Should Monetary Policy Lean Against the Wind?

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

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Abstract

Are credit booms and high leverage in the financial sector better addressed by conventional monetary policy "leaning against the wind" (LAW) or by macroprudential policy? I exploit a natural experiment to answer this question. In 1920, when U.S. monetary policy was still decentralized, four Federal Reserve Banks implemented a conventional rate hike to address financial stability concerns. Another four Reserve Banks resorted to macroprudential policy. Due to regional financial segmentation and local continuity in baseline covariates, I can estimate a geographic regression discontinuity model using borders with the remaining four Federal Reserve districts which did not change policy stance. Macroprudential policy caused both bank-level loan growth and leverage to fall significantly, whereas LAW did not have a statistically significant effect on these bank-level outcomes. I show that macroprudential policy reined in over-extended banks more effectively because it allowed Federal Reserve Banks to use price discrimination when lending to highly leveraged counterparties.

JEL classifications:
E44, E52, E58, G21, N12, N22

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Summary

Credit booms can amplify business cycle fluctuations by fueling excessive credit growth for local conditions (Rey, 2013; Borio, 2014). When credit booms "go bust", they tend to end in financial crises which inflict large costs on creditors, tax payers and the real economy (Cerra and Saxena, 2008; Schularick and Taylor, 2012; Romer and Romer, 2017). Although the pecuniary externalities and aggregate demand externalities of unconstrained credit growth provide a clear rationale for financial stability policy (Stein, 2012; Farhi and Werning, 2016; Martinez-Miera and Repullo, 2019), there is an ongoing debate about which measures should be deployed to rein in financial excesses during a boom.

This paper sheds light on the comparative causal effects of the two most prominent policy options available. I estimate the effects of monetary policy "leaning against the wind"[1] (LAW) and macroprudential policy[2] on bank-level credit by exploiting a single natural experiment. I draw on geographic discontinuities along U.S. Federal Reserve district borders, at a time when each of the twelve Federal Reserve Banks still had the power to conduct independent monetary policies. In late spring 1920, four Federal Reserve Banks (Boston, Chicago, Minneapolis and New York) leant against the wind by hiking their interest rate from 6% to 7% to address financial stability concerns. Four other Reserve Banks (Atlanta, Dallas, Kansas City and St Louis) used a macroprudential tool to safeguard financial stability, while keeping their policy rate constant at 6%. The remaining four districts (Cleveland, Philadelphia, Richmond and San Francisco) represent my control group regions as they did not change their policy stance (Figure 1 below). The nearly simultaneous enactment of the measures allows me to stage a real "horse race" between the two policy types while fixing time and environment - an opportunity not available in modern day settings as LAW and macroprudential policies are usually considered substitutes rather than complements. Consequently, my paper addresses the core question of relative policy effectiveness more directly than any previous study.

My identification strategy builds on a unique institutional setting. First, although the policy decisions were endogenous to financial developments in the twelve Federal Reserve districts, my discontinuity design compares treated and control group banks in close bandwidths of 25 kilometers around borders of districts with different policies. Within these bands, pre-treatment characteristics show statistically identical levels and pre-trends. This homogeneity in baseline characteristics minimizes omitted variable bias and allows me to disentangle supply-side from demand-side drivers of bank lending. Second, banking laws established a uniform regulatory framework for national banks across the entire territory of the United States. Hence, my setting rules out spurious correlation concerns related to legal discontinuities in bank regulation and supervision. Third, the U.S. banking system in the 1920s was characterized by a combination of *de jure* and *de facto* financial segmentation. National banks did not have the right to establish branches. These unit banks thus operated predominantly within strict geographic confines (local businesses and their agricultural community), which were cemented into their business models by the prohibition to lend on real estate located outside their district. The Law also forbade national banks to borrow from other Federal Reserve Banks (and their branches) outside their district.[3] Finally, the borders of the twelve Federal Reserve districts ringfenced large parts of the existing interbank links between bank locations.[4] Therefore, the prevailing financial segmentation significantly limited spill-over effects from arbitrage and contagion which complicates the identification of causal effects in modern settings.

Using new hand-collected bank-level panel data sets, I find that macroprudential policy caused both lending and leverage to fall significantly relative to districts without a policy change. Treatment led to a reduction in

[1] When "leaning against the wind", central banks raise their conventional monetary policy instrument, the nominal interest rate, to steer against financial market developments deemed unsound. More precisely, LAW is defined as "monetary policy that is somewhat tighter (that is, with a somewhat higher policy interest rate) than what is consistent with flexible inflation targeting without taking any effects on financial stability into account"(Svensson, 2017, p.193).

[2] Macroprudential policies represent tools designed to address the build-up of systemic risks in the financial system or some of its sub-sectors (e.g. loan-to-value ratios and countercyclical buffers).

[3] The prohibition of interdistrict borrowing did not apply to Federal Reserve Banks themselves (Wallace, 1956; Tallman and White, 2017).

[4] See Jaremski and Wheelock (2017) for details.

both outcome variables by between 8 and 17%, depending on the sample/borders drawn on for estimation. In contrast, depending on border discontinuities considered, the conventional interest rate hike either yielded no statistically significant effects or triggered a perverse impact on bank-level outcomes, increasing both lending and leverage relative to banks not subject to LAW. My results are robust to a wide range of robustness checks. Apart from changes in the specifications and control variables, I conduct a series of Placebo tests to verify that treatment effects do not exist before treatment began and do not persist after treatment ended. Furthermore, I show that there are no systematic discontinuities across district borders with identical policies. Finally, I limit my sample to bank-level data from states which were split by Federal Reserve district borders to show that my estimates are not merely driven by discontinuities across state borders unrelated to LAW or macroprudential policy.

Whether unsound financial developments are more effectively addressed by LAW or by macroprudential policies continues to constitute a heated debated among policymakers and academics. Existing theoretical studies reach opposing conclusions on the relative merits of LAW and its alternatives.[5] Whereas LAW famously "gets into all cracks" of both regulated and shadow financial sectors (Stein, 2013), macroprudential tools are less likely to cause collateral damage[6] but they are more prone to regulatory arbitrage and difficult to deploy[7] (Smets, 2014). In this paper, I empirically exploit conditions of swift macroprudential policy deployment and limited arbitrage under which there is no clear *a priori* case for LAW. This unique setting allows me to advance another argument against LAW which is independent of the greater collateral damage it may cause. Staging a real "horse race" between policies while fixing time and environment, I show not only that macroprudential policy can be more effective than conventional monetary policy in addressing excessive credit growth, but also that LAW can have severe counterproductive effects.

To identify the mechanisms behind my empirical results, I proceed in two steps. First, I show that the specific macroprudential policy used in 1920-21 endowed Federal Reserve Banks with a stronger and more targeted tool to exert pressure on over-leveraged counterparties than LAW. In 1920, monetary policy transmission functioned through the so-called "reserves channel" (Carlson and Duygan-Bump, 2018).The primary motive for borrowing from a Federal Reserve Bank was to make good on reserve requirements: commercial banks had to hold reserves against their deposit liabilities and all reserves needed to be stored with the Reserve Banks. When a commercial bank granted a new loan to a customer, it usually created a deposit for the borrower. This increase in deposits meant a higher absolute reserve requirement and implied borrowing from the Federal Reserve Bank to abide by the new requirement.Both LAW and the macroprudential tool used in 1920-21 increased the marginal cost of reserves and thus acted upon banks' incentive to grant new loans. In contrast to LAW, however, the macroprudential tool turned the cost of new borrowing from the Federal Reserve Bank into a function of a bank's current level of outstanding borrowings from the Reserve Bank relative to a maximum credit line. The maximum line was calculated for each bank on the basis of its reserves and capital position. The more a given bank was already borrowing, the higher the interest rate became it was charged for additional loans from the Reserve Bank. Hence, the macroprudential tool - officially named the "progressive discount rate scheme" (PDR) - entailed price discrimination of central bank counterparties depending on their respective level of leverage.

The design of the PDR clarifies why macroprudential policy was more successful in taming banks' credit expansion but it does explain the perverse treatment effect of LAW. Hence, in a second step, I investigate why LAW led to an increase in bank lending and leverage in some of the treated districts. I show that the 6% usury

[5]Most recent contributions use DSGE models (Gambacorta and Signoretti, 2014; Gourio et al., 2017) or static cost-benefit analysis (Svensson, 2016, 2017) to model the impact of LAW. These two approaches cannot be easily mapped into each other *and* the authors reach different conclusions. While the former suggest LAW can be a first-best policy response in some scenarios, the latter argues in favor of more targeted prudential policies because the costs of "leaning against the wind" almost always outweigh its benefits.

[6]Monetary policy tightenings have costs in terms of higher inflation volatility, foregone output and employment. Incorporating financial stability into the monetary policy reaction function can therefore lead to trade-offs between price stability and financial stability with direct macroeconomic consequences (IMF, 2015). By weakening the economy, LAW may even become counterproductive. The economy faces future negative shocks in a more fragile state, potentially implying higher costs during future crises than without the preemptive rate increase (Svensson, 2017).

[7]Macroprudential tools are more difficult to adjust and deploy than conventional monetary policy because they often require legal changes and direct political voting/backing.

rates on the East Coast worked as a binding credit friction before LAW was implemented. The friction likely prevented financial intermediaries to adequately price risk before the policy intervention and it may have forced them to ration credit. Bank-level data on interest rates from examiner reports suggests that treated banks benefited from regulatory forbearance and increased their rates above 6% after the rate hike. In other words, LAW likely relaxed a binding credit friction, allowing banks to expand their lending. In addition, I find that treated banks shifted their loan supply to forms of credit that were exempt from the usury ceilings, in particular the call market in New York.

This paper fills several gaps in the literature, in addition to responding to the theoretical ambiguity which currently characterizes the debate about the costs and benefits of LAW and its alternatives. First, I contribute to the empirical literature on the effectiveness of macroprudential policies in two distinct ways. My research design solves serious identification challenges which are left unaddressed in recent work. In order to interpret policy treatment effects as causal, the so-called stable unit treatment value assumption (SUTVA) must be fulfilled. One major component of SUTVA is the absence of interference: the treatment applied to any one unit must not impact the outcome for other units. This assumption is generally violated in previous studies which use other financial intermediaries as control groups. Bank borrowers have an incentive to switch from treated credit institutions to untreated (or less heavily treated) banks in order to avoid higher credit costs or cuts in funding. These contagion effects induce an upward bias in the treatment coefficient as they blow up the difference between treatment and control groups.[8] In this paper, I use a unique quasi-experimental setting characterized by regional financial segmentation to tackle the problem of interference. In my setting, the prevailing legal environment limited borrowers from applying to credit institutions located in non-treated regions. Furthermore, I explicitly control for remaining concerns that interbank movements of funds triggered contagion effects. Recent contributions to this literature are based on micro-level data and use difference-in-difference models to identify the treatment effect of policies (Aiyar et al., 2014; Barroso et al., 2017; Camors et al., 2017; Jiménez et al., 2017; Reinhardt and Sowerbutts, 2017). However, none of these works develops an explicit strategy to address contagion bias.

An additional advantage of my historical setting consists of the simplified and direct transmission of monetary policy onto bank balance sheets via Federal Reserve member banks' reserve requirements. Ultimately, the relative effectiveness of LAW and alternative policies rests crucially on their successful transmission to the financial sector. Pinning down the isolated effect of any one specific transmission mechanism to trace the impact of monetary policies is increasingly difficult in modern economies.[9] The study of the simplified transmission mechanism prevailing in 1920-21 contributes to the current debate on LAW and its alternatives in two ways. First, the transmission mechanism of LAW and macroprudential policy in my setting closely resembles an idea put forward in a seminal paper by Stein (2012). Stein (2012) proposes a version of LAW based on the introduction of a system of cap-and-trade permits to regulate banks' money creation. This system can be implemented by making use of existing reserve requirements for short-term liabilities.[10] In my historical setting, LAW and macroprudential policy were both directly transmitted to bank balance sheets because they varied the marginal cost of reserves. My contribution thus closely corresponds to a tailored empirical test of Stein's (2012) proposal. Second, the design of macroprudential policy in 1920 caused the marginal cost of reserves to become a function of individual banks' leverage. My findings reveal that this form of customized price discrimination against central bank counterparties was highly effective in reducing bank-level leverage and credit growth, whereas LAW was not. Central bank price discrimination represents one of the elephants in the discussion room where LAW and its alternatives are currently debated. The results of this paper suggest that policy-makers may gain from initiating a conversation on the benefits and costs of rules-based price discrimination in the context

[8] Interference might also occur among treated units if the intensity of treatment is a function of bank-level characteristics. In this case, however, contagion triggers a downward bias in the coefficient, stacking the cards against finding a significant treatment effect.

[9] A large variety of potential transmission channels has been explored in the literature (c.f. IMF (2015) for a survey).

[10] Required reserves represent the permits and the cost of permits is dictated by the central bank policy rate (i.e. the marginal cost of reserves).

of their financial stability mandates.[11] This conclusion applies in particular to situations or contexts where the "reserves channel" remains an important lever of monetary policy.

This paper also adds new insights to the economic history literature relevant to my quasi-experimental setting. I extend the methodology of seminal papers by Richardson and Troost (2009) and Jalil (2014) who exploit historical Federal Reserve border discontinuities to show that liquidity provision by the Federal Reserve System mitigated banking panics during the Great Depression of the 1930s. My study differs from theirs along several important dimensions. First, I study the effects of explicit monetary policy and macroprudential policy decisions rather than implicit differences in the willingness of Federal Reserve Banks to provide emergency liquidity. Second, I analyze an earlier episode at the beginning of the 1920s when the Federal Reserve System was still in its infancy, the stigmatization of discount window borrowing was limited at best and the economic environment was initially characterized by a large boom rather than a severe depression.[12] Third, I exploit several so far unexplored border discontinuities in the north-east of the United States.[13] Finally, in contrast to earlier studies, I use an explicit regression discontinuity estimation framework.

My second contribution to the economic history literature is to provide plausibly causal evidence on the role of Federal Reserve policy during the recession of 1920-21. Many authors argue that contractionary Federal Reserve policy amplified the downturn (Friedman and Schwartz, 1963; Wicker, 1966; Kuehn, 2012; Shaw, 2016) but there are also dissenting voices (Benner, 1925; Link, 1946). Previous conclusions on the role of the Federal Reserve System during the 1920-21 crisis are difficult to compare. Authors focus on different Federal Reserve districts, use different units of observation and compare statistics over different time spans. Most importantly, all studies face identification challenges because the effects of monetary policy contraction are difficult to disentangle from other developments at the time. The most recent contribution by Tallman and White (2017) presents a more detailed, disaggregated analysis, separating Federal Reserve Banks into "doves" and "hawks" according to their policy stance during the recession. My paper contributes to this debate by exploiting the advantages of both, micro-data and a quasi-experimental setting. In addition to these quantitative estimates, I provide new archival evidence on the importance of financial stability preoccupations during the Federal Reserve System's early years. I also show that some Federal Reserve Banks devised a sophisticated macroprudential tool to address financial stability concerns and I describe the functioning as well as the impact of this policy tool which has been almost entirely neglected in the extant literature.[14]

Finally, my paper speaks to recent work on the extent of historical financial market integration in the United States of the 1920s and the characteristics of U.S. interbank markets during the first two decades of the Federal Reserve System. In contrast to findings by Cohen-Setton (2016), my results suggest that national banks used their interbank connections to partly circumvent Federal Reserve Bank policy. I also find evidence that interbank movements of funds reflected the pyramid structure of U.S. banking markets: central reserve cities lost bank deposits when financial institutions in the hinterland reacted to policy pressure. These results are in accordance with work by Mitchener and Richardson (2013), Jaremski and Wheelock (2017), Anderson et al. (2018), Carlson and Duygan-Bump (2018) and Mitchener and Richardson (2018) who argue that interbank markets were highly integrated at the time.

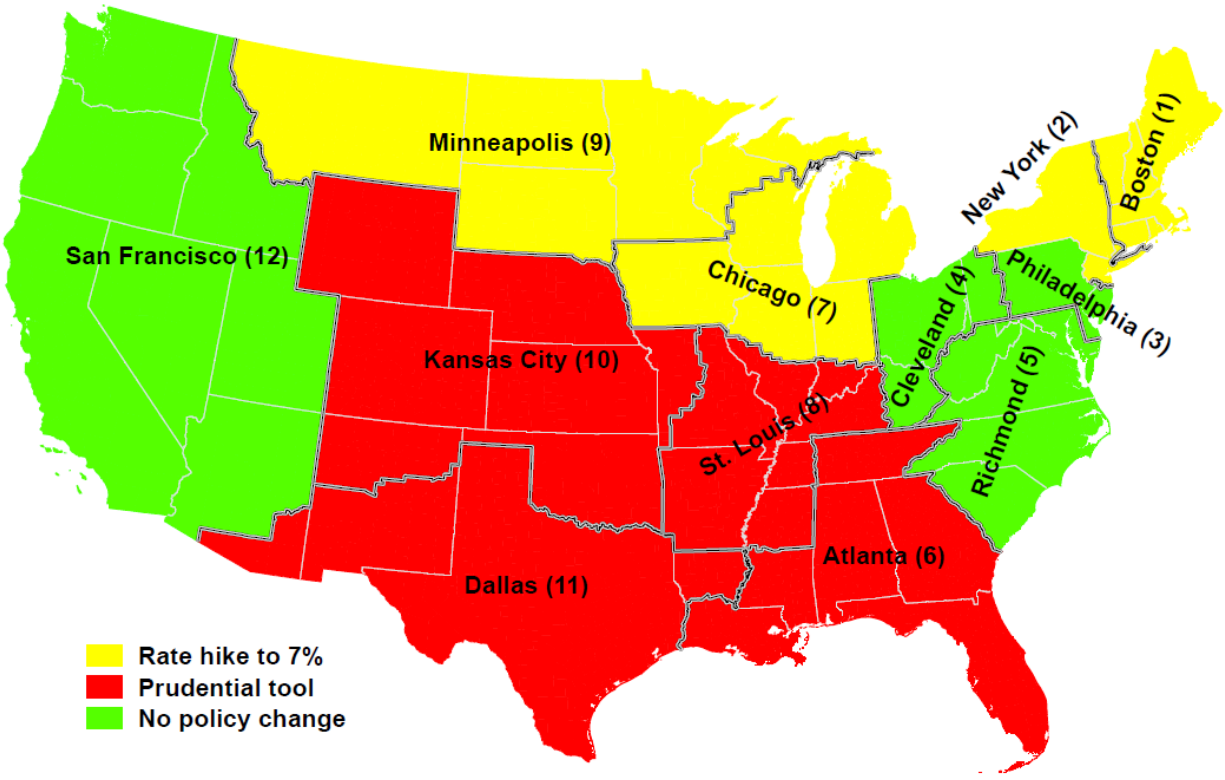
[11] Rules-based price discrimination was part of the day-to-day business in nineteenth century central banking practice (Wood, 1939; Anson et al., 2017).

[12] For details on the stigma attached to the Fed's discount window, c.f. Rotemberg (2013) and Gorton and Metrick (2013).

[13] The focus on these geographic regions makes inference more robust because they hosted a higher number of banks than the southern districts which are studied in the previous contributions. Moreover, the inclusion of large financial centers in my sample (e.g. New York, Philadelphia, Pittsburgh) enables me to analyze interbank dynamics hitherto unexplored.

[14] Two exceptions include Goldenweiser (1925) and, in particular, Wallace (1956). The latter provides a descriptive study of the impact of the macroprudential tool from the perspective of regional balances of payments within the United States.

Figure 1: Geographical distribution of policies adopted in late spring 1920



Source: Federal Reserve Board (1921)

The prudential tool implemented by the Federal Reserve districts of Atlanta, Dallas, Kansas City and St. Louis was called the "progressive discount rate" (PDR) scheme. This map shows the different policies adopted by Federal Reserve districts in late spring 1920.

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