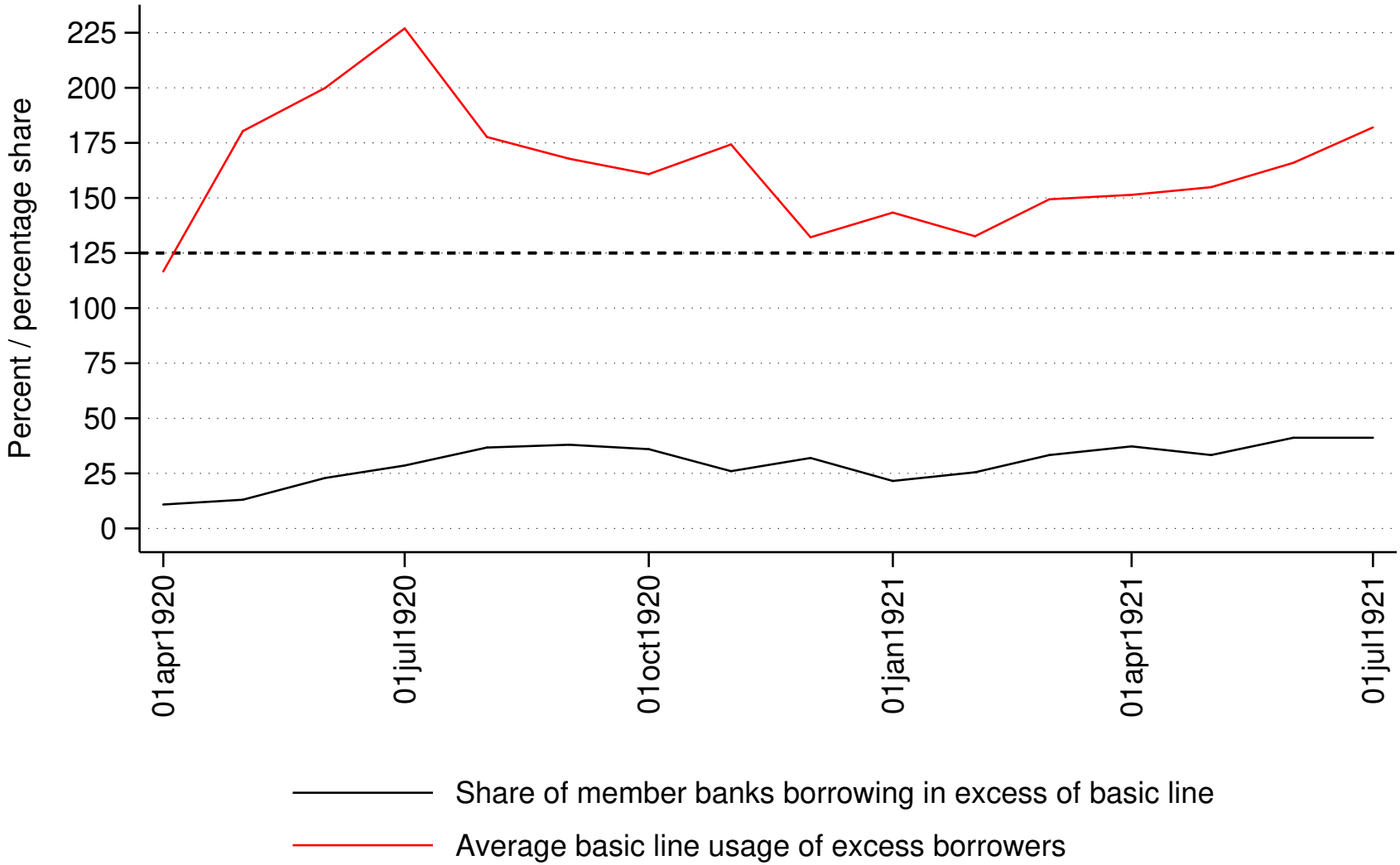


Source: Joint Commission of Agricultural Inquiry

Horizontal dashed line corresponds to 125% BL usage.

Wyoming: aggregate data on basic line usage

Back



Source: Joint Commission of Agricultural Inquiry

Horizontal dashed line corresponds to 125% BL usage.

Wallace (JPE, 1956) on the progressive discount rate: Back

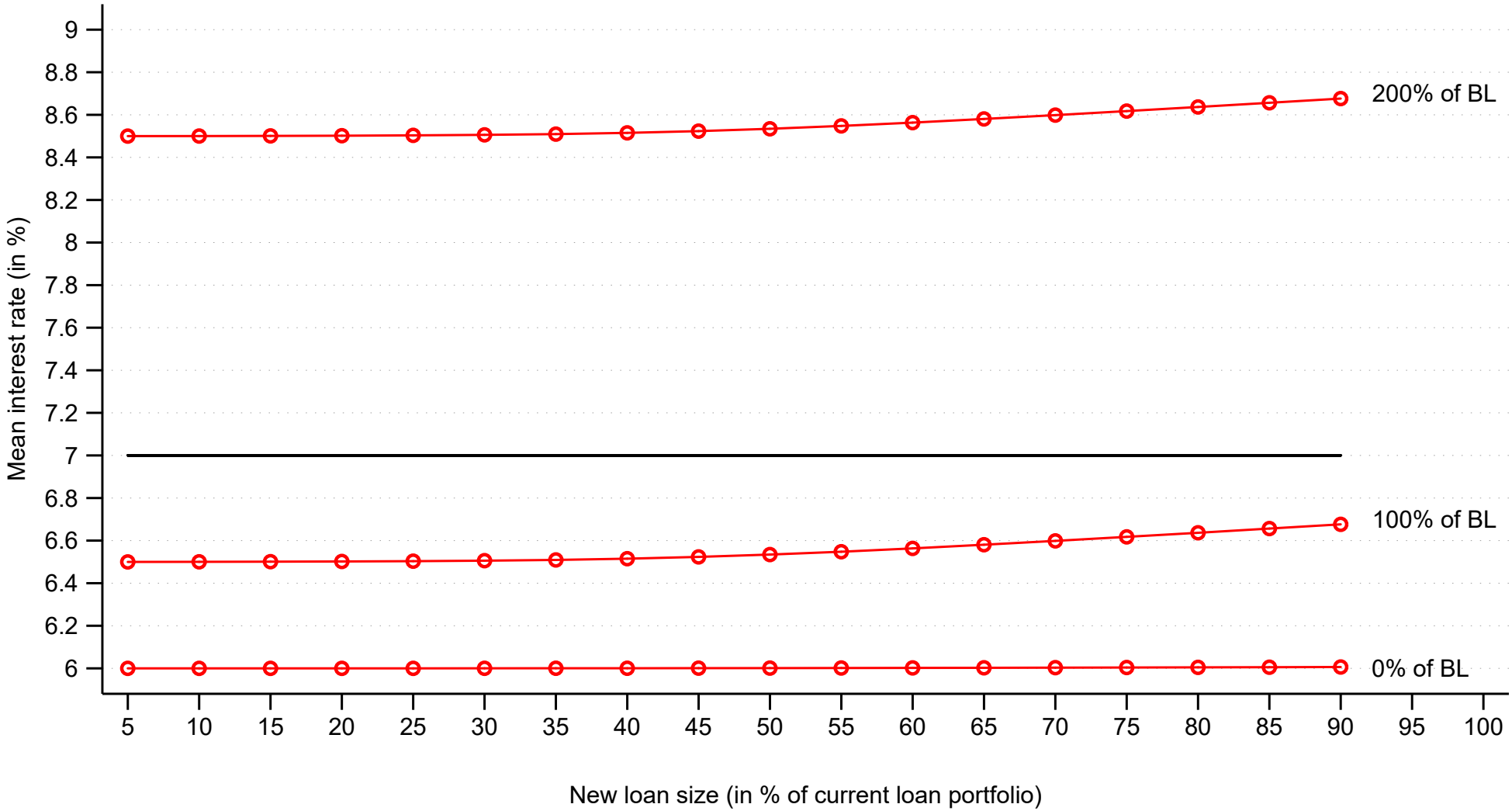
Farmers in agricultural districts being unable to sell their products for enough to liquidate bank loans, or in many cases to sell them at all, ***drew down their deposits*** *to pay debts to merchants and factors and others who in turn paid wholesalers or manufacturers in the cities who in turn liquidated their bank loans.*

In every such transaction an equivalent amount of reserves was transferred from the bank in the agricultural area to the bank in the non-agricultural area, [...] the ***full explanation of why basic lines fell so low*** *in agricultural areas, thereby forcing the banks to borrow heavily at their Federal Reserve bank.*

The difficulty of the banks lay not so much in a tremendous increase in deposits relative reserves as in a tremendous decrease in reserves relative to deposits. At the time an Alabama bank was forced to pay a ***rediscount rate of 87.5 per cent, its reserve balance had fallen to $86!***

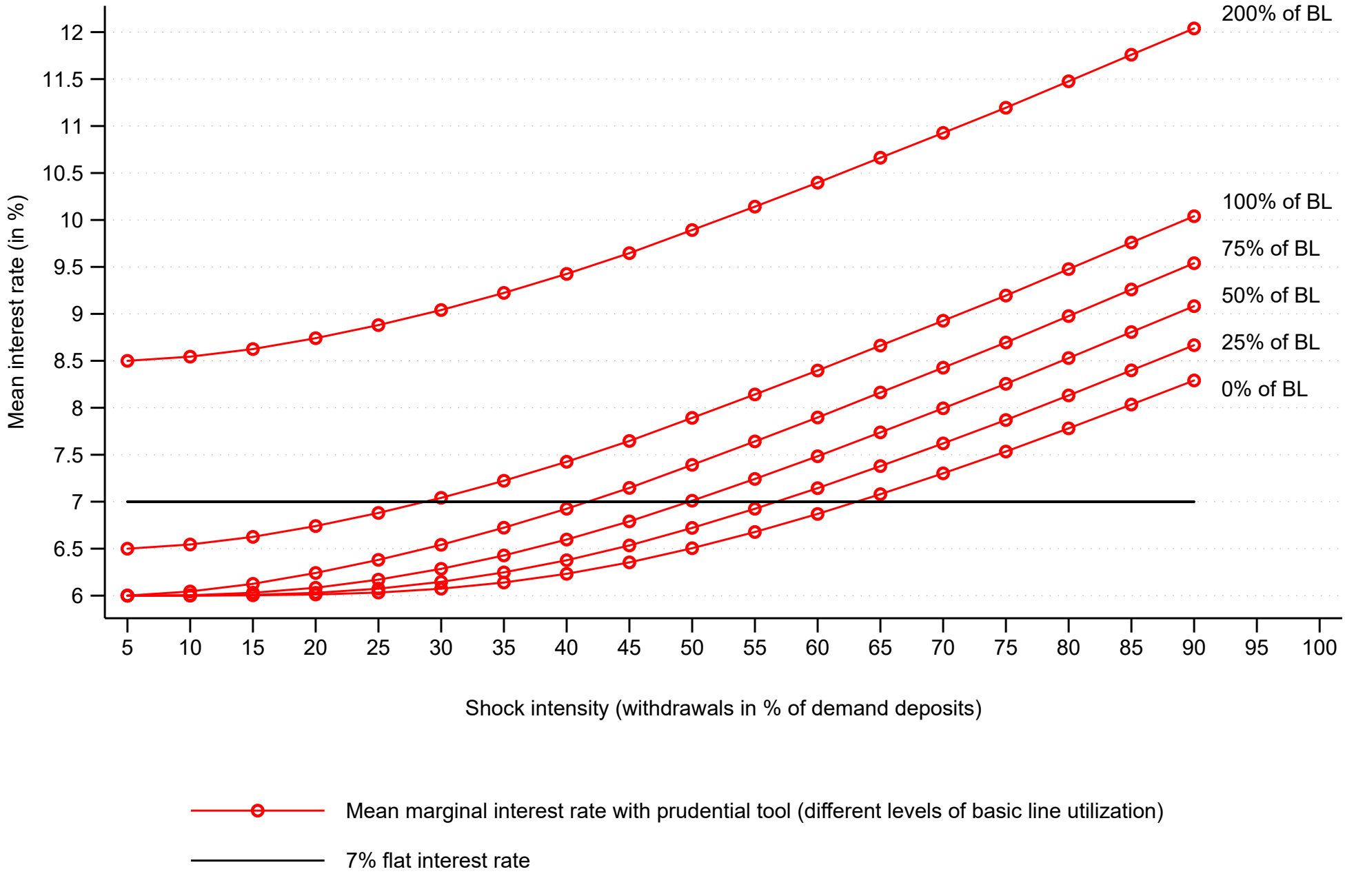
Mean marginal interest rates under different policy regimes

Back



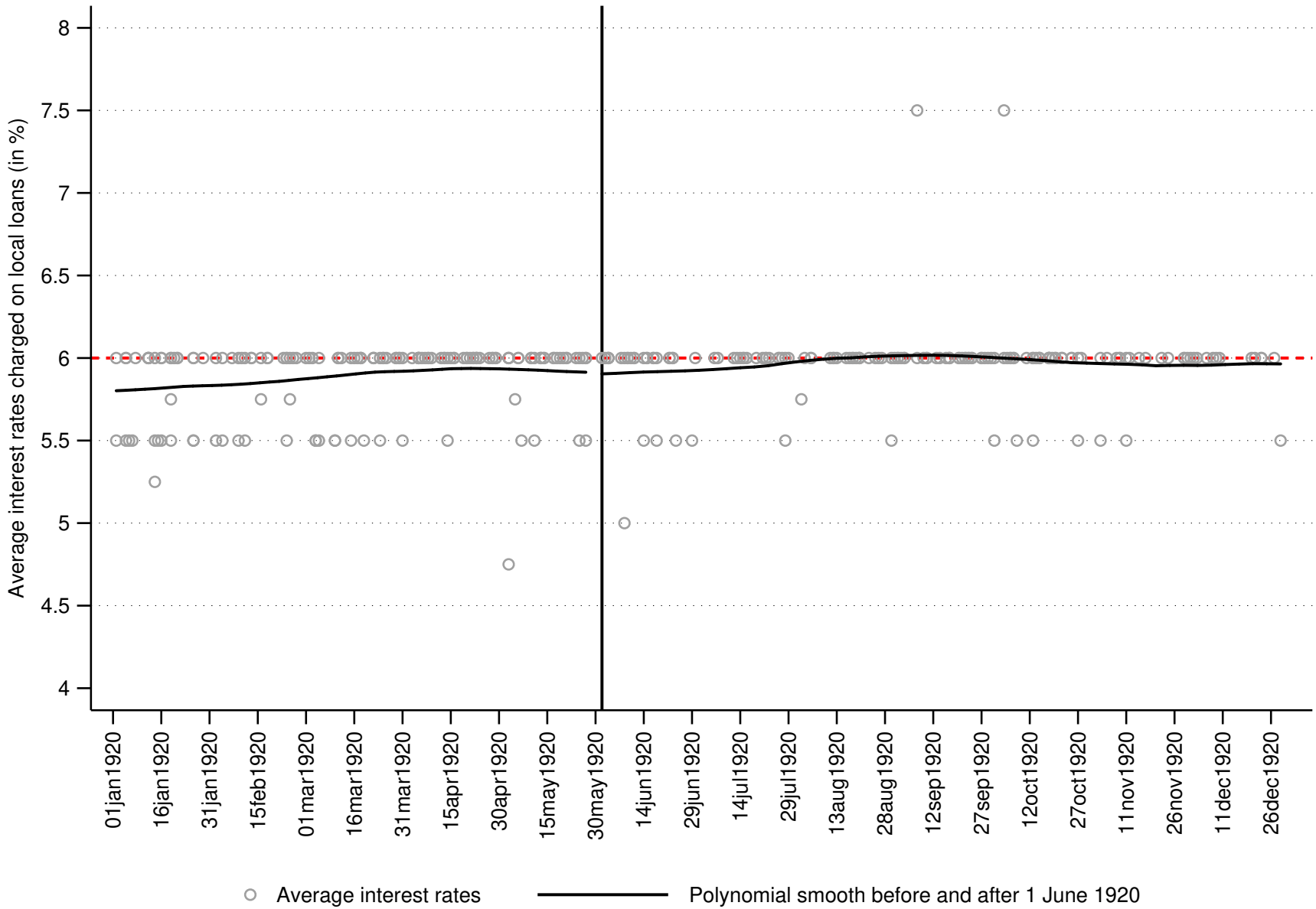
Impact of funding shocks on marginal interest rate

Back



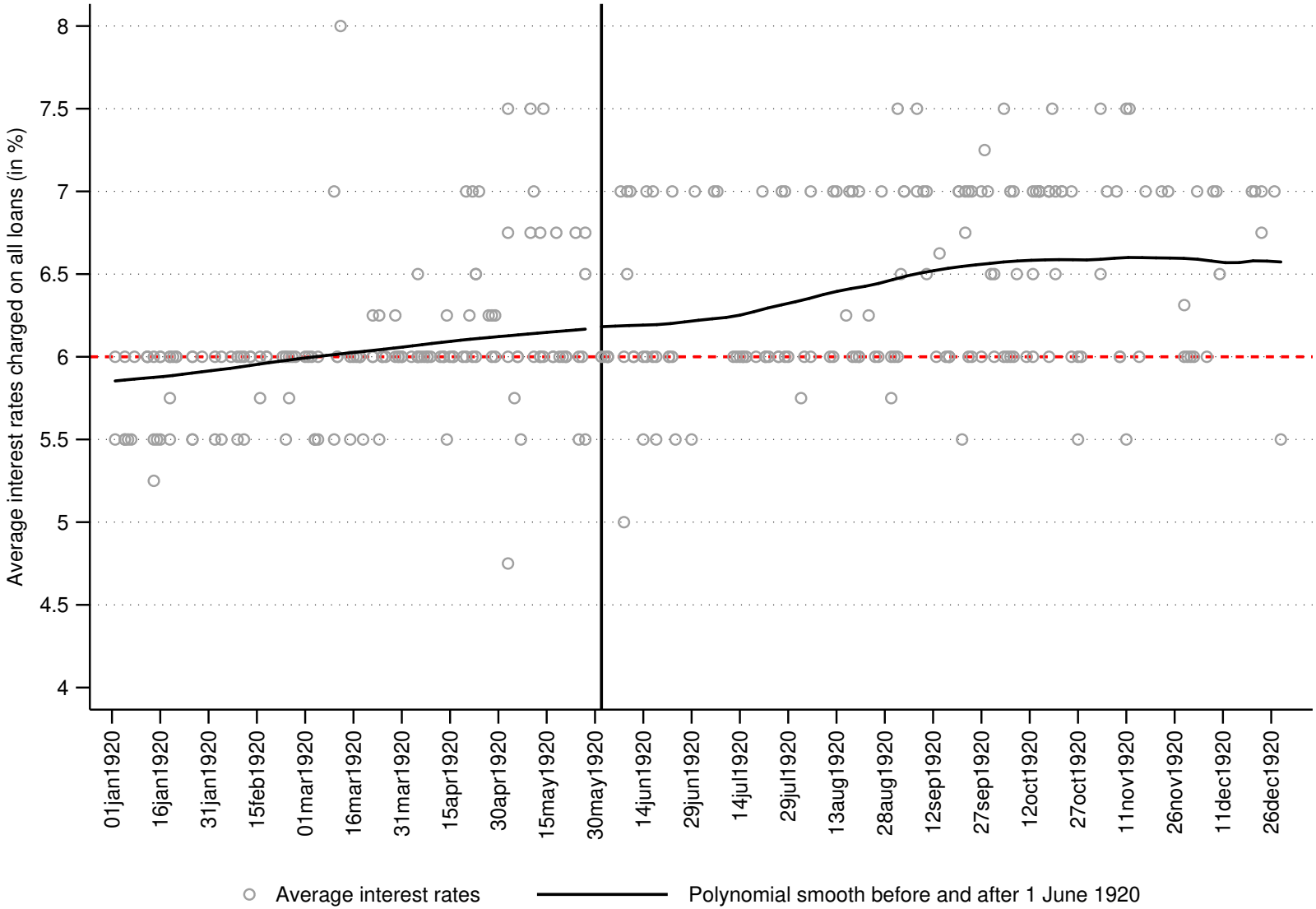
Interest rate on local loans charged by national banks in New Jersey in 1920

Back



Average interest rate on all loans charged by national banks in New Jersey in 1920

Back



LAW: forbearance or alternative lending? ▸ Back

Panel A. Bank-level lending rates in New Jersey (DiD,1920)

	<200km	<150km	<100km	<75km	<50km	<25km
Treatment	-0.14	-0.14	-0.14	-0.16	-0.13	-0.03
	(0.11)	(0.11)	(0.11)	(0.13)	(0.13)	(0.15)
R-squared	0.42	0.42	0.41	0.38	0.42	0.40
Observations	315	315	309	263	171	101

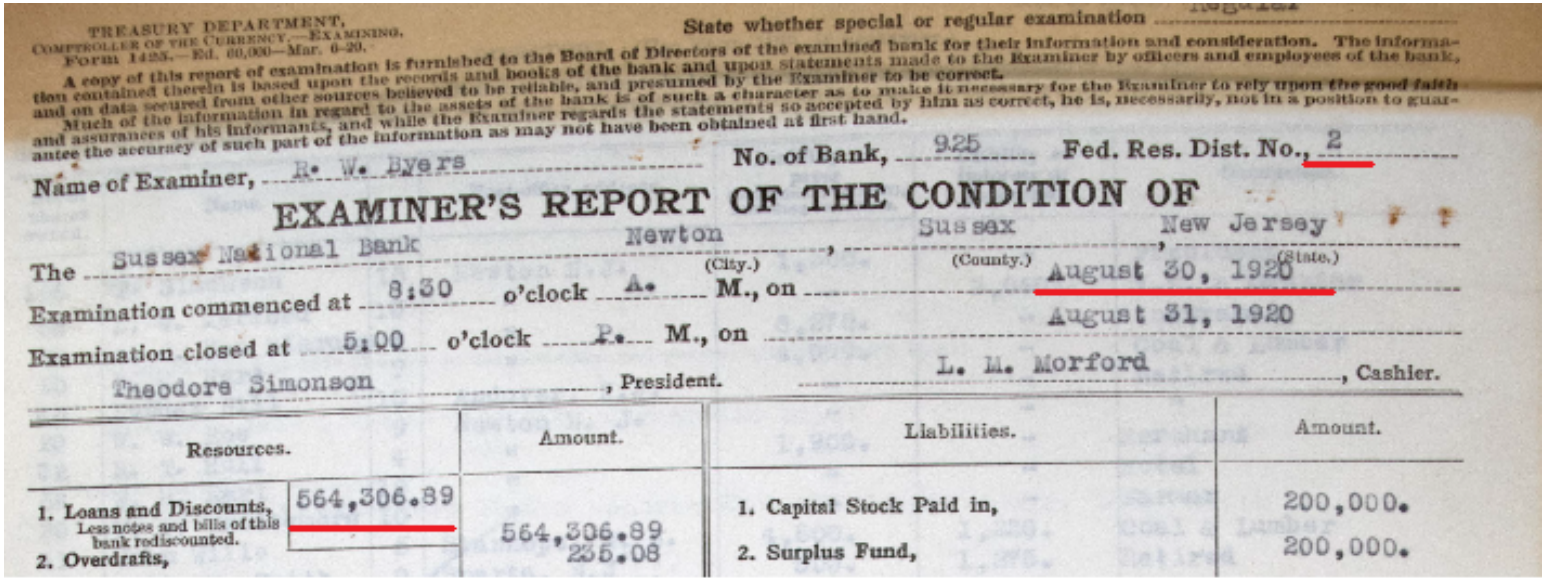
Panel B. Bank-level call loan participation in New Jersey (DiD, 1920)

	<200km	<150km	<100km	<75km	<50km	<25km
Treatment	0.16	0.16	0.16	0.18	0.16	0.09
	(0.05)***	(0.05)***	(0.05)***	(0.05)***	(0.05)***	(0.07)
Log-LL	-141.32	-141.32	-140.45	-119.63	-65.05	-40.42
Observations	315	315	309	262	170	101

Clustered standard errors in brackets. All regressions with bank FE/RE.
*** p<0.01, ** p<0.05, * p<0.1

Examiner report snippets: Sussex National Bank in Newton, New Jersey

Back



TREASURY DEPARTMENT,
COMPTROLLER OF THE CURRENCY—EXAMINING.
Form 1425.—Ed. 60,000—Mar. 6-20.

State whether special or regular examination ....

A copy of this report of examination is furnished to the Board of Directors of the examined bank for their information and consideration. The information contained therein is based upon the records and books of the bank and upon statements made to the Examiner by officers and employees of the bank, and on data secured from other sources believed to be reliable, and presumed by the Examiner to be correct.
Much of the information in regard to the assets of the bank is of such a character as to make it necessary for the Examiner to rely upon the good faith and assurances of his informants, and while the Examiner regards the statements so accepted by him as correct, he is, necessarily, not in a position to guarantee the accuracy of such part of the information as may not have been obtained at first hand.

Name of Examiner, R. W. Byers ..... No. of Bank, 925 ..... Fed. Res. Dist. No., 2 .....

EXAMINER'S REPORT OF THE CONDITION OF

The Sussex National Bank ..... Newton (City.), Sussex (County.), New Jersey (State.)

Examination commenced at 8:30 o'clock A. M., on August 30, 1920

Examination closed at 5:00 o'clock P. M., on August 31, 1920

Theodore Simonson, President. L. M. Morford, Cashier.

Resources.		Amount.	Liabilities.	Amount.
1. Loans and Discounts, Less notes and bills of this bank rediscounted.	564,306.89	564,306.89	1. Capital Stock Paid in,	200,000.
2. Overdrafts,		235.08	2. Surplus Fund,	200,000.

LOANS AND DISCOUNTS IN GENERAL.

1. To what general lines of industry or classes of borrowers are loans chiefly made?

Local merchants and farmers, local manufacturers and a few loans to merchants in surrounding territory

2. Is distribution satisfactory both as to classes of borrowers and amounts of loans?

Yes

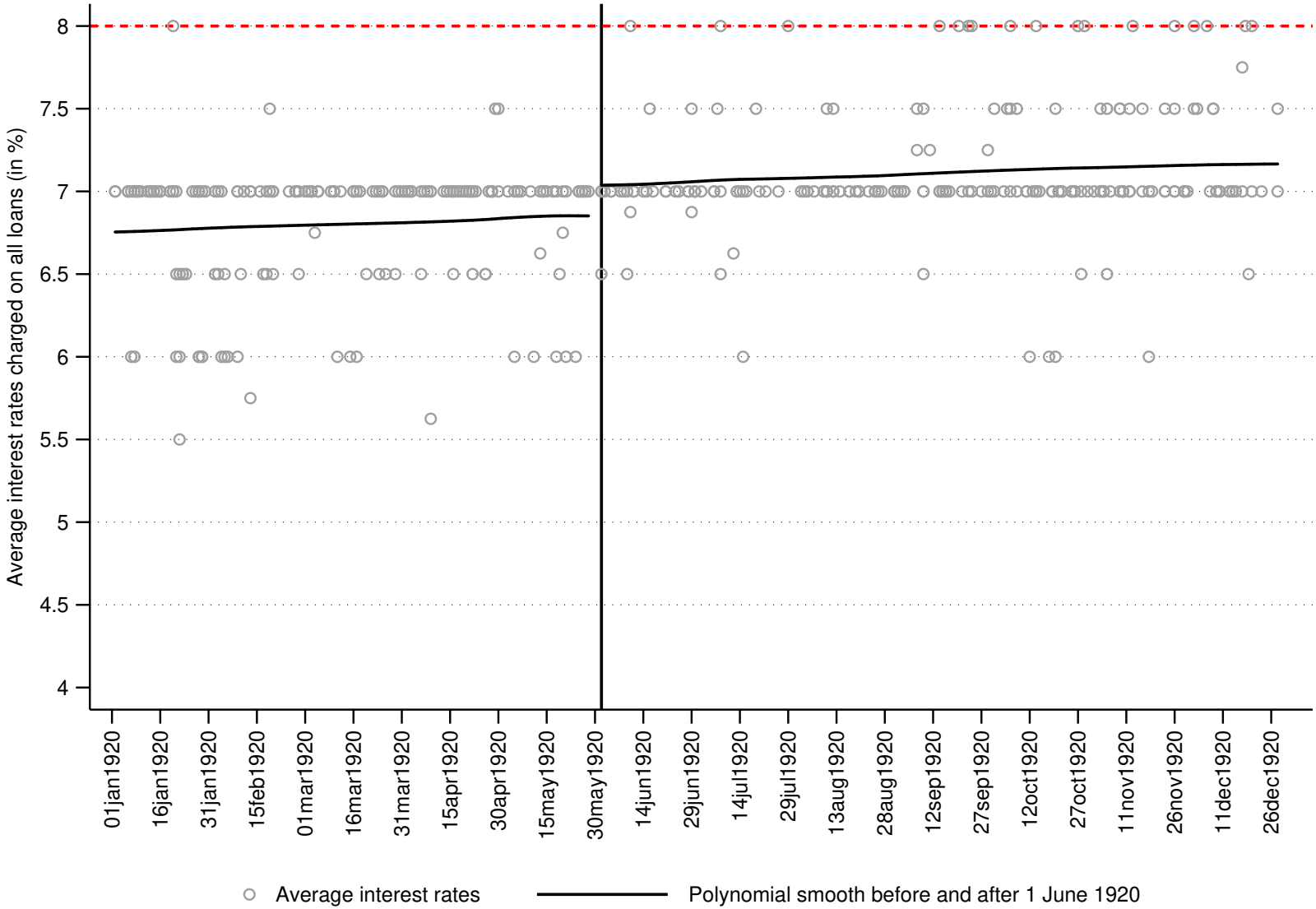
3. State approximate aggregate of loans to noncustomers and general nature of such loans.

200,000. Call Loans - 65,000. Commercial Paper

8. Give current rate of interest obtained. 5 and 6% & current rate on call loans

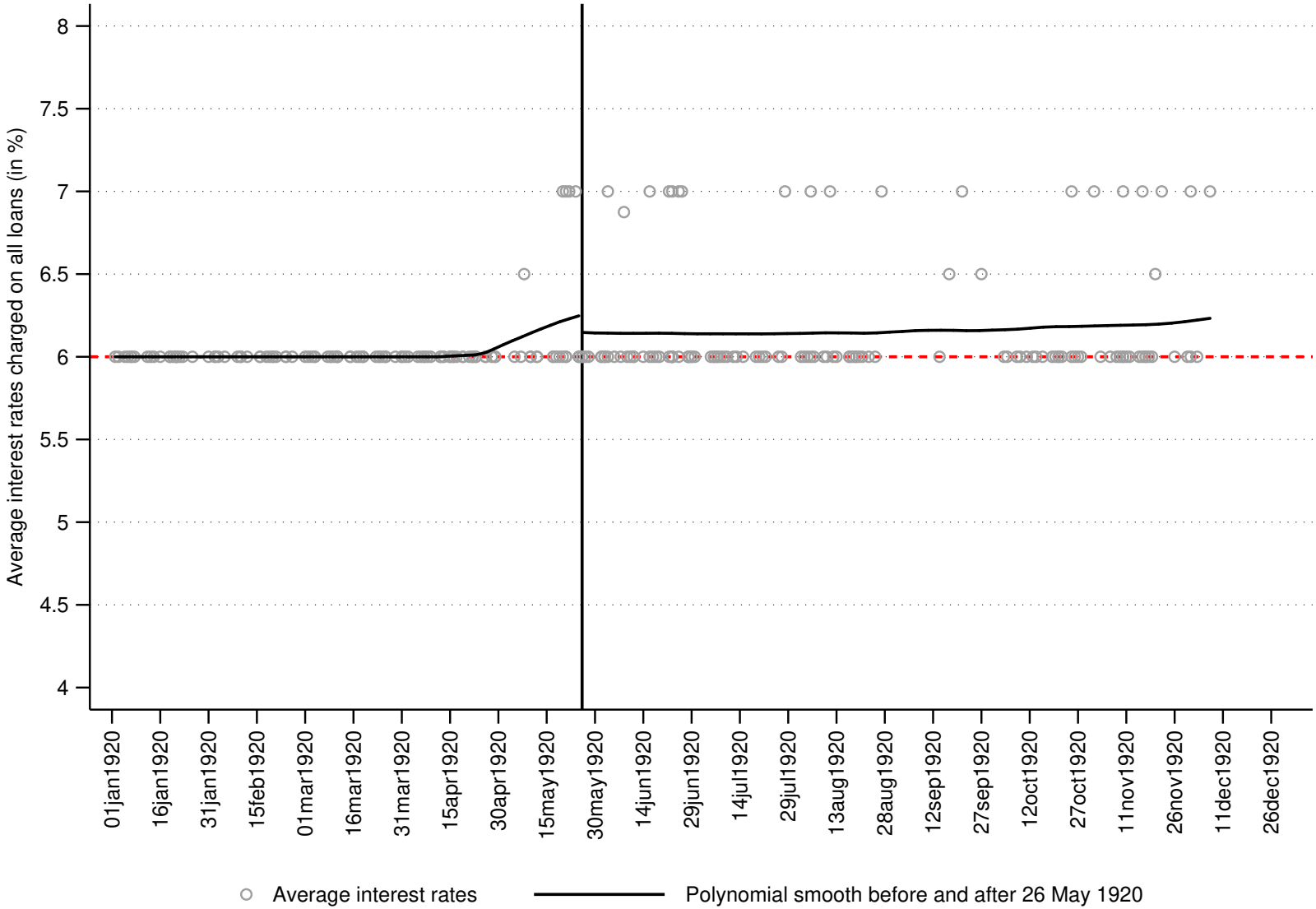
Average interest rate on all loans charged by national banks in Indiana in 1920

Back



Average interest rate on all loans charged by national banks in Kentucky in 1920

Back

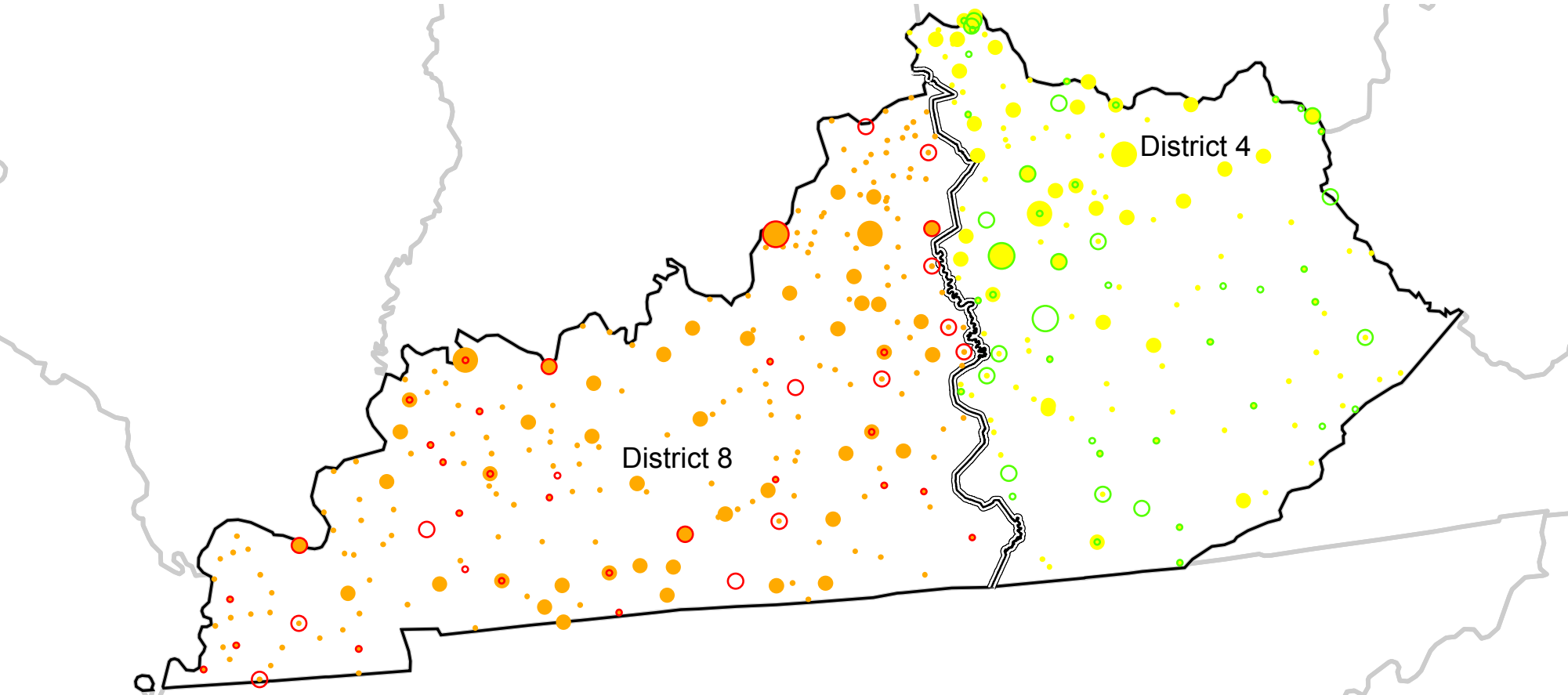


Robustness

Back

All Kentucky banks (split state for PDR)

Back



Split state evidence: macroprudential policy (DiD)

Back

Panel A. Loan growth (full panel for Kentucky, 1919-1921)

	<200km	<150km	<100km	<75km	<50km	<25km
Treatment effect	-0.14	-0.11	-0.11	-0.09	-0.07	-0.10
	(0.03)***	(0.03)***	(0.03)***	(0.04)**	(0.04)*	(0.07)
R-squared	0.22	0.20	0.19	0.19	0.16	0.21
Observations	648	551	503	409	342	155

Panel B. Leverage ratio (full panel for Kentucky, 1919-1921)

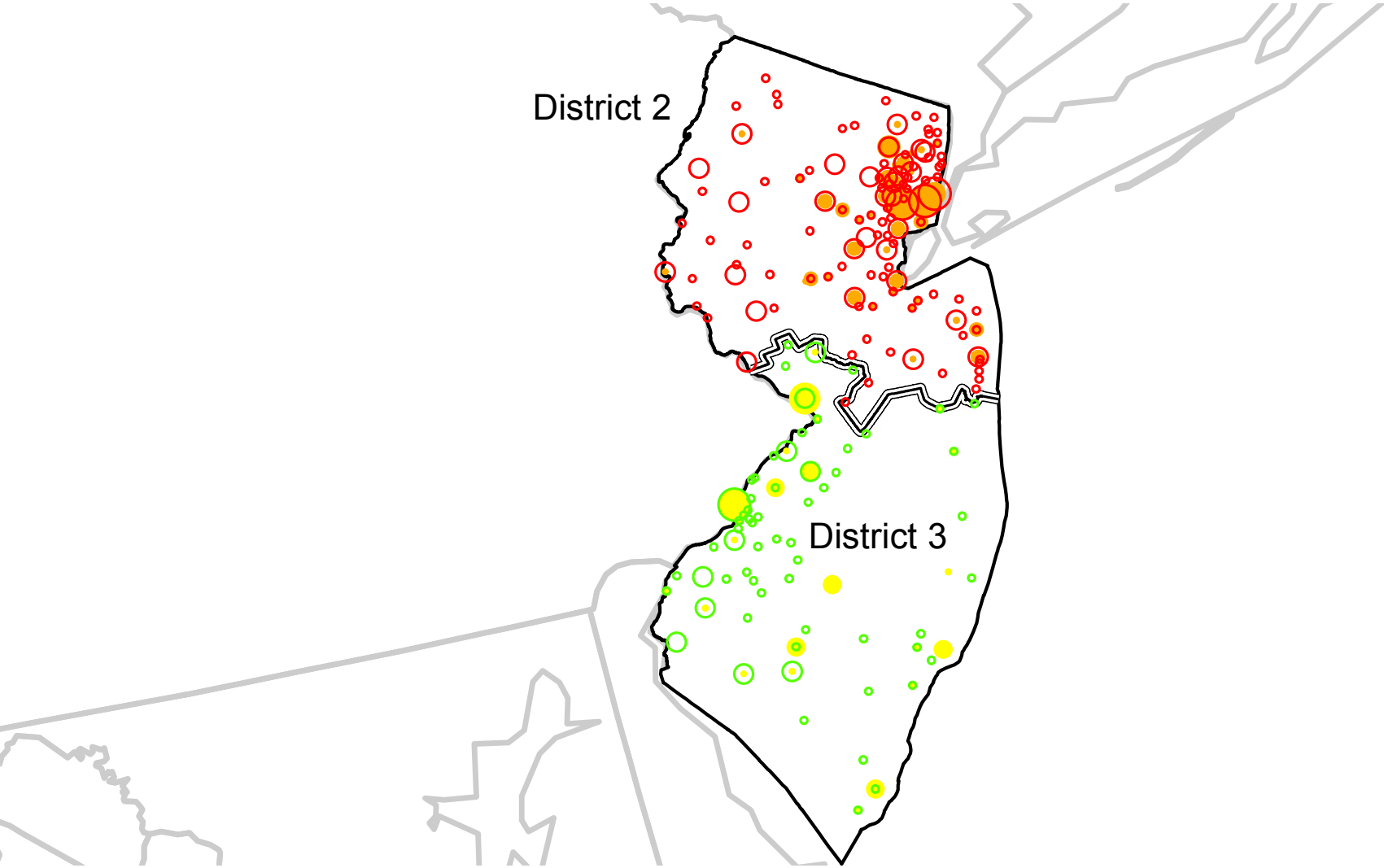
	<200km	<150km	<100km	<75km	<50km	<25km
Treatment effect	-0.13	-0.12	-0.11	-0.08	-0.07	-0.10
	(0.03)***	(0.03)***	(0.04)***	(0.04)**	(0.04)*	(0.07)
R-squared	0.16	0.17	0.19	0.13	0.13	0.16
Observations	648	551	503	409	342	155

Standard errors in brackets.

All regressions with bank FE, time FE and bank-level $\mathbf{X}'$.

*** p<0.01, ** p<0.05, * p<0.1

All New Jersey banks (split state for LAW) ▸ Back



Split state evidence: leaning against the wind (DiD) ▸ Back

Panel A. Loan growth (full panel for New Jersey, 1919-1921)

	<200km	<150km	<100km	<75km	<50km	<25km
Treatment effect	0.08	0.08	0.08	0.07	0.07	0.11
	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.03)**	(0.04)***
R-squared	0.31	0.31	0.30	0.31	0.33	0.39
Observations	1032	1032	1012	843	508	243

Panel B. Leverage ratio (full panel for New Jersey, 1919-1921)

	<200km	<150km	<100km	<75km	<50km	<25km
Treatment effect	0.06	0.06	0.06	0.06	0.08	0.11
	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.03)***	(0.04)***
R-squared	0.29	0.29	0.29	0.30	0.35	0.39
Observations	1032	1032	1012	843	508	243

Standard errors in brackets.

All regressions with bank FE, time FE and bank-level $\mathbf{X}'$.

*** p<0.01, ** p<0.05, * p<0.1

Placebo test: post-treatment effects for PDR (Jul 1921 - Sep 1921)

Back

Panel A. Loan growth (Kentucky)

	<200km	<150km	<100km	<75km	<50km	<25km
Treatment effect	0.00	0.01	0.03	0.03	0.01	0.02
	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.06)
R-squared	0.05	0.06	0.07	0.06	0.10	0.03
Observations	227	194	179	145	121	55

Panel B. Leverage ratio (Kentucky)

	<200km	<150km	<100km	<75km	<50km	<25km
Treatment effect	0.01	0.02	0.05	0.04	0.03	0.07
	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.06)
R-squared	0.18	0.34	0.36	0.31	0.37	0.50
Observations	227	194	179	145	121	55

Standard errors in brackets.

All regressions with bank FE, time FE and bank-level $\mathbf{X}'$.

*** p<0.01, ** p<0.05, * p<0.1

Placebo test: post-treatment effects for LAW (Jul 1921 - Sep 1921)

Back

Panel A. Loan growth (New Jersey)

	<200km	<150km	<100km	<75km	<50km	<25km
Treatment effect	-0.01	-0.01	-0.01	-0.03	-0.05	-0.07
	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)	(0.05)
R-squared	0.23	0.23	0.23	0.23	0.26	0.37
Observations	428	428	420	350	214	100

Panel B. Leverage ratio (New Jersey)

	<200km	<150km	<100km	<75km	<50km	<25km
Treatment effect	-0.03	-0.03	-0.03	-0.04	-0.04	-0.06
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.05)
R-squared	0.26	0.26	0.26	0.23	0.31	0.47
Observations	428	428	420	350	214	100

Standard errors in brackets.

All regressions with bank FE, time FE and bank-level $\mathbf{X}'$.

*** p<0.01, ** p<0.05, * p<0.1

Placebo test: all possible non-policy border combinations

Back

Panel A. Loan growth

	3 vs 4,5 <25km	**4 vs 3,5** <25km	**5 vs 3,4** <25km
Treatment effect	**-0.02**	**0.11**	**-0.05**
	[0.04]	[0.05]**	[0.04]
R-squared	0.17	0.18	0.18

Panel B. Leverage ratio

	3 vs 4,5 <25km	**4 vs 3,5** <25km	**5 vs 3,4** <25km
Treatment effect	**-0.01**	**0.04**	**-0.01**
	[0.03]	[0.03]	[0.03]
R-squared	0.15	0.15	0.15
Observations	661	661	661

Standard errors in brackets.

All regressions with bank FE, time FE and bank-level $\mathbf{X}'$.

*** p<0.01, ** p<0.05, * p<0.1

Local linear regression model:

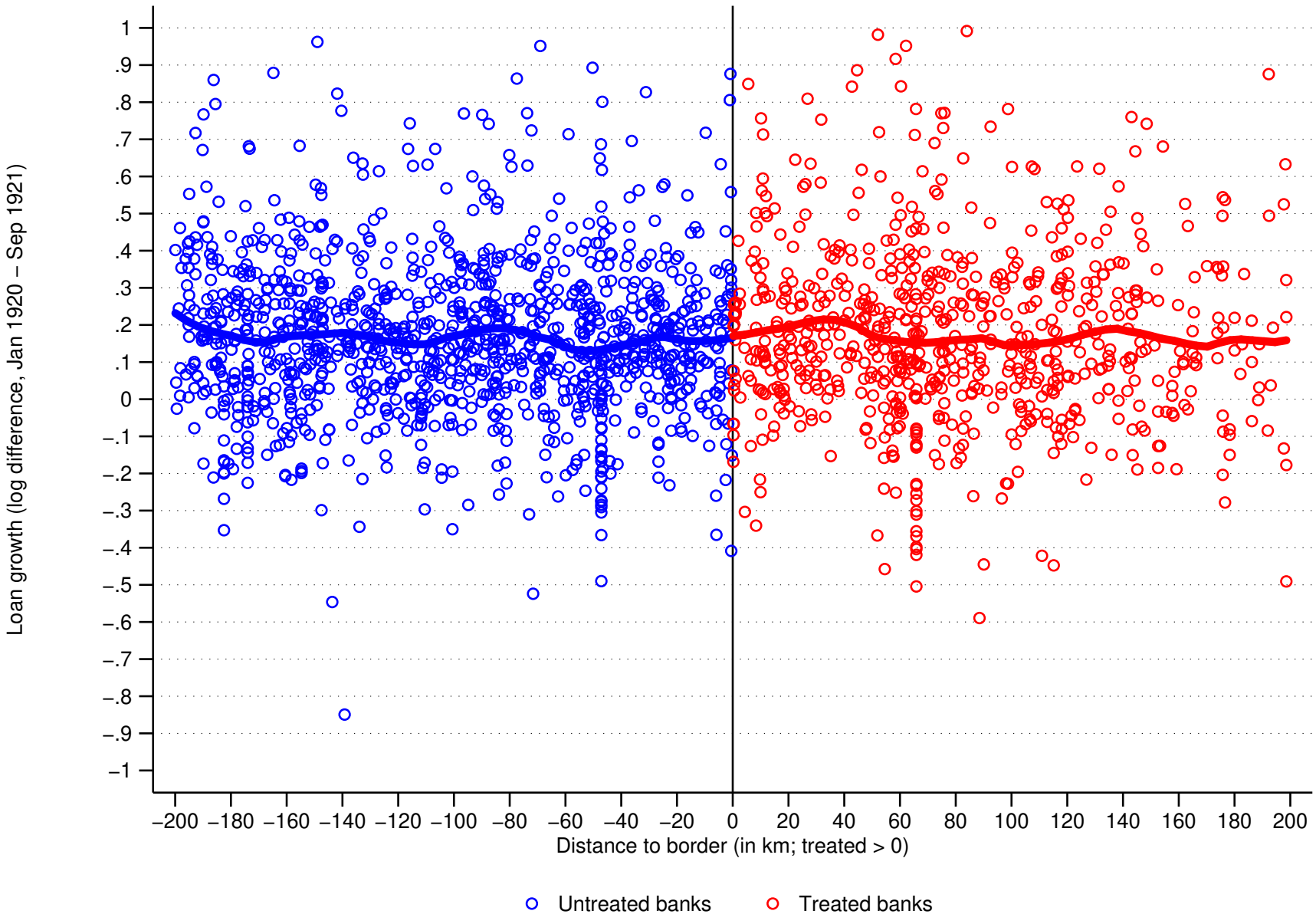
$$\underbrace{Y_i}_{Bank-level\ outcome} = \underbrace{\alpha}_{Constant} + \underbrace{\beta T_i}_{Treatment\ dummy} + \underbrace{\gamma(D_i - b) + \delta(D_i - b)T_i}_{Running\ variable\ (distance\ to\ border)} + \underbrace{\Psi' \mathbf{X}_i}_{Bank-level\ controls} + \underbrace{\Omega' \mathbf{B}_i}_{Border-segment\ FE} + \underbrace{u_i}_{Error\ term}$$

Specification:

- Y_i = % Δ in loan portfolio *OR* % Δ in leverage ratio
  - Different horizons: 4, 8, 16 months
- Estimated for 200, 100, 50, 25 km bands around borders

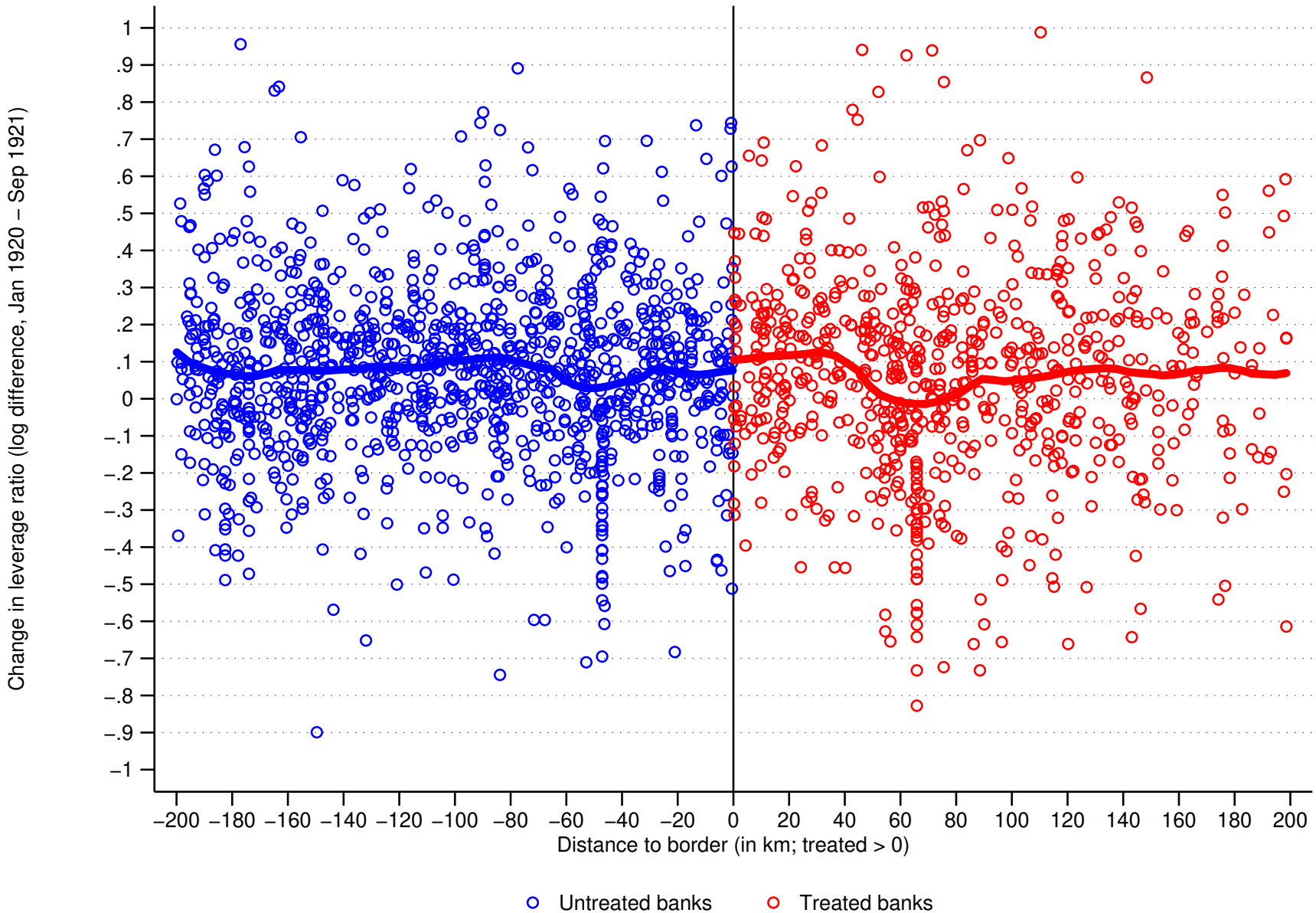
"Eyeball metrics": **leaning against the wind** - loan growth

Back



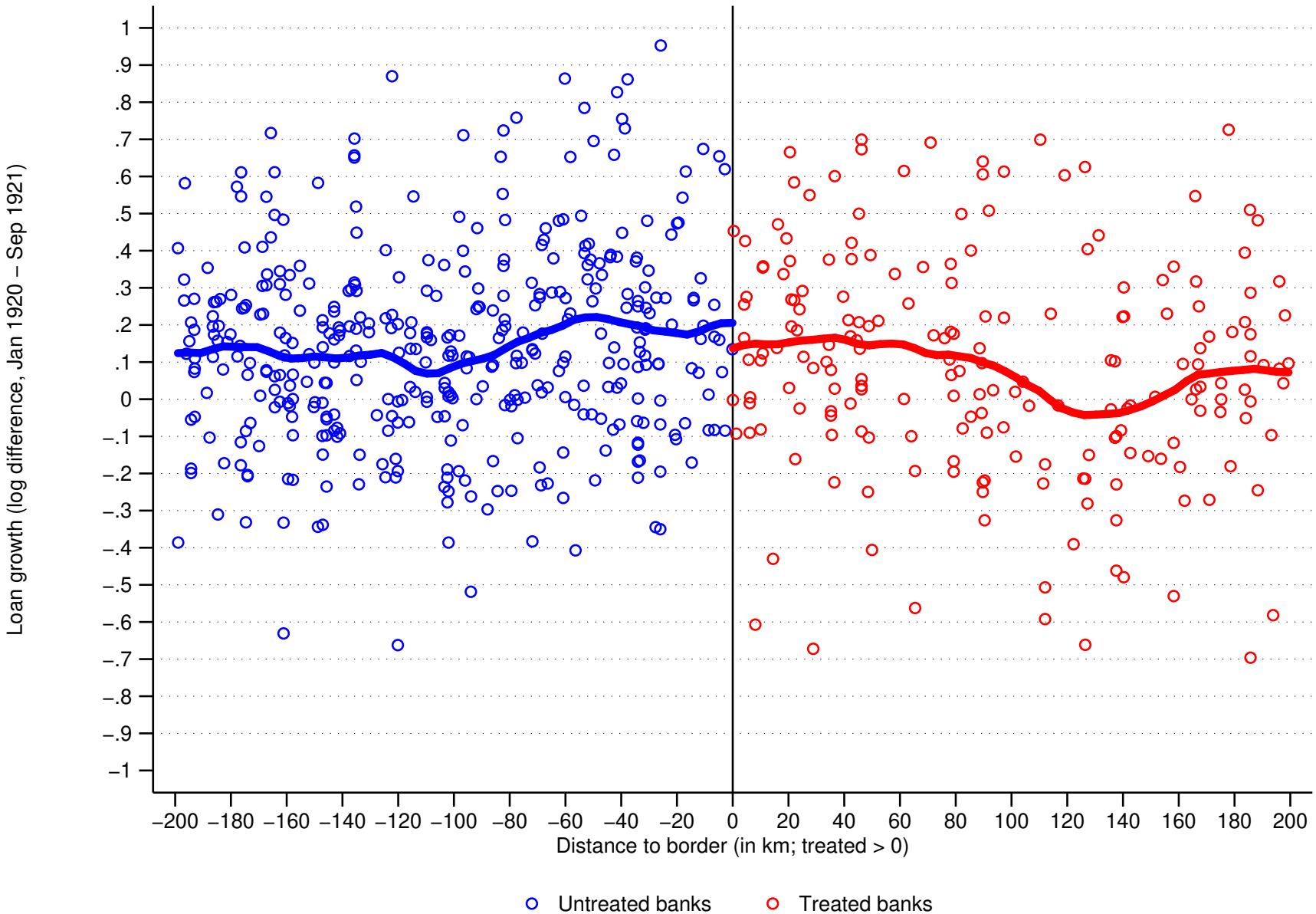
"Eyeball metrics": **leaning against the wind** - leverage ratio

Back



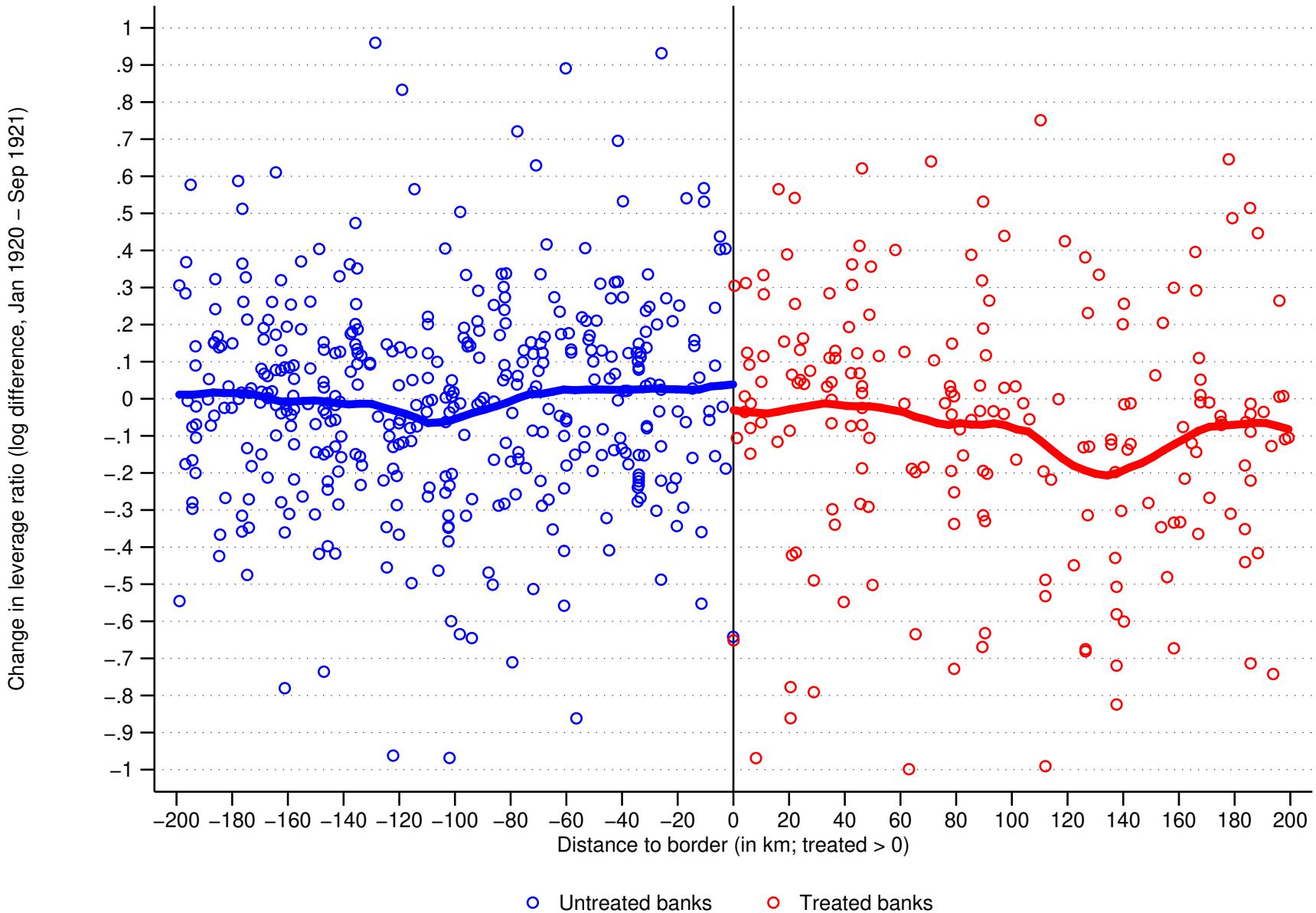
"Eyeball metrics": **macroprudential policy** - loan growth

Back



"Eyeball metrics": **macroprudential policy** - leverage ratio

Back



Baseline results: leaning against the wind (RDD)

Back

Panel A. Short-run effects (Jan 1920 - Sep 1920)

Treatment effect	<200km	<100km	<50km	<25km
Loan growth	**-0.01**	**-0.01**	**-0.03**	**-0.04**
	[0.02]	[0.02]	[0.04]	[0.04]
R-squared	0.19	0.28	0.28	0.53
Δ leverage ratio	**-0.01**	**0.01**	**-0.02**	**-0.04**
	[0.02]	[0.02]	[0.04]	[0.05]
R-squared	0.25	0.32	0.37	0.55
Observations	1,794	1,005	474	248

Panel B. Medium-run effects (Jan 1920 - Sep 1921)

Treatment effect	<200km	<100km	<50km	<25km
Loan growth	**0.01**	**-0.01**	**-0.04**	**-0.05**
	[0.03]	[0.04]	[0.05]	[0.05]
R-squared	0.20	0.25	0.23	0.49
Δ leverage ratio	**-0.02**	**0.03**	**0.01**	**-0.01**
	[0.02]	[0.03]	[0.06]	[0.05]
R-squared	0.23	0.28	0.29	0.52
Observations	1,787	1,007	476	250

Conley standard errors in brackets.

All regressions with border FE and bank-level $\mathbf{X}'$.

*** p<0.01, ** p<0.05, * p<0.1

Baseline results: macroprudential policy (RDD)

Back

Panel A. Short-run effects (Jan 1920 - Sep 1920)

Treatment effect	<200km	<100km	<50km	<25km
Loan growth	**-0.09**	**-0.17**	**-0.10**	**-0.15**
	[0.05]*	[0.07]**	[0.14]	[0.13]
R-squared	0.32	0.38	0.37	0.48
Δ leverage ratio	**-0.08**	**-0.12**	**-0.05**	**-0.21**
	[0.03]***	[0.03]***	[0.06]	[0.09]**
R-squared	0.33	0.41	0.47	0.61
Observations	562	281	146	63

Panel B. Medium-run effects (Jan 1920 - Sep 1921)

Treatment effect	<200km	<100km	<50km	<25km
Loan growth	**-0.10**	**-0.10**	**-0.08**	**-0.34**
	[0.04]**	[0.04]**	[0.11]	[0.12]***
R-squared	0.25	0.32	0.29	0.38
Δ leverage ratio	**-0.08**	**-0.08**	**-0.08**	**-0.23**
	[0.04]**	[0.03]***	[0.08]	[0.07]***
R-squared	0.30	0.35	0.30	0.59
Observations	548	277	143	61

Conley standard errors in brackets.
All regressions with border FE and bank-level $\mathbf{X}'$.
*** p<0.01, ** p<0.05, * p<0.1

Additional results

▸ Back

What were the real economic costs of policies?

1. **Trade-off**: policy effectiveness vs. collateral damage
2. Collateral damage relative to no-policy scenario

Real economic proxy

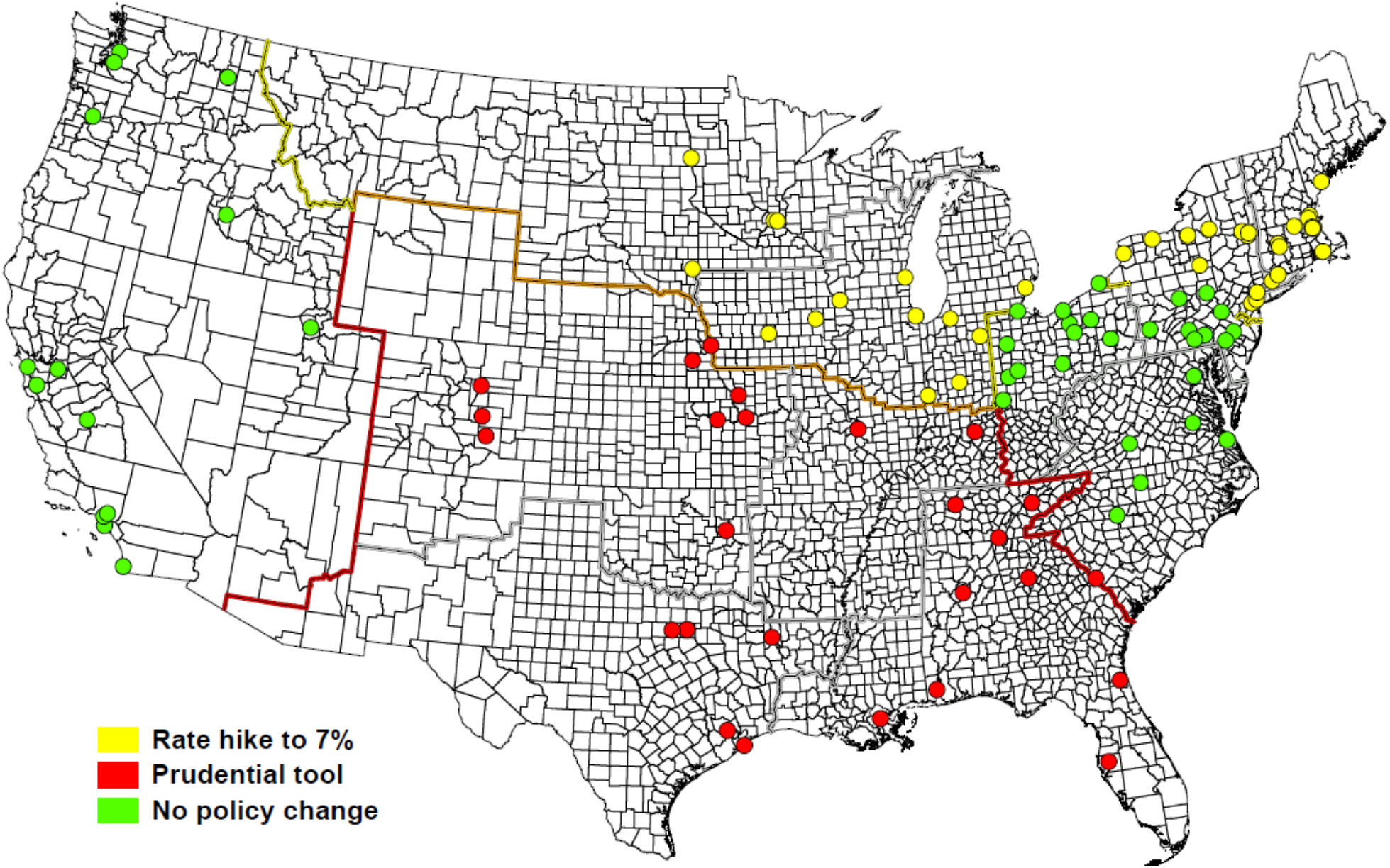
- Monthly value of new building permits (constant USD)

Econometric approach

- Local projections
- Cumulative impulse responses
- Month FE, city FE, parallel trend assumption

City-level data on building activity

Back



Real economic impact: local projection method

Back

$$\underbrace{\Delta^h B_{i,t}}_{City-level\ \ outcome} =$$

$$\underbrace{\alpha}_{Constant} + \underbrace{\mathbf{\Gamma} \sum_{j=0}^{k} \Delta T_{i,t-j}}_{Treatment\ \ dummy} + \underbrace{\mathbf{\Psi} \sum_{j=0}^{k} \Delta B_{i,t-j}}_{Lagged\ \ dependent\ \ variable} +$$

$$\underbrace{\sum_{i=1}^{n} c_i}_{City\ \ FE} + \underbrace{\sum_{t=1}^{m} y_t}_{Month\ \ FE} + \underbrace{u_{i,t}}_{Error\ \ term}$$

- $B_{i,t}$ = value of building permits (constant April 1920 USD)
- h set to 12 months, k set to 1 months

Parallel trend assumption: city-level data on building permits

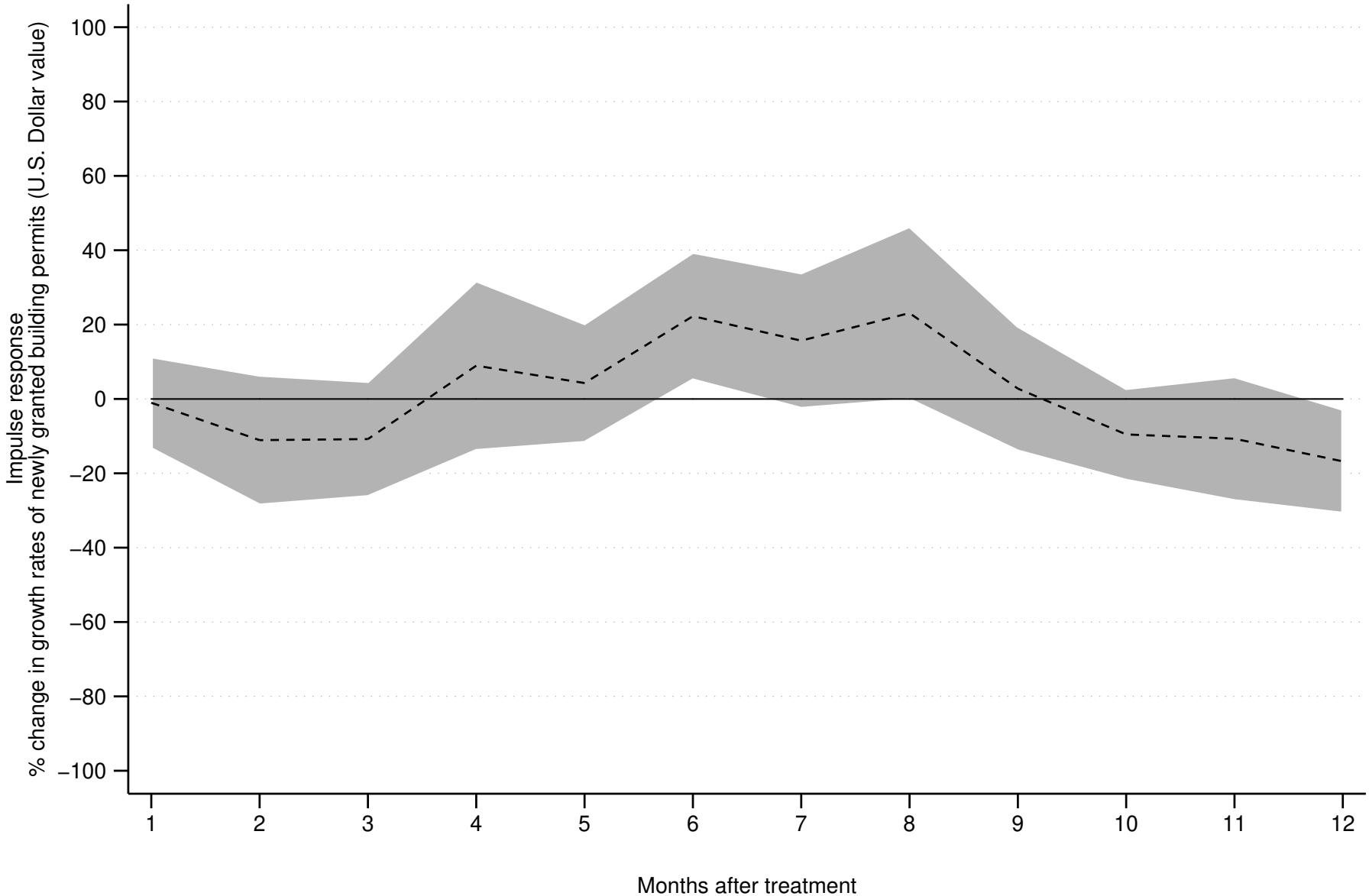
Back



Source: Bradstreet's − A Journal of Trade, Finance and Public Economy (1919−1921); own calculations
* Microprudential tool = progressive discount rate (PDR)

Relative economic cost: PDR vs. LAW

Back



Source: Bradstreet's – A Journal of Trade, Finance and Public Economy (1919–1921); own calculations

Impact on financial stability

Back

- **T** on bank-level probability of failure (1921-1926)
- Smallest possible radius around border

Panel A. Leaning against the wind (logit regression)

Bank failure	<200km	<150km	<120km	<110km
Treatment effect	-0.66	-0.38	-1.94	-19.72
Marginal effect	-0.00	-0.00	-0.00	-0.00
	[4.85]	[7.88]	[12.69]	[29.76]
Observations	1,820	1,474	1,214	1,125
Log-LL	-52.36	-34.35	-23.19	-15.96

Panel B. Prudential policy (logit regression)

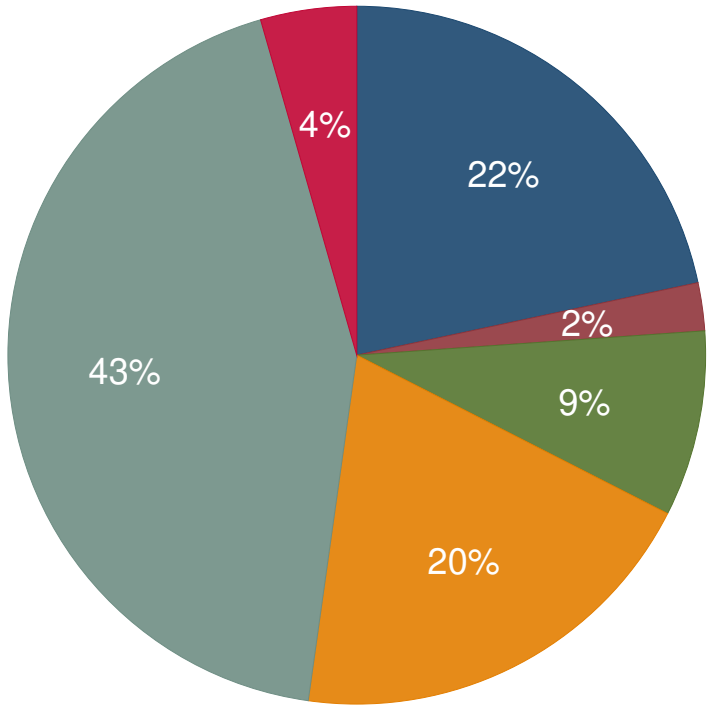
Bank failure	<200km	<150km	<100km	<75km
Treatment effect	1.22	-0.66	-2.56	-15.68
Marginal effect	0.03	-0.01	-0.01	-0.09
	[1.10]	[1.30]	[0.95]***	[2.68]***
Observations	570	428	284	206
Log-LL	-72.77	-58.90	-25.76	-21.12

Conley standard errors in brackets.
All regressions with border FE and bank-level $\mathbf{X}'$.
*** p<0.01, ** p<0.05, * p<0.1

Causes of bank failures in sample (N=46)

Back

Back



- Incompetence
- Incompetence, fraud
- Incompetence, local financial depression from unforeseen agricultural disaster
- Fraud
- Local financial depression from unforeseen agricultural disaster
- Closed by run

Source: Office of the Comptroller of the Currency (1921–1926)