Monetary Policy When One Size Does Not Fit All: Federal Reserve Banks and the Recession of 1920-1921

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Quick Summary

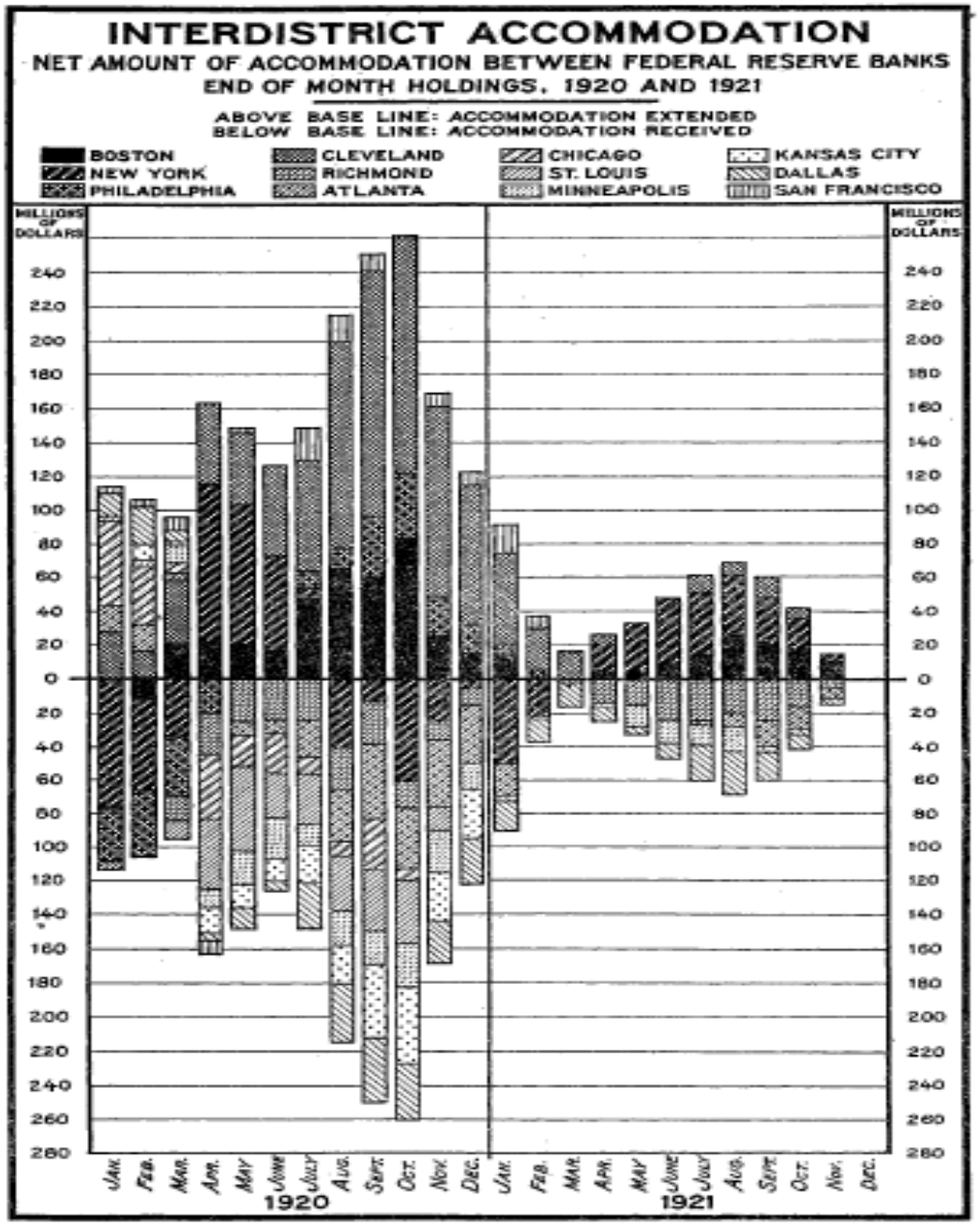
- Unique FR policy regime, 1919-1922, pre-Tenth Report (1923), pre-OMIC, brief but dramatic!
- FR Banks have considerable discretion in discounting and OM operations subject to gold reserve requirements
- Beginning 1919, tight money policy initiated by the Fed
- Recession of 1920-1921, asymmetric shock to FR Districts, some FR Banks continue contractionary policy, others pursue expansionary policy
- We document internal struggle between FR Banks—new documentation
- We show that the "Dovish" FR Banks bolstered lending to their member banks by borrowing from "Hawkish" FR Banks and that member banks then increased lending to their customers---new data
- Lack data to take it the next step and show that increased member bank lending served to mitigate the recession in those districts or to prevent a panic.

A Decentralized Central Bank

- House Banking Committee on the Glass bill: No single central bank because in a country as large as the United States "equally good results can be obtained" by several independent reserve banks, cooperating to achieve the advantages of central banking
- Allowed each bank to set its own discount rate. FR banks may conduct open market operations in any assets acceptable as collateral for rediscounts and to purchase and sell gold and government bonds.
- But : the "root of the central banking argument" is pooling of gold reserves to enable note issue and discounting.
- BUT division of power between Board and Banks becomes a source of tension over large number of issues

Pooling of Gold Reserves and the Gold Settlement Fund

- Reserve Requirements set by FR Act: 40% in lawful money (gold and gold certificates held by the Treasury) for FR notes and 35% for member bank deposits at the Federal Reserve Banks. Requirements for each Bank and the System as a whole.
- Problem identified by Strong---one Bank could be leaking reserves while other eleven try to improve their reserve positions. Board given power to require FR Banks to rediscount for other FR Banks
- Inter-Reserve Bank lending via the Gold Settlement Fund in D.C.
- A FR Bank with falling reserves may re-discount paper with another FR Bank, which would wire the Fund to transfer gold certificates between accounts of the two banks. Re-rediscount rate set by Board on each transaction 1916-1920.
- Rate raised to 7 percent on September 7, 1920
- Re-rediscounts cease March 22, 1922.



Some limited Interdistrict Lending during WWI but then grows considerably during postwar recessions, booms, inflations, deflations. New data base of FR banks 1918-1924…new data push this graph back

Inherent Tensions

- **Between the Board and the Banks: well known**
- "The Federal Reserve Board and the Federal Reserve Banks were the bodies established to exercise jointly the functions [of a central bank] …….How the functions were initially divided between the two…….gave rise to numerous conflicts within the System, the most notable being the continual struggle for power between the Federal Reserve Bank of New York and the Federal Reserve Board, with the balance shifting from time to time depending largely on the personalities involved." Friedman & Schwartz (1963, p. 190).
- Informed by Hamlin (FR Board) diary and Harrison (Governor FRBNY). Most history of Fed largely from vantage point of the Board/NY Fed.
- **Between the FR Banks**: **less well known:** important for how the Fed responds to 1920-1921 recession. New source, the Minutes of the Boards of Directors and Executive Committees of the FRBs. Here Atlanta and Cleveland. **Feud over how to respond to the 1920-1921 recession---not important if economy is highly integrated, but…**

The Recession of 1920-1921:

Asymmetric Shocks in Less Than Fully Integrated Economy

- In an economy with a frictionless money market, a nominal economic shock should be offset by open market operations or lowering discount rate. Any asymmetries in the shock to different regions can be handled through the interbank market for lending.
- However, a shock may produce a regional or general crisis is greater if money markets are not fully integrated and/or if interbank market for liquidity has information asymmetries.
- Models of multi-region economies, Freixas, Parigi, and Rochet (2000) and Allen and Gale (2009): if there is an aggregate liquidity shortage, a shock may be transmitted from the weaker regions to the stronger regions by unexpected forced liquidations, which may yield a general banking crisis. Both of these conditions appear to have been present in the early 1920s, leaving the twelve Federal Reserve banks facing very different regional conditions during the recession of 1920-21.

U.S.: a less than fully integrated economy

- An Optimal Currency Area (Rockoff, 2010) should have several attributes:
  1. It should be a large area
  2. It does not have regions that are specialized in goods subject to systemic shocks specific to the regions
  3. Labor mobility between regions is not limited
  4. Capital mobility between regions is not limited
  5. Fiscal transfers between regions is not limited.

U.S. circa 1920: a less than fully integrated economy

1. FR Districts large—as big as European countries
2. Some districts heavily industrial, others agricultural, cotton important in Atlanta, Dallas, Richmond and St. Louis
3. The South was a distinct labor market pre-WWII
4. Money markets: Landon-Lane and Rockoff (2004) "In the nineteenth century, perhaps until World War II, the peripheral regions of the United States did not simply import interest rate shocks from other regions. They generated their own……This lack of synchronicity set a difficult problem for a potential monetary authority."
5. Pre-New Deal: fiscal transfers between regions was limited.

Liquidity Shocks in the less than fully integrated U.S. Economy

- Absence of branch banking, banks tied together via correspondent banking
- High degree of vulnerability
- Money market integration---arbitraging interest rate differentials and transferring funds relied on the limited information about unit banks in distant regions that did not fully capture the condition of banks' balance sheets or the underlying loan collateral.

Liquidity Shocks in the less than fully integrated U.S. Economy

- Big shock: decline of cotton prices in 1920-1921: In the Sixth District, for example (White, 2015) a substantial portion of bank loans were collateralized by cotton and other commodities. Hard for illiquid banks to access national interbank market for liquidity.
- If banks refused to renew loans, customers may dump their commodities on the market. Fire sale could lead to wider banking collapse

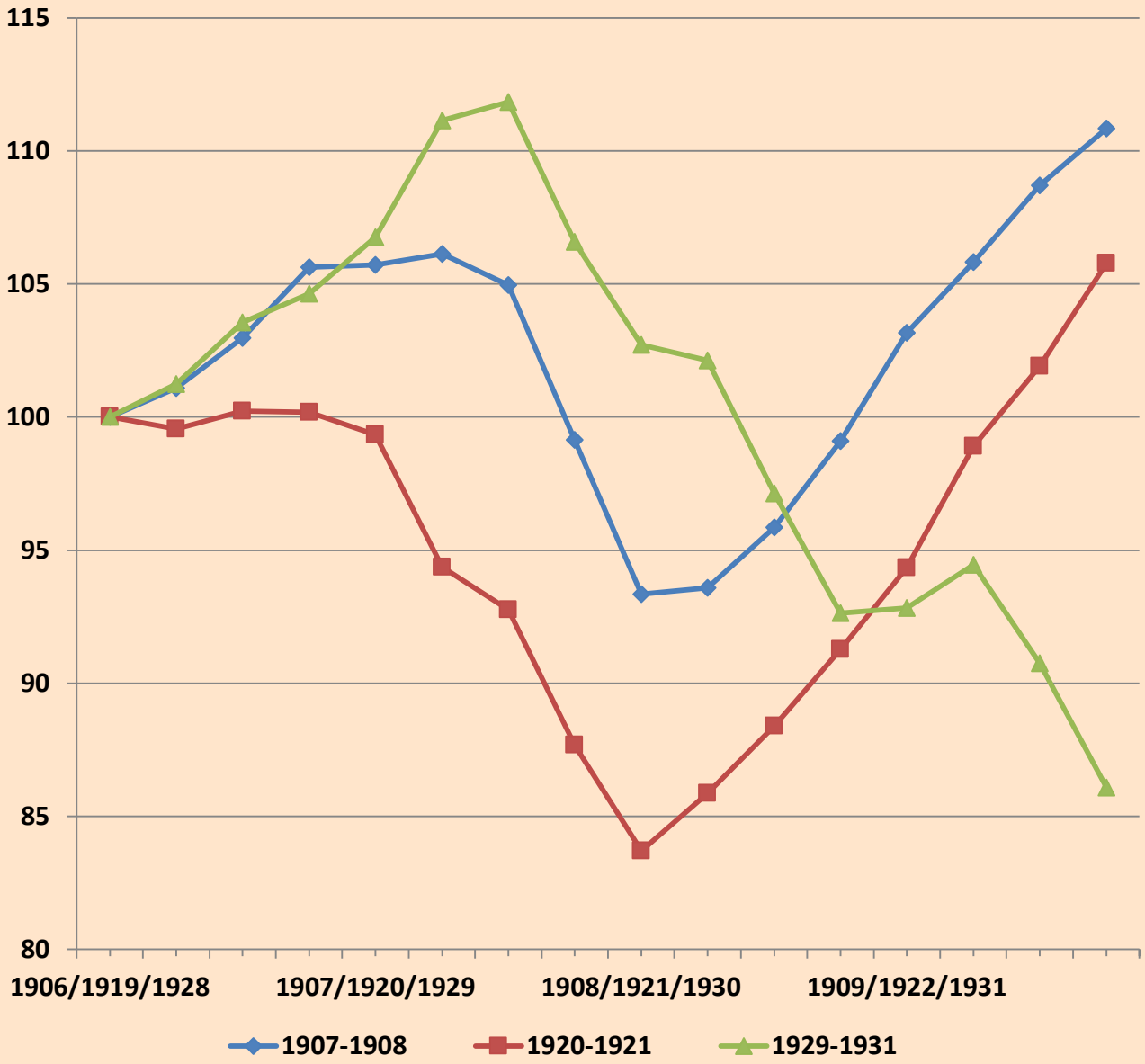
	Price of Cotton per Pound (cents)	CPI	Real Price of Cotton (cents)
1913	10	100	10
1920	42	202	21
1921	12	170	7

More Generally….
Origins of 1920-1921 Recession

- Armistice→Federal Budget slashed but Treasury still needs to finance last Liberty and Victory bond issues→Fed keeps discount rate at 4% until November 1919
- Discount rate lower than market rates→commodities and economic boom to January 1920
- Aggregate FRS gold ratio fall 6/1919 from 50.6% to 42.7% in 1/1920.
- Board rejects FR Bank requests to raise discount rates until 12/ 1919 to 4 ¾% then 6% by 1/1920

Three Recessions

Quarterly GDP



Prices, Unemployment, Money and Discount Rate

Year	Manuf Prod	CPI	WPI	Farm Products Price Index	Unemployment	Gold Stock	NY Fed Discount Rate
1913	100	100	100	100	5.7	na	na
1914	91.9	100.9	95	100	8.5	1,526	5
1915	102.7	101.5	97.5	100	9	2,025	4
1916	122.4	110.8	126.1	118.3	6.5	2,556	3
1917	123.4	133.5	163.9	181.1	5.2	2,868	3.5
1918	121.3	156.9	177.3	207.8	1.2	2,873	4
1919	118.5	180.2	184.9	221.1	2.3	2,707	4.75
1920	125.7	208.8	230.3	211.7	5.2	2,639	7
1921	97.3	186.5	149.6	123.9	11.3	3,373	4.5
1922	128.8	174.7	146.2	131.7	8.6	3,642	4
1923	152.8	177.8	149.6	138.3	4.3	3,957	4.5
1924	140.8	178.1	142.9	140	5.3	4,212	3
1925	157.6	182.6	147.1	153.9	4.7	4,112	3.5

Peak (1/1920) to Trough (7/1921); annual data

- Manufacturing output: -23%
- CPI: -11%
- WPI: -35%
- Farm Prices: -41%
- Benjamin Strong: market rates should fall below discount rate ("penalty rate") end inflationary stimulus, wants to member bank borrowing to fall 20%. Steady at 6% so Strong raises NY rate to 7% in June 1920, (Boston 7% May 1920), 6% seems to work for Cleveland and Philadelphia
- Austerity resisted by FR Banks in agricultural districts, increase discounts to member banks and borrow via the Gold Settlement Fund to replenish reserves

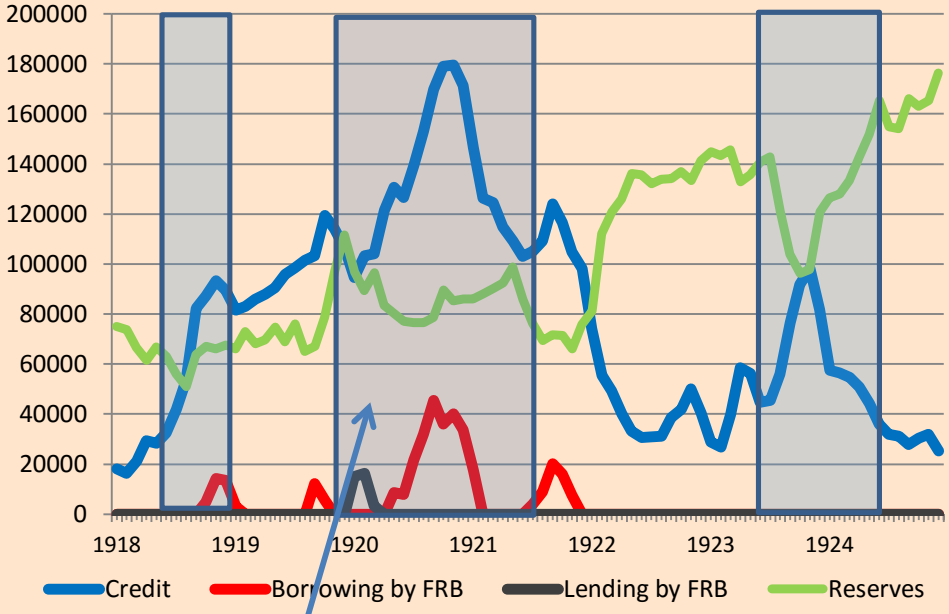
Hawks and Doves in the

Recession January 1920-July 1921

No.	District	Credit Outstanding 12/1919	Reserve (Adjusted) Ratios 1/1920	Percent Change in Credit 12/1919 to 9/1920	Reserve (Adjusted) Ratios 11/1920	Percent Change in Credit 12/1919 to 7/1921
1	Boston	211,342	42.6 (42.3)	-27.4	55.0(61.9)	-68.3
2	New York	1,028,991	40.3 (39.3)	-2.5	40.8(39.2)	-62.5
3	Philadelphia	212,838	40.6 (35.4)	-23.1	49.6(55.4)	-43.5
4	Cleveland	281,423	48.3 (49.0)	-55.1	56.5(79.4)	-50.7
5	Richmond	119,963	44.6 (41.9)	19.5	43.2(38.0)	5.1
6	Atlanta	106,453	48.5 (50.6)	59.6	40.1 (21.2)	-1.2
7	Chicago	349,009	50.3 (57.3)	44.1	40.3(39.4)	-18.9
8	St. Louis	115,171	48.9 (48.9)	38.9	41.3(34.9)	-26.4
9	Minneapolis	84,458	50.2 (50.2)	26.7	39.5(18.0)	-16.3
10	Kansas City	131,530	49.6 (49.6)	43.8	40.2(24.4)	-29.2
11	Dallas	61,795	62.0 (62.0)	85.4	40.3(18.9)	24.4
12	San Francisco	165,300	40.3 (41.3)	34.9	44.9(46.8)	-14.7

Federal Reserve Bank of Atlanta: Dove

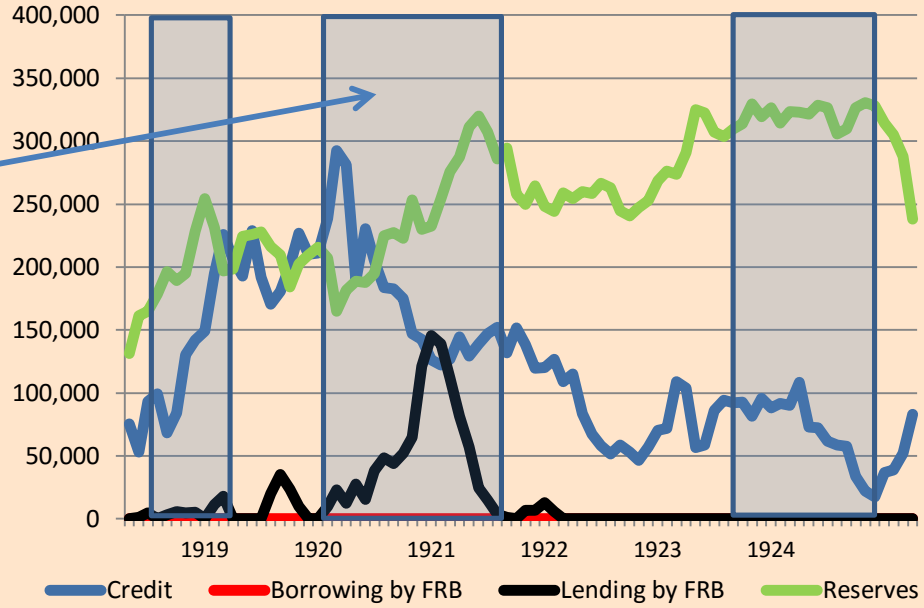
(thousands of dollars)



Recession of 1920-1921

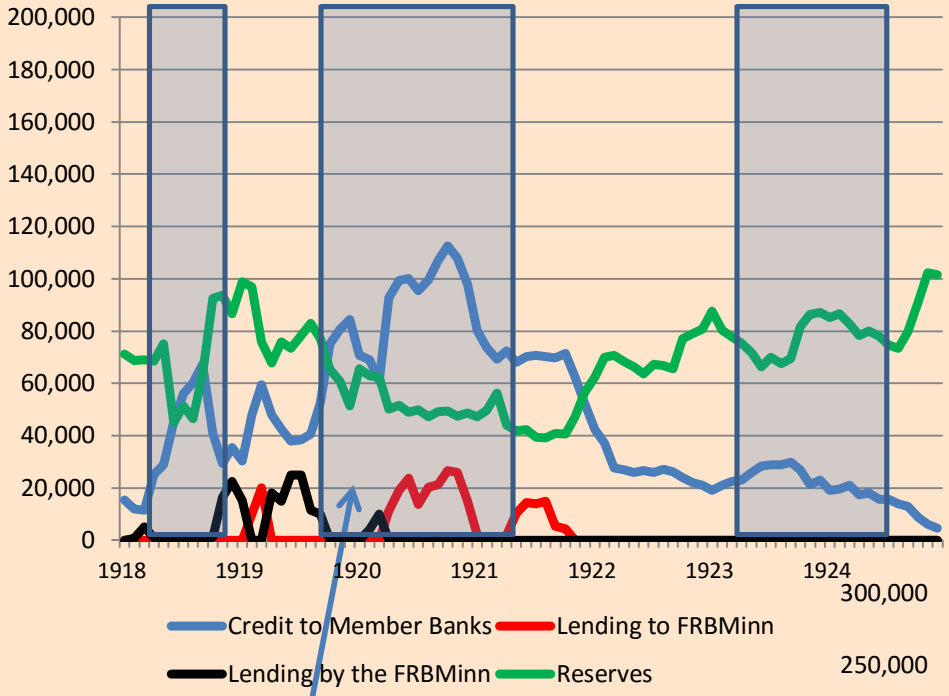
Federal Reserve Bank of Cleveland: Hawk

(thousands of dollars)



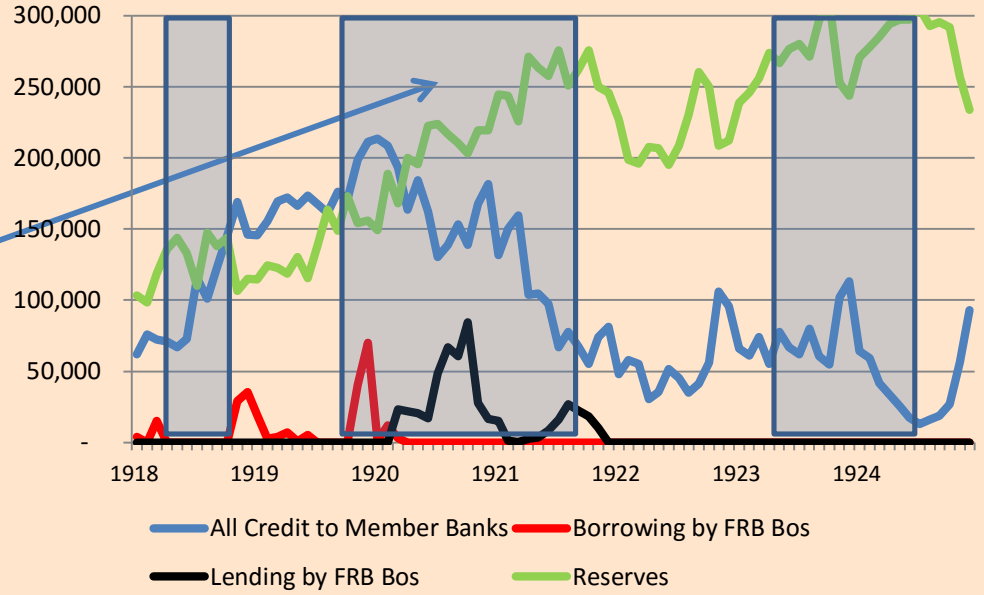
Federal Reserve Bank of Minneapolis: Dove

(thousands of dollars)



Federal Reserve Bank of Boston: Hawk

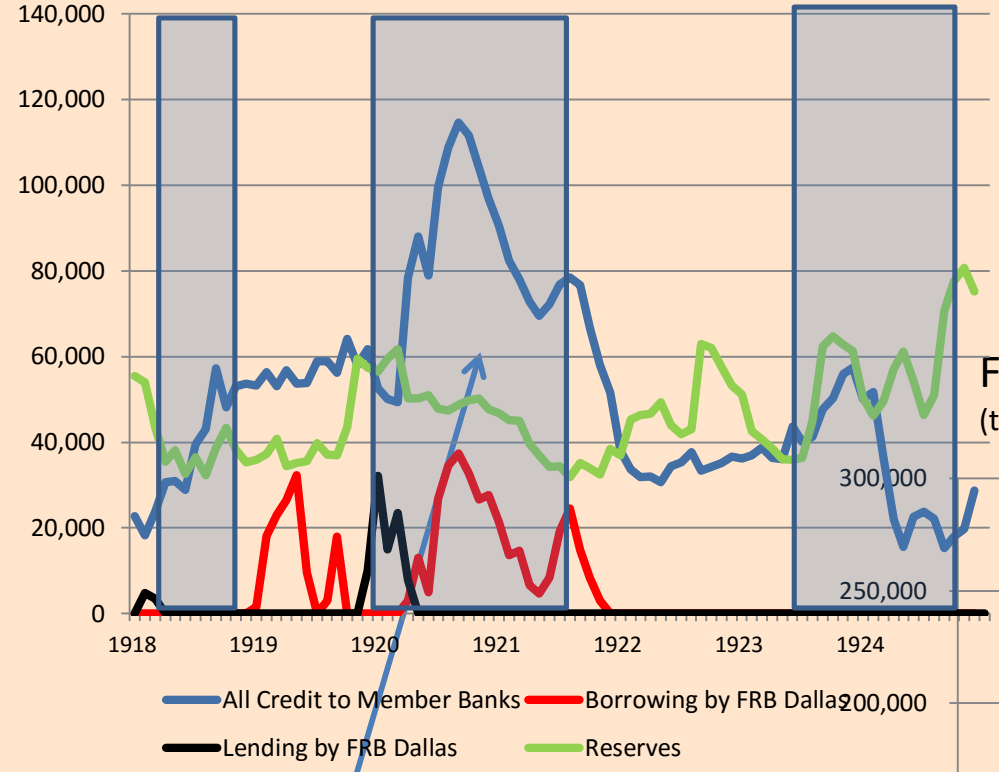
(thousands of dollars)



Recession of 1920-1921

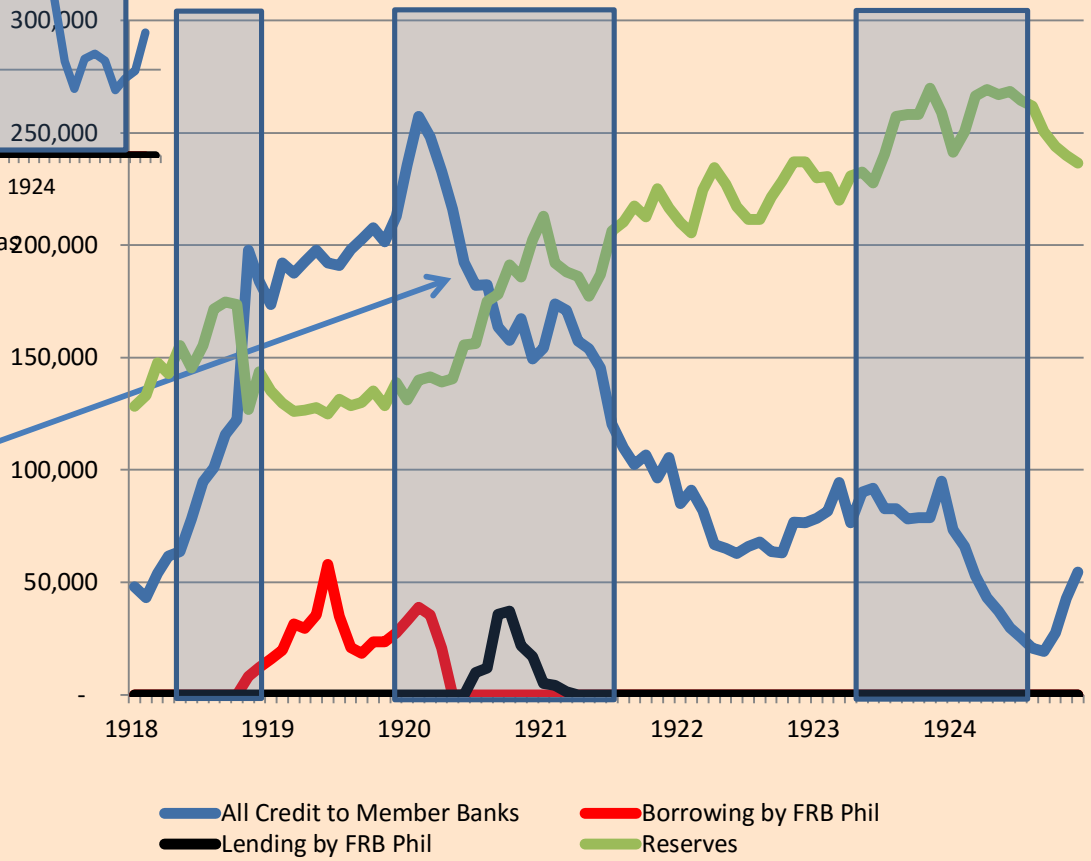
Federal Reserve Bank of Dallas: Dove

(thousands of dollars)



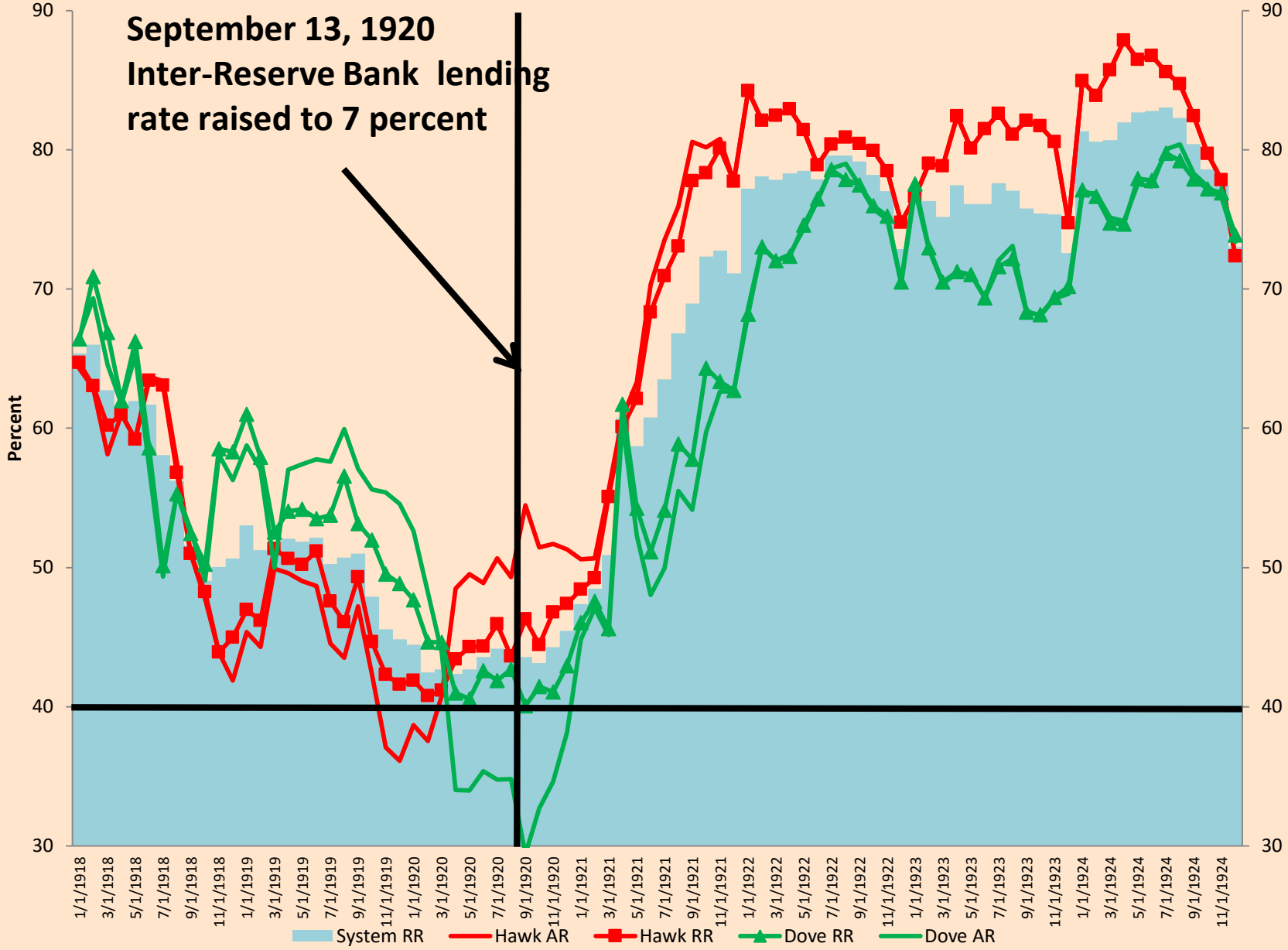
Federal Reserve Bank of Philadelphia: Hawk

(thousands of dollars)



Recession of 1920-1921

Combined Hawk and Dove Reserve and Adjusted Reserve Ratios, and FRS Reserve Ratio



How Much Borrowing ?

- Peak Inter-Federal Reserve Bank Borrowing October 1920: $260 million
- Total gold reserves of the FR Banks $2,168 million or 12%
- But, after the borrowing, there was only $84 million left in “free reserves” or barely 4% above the 40% required reserve ratio for the System in aggregate. Atlanta, Chicago, and St. Louis had less than 41% and Dallas, Minneapolis and New York had between 39 and 40%.

The Official View from the FR Board

- W. P. G. Harding, Governor of the FR Board. Neutral description of the 1920-1921 deflation, no hint of the internal conflicts within the Fed.
- “Because of the low reserve percentage of the banks and of the constant tendency of balances to shift from one Federal Reserve District to another, it had become necessary in 1919 to resort to large and frequent rediscount transactions between the Federal Reserve Banks themselves. Such transactions increased both in frequency and in volume during the year 1920 and continued in a smaller degree for several months in 1921.” (Harding, 1925, p. 182).
- “The banks, however showed such a spirit of cooperation that no compulsion was ever necessary…..No application of a Federal Reserve Bank for rediscount accommodation was ever declined. (Harding, 1925, p. 183).

Recent Research

- Historical perspective on TARGET2 Euro imbalances, Eichengreen, Mehl, Chitu and Richardson (2014) examined mutual FR Bank assistance for 1913-1960:
- Cite the 1920 FR Board Annual Report "there has…been such a spontaneous spirit of cooperation between the Federal Reserve Banks that all transactions suggested by the Federal Reserve Board have been made voluntarily."
- They write: "Fortunes could change quickly with earlier emergency recipients of gold turning into providers. Imbalances did not grow endlessly but narrowed once shock subsided. Mutual assistance did not excite experts or the American public, nor in most cases did they trigger insurmountable tensions between regions "
- BUT, IT AIN'T SO……

Federal Reserve Bank of Atlanta: Borrower

- Governor Wellborn to Atlanta Fed's Board of Directors:
- "to effectually cooperate with the Federal Reserve Board in their earnest efforts towards deflation and control of credits….we rely not only on repeated admonitions to member banks, but….we continue to exercise that discretion permissible under the law as to the desirability of certain paper, and especially the frequency and volume of discount transactions of certain members banks with the Federal Reserve Bank." (FRBA Board of Directors minutes, August 6, 1920)
- Meaning…….
- J.R. Morgan, the cashier (CFO) of the Bank of Union Springs Alabama (quoted in Garrett, Chapter 9, undated).
- "All we country bankers could do was endorse notes and send them to the Federal Reserve. Governor Wellborn met every legitimate demand….For its duration it was the worst we ever had, though it only lasted six to eight months. Governor Wellborn broke it by throwing the whole resources of the Federal Reserve behind the banks of the South"

Federal Reserve Bank of Cleveland: Lender

- Governor reports (BoD Minutes, September 10, 1920) following complaints by Cleveland about the heavy borrowing by the FRB Atlanta
- Federal Reserve Board confirmed that effective September 13, 1920 all rediscounts made by any FRB for another FRB would be at a rate of 7 percent ”regardless of the class of paper rediscounted.”
- Minutes of the BoD Meeting: “Resolved: ….while the Directors of the Cleveland Bank recognize the desirability of inter-reserve bank rediscounting in all parts of the country nevertheless the members of this Board of Directors…..are fearful lest the funds of one district, obtained by the cooperation of the member banks in a systematic consistent and healthy policy of deflation may be used by banks in other districts to continue a policy of expansion or retarded liquidation, and further if there is danger of such a situation existing or coming into existence that the Federal Reserve Board take such steps to remedy or prevent it as may be found necessary or advisable.”

Conference of Governors of FR Banks and the FR Board October 13-16, 1920

- W. F. Ramsey, Chairman of the FR Bank of Dallas (pp. 123-126):
- "…rediscounts between Federal Reserve Banks should be made easy rather than difficult...
- "…this policy should be established so that New York, during times when enormous drafts are being made on its resources …..should be able, at reasonable rates, to replenish her reserves….from the surplus of other Banks….and that Banks in the west and southwest should, in times like these have the same favorable consideration
- "It is my impression that the strong position of the Cleveland and Boston banks, which in recent months have been carrying most of the rediscounts of other Federal reserve banks, is not largely or especially due to any difference between these and other banks in the matter of credit control, but is directly due to…local conditions
- "…..If the other Federal reserve banks of the country, and the Federal Reserve Board, could know and understand the groans unmentionable welling up in Dallas from all of us and especially from Governor Van Zandt, every time we are called upon to rediscount with other Federal Reserve banks, there would be no suspicion even that we were not endeavoring to limit out rediscounts to the absolute imperative needs of our country"

Conference of Governors of FR Banks and the FR Board October 13-16, 1920

- Followed by…..George Norris, Governor of the Philadelphia Fed: It is not an "emergency"
- Noted that twelve regional banks were made independent of every other except when in an emergency, the central board should require one regional bank to re-discount for another…..an extraordinary operation rather than a usual function…..
- "The fact that a regional system was adopted in preference to a central system seems to me to impose on each bank the duty of controlling credit in its district and of preserving its own required reserve at all times except in cases of emergency. In other words, the policy of a bank should be controlled primarily by the condition of its own reserve , and not the condition of the reserve of the system as a whole."
- When he arrived a Philadelphia he thought the Bank was too dependent on resources from other banks, so " I set myself to the task of securing such liquidation in the district as would relieve the other banks of the system of the necessity of carrying Philadelphia."

Minutes of Executive Committee of the BoD of the FR Bank of Cleveland (December 3, 1920)

- Borrowing via Gold Settlement Fund continues…..
- “Whereas, the Federal Reserve Bank of Atlanta has continuously rediscounted with the Federal Reserve Bank of Cleveland ….. until at present they amount to $38,100,000…….
- Therefore, be it resolved that it is the desire of the Executive Committee of the FRB of Cleveland that the FRB of Atlanta be requested to liquidates it loans and rediscounts with the FRB of Cleveland to $25,000,000 on or before December 20, 1920, and to further liquidate the same to $20,000,00 on or before January 1, 1921.
- Whereas, the general policy of the Federal Reserve Bank of Cleveland as set forth in the resolution of its Board on November 3 stated that offerings of paper by other Federal Reserve Banks to this bank for rediscount should consist of Government secured and commercial paper in proportion that these two classes of paper are held by the offering bank;

W.P.G. Harding Ch. of Bd. to Gov M. Wellborn of FRBA,Letter in BoD minutes December 5, 1920

- “The Board is of the opinion that your present experience should convince you that your lending policy has been rather too lenient and that in some cases credit was granted in such large amount to banks when no emergency existed as to impair your ability to make loans out of your own resources when a real emergency did arise.”
- Tells them they should write directly to those banks to reduce their lines of credit and that they should provide the additional 15% margin of collateral for the Cleveland loans in form of commercial paper

Wellborn Letter to Harding (December 9, 1920)

- Wellborn argued that the regional economies were too tightly integrated to allow a disaster to occur in one and not expect severe repercussions throughout
- …if this bank had failed to stand as a buffer between the business of this section and disaster, it would not only have failed in its duty, but it would have permitted a situation to develop which would have seriously affected all other sections of the country and every other reserve bank…….We have not undertaken to draw upon the reserves or the resources of other sections, to hold our crops for artificial or inflated prices…The commerce of all the states are too closely knit together to permit the confining of the results of financial upheaval to any one particular state or group of states. The **restless** Cleveland District itself, counts this section one its principal markets. The Sixth District is filled with farm implements, trucks, automobiles and other manufactured products emanating from the Cleveland District. The commercial banks of the Sixth District have financed the local dealers [of] many of these commodities, that such local dealers might pay cash to the manufacturers in the Cleveland District. To shut off completely, or hamper the buying power of this and other agricultural districts, would bring about a situation which would be felt from the Pacific to the Atlantic.

FR Board pressure continued, Letter from Harding to Wellborn, December 15, 1920

- Harding: “Board at no time suggested drastic and immediate liquidation but has repeatedly reiterated its preference for orderly processes.”
- “In your letter you do not express any opinion as to when your bank will be able to pay off its rediscounts without falling below its legal minimum reserve, and on the other hand, you assume that it will be necessary for other Federal reserve banks to extend your bank accommodation for an indefinite period.”
- “The Board has never advised farmers to produce a larger crop of cotton and does not, therefore, coincide with your view that the Federal Reserve Bank should carry loans indefinitely for member banks until cotton reaches a price that is satisfactory to the producers…. the Board is forced to the conclusion that your credit situation is not caused entirely by agricultural conditions. It is observed also that your loans to these banks in financial and commercial centers are….showing no appreciable reduction.
- Atlanta and other Doves begin to reduce credit to member banks

Mid-Recession

- Atlanta reduces its discounts and repays its inter-FR Bank loans, eventually cotton prices rebound
- But how much did Atlanta and the other dissenting "Dove" Federal Reserve Banks contribute to the expansion of credit?

Naïve Counterfactual---assume all inter-FR Bank eliminated---1 for 1 reduction/increase in member bank loans as a result

		No Inter-Federal Reserve Bank Lending Counterfactual: Added Effect on Member Bank Lending (Percent)
1	Boston	6.5
2	New York	-0.3
3	Philadelphia	4.9
4	Cleveland	11.8
5	Richmond	-5.3
6	Atlanta	-11.2
7	Chicago	-1.5
8	St. Louis	-8.2
9	Minneapolis	-8.4
10	Kansas City	-7.6
11	Dallas	-13.5
12	San Francisco	0.8

First Econometric Results Comments Welcome!

- Regressions to explain Credit provided by each District bank to Member banks
- Regressions to explain Member bank lending
- Counterfactual estimates of Credit provided to Member banks if District banks could not have borrowed from one another
- Counterfactual estimates of member bank lending if District banks credit had been limited to own resources
- "Dove" Districts and "Hawk" Districts---N.B. before recession some Hawks are borrowers and it aids their Credit and Member bank lending but not all

Credit from District Banks to Member Banks

- $CR_t = \alpha + \rho\, CR_{t-1} + \beta_1\, AdjRes_t + \beta_2\, AdjRes_{t-1} + \beta_3 Borrowed_t + u_t$

- Where:
- CR = Credit issued by District bank
- AdjRes = Adjusted gold reserves – those available to district bank if borrowing from other reserve banks was unavailable
- Borrowed = Volume of gold reserves borrowed from other reserve banks

Lending by Member Banks

- $Lending_t = \alpha + \rho\ Lending_{t-1} + \beta_1\ CR_t + \beta_2\ NetDeps_{t-1} + \beta_3\ Spread_{t-1} + \upsilon_t$

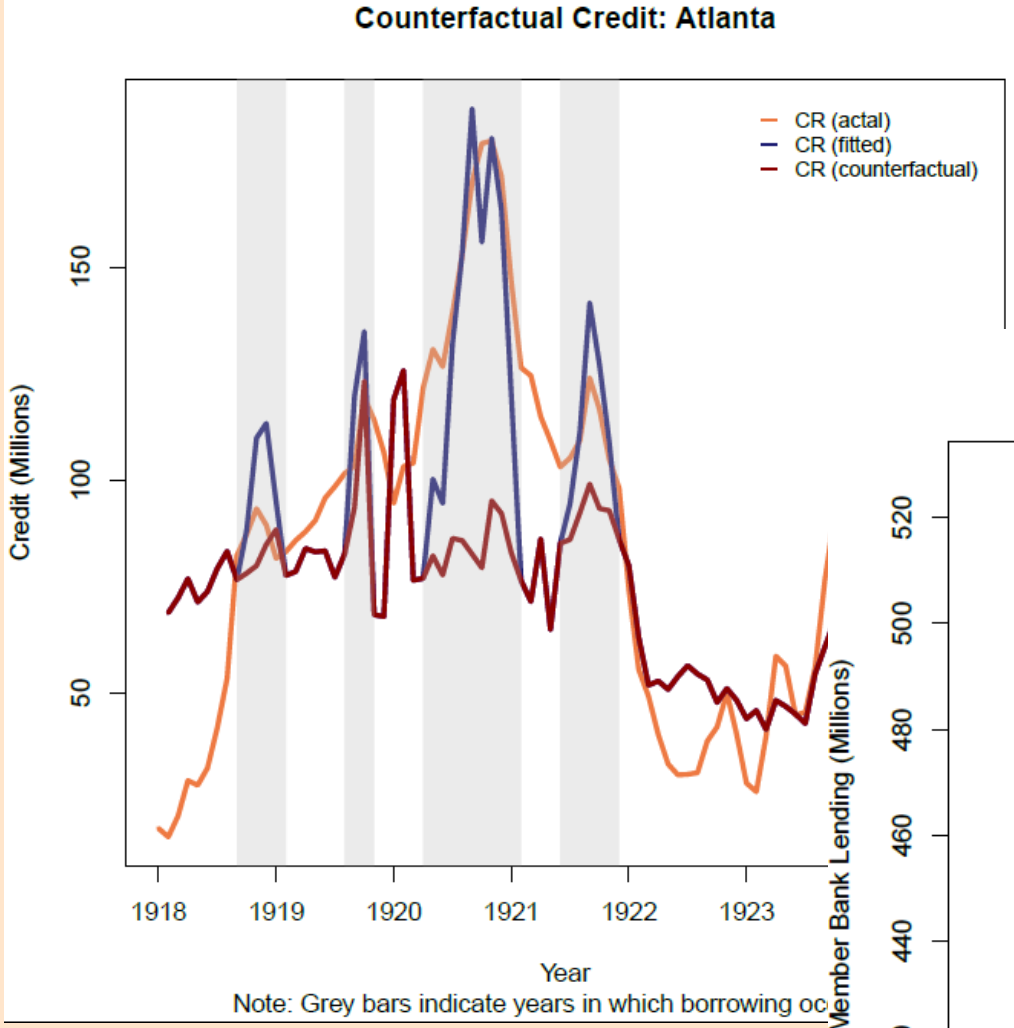
- Where:
- Lending = Member bank lending
- CR = Credit issued by District bank
- NetDeps = Net deposits of member banks
- Spread = Commercial paper rate less District Discount Rate

Table 1: Atlanta

	Dependent variable:
	Credit_t
Credit_{t-1}	0.063***
	(0.016)
Adj. Reserves_t	−0.394***
	(0.087)
Borrowed_t	2.170***
	(0.322)
Adj. Reserves_{t-1}	−0.012
	(0.013)
Constant	102.055***
	(9.832)
Observations	83
R^2	0.692
Adjusted R^2	0.676
Residual Std. Error	23.775 (df = 78)
F Statistic	43.714*** (df = 4; 78)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 1: Atlanta

	Dependent variable:
	Member Lending_t
Credit_t	0.611***
	(0.113)
$\text{Net Deposits}_{t-1}$	0.018
	(0.016)
$\text{Member Lending}_{t-1}$	−0.015
	(0.013)
Spread_{t-1}	−10.370*
	(5.748)
IP_{t-1}	53.065***
	(4.048)
Constant	147.351***
	(26.067)
Observations	72
R^2	0.740
Adjusted R^2	0.721
Residual Std. Error	21.119 (df = 66)
F Statistic	37.667*** (df = 5; 66)
Note:	*p<0.1; **p<0.05; ***p<0.01


Counterfactual Credit: Atlanta
CR (actal)
CR (fitted)
CR (counterfactual)
Credit (Millions)
50
100
150
1918
1919
1920
1921
1922
1923
Year
Note: Grey bars indicate years in which borrowing oc

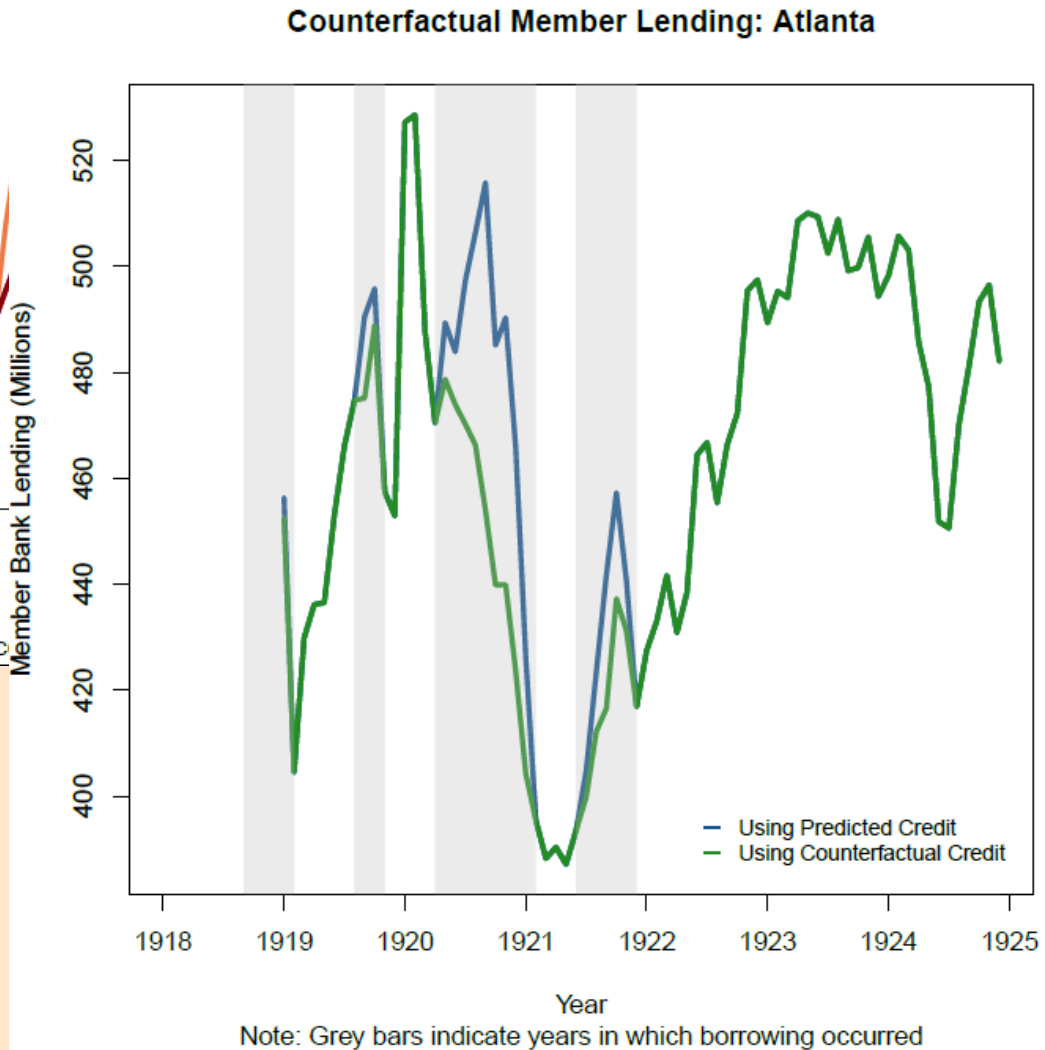
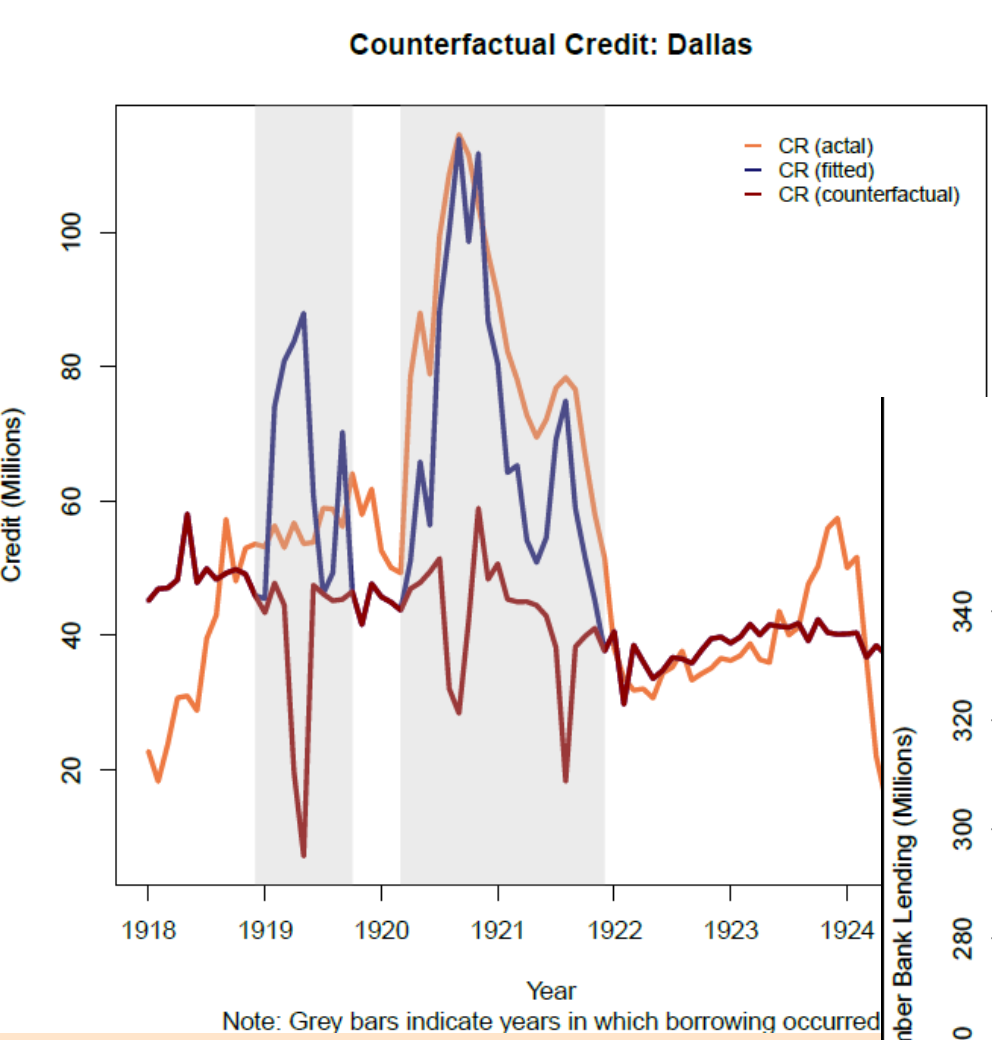

Counterfactual Member Lending: Atlanta
Member Bank Lending (Millions)
400
420
440
460
480
500
520
Using Predicted Credit
Using Counterfactual Credit
1918
1919
1920
1921
1922
1923
1924
1925
Year
Note: Grey bars indicate years in which borrowing occurred

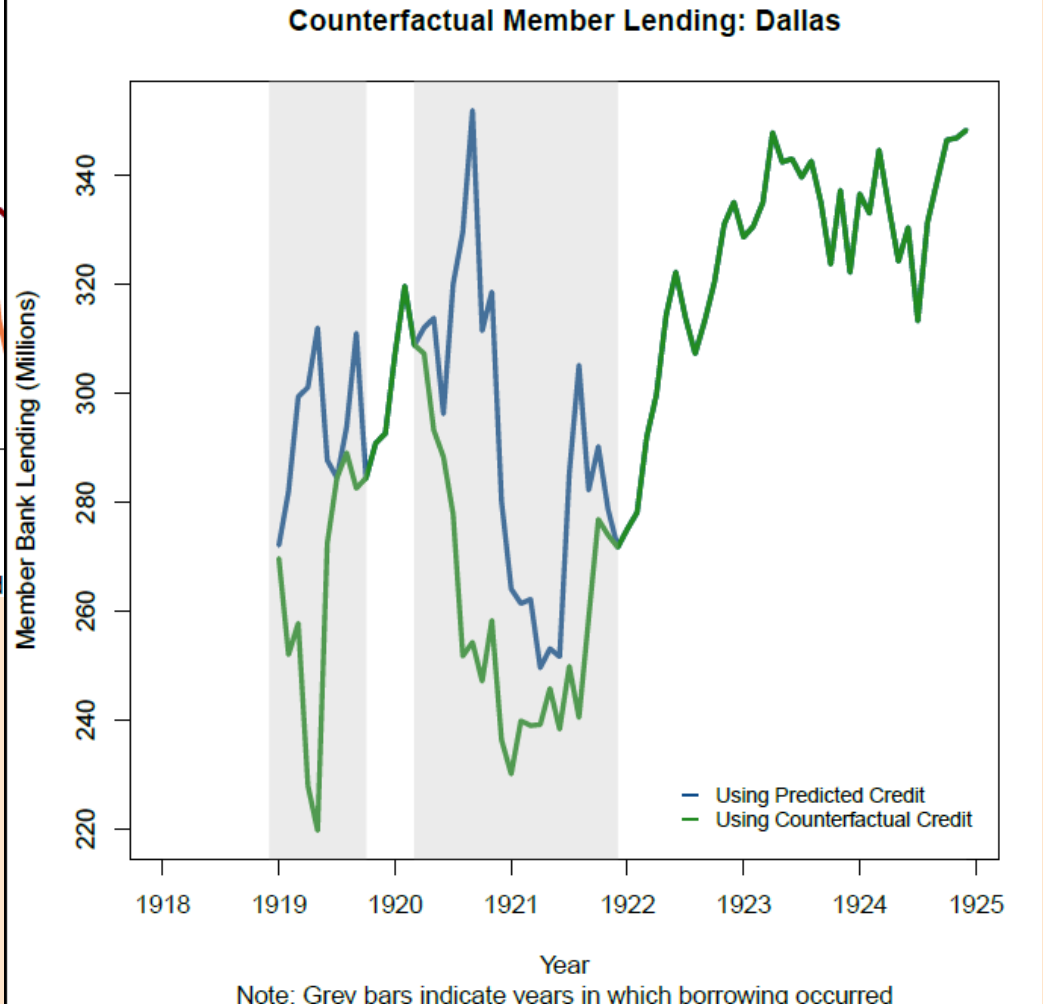
Table 5: Dallas

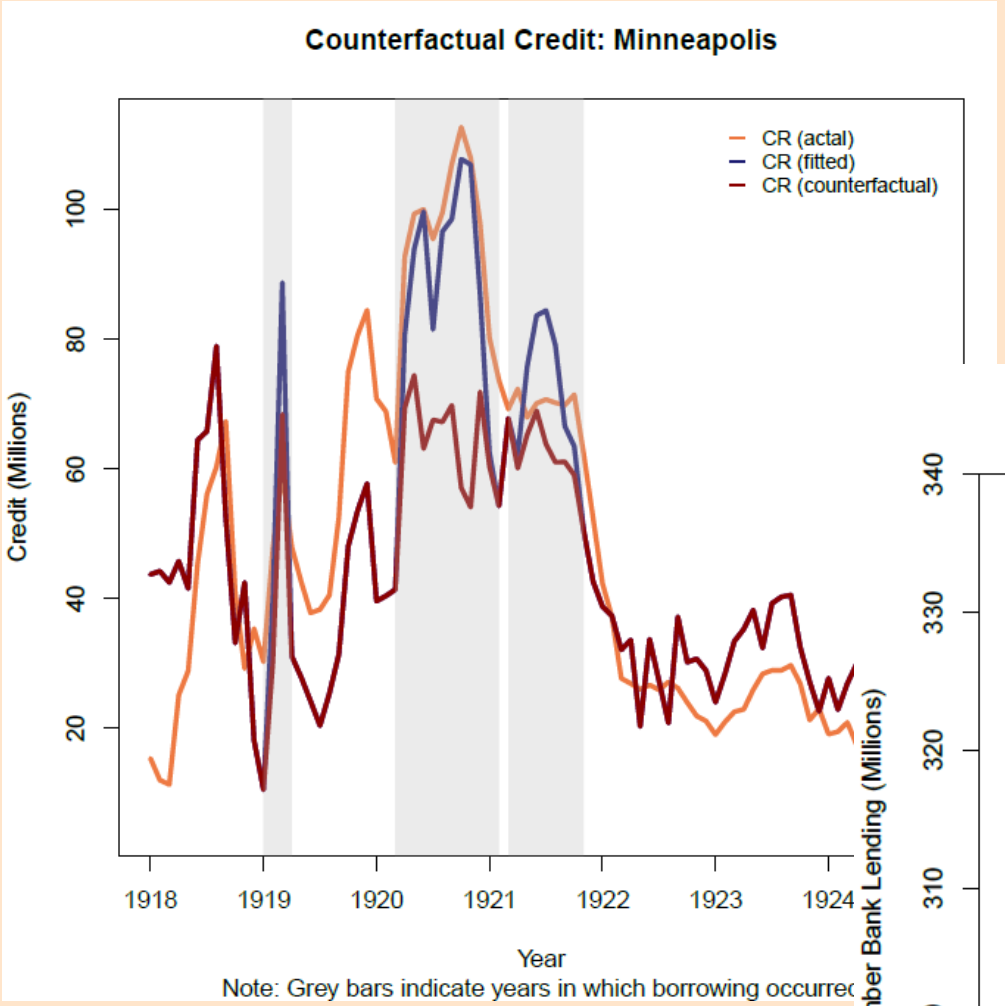
	Dependent variable:
	Credit_t
Credit_{t-1}	0.046***
	(0.015)
Adj. Reserves_t	−0.085
	(0.127)
Borrowed_t	1.381***
	(0.254)
Adj. Reserves_{t-1}	−0.018**
	(0.009)
Constant	45.502***
	(6.835)
Observations	84
R^2	0.629
Adjusted R^2	0.610
Residual Std. Error	14.706 (df = 79)
F Statistic	33.522*** (df = 4; 79)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 5: Dallas

	Dependent variable:
	Member Lending_t
Credit_t	0.720***
	(0.178)
$\text{Net Deposits}_{t-1}$	−0.020
	(0.017)
$\text{Member Lending}_{t-1}$	0.020
	(0.014)
Spread_{t-1}	−15.085***
	(5.670)
IP_{t-1}	32.825***
	(3.917)
Constant	100.896***
	(24.946)
Observations	72
R^2	0.562
Adjusted R^2	0.529
Residual Std. Error	21.559 (df = 66)
F Statistic	16.952*** (df = 5; 66)
Note:	*p<0.1; **p<0.05; ***p<0.01


Counterfactual Credit: Dallas
CR (actal)
CR (fitted)
CR (counterfactual)
Credit (Millions)
20
40
60
80
100
1918
1919
1920
1921
1922
1923
1924
Year
Note: Grey bars indicate years in which borrowing occurred


Counterfactual Member Lending: Dallas
Member Bank Lending (Millions)
220
240
260
280
300
320
340
1918
1919
1920
1921
1922
1923
1924
1925
Using Predicted Credit
Using Counterfactual Credit
Year
Note: Grey bars indicate years in which borrowing occurred


Counterfactual Credit: Minneapolis
CR (actal)
CR (fitted)
CR (counterfactual)
Credit (Millions)
20
40
60
80
100
1918
1919
1920
1921
1922
1923
1924
Year
Note: Grey bars indicate years in which borrowing occurred

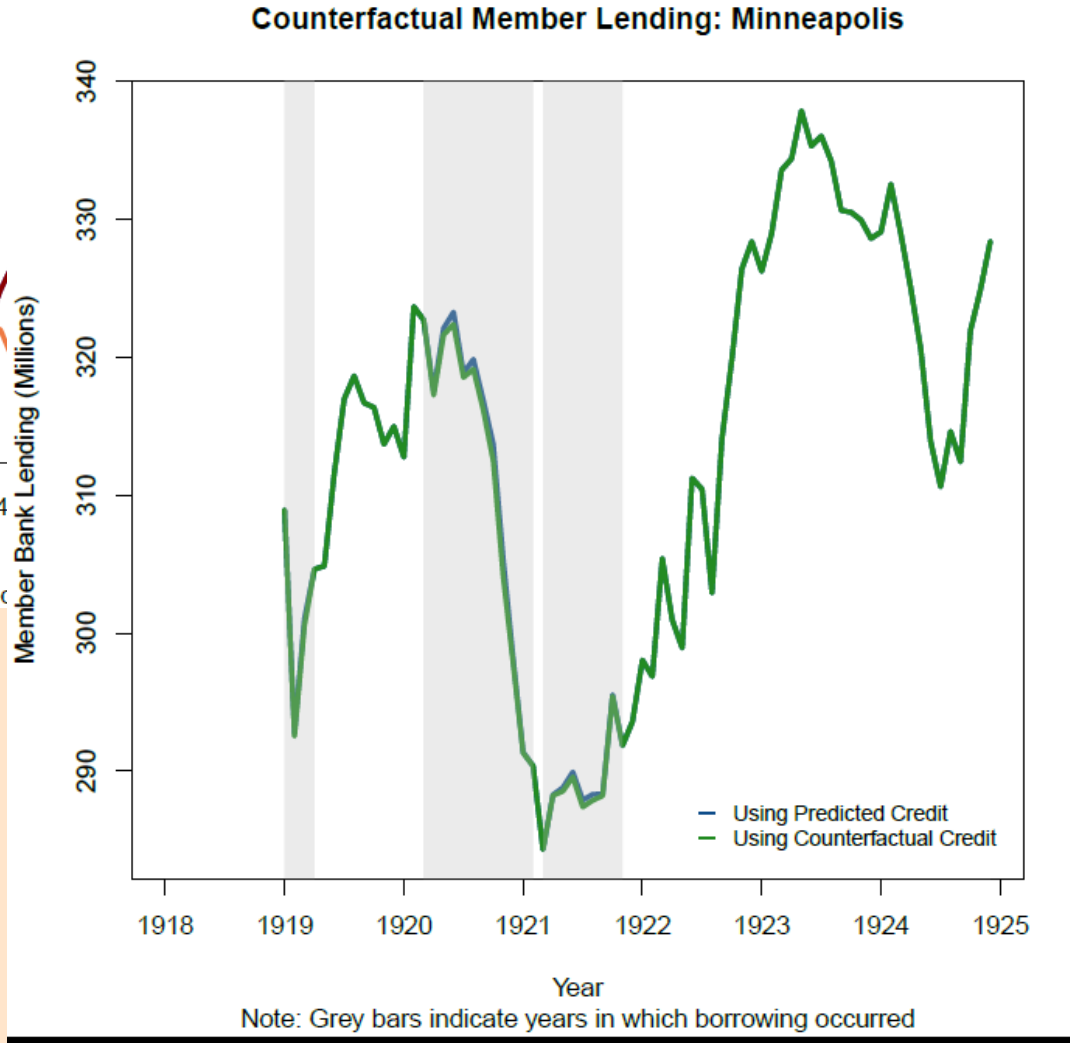
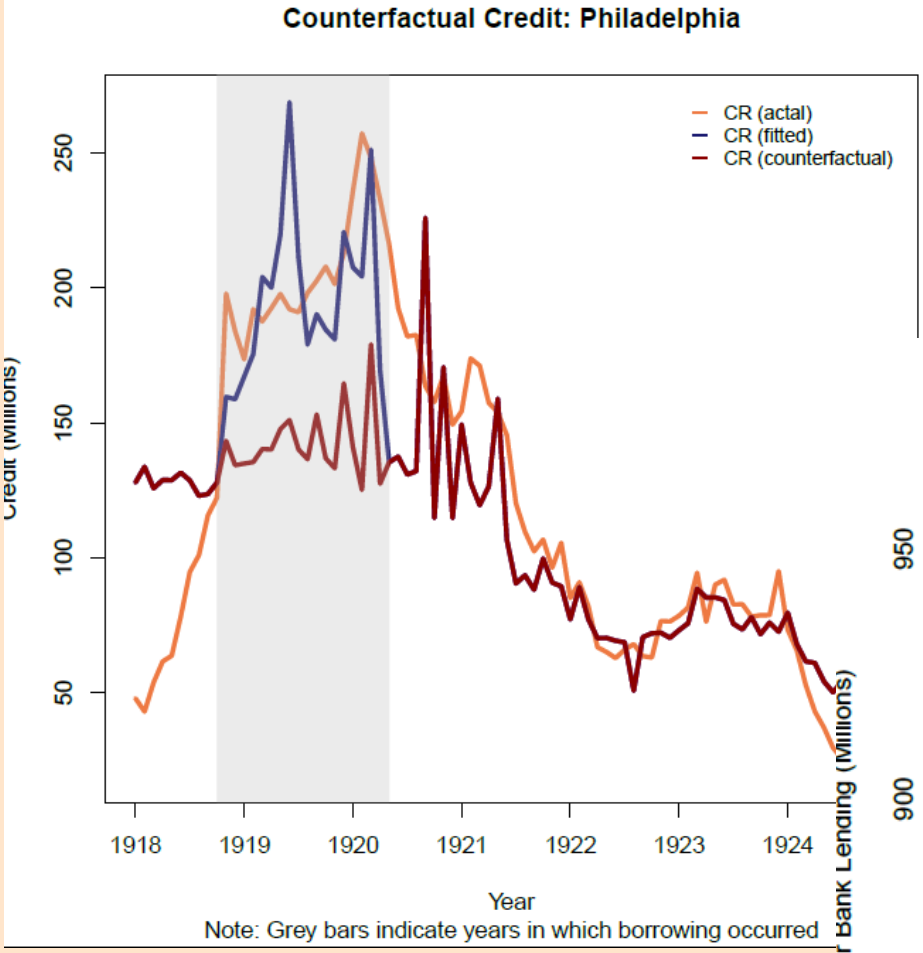

Counterfactual Member Lending: Minneapolis
Member Bank Lending (Millions)
290
300
310
320
330
340
1918
1919
1920
1921
1922
1923
1924
1925
Using Predicted Credit
Using Counterfactual Credit
Year
Note: Grey bars indicate years in which borrowing occurred

Table 9: Philadelphia

	Dependent variable:
	Credit_t
Credit_{t-1}	0.175***
	(0.031)
Adj. Reserves_t	−0.511***
	(0.107)
Borrowed_t	1.499***
	(0.476)
Adj. Reserves_{t-1}	−0.036**
	(0.018)
Constant	194.459***
	(23.125)
Observations	84
R^2	0.713
Adjusted R^2	0.699
Residual Std. Error	34.516 (df = 79)
F Statistic	49.123*** (df = 4; 79)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 9: Philadelphia

	Dependent variable:
	Member Lending_t
Credit_t	0.091
	(0.147)
$\text{Net Deposits}_{t-1}$	0.027
	(0.041)
$\text{Member Lending}_{t-1}$	−0.023
	(0.034)
Spread_{t-1}	1.180
	(12.870)
IP_{t-1}	56.062***
	(9.044)
Constant	593.001***
	(54.244)
Observations	72
R^2	0.376
Adjusted R^2	0.328
Residual Std. Error	54.058 (df = 66)
F Statistic	7.945*** (df = 5; 66)
Note:	*p<0.1; **p<0.05; ***p<0.01


Counterfactual Credit: Philadelphia
CR (actal)
CR (fitted)
CR (counterfactual)
Credit (Millions)
50
100
150
200
250
1918
1919
1920
1921
1922
1923
1924
Year
Note: Grey bars indicate years in which borrowing occurred

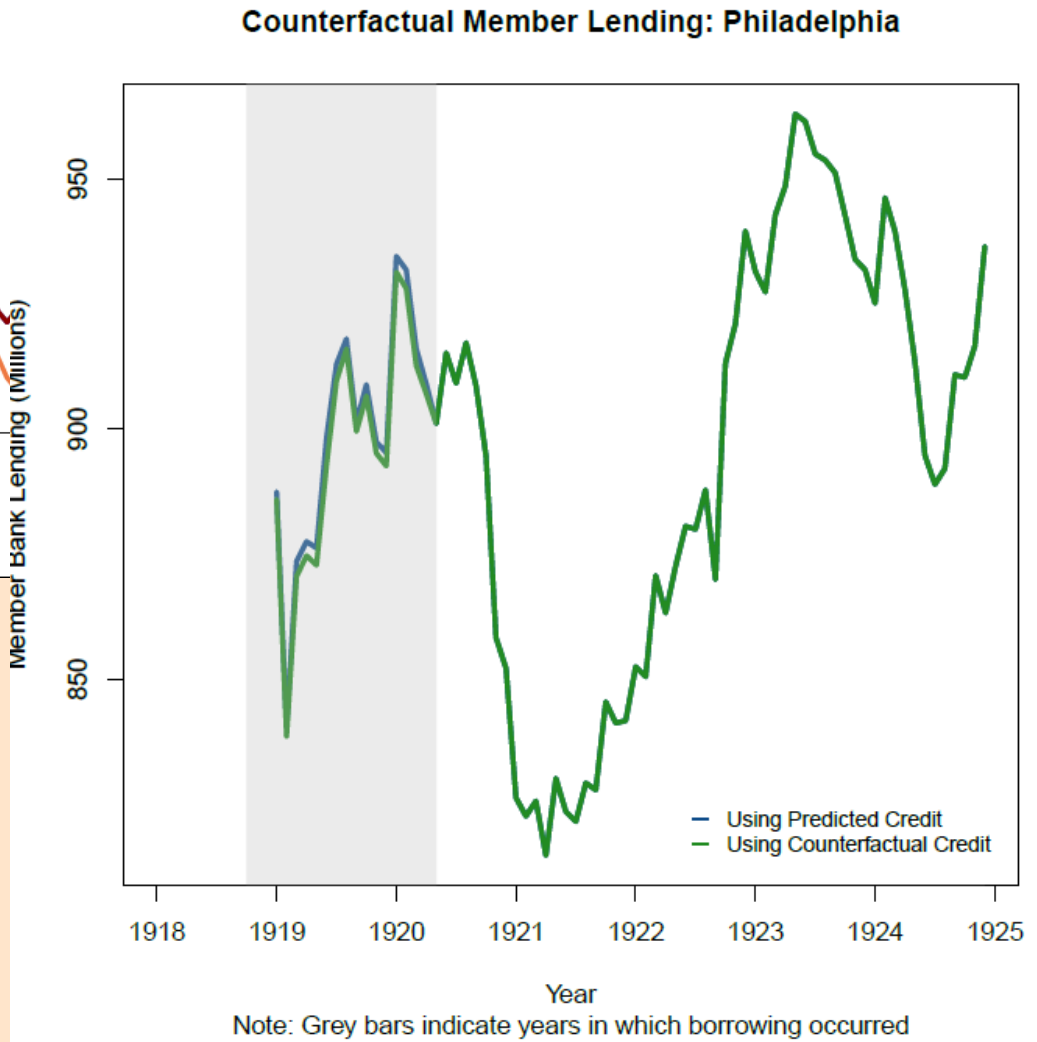
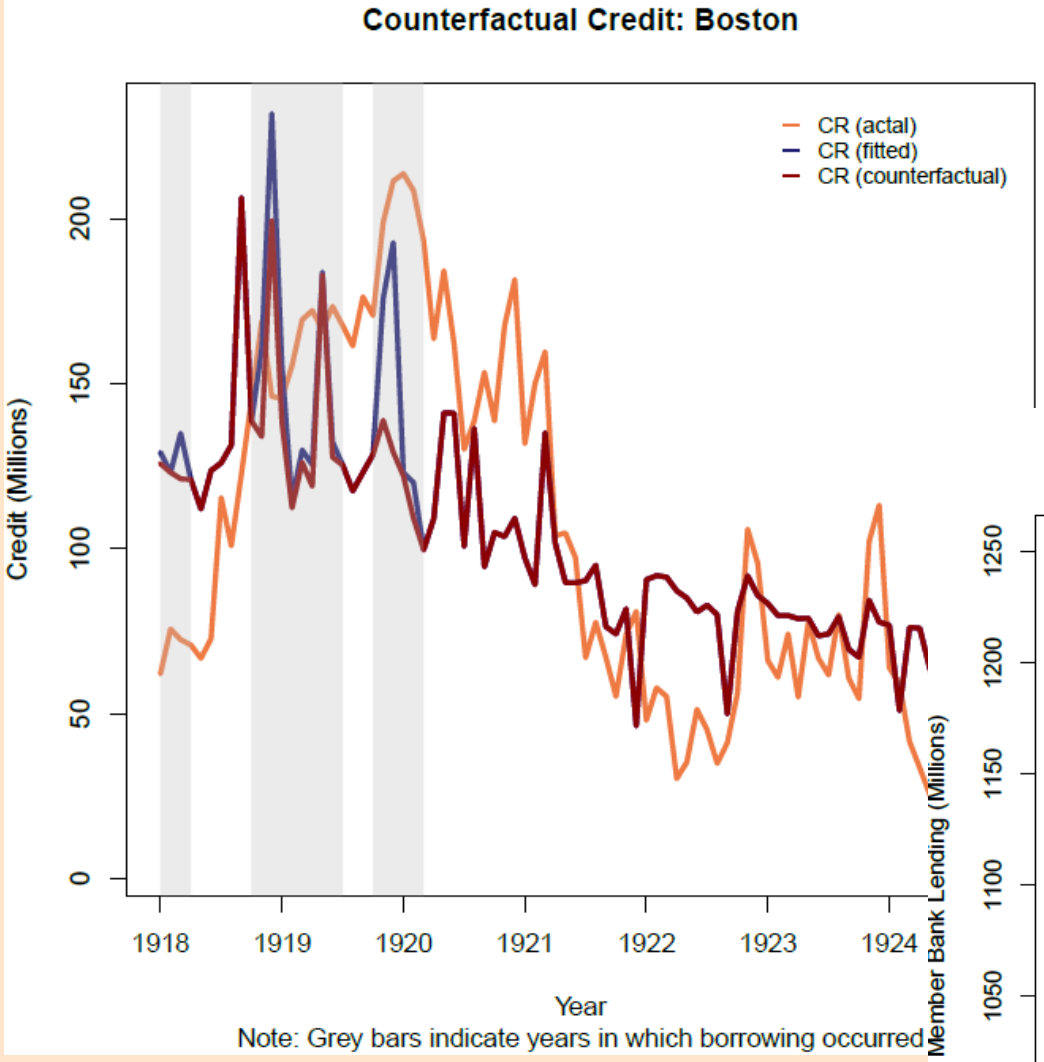

Counterfactual Member Lending: Philadelphia
Member Bank Lending (Millions)
850
900
950
Using Predicted Credit
Using Counterfactual Credit
1918
1919
1920
1921
1922
1923
1924
1925
Year
Note: Grey bars indicate years in which borrowing occurred

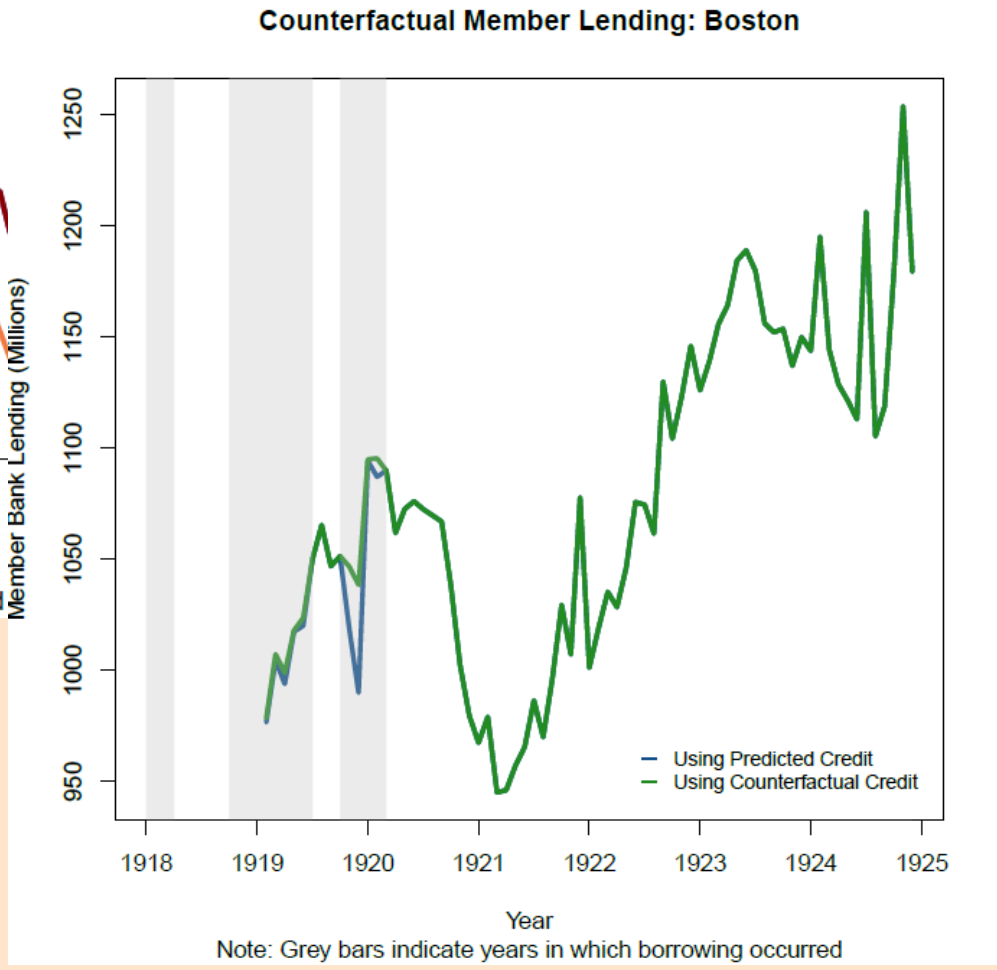
Table 2: Boston

	Dependent variable:
	Credit_t
Credit_{t-1}	0.171***
	(0.035)
Adj. Reserves_t	−0.244***
	(0.080)
Borrowed_t	0.837
	(0.511)
Adj. Reserves_{t-1}	−0.076***
	(0.024)
Constant	144.620***
	(19.762)
Observations	84
R^2	0.468
Adjusted R^2	0.441
Residual Std. Error	41.432 (df = 79)
F Statistic	17.381*** (df = 4; 79)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 2: Boston

	Dependent variable:
	Member Lending_t
Credit_t	−0.827***
	(0.144)
Net Deposits_{t-1}	−0.010
	(0.033)
$\text{Member Lending}_{t-1}$	0.020
	(0.027)
Spread_{t-1}	5.643
	(11.375)
IP_{t-1}	79.732***
	(7.371)
Constant	710.831***
	(42.300)
Observations	71
R^2	0.788
Adjusted R^2	0.771
Residual Std. Error	45.273 (df = 65)
F Statistic	48.234*** (df = 5; 65)
Note:	*p<0.1; **p<0.05; ***p<0.01


Counterfactual Credit: Boston
CR (actal)
CR (fitted)
CR (counterfactual)
Credit (Millions)
0
50
100
150
200
1918
1919
1920
1921
1922
1923
1924
Year
Note: Grey bars indicate years in which borrowing occurred


Counterfactual Member Lending: Boston
Member Bank Lending (Millions)
950
1000
1050
1100
1150
1200
1250
1918
1919
1920
1921
1922
1923
1924
1925
Using Predicted Credit
Using Counterfactual Credit
Year
Note: Grey bars indicate years in which borrowing occurred

Cleveland Never Borrowed

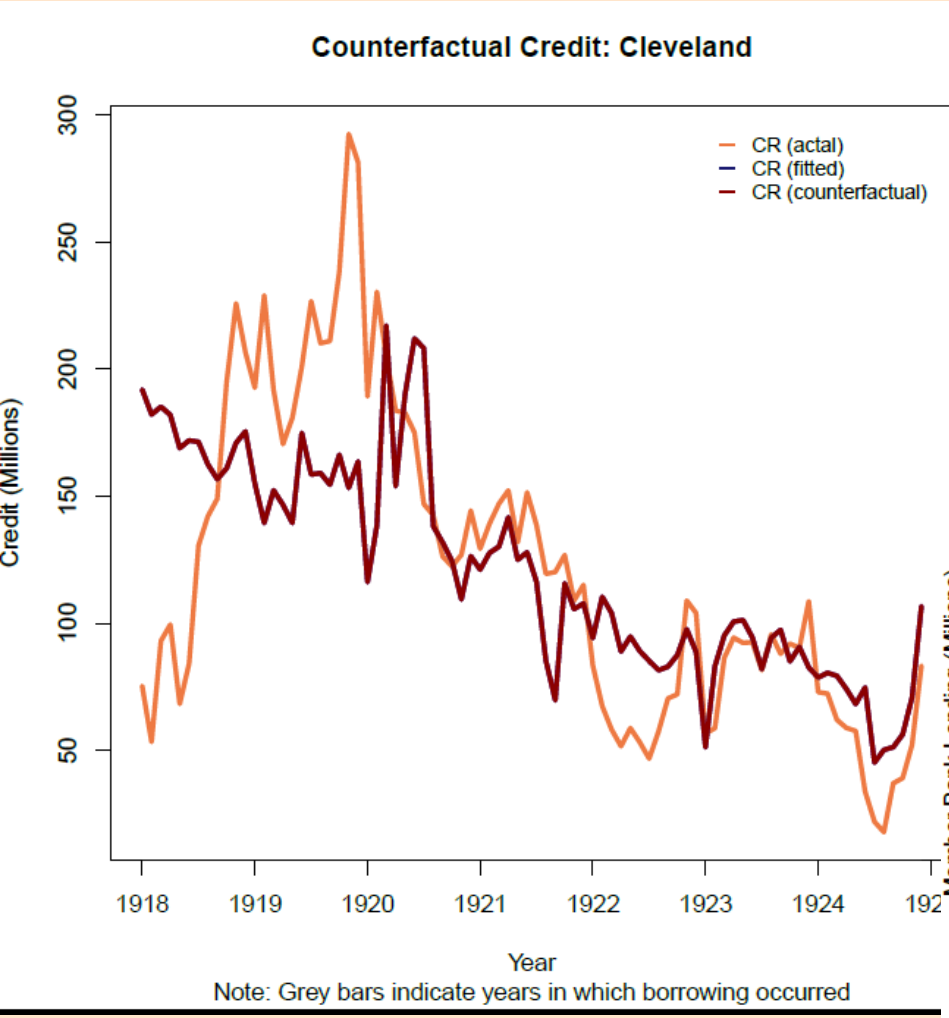
Table 4: Cleveland

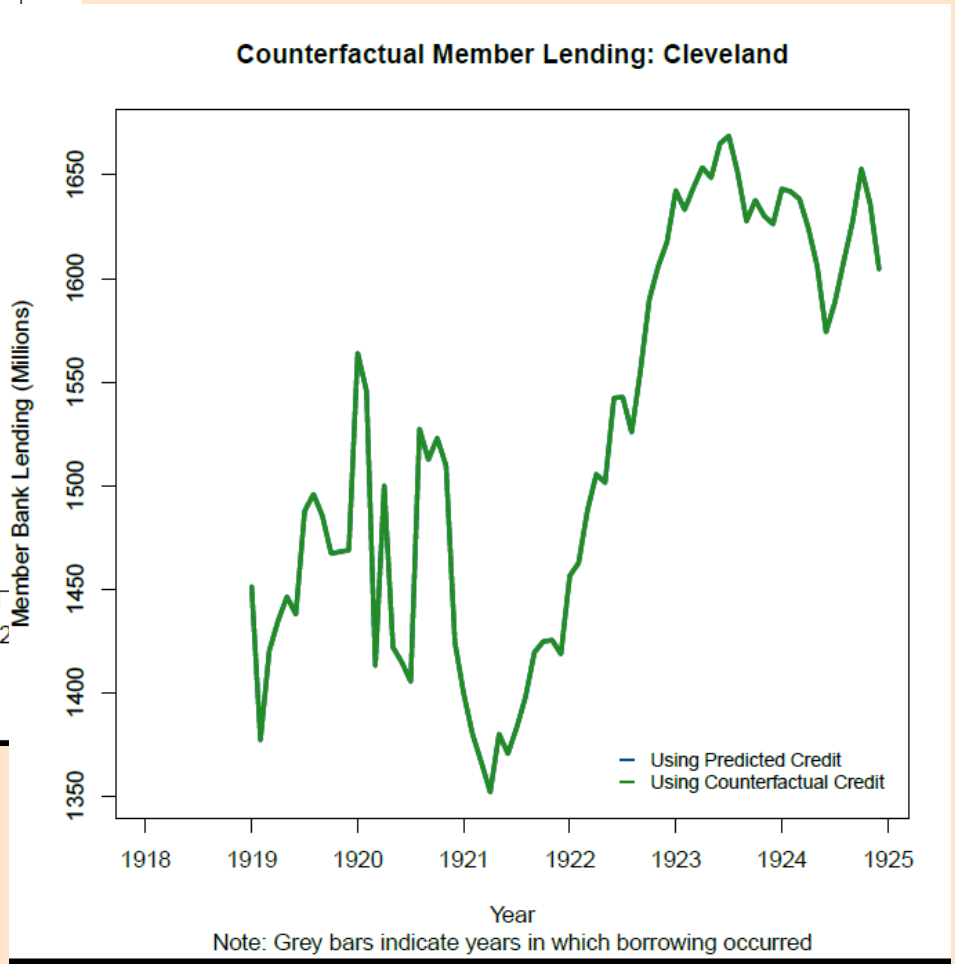
	Dependent variable:
	Credit_t
Credit_{t-1}	0.175***
	(0.037)
Adj. Reserves_t	−0.395***
	(0.104)
Borrowed_t	
Adj. Reserves_{t-1}	−0.102***
	(0.034)
Constant	224.256***
	(28.393)
Observations	84
R^2	0.338
Adjusted R^2	0.313
Residual Std. Error	51.877 (df = 80)
F Statistic	13.589*** (df = 3; 80)
Note:	*p<0.1; **p<0.05; ***p<0.01

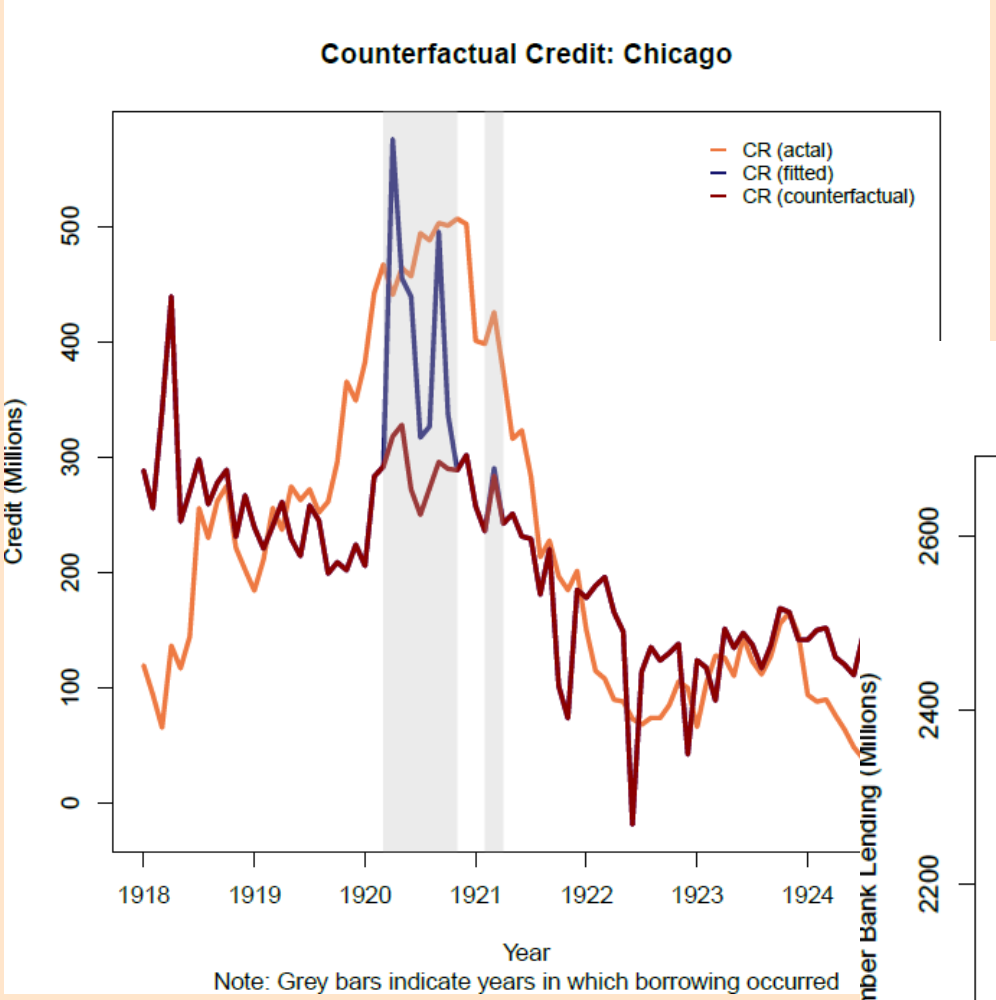
Table 4: Cleveland

	Dependent variable:
	Member Lending_t
Credit_t	−1.131***
	(0.214)
$\text{Net Deposits}_{t-1}$	−0.046
	(0.101)
$\text{Member Lending}_{t-1}$	0.035
	(0.088)
Spread_{t-1}	6.201
	(19.268)
IP_{t-1}	102.449***
	(13.450)
Constant	1,101.576***
	(81.267)
Observations	72
R^2	0.693
Adjusted R^2	0.670
Residual Std. Error	81.236 (df = 66)
F Statistic	29.798*** (df = 5; 66)
Note:	*p<0.1; **p<0.05; ***p<0.01

Cleveland Never Borrowed






Counterfactual Credit: Chicago
CR (actal)
CR (fitted)
CR (counterfactual)
Credit (Millions)
0
100
200
300
400
500
1918
1919
1920
1921
1922
1923
1924
Year
Note: Grey bars indicate years in which borrowing occurred

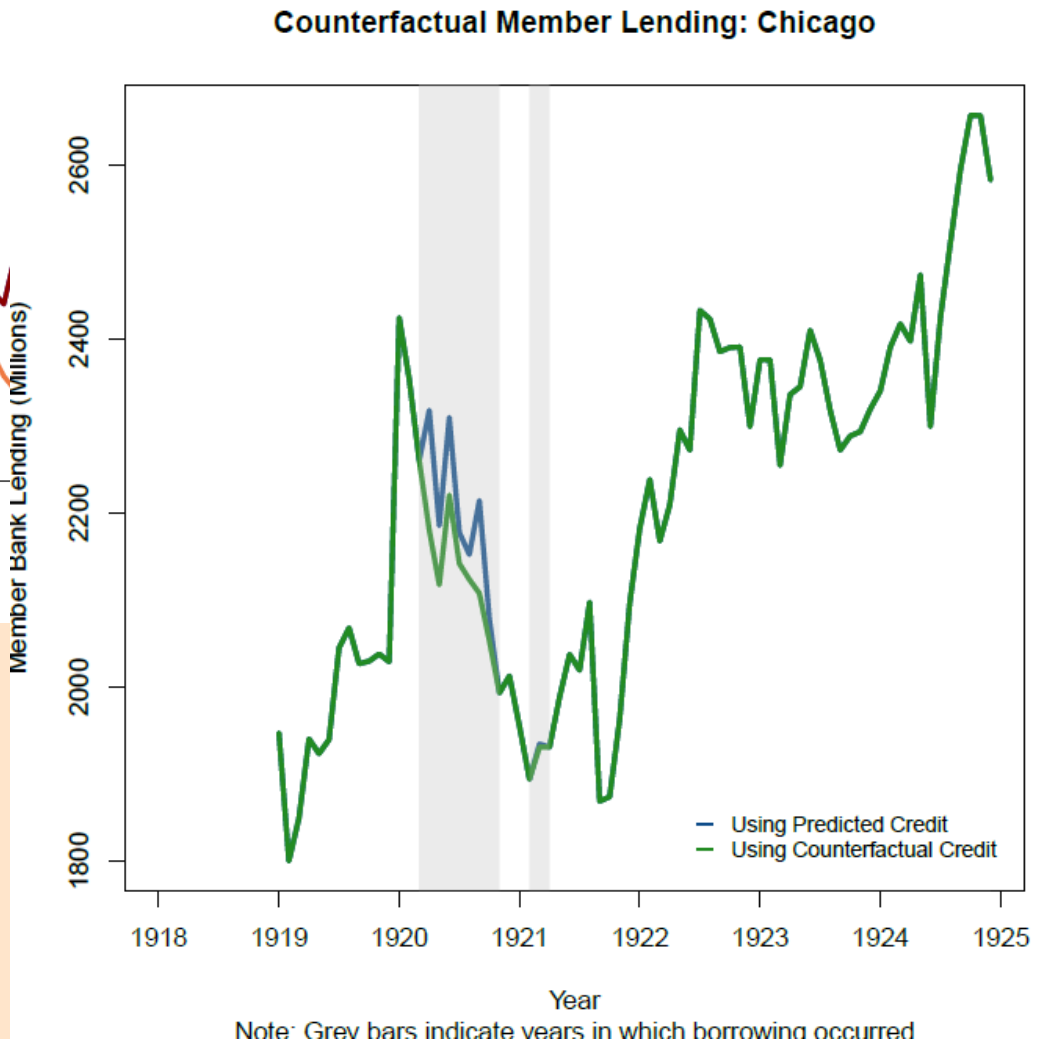
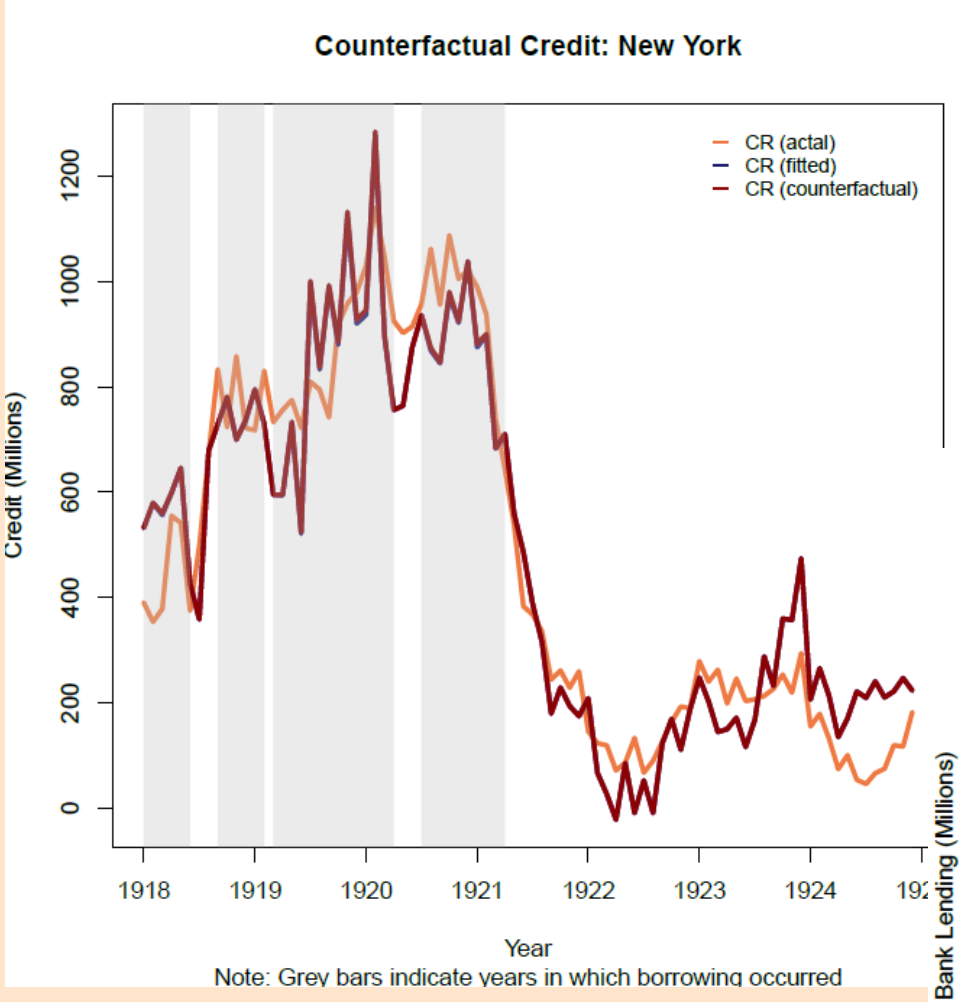

Counterfactual Member Lending: Chicago
Member Bank Lending (Millions)
1800
2000
2200
2400
2600
1918
1919
1920
1921
1922
1923
1924
1925
Using Predicted Credit
Using Counterfactual Credit
Year
Note: Grey bars indicate years in which borrowing occurred

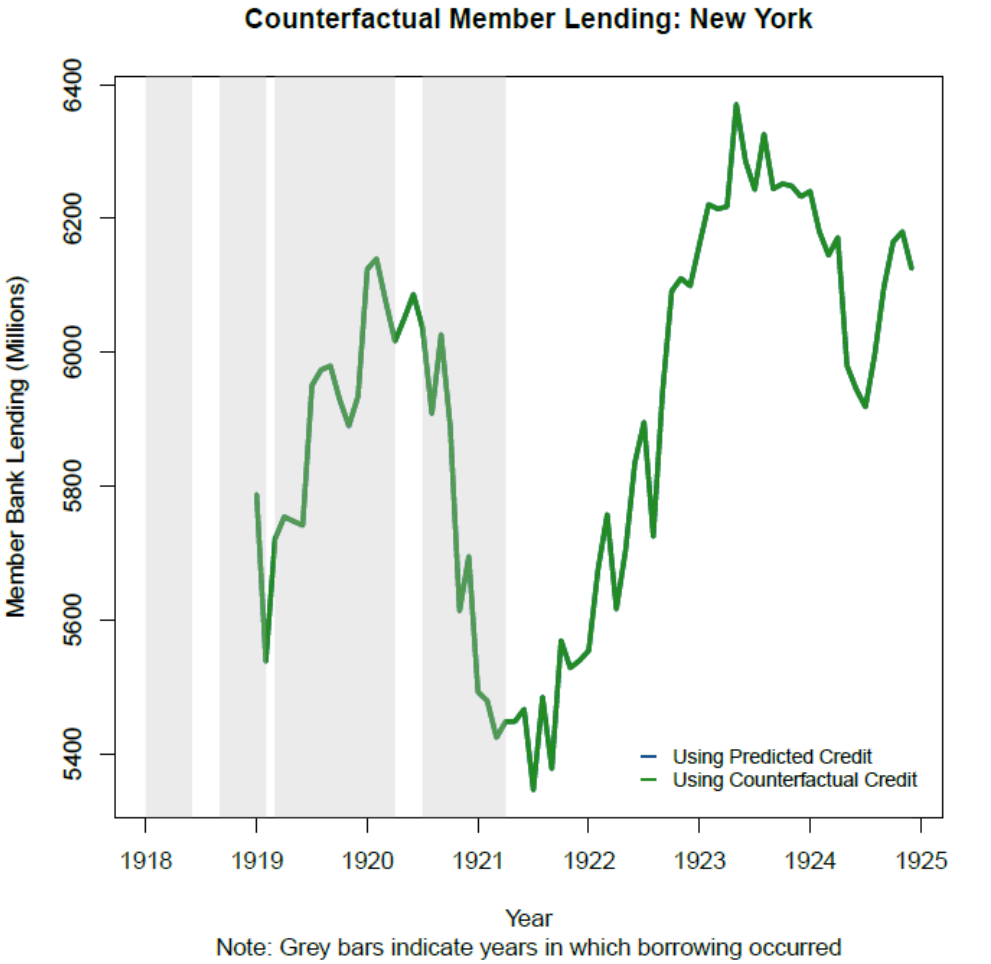
Table 8: New York

	Dependent variable:
	Credit_t
Credit_{t-1}	2.446***
	(0.318)
Adj. Reserves_t	−1.074***
	(0.084)
Borrowed_t	0.237
	(0.819)
Adj. Reserves_{t-1}	−0.566***
	(0.114)
Constant	1,276.972***
	(86.799)
Observations	84
R^2	0.903
Adjusted R^2	0.898
Residual Std. Error	110.436 (df = 79)
F Statistic	184.565*** (df = 4; 79)
Note:	*p<0.1; **p<0.05; ***p<0.01

Table 8: New York

	Dependent variable:
	Member Lending_t
Credit_t	0.533***
	(0.183)
Net Deposits_{t-1}	−0.995*
	(0.535)
Member Lending_{t-1}	0.634*
	(0.327)
Spread_{t-1}	−279.623***
	(93.244)
IP_{t-1}	379.503***
	(52.652)
Constant	3,784.011***
	(293.061)
Observations	72
R^2	0.492
Adjusted R^2	0.454
Residual Std. Error	313.650 (df = 66)
F Statistic	12.785*** (df = 5; 66)
Note:	*p<0.1; **p<0.05; ***p<0.01


Counterfactual Credit: New York
CR (actal)
CR (fitted)
CR (counterfactual)
Credit (Millions)
0
200
400
600
800
1000
1200
1918
1919
1920
1921
1922
1923
1924
Year
Note: Grey bars indicate years in which borrowing occurred


Counterfactual Member Lending: New York
Member Bank Lending (Millions)
5400
5600
5800
6000
6200
6400
Using Predicted Credit
Using Counterfactual Credit
1918
1919
1920
1921
1922
1923
1924
1925
Year
Note: Grey bars indicate years in which borrowing occurred

Conclusion: Did Divergent FR Bank Policy Matter?

- Some contemporaries thought so:
- D.W. Crissinger Fed Chairman in 1923:
- “We were inclined at first to disagree with Governor M.B. Wellborn of the Atlanta bank, in some of the policies which he pursued, but…he was right and we---the members of the federal reserve board---were wrong.”
- Can we provide a measure of mitigation of the recession in expanding Districts?
- Can we provide a measure of how the banking system was strengthened---failures reduced? Panic avoided?