# Local Monetary Policy*

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**Abstract**

When Federal Reserve districts experience high inflation but lack voting rights to influence FOMC decisions, Federal Reserve Banks reduce credit extended through the Discount Window (DW). The identification strategy is based on the exogenous rotation of voting rights among Reserve Banks and on within borrower-time and district-time variations in DW loans and Federal Home Loan Bank (FHLB) loans. Our empirical design ensures that factors related to changes in macroeconomic conditions, local credit demand or borrower characteristics do not drive the results. Our findings suggest the existence of Local Monetary Policy (LMP) executed by the Federal Reserve Banks.

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# 1 Introduction

The Federal Reserve System (the Fed) is responsible for setting monetary policy in the United States, and the Federal Open Market Committee (FOMC) is the monetary policy-making body of the Fed. The FOMC consists of the governors who serve on the Board of Governors and the twelve presidents of the Federal Reserve Banks. Of those twelve, all attend FOMC meetings but only five vote at any one time. Therefore, the degree to which a Reserve Bank president can influence national monetary policy varies over time. Indeed, Fos and Xu (2024) show that during periods of large cross-district dispersion in inflation rates, inflation rates in Reserve Bank districts affect the Federal funds target rate (FFR) only when the presidents of those banks have voting rights at FOMC meetings.

Given the variation in the influence of Reserve Banks on national monetary policy, we ask whether Reserve Banks use *local* monetary tools when they have limited influence over national monetary policy. Specifically, we test whether Reserve Banks change the amount of loans extended at the Discount Window (DW) in response to changes in local inflation. We focus on the DW lending facility because it is one of the few central bank functions under the direct oversight of local Reserve Banks. While the price of DW loans (i.e., the discount rate) is homogeneous across all twelve districts, if Local Monetary Policy (LMP) exists, we should observe that Reserve Banks affect their local economy by controlling the quantity of DW loans. Our null hypothesis, that local inflation has no effect on DW loan amounts, is consistent with the FOMC being the sole maker of monetary policy in the U.S. However, a rejection of the null hypothesis implies that monetary policy is executed by the FOMC nationally and by the Reserve Banks at the local level. Our paper establishes that the latter exists.

Our empirical strategy must overcome the following challenges. First, we need to have measurable variation in the incentives of Federal Reserve Banks to rely on Local Monetary Policy, rather than national monetary policy, to address local needs.

Second, we need to identify the actions taken by the Federal Reserve Banks. This is an empirical challenge because loan quantities are jointly determined by the Reserve Banks' supply and the borrowers' demand. Third, we need to ensure that the results are not driven by national inflation.

To address the first challenge, we use the exogenous yearly FOMC voting rotation established in 1942. This variation distinguishes between district-time level observations where Federal Reserve Banks can react to changes in local inflation by influencing aggregate FFR decisions, and observations for which this national tool is less effective. To address the second challenge, our main analysis includes other liquidity loans that are available to borrowers but not controlled by Federal Reserve Banks, such as Federal Home Loan Bank (FHLB) loans and Repurchase Agreement (REPO) loans. By focusing on the differential responses of DW loans and other liquidity loans to changes in local inflation, we isolate the incremental effect of Federal Reserve Banks on DW loans.[1] To address the third challenge, we use district-by-time fixed effects to absorb variations resulting from changes in local (and thus aggregate) economic conditions. This allows us to better compare DW and other liquidity loan activities within each district-time. We also use borrower-by-time fixed effects to absorb variations due to changes in a borrower bank's characteristics.

We use various publicly available datasets. From the Federal Reserve website, we obtain DW loan-level data that is published quarterly from Q3 of 2010 with an approximately two-year delay. From Call Reports, we obtain loan data available at the quarterly frequency: Federal Home Loan Bank (FHLB) loans and Repurchase Agreement (REPO) loans. In our main empirical analysis, we aggregate the DW loan-level data to the borrower-quarter level and combine it with quarterly FHLB loan data to isolate the supply-side effect. Our main dependent variable is liquidity loan amount scaled by the borrower's total assets at the last quarter-end. Our main

[1]This empirical design draws inspiration from Khwaja and Mian (2008), who use a firm's relationship to multiple lenders to control for credit demand. In our setting, we study within-borrower borrowing from the DW and the FHLB.

sample spans from Q3 of 2010 to Q4 of 2020 and covers 7,843 unique banks. About 35% of them have accessed the DW in their registered district and 28% have accessed it more than one time during our sample period. To measure local economic conditions, we consider the population-weighted Reserve Bank office's Metropolitan Statistical Area (MSA) inflation rates. Compared to other measures of economic activity, MSA inflation measures are more moderately correlated across districts and are available at a more timely release (i.e., monthly or bimonthly). Lastly, we use voting status data summarized by Fos and Xu (2024).

We begin by presenting the unconditional relationship between local inflation and liquidity loan activities. We find a negative and significant relationship between DW loan activity and local inflation, and a positive and significant relationship between FHLB loan activity and local inflation, both within-district and within-borrower. In a joint specification, we confirm that the two responses are statistically different, and the results are robust when further controlling for district-time and borrower-loan-type fixed effects. These results provide the initial evidence that DW loans respond to local inflation differently than loan activities not directly controlled by the Reserve Banks, such as FHLB loans.

For identification, we use the exogenous FOMC voting rotation to isolate district-times when local Reserve Banks have limited access to national monetary policy to address local economic needs, and examine whether the differential response of DW and FHLB loan activities to changes in local inflation is driven by this subsample. To start, we find that when a district has voting rights, the responses of DW and FHLB loans to changes in local inflation are similar. This is expected because in these times local needs can be addressed by influencing national monetary policy, and therefore local monetary policy takes a smaller role. On the other hand, indeed, when a district lacks voting rights, higher local inflation leads to significantly lower DW activities compared to FHLB activities. These results hold when we use district-time fixed effects to absorb aggregate and district-time variation, and borrower-time fixed

effects to absorb changing borrower bank characteristics.

We conduct several robustness tests to further strengthen our findings. First, when we explore heterogeneity in borrower size, we find that small borrowers drive our results. This is expected because liquidity borrowing by large borrowers is likely less sensitive to local inflation: large banks can better handle liquidity shocks and should have better cross-regional diversification. Second, we find that our results are stronger when local inflation dispersion is high, either relative to the voting group or across districts. Indeed, when districts have different (similar) inflation rates, voting rights should become more (less) important. Third, the results are stronger during periods when DW activities (hence applications to access DW) are heightened. Local monetary policy, if present, can only exert influence when applications are submitted. Our fourth robustness test confirms that the results are not sensitive to sample selection. For example, if we restrict the sample only to borrowers that have accessed both DW and FHLB loans, the main results hold and remain statistically significant. In the fifth robustness test, we substitute FHLB loans with REPO loans. While both types of loans capture borrowers' liquidity needs and are driven by similar demand factors, FHLB loans are sponsored by the U.S. Federal government via local offices while REPO loans are market driven and have been used to conduct unconventional monetary policy. While we consider FHLB loans more suitable for our research as they capture local demands, we find statistically similar coefficient estimates with using REPO loans.

Lastly, we construct and examine two more granular measures of Discount Window activities, at the loan-level and the district-week-level. First, the loan-level DW sample spans from 2010 to 2020 and covers about 3,730 unique borrowing institutions and 38,000 loans across the twelve districts. We find that when a district does not have a vote at the FOMC, higher local inflation leads to significantly lower loan quantities and higher collateral requirements. The second test utilizes weekly snapshots of Reserve Banks' balance sheets for each district, spanning from 2002 to 2020, as pro-

vided by the Federal Reserve Board's H.4.1 statistical releases. This dataset is useful because it extends the analysis to a period before 2010. The results are consistent with our main findings. In these tests, we cannot use FHLB or REPO loans as benchmarks given their frequency limitation. As a result, we use Term Auction Facility (TAF) loans – issued through Discount Window but not directly controlled of Reserve Banks – in our placebo test, and find no evidence that TAF loans respond to changes in local economic conditions.

Our paper contributes to three strands of the literature. First, this study contributes to the extensive monetary policy literature which studies how the Federal Reserve reacts to changing economic conditions (e.g., Taylor (1993) and many that follow). To the best of our knowledge, Richardson and Troost (2009) and Amir-Ahmadi, Cortes, and Weidenmier (2020) are the only studies that point to the idea that Reserve Banks react to local economic conditions. In Richardson and Troost (2009), the authors use the borders between the St. Louis and Atlanta districts to show that during a banking crisis in 1930 Atlanta extended discount loans and St. Louis did not. Amir-Ahmadi, Cortes, and Weidenmier (2020) document that between 1923-33 each Reserve Bank sets their own discount rates in response to regional economic conditions. We contribute to this literature by documenting the robust effect of local economic conditions on Reserve Banks' decisions to use *local* monetary tools, highlighting the usefulness of the exogenous FOMC voting rotation for identification.

Second, our paper contributes to the literature that studies the functioning of the Discount Window. Most of the extant literature has focused on understanding who borrows from the "lender of last resort" (e.g., Drechsler, Drechsel, Marques-Ibanez, and Schnabl (2016)).[2] A large number of papers in this literature discuss the "Discount Window Stigma," showing mixed evidence (see, e.g., Armantier, Ghysels, Sarkar, and Shrader (2015) versus Artuç and Demiralp (2010)). A more recent strand

[2]The literature on FHLBs is relatively small, focusing mostly on documenting the FHLB as practically a lender-of-to-last resort (e.g., Stojanovic, Vaughan, and Yeager (2008), Ashcraft, Bech, and Frame (2010), Acharya and Mora (2015)).

of the literature focuses on documenting the functioning of the DW during normal times (e.g., Ackon and Ennis (2017), Ennis, Ho, and Tobin (2019), Ennis and Klee (2021)). Our paper contributes to this strand of the literature by establishing the DW as an active *local* Monetary Policy tool. We find evidence that local inflation affects the supply of DW credit offered by Reserve Banks. Our evidence may offer an alternative perspective of seeing the Discount Window as an "open-door" credit facility. The collapse of Silicon Valley Bank in March 2023 illustrates a real-world case where a bank attempted to borrow from the Discount Window but was unable to obtain overnight loans.

Finally, this paper builds on the literature that studies the role of governance and voting in the Fed system. One traditional strand of this literature studies how FOMC member background characteristics explain their voting behaviors (e.g., Belden (1989), Havrilesky and Schweitzer (1990), Havrilesky and Gildea (1991), Chappell Jr, Havrilesky, and McGregor (1993), Chappell Jr and McGregor (2000), Meade and Sheets (2005), Crowe and Meade (2008), Malmendier, Nagel, and Yan (2021), and Bordo and Istrefi (2023)). Two recent contemporaneous works use the exogenous FOMC voting rotation to study the causal effect of the hawk-dove balance on economic outcomes (Hack, Istrefi, and Meier (2023)) and the causal effect of presidents' voting rights on their communication behavior (Ehrmann, Tietz, and Visser (2022)). More relevant to our research, Fos and Xu (2024) show that economic conditions in Reserve Bank districts affect the Federal funds target rate (FFR) only when presidents of those banks hold voting seats at FOMC meetings. Our paper contributes to this literature by showing that the governance structure of the Fed system leads to a tension between national and local interests, and that local Reserve Banks take actions to more closely align monetary policy with local economic conditions.

# 2 Data

In this section, we describe data sources and construction details for our main datasets, we then discuss key summary statistics. We provide supplementary information to Section A in the Appendix.

## 2.1 Discount Window Loans

"The Discount Window is an instrument of monetary policy that allows eligible borrowers to borrow money, usually on a short-term basis, to meet temporary shortages of liquidity caused by internal or external disruptions."[3] The Discount Window was established by the Federal Reserve Act of 1913. For the first 100 years, its activities were not easily observed by the public. However, following the implementation of the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010, the Board of Governors of the Federal Reserve System began disclosing loan-level information on Discount Window lending activity; the data is published quarterly on the Federal Reserve's website with approximately a two-year delay.[4]

Discount Window loans have three types: primary, secondary, and seasonal. According to this loan-level dataset, 75% of all DW loans are primary loans (i.e., made to borrowers in sound financial condition), while seasonal and secondary loans make up 24% and 1% respectively. We consider all three types of DW loans in our research.[5] Interest rates on DW loans, or commonly known as the discount rates, are set homogeneously across the Reserve Banks and constitute an upper bound on the Federal funds rate since January 6, 2003, according to the regulatory change announced

[3]Source: https://www.frbdiscountwindow.org/RightNavPages/Getting-Started.

[4]For each DW loan, we observe the origination date, the identity of the borrower (i.e., name, city, state, primary ABA routing number), the lending Federal Reserve Bank, the dollar amount, the amount of collateral on the borrower's balance sheet, the loan's maturity, and the type of credit. The initial reporting period covers loans made between July 22, 2010 and September 30, 2010, which marks the start of our sample period. Sources: https://www.federalreserve.gov/monetarypolicy/bst_reports.htm, https://www.federalreserve.gov/regreform/discount-window.htm.

[5]We also conduct robustness using just primary loans.

on October 31, 2002.[6] The average size of a DW loan is $7.5 million. There is a wide variation in the size of the loans, ranging from $1,000 to $5 billion. The very small loans are mostly testing exercises to ascertain the correct functioning of a bank's direct line of credit to the DW. Knowing that, we only consider individual DW loans above $100,000.

We next discuss and motivate the use of DW as our Local Monetary Policy gauge, which is at the core of our empirical strategy. The Discount Window lending facility is one of the few central bank functions still under the direct oversight of local Reserve Banks. While the "price" of DW loans is homogeneous across all districts, if Local Monetary Policy exists, we should observe that local Reserve Banks affect the local economy by controlling the "quantity" of DW loans, i.e., the supply of DW credit. As such, Discount Window lending constitutes a suitable and measurable gauge to test for the existence of Local Monetary Policy.

This hypothesis challenges the conventional view of the Discount Window as merely a liquidity "backstop," a "lender-of-last-resort," guaranteed by the Fed to ensure the smooth functioning of financial markets (Bernanke (2008)). Indeed, recent research has shown that after the global financial crisis, some banks start to access the DW as their main liquidity management resource in regular times as well (e.g., Ennis, Ho, and Tobin (2019), Ennis and Klee (2021)). In our replication, Figure 1 depicts the level of Discount Window loan activities (in log total dollar amount) on a quarterly basis from 2010 to 2020, both at the U.S. level (subfigure (A)) and the district level (subfigure (B)). The figure shows heightened activity during the early 2020 stress period, as anticipated, and also reveals significant activity during non-stress periods. In a typical year before 2020, Reserve Banks extended around $6.5 billion in DW credit, compared to approximately $221 billion in DW loans during 2020. The variation in DW activities over time and across districts is valuable for our study.

[Insert Figure 1 here]

[6] See Appendix Section A.1 for details on the new regulation.

We advance the possibility that the supply of credit might be influenced by Reserve Banks' consideration of local economic conditions, hence serving as one channel for local monetary policy. One potential mechanism is that Reserve Banks may adjust their stance on a bank's solvency when deciding whether to approve a DW loan. As noted in a *Wall Street Journal* article from September 12, 2008: "Any borrower to the Discount Window must put up collateral that the Fed values on its own before making the loan. The Fed could decide not to put government money at risk by lending to a seriously troubled firm even against collateral."[7]

Finally, the Discount Window literature has coined the term "Discount Window Stigma" to describe a condition where accessing the DW is interpreted as a sign of financial weakness (see e.g. Armantier, Ghysels, Sarkar, and Shrader (2015) and Beyhaghi and Gerlach (2023)). This concept is less concerning for our empirical design (see later in Sections 3 and 4) because it is unlikely that variations in this stigma align with FOMC voting status and local economic conditions, both over time and across districts. Moreover, while stigma may be a latent factor influencing bank applications for DW loans, it is unlikely to be a significant driver of Reserve Banks' loan decisions.

## 2.2 Main Outcome Variables

Our main analysis is conducted at the borrower-quarterly level. This approach enables us to test differences between various types of liquidity loans, thus better examining supply versus demand. It also allows for the flexible incorporation of controls for borrower-quarterly characteristics.

Specifically, we aggregate all non-testing DW loans (i.e., those over \$100K) at the borrower-quarterly level and scale them by the borrower's total assets at the previous quarter-end. This variable is labeled "DW Loan $>$ 100k % Assets" throughout the paper. During our sample period (2010-2020), over 35% of all commercial banks in

[7]Source: https://www.wsj.com/articles/BL-REB-1952.

the U.S. accessed the Discount Window at least once.[8]

Using Call Reports, we obtain information on two additional sources of liquidity loans available to commercial banks: Federal Home Loan Bank (FHLB) loans and Repurchase Agreements (REPOs). The U.S. government-sponsored FHLB system aims to enhance the efficiency of the housing market by providing member banks with access to on-demand liquidity. Recent literature (e.g., Ashcraft, Bech, and Frame (2010)) suggests that FHLBs function as "typical lenders of last resort," benefiting from significant support from Congress and the Federal government, which contributes to lower operational costs. The FHLB system is divided into 11 districts, closely paralleling the Federal Reserve district map. Appendix Section A.2 provides more details.

Both the DW and the FHLB serve as important sources of liquidity, not only for the broader financial sector during times of distress but also for small banks that face barriers to participating in open markets and are more vulnerable to local economic conditions. In fact, nearly 90% of the banks that have used the Discount Window also reported borrowing from the FHLB — a significant portion of the sample between 2010 and 2020. In our main analysis, we focus on FHLB loans as our the primary alternative funding source to capture local liquidity demand, allowing us to draw comparisons with our hypothesis of local liquidity supply. To align with the short-term nature of Discount Window (DW) loans, we concentrate on FHLB advances maturing in less than one year. We construct the variable "Chg FHLB % Assets," which represents the quarterly change in outstanding FHLB advances, scaled by the borrower's total assets at the previous quarter-end. Our results remain robust when using REPOs as an alternative control for borrower bank liquidity demand.[9]

[8]We then use the primary ABA routing number to merge this dataset with commercial banks' Call Report data.

[9]Given the extremely short timeline of Repurchase Agreements (within three months), our REPO variable "Security REPOs % Assets" is constructed as the outstanding amount of REPO securities scaled by the borrower bank's previous quarter-end total assets. REPOs have clear limitations: they operate on a national scale without local variations, and only 40% of banks using the Discount Window engage in REPO transactions, indicating differences in borrower groups. Moreover, events such as

We supplement our main analysis with two additional, more granular DW datasets. The first is the previously mentioned loan-level data. The second dataset is derived from the weekly H.4.1 statistical releases, which provide snapshots of local Reserve Banks' balance sheets, including an item that shows the total amount of loans outstanding (i.e., "Loans"). We relegate more data details in Appendix Section A.3.

## 2.3 Macro Variables and Control Variables

We follow Fos and Xu (2024) and consider the population-weighted MSA CPI inflation rates as an empirical proxy for monthly district inflation. Compared to other measures of economic activity such as output growth and unemployment rates, MSA CPI inflation rates from BLS are moderately correlated across districts and are available at a more timely release (i.e., monthly or bimonthly).[10] Ideally, we would want to know when Reserve Banks make DW decisions and then use the most recent inflation measure to test whether it affects DW decisions. Unfortunately, the exact or approximate time when Reserve Banks discuss DW activities is not public knowledge. Therefore, we use loan-level data to proxy for the schedule, meaning when these loans are granted and transacted.

Figure 2 illustrates the timing of DW loan transactions within one calendar quarter using the longest possible loan-level sample. The majority of DW loans are granted in the last month of each quarter. Therefore, we use the weighted average of inflation rates in the first and second months of each quarter, with weights corresponding to the number of FOMC meetings in the following month. Intuitively, this inflation measure should capture relevant information that informs monetary policy in a given quarter. Our main measure "Local Inflation" is labeled as $\text{Infl}_{jt-1}$, where $j$ represents district $j$ and $t-1$ indicates the weighted average inflation rate of the first two months of

the Fed's liquidity injections through REPOs in March 2020 complicate their interpretation, unlike the more targeted support provided by the Federal Home Loan Banks. Therefore, while comparing DW and REPOs can yield valuable insights, these limitations should be taken into account.

[10] Please see more discussions in Fos and Xu (2024)'s Online Appendix A.

quarter $t$.

[Insert Figure 2 here]

A useful robustness test is to use the second month's inflation only. The FOMC meets approximately eight times a year, with meetings typically occurring at the end of the first month and the middle of the last month within a quarter, as shown in Figure 3. As a result, the first month's inflation may have already been addressed, making the second month's inflation a relatively more "pure" source of information for quarter-end DW transaction decisions.[11]

[Insert Figure 3 here]

Finally, the main analysis can also include controls for borrower-quarterly characteristics. We consider standard variables such as ln(Assets), Tier 1 capital ratio, return on assets, total deposits as a percent of bank's liabilities, and the amount of commercial and industrial loans outstanding scaled by the bank's assets. Details are provided in Appendix Table A.1.

## 2.4 Federal Reserve President Voting Rotation

The modern FOMC is comprised of twelve voting members: the seven individuals on the Board of Governors of the Federal Reserve System, the president of the Federal Reserve Bank of New York, and four of the other eleven Reserve Bank presidents, who assume their voting roles for one-year terms through a rotation system. The rotation rule is based on the 1942 amendment to the 1913 Federal Reserve Act. We use voting status data summarized by Fos and Xu (2024).

[11] Other measures of economic activity are less suitable for our research setting. For example, real personal income growth can be constructed at district-quarter level (source: BEA), but macro conditions from the last quarter-end may be outdated for current quarter-end DW decisions. Alternatively, unemployment rates are available at the district-monthly level but are highly correlated (above 0.9) across states and districts, which limits their usefulness for our analysis.

## 2.5 Summary Statistics

Our main borrower-quarter sample spans from Q3 of 2010 to Q4 of 2020 and covers 7,843 unique banks. About 35% of them accessed the DW in their registered district and 28% did so more than once during our sample period (20% when we exclude any loans below $100k). On average, 5% of the borrower-quarters in our sample accessed their respective district Discount Windows. For borrower-quarters with non-zero DW transactions, the average quarterly DW loan amount is around $37 million, or 4.8% of the total assets outstanding.

[Insert Table 1 here]

Discount Window loans have very short maturities; therefore, at the quarterly frequency, we use the cumulative loan amount within the quarter. This approach explains why the first variable in Table 1 does not have negative values. In contrast, we observe quarterly snapshots of FHLB loan balances, which allows for negative observations. Table 1, Panel A(1), shows comparable variability (standard deviation) of DW, FHLB, and REPO loans % Assets in our main panels.

Table 1, Panel B, shows that monthly local inflation from 2010 to 2020 is an average of 0.142% (or 1.70 per annum). In addition, 60% of the data points correspond to periods in which the district has no voting right at FOMC meetings. To conserve space, summary statistics for control variables such as borrower bank characteristics are relegated to Appendix Table B.2.

Summary statistics for loan-level DW transaction amounts of all DW loans are shown in Table 1, Panel C. The median loan amount corresponds to about $315K, while the lower 30% can be interpreted as test transactions (with amounts of exactly 1K, 10K, and so on). From Panel D, DW loan amounts on average account for 0.042% of total Reserve Bank assets; during times of financial distress, DW loan amounts can account for up to 9.73% of assets.

# 3 Empirical Strategy

In this section, we describe the empirical strategy used to identify actions taken by Reserve Banks. That is, our goal is to identify the actions of Federal Reserve Banks in response to local conditions, which defines what we call Local Monetary Policy (LMP). As a proxy for actions taken by Federal Reserve Banks, we use loan quantities extended via Discount Windows. Any attempt to identify the existence of LMP faces the following challenges. First, we need to have measurable variation in the incentives of Federal Reserve Banks to rely on Local Monetary Policy, rather than national monetary policy. Second, we need to identify the actions taken by Federal Reserve Banks, even though loan quantities are jointly determined by the Reserve Banks (supply) and the borrowers (demand). Third, we need to isolate the variation in local economic conditions that is not driven by aggregate conditions.

To address the first challenge, we use the exogenous yearly FOMC voting rotation. This variation *separates* observations at the district-time level in which Federal Reserve Banks can react to changes in local economic conditions by affecting aggregate FFR decisions (i.e., the voting sample) *and* observations for which such a tool is less effective (i.e., the non-voting sample). Fos and Xu (2024) provide evidence for the former case, showing that when cross-district dispersion in inflation rates is large, district-level inflation rates affect FFR decisions only when a Reserve Bank President has a vote during FOMC meetings. To validate the exogeneity of the FOMC rotation in our framework, Table 2 shows that a Reserve Bank's voting status is uncorrelated with recent past local economic conditions and loan activities, whether measured at the end of Q4 or as last year's aggregate.

[Insert Table 2 here]

To address the aforementioned second challenge, we include liquidity loans that are not controlled by Federal Reserve Banks, such as FHLB and REPO loans. While

these liquidity loans are often used by borrowers to manage liquidity needs (see our discussion in Section 2.2), Federal Reserve Banks do not have a direct impact on whether a borrower receives such a loan. Therefore, by focusing on the differential responses of DW loans and other on-demand liquidity loans to changes in local economic conditions, we can isolate the incremental effect of Federal Reserve Banks on DW loans.

To address the third challenge, we use granular sets of fixed effects. Specifically, we use district-by-time fixed effects to absorb the variation resulting from changes in local economic conditions (and hence also national economic conditions). This allows us to better compare DW and other liquidity loan activities within district-time. Importantly, by creating a stacked sample of various liquidity loans we can also include borrower-by-time fixed effects to absorb variations due to changes in a borrower's characteristics. The inclusion of this set of fixed effects ensures that the estimates are not driven by changes in banks' liquidity needs (i.e., demand for liquidity).

# 4 Results

In Section 4.1, we examine the unconditional relationship between local economic conditions and liquidity loans. Our main findings on LMP are presented in Section 4.2. Lastly, in Section 4.3, we discuss loan access criteria, an alternative demand-side proxy, and heterogeneous effects based on bank size, local inflation dispersion, and DW activities.

## 4.1 Unconditional Results

We start by examining the unconditional relationship between local inflation and liquidity loans at the borrower-quarter level, for DW and FHLB loans separately. Here, $i$ represents borrower banks, $j$ or $j(i)$ represents the Federal Reserve district of the

borrower bank, and $t$ represents quarters. We estimate the following regressions:

$$Y_{ijt}^{DW} = \theta_i^{DW} + \gamma_t^{DW} + \beta^{DW} \times \text{Infl}_{jt-1} + \epsilon_{ijt}^{DW}, \tag{1}$$

$$Y_{ijt}^{FHLB} = \theta_i^{FHLB} + \gamma_t^{FHLB} + \beta^{FHLB} \times \text{Infl}_{jt-1} + \epsilon_{ijt}^{FHLB}, \tag{2}$$

where, as discussed in Section 2.2, $Y_{ijt}^{DW}$ denotes the total amount of new DW loans and $Y_{ijt}^{FHLB}$ denotes the quarterly change in quarter-end FHLB balances for a borrower-district-quarter $\{ijt\}$. Both are scaled by the total asset amount of borrower $i$ at the end of the previous quarter. On the right-hand side, $\text{Infl}_{jt-1}$ is the weighted average local inflation in the first and second months of each quarter, as discussed in Section 2.3. $\theta_i$ represents borrower fixed effects. $\gamma_t$ represents time fixed effects, which absorbs aggregate outcomes (e.g., FFR, inflation, inflation in voting districts). The coefficients of interest are $\beta^{DW}$ and $\beta^{FHLB}$.

Panels A and B of Table 3 present regression results for Equations (1) and (2), respectively. Columns (1) and (2) in Panel A show that when we use within-district or within-borrower variation, there is a negative and significant relationship between DW loan activity and local inflation. Specifically, the $-0.119^{***}$ coefficient means that a one standard deviation (SD) increase in local inflation leads to a 0.037% decrease in the fraction of DW loans as a percent of a bank's assets, which is sizable as the average is 0.105% (see Table 1, Panel A(1)). Columns (3) and (4) in Panel A show that the relationship remains robustly negative, though less significant, when the regression includes time-varying borrower characteristics – such as size, regulatory requirements, returns, and financial risk exposure – and when the New York district is excluded from the sample.[12]

[Insert Table 3 here]

[12]The New York Fed is special, given its unique role in providing emergency liquidity (e.g., operating the Primary Dealer Credit Facility (PDCF) in 2008) and its strategic position within the Federal Reserve System (e.g., always voting at the FOMC). It is plausible that the incentives of the New York Fed could be different from other Reserve Banks.

The results in Panel B indicate that the relationship between FHLB loans and local inflation is significant and positive. The $0.106^{***}$ coefficient indicates that a one SD increase in local inflation is associated with a 0.033% increase in the FHLB fraction of a bank's total assets. The model explanatory power in FHLB regressions is overall slightly weaker than that in DW regressions. This is expected for two reasons. First, these FHLB loans often mature after 3 months, causing less variation in the quarterly changes. Second, while we observe the timing of DW loan arrivals, the most detailed data available for FHLB loans are quarterly snapshots, resulting in a noisier measurement of FHLB loan activity.

Next, we formally test the difference between $\beta^{DW}$ and $\beta^{FHLB}$. We stack the two samples (doubling the number of observations), use $l$ to denote the loan type (i.e., DW or FHLB), and estimate the following regression:

$$Y_{ijtl} = \gamma_t \times \omega_l + \gamma_t \times \phi_j + \theta_i \times \omega_l + \beta \times \mathbf{1}_{l=DW} \times \text{Infl}_{jt-1} + \epsilon_{ijtl}, \tag{3}$$

where $\mathbf{1}_{l=DW}$ represents a loan type indicator that equals one if the loan type is DW. Therefore, $\beta$ captures the difference in the sensitivities between the two types of loans, DW and FHLB, in response to local inflation. In this specification, $\gamma_t \times \omega_l$ absorbs aggregate time trends (e.g., FFR, U.S. inflation, inflation in voting districts and so on) as well as differential aggregate time trends for the types of loans. Furthermore, in some more restrictive specifications, we include $\gamma_t \times \phi_j$ to absorb any time-by-district variation.

Table 3, Panel C, presents the regression results. Our research focuses on the double interaction coefficient in the first row, which is negative and significant across various specifications. Column (1) controls for aggregate time variation and district variation in loan types and has the $\beta$ estimate of $-0.225^{***}$. Given a one SD increase in local inflation, the differential response of DW%Assets and FHLB%Assets widens and grows to be more negative by around -0.071%. When we take this result together with

the previous two panels, we find that the total effect of -0.071% comes from -0.037% in DW%Assets and +0.033% in FHLB%Assets. Column (2) reflects the estimation results of Equation (3) with district-time and borrower-loan-type fixed effects.[13] Column (3) adds other borrower bank control variables and Column (4) drops the New York district. The main result remains intact, in terms of both economic magnitude and statistical significance.

These results provide the initial evidence that Discount Window loans respond to local inflation significantly and differently from FHLB loans. The overall *positive* response of FHLB loans to inflation suggests that when local inflation increases, borrowers demand more liquidity to expand and grow. In contrast, the overall *negative* response of DW loans to inflation indicates the existence of a counteracting force. In our paper, we propose that a *supply* mechanism could explain this negative relationship: as local inflation increases, Reserve Banks may restrict the supply of Discount Window loans to depository borrowers, thereby tightening local economic conditions. For example, Reserve Banks might change their assessment of a bank's solvency when deciding whether to approve a DW loan.

## 4.2 Local Monetary Policy and FOMC Voting

To test for the existence of Local Monetary Policy (LMP), we use the exogenous FOMC voting rotation to separate a sub-sample for which local economic needs can be addressed through FFR decisions (i.e., when a district has a voting right) and another sub-sample for which this national mechanism is available to a smaller degree (i.e., when a district has no voting right). Panel A in Table 4 considers voting district-quarters only. Because the president of the New York district always votes, we also consider specifications without the New York district. In all columns, insignificant interaction coefficient estimates mean that we do not find significant differential

[13]The "borrower $i$ × loan type" fixed effect is stricter than the "district $j$ × loan type" fixed effect because $i$ is more precisely written as $i(j)$.

responses of DW and FHLB loans to local inflation.

[Insert Table 4 here]

Panel B in Table 4 presents the results using non-voting district-quarters. The first three columns are the same specifications as those in Table 3, Panel C, which control for time trends in loan types (DW or FHLB), time trends in district conditions, borrower-loan characteristics, and borrower-level variables such as size, regulatory requirement, returns, and financial risk exposure. Column (4) further absorbs all borrower-time-level variations such as its liquidity demands. Across all specifications, the interaction between the DW loan type dummy and local inflation (see coefficients in the first row) is negative and significant at the 1% level. The coefficients are larger than those in Panel C of Table 3. In terms of economic magnitude, an estimate of $-0.414^{***}$ indicates that a one SD increase in local inflation leads to around -0.126% (more negative) response in DW%Assets compared to FHLB%Assets. For the full sample, this magnitude is -0.071%, as discussed above. This sharply contrasts with Panel A of Table 4, suggesting that the lack of FOMC voting rights triggers the usage of local tools to respond to local inflation.

Next, we formally test whether the double interaction coefficient in the non-voting sub-sample differs significantly from that in the voting sub-sample and whether this difference holds across various sets of fixed effects. When a district lacks voting rights at FOMC meetings, we expect local inflation to have a limited impact on national monetary policy (e.g., FFR), allowing local monetary policy to emerge. The evidence is reported in Table 5. We find negative and significant coefficient estimates for the triple interaction terms across various regression specifications.

[Insert Table 5 here]

## 4.3 Robustness

In this section, we present several robustness tests, using Column (4) in Table 5 as the baseline specification. First, Table 6 explores heterogeneity in borrower size. We expect liquidity borrowing by large borrowers to be less sensitive to local inflation, as large banks typically can better handle liquidity shocks and have better cross-regional diversification. We use a total value of $1 billion dollar of asset as a cutoff point to differentiate between small and large banks. Results in Table 6 indicate that small borrowers drive our results, although the coefficients for large banks show similar signs.

[Insert Table 6 here]

Second, in Table 7, we examine whether our results are driven by periods when cross-district inflation dispersion is high. We consider two inflation dispersion measures to construct high versus low dispersion sub-samples, based on the median level: (1) the absolute distance between local inflation and voting-group average inflation, and (2) the max-min spread of local inflation across districts. To ensure comparability over time, both dispersion measures are scaled by the average level of U.S. overall inflation over the past three years. We call the former (latter) "micro wedge" ("macro wedge"). We find that results are driven by high (i.e., above median) local inflation dispersion periods. This finding is intuitive, as we expect a district's voting status to be less important when inflation is similar across districts.

[Insert Table 7 here]

The third robustness test compares sample periods with (possibly) high versus low DW applications. Our empirical measure of local monetary policy actions – through Discount Windows in the present paper – can only exert influence when applications for DW loans are being submitted. We use periods of heightened aggregate DW activity as a proxy for when a large volume of applications is likely being received

by Federal Reserve Banks. Based on Figure 2, we use the pre-2019 period to capture a period of high volume of DW applications and the post-2019 period to capture a period of high volume of DW loan applications. The results in Table 8 indicate that our results are stronger when the volume of DW applications is likely high.

[Insert Table 8 here]

Our main sample covers all financial institutions included in Call Reports, and therefore could include borrowers who do not use DW or FHLB loans. Our fourth robustness test verifies that the results are not driven by banks that do not use DW or FHLB loans. Table 9, Panel A, presents the results. Column (1) is the baseline specification (i.e., Table 5's column (4)). Column (2) ((3)) shows that if we require borrowers to use DW or (and) FHLB loans, the main coefficient increases from $-0.498^{***}$ to $-0.608^{***}$ ($-0.911^{***}$) and remains statistically significant.

[Insert Table 9 here]

In the fifth robustness test, we substitute FHLB loans with REPO loans. While both types of loans address borrowers' liquidity needs, FHLB loans are provided by a local federal lender whereas REPO loans are provided by national markets. In Panel B of Table 9, we use REPO%Assets within the quarter instead of changes in FHLB balances. The three columns consider the full sample, borrowers with "access to either," and borrowers with "access to both," respectively. We find quantitatively similar coefficient estimates.

# 5 Additional Evidence on DW Loans

In the main specification, we use a quarterly measure of DW loan activity because data on alternative liquidity loans obtained from the Call Reports is available only at a quarterly frequency. In this section, we construct and examine two more granular

measures of Discount Window activities: loan-level data and district-week-level data (see data details in Section 2.3 and Appendix Section A.3).

First, we use the loan-level sample from 2010 to 2020, covering about 3,730 unique borrowing institutions and 38,000 loans (with 22,000 loans larger than \$100k) across the twelve districts. We test whether a DW loan amount and collateral ratio requirements respond to recent local inflation using the following regression specification:

$$\begin{aligned} Y_{ijk} = \phi_j \times \omega_{l(k)} + \gamma_{t(k)} \times \omega_{l(k)} + \beta_1 \text{Infl}_{j,t(k)-1} + \beta_2 \text{NoVote}_{j,m(k)} \\ + \beta_3 \text{Infl}_{j,t(k)-1} \times \text{NoVote}_{j,m(k)} + \epsilon_{ijk}, \end{aligned} \tag{4}$$

where $Y_{ijk}$ denotes the characteristics of loan $k$ extended to borrower $i$ by Reserve Bank $j(i)$. We consider ln(1+loan amount) and ln(Collateral ratio) as dependent variables. $\text{Infl}_{j,t(k)-1}$ denotes the monthly local inflation rate as of the previous month $t(k)-1$. $\text{NoVote}_{j,m(k)}$ equals one if Reserve Bank $j$ lacks voting rights at the previous FOMC meeting $m(k)$, and zero otherwise. $\phi_j \times \omega_{l(k)}$ and $\gamma_{t(k)} \times \omega_{l(k)}$ are reserve-bank-by-credit-type and time-by-credit-type fixed effects, respectively.

Panel A of Table 10 presents the results. We find that when a district does not have a vote and lacks a pathway to influence national policy, higher local inflation leads to significantly lower loan quantities and higher collateral requirements. Specifically, the $-0.699^{***}$ ($0.540^{***}$) coefficient from column (3) ((6)) indicates that a one SD increase in local inflation leads to a 0.23 (0.21) lower (higher) log DW loan quantity (log collateral ratio) when a district does not have a vote compared to when a district does have a vote.

[Insert Table 10 here]

The second test uses the weekly district H.4.1 balance sheets from 2002 to 2020, available for download from the FRB website. Panel B of Table 10 shows results that

are consistent with our main findings: higher local inflation leads to lower DW activity in non-voting districts, relative to voting districts. This evidence is useful because it is based on a longer sample of DW activities (starting in 2002 rather than in 2010).

Finally, we use Term Auction Facility (TAF) loan-level activities as a placebo test for Panel A of Table 10. From late 2007 to early 2010, TAF was a credit facility established by the Board of Governors to distribute loans directly to borrower banks, transacted through the Discount Window. Importantly, the Board determined the total amount of funds to be lent nationally, with individual loans extended through an auction process. Although loans were distributed via a local vehicle, Federal Reserve Banks had no effective control over the supply of TAF loans, making this an ideal placebo for Discount Window loans. Since the facility ended on March 8, 2010, we cannot collapse the TAF loan-level data into borrower-quarterly levels as in Table 5. Instead, we conduct the same loan-level analysis and report detailed results in Appendix Table B.3. We find an insignificant coefficient in the interaction coefficient in the first row, confirming that TAF – though distributed locally via the same DW tool and determined by the Board – indeed does not exhibit a strong relationship with local inflation when districts lack voting rights or aggregate rights to address local needs.

# 6 Conclusion

In this paper, we show that when Federal Reserve districts experience high inflation but lack voting rights to influence FOMC decisions, Federal Reserve Banks decrease the credit they extend through the Discount Window (DW). Our identification approach is based on the exogenous rotation of voting rights among Reserve Banks and on within borrower-time and district-time variations in DW loans and Federal Home Loan Bank (FHLB) loans, implying that factors related to changes in local demand for credit or changes in borrower characteristics cannot drive the results. Our results indicate the presence of a Local Monetary Policy (LMP) implemented by

Federal Reserve Banks.

Our findings point to several important questions for future research. To what degree are Federal Reserve Banks effective in closing the gap between national monetary policy and the interests of their districts? Would studying district-level Taylor rule regressions help with our understanding of the full effectiveness of U.S. monetary policy? Does the tension between national and local monetary policies have implications for the stability of financial markets and asset prices? Answers to these questions will not only contribute to academic research, but also be useful for policymakers.

# References


Acharya, V. V., Mora, N., 2015. A crisis of banks as liquidity providers. The Journal of Finance 70 (1), 1–43.

Ackon, F. P., Ennis, H. M., 2017. The Fed's discount window: An overview of recent data. Economic Quarterly (Q1-Q4), 37–79.

Amir-Ahmadi, P., Cortes, G. S., Weidenmier, M. D., 2020. Regional monetary policies and the great depression. Tech. rep., National Bureau of Economic Research.

Armantier, O., Ghysels, E., Sarkar, A., Shrader, J., 2015. Discount window stigma during the 2007–2008 financial crisis. Journal of Financial Economics 118 (2), 317–335.

Artuç, E., Demiralp, S., 2010. Discount window borrowing after 2003: The explicit reduction in implicit costs. Journal of Banking & Finance 34 (4), 825–833.

Ashcraft, A., Bech, M. L., Frame, W. S., 2010. The Federal Home Loan Bank system: The lender of next-to-last resort? Journal of Money, Credit and Banking 42 (4), 551–583.

Belden, S., 1989. Policy preferences of FOMC members as revealed by dissenting votes. Journal of Money, Credit and Banking 21 (4), 432–441.

Bernanke, B. S., 2008. Liquidity provision by the Federal Reserve. Speech at the Federal Reserve Bank of Atlanta Financial Markets Conference, Sea Island, Georgia (via satellite); https://www.federalreserve.gov/newsevents/speech/bernanke20080513.htm.

Beyhaghi, M., Gerlach, J. R., 2023. Adverse selection in central bank lending – an empirical analysis of the Federal Reserve's primary credit program. Working paper.

Bordo, M., Istrefi, K., 2023. Perceived FOMC: The making of hawks, doves and swingers. Journal of Monetary Economics 136, 125–143.

Chappell Jr, H. W., Havrilesky, T. M., McGregor, R. R., 1993. Partisan monetary policies: Presidential influence through the power of appointment. The Quarterly Journal of Economics 108 (1), 185–218.

Chappell Jr, H. W., McGregor, R. R., 2000. A long history of FOMC voting behavior. Southern Economic Journal 66 (4), 906–922.

Crowe, C., Meade, E. E., 2008. Central bank independence and transparency: evolution and effectiveness. European Journal of Political Economy 24 (4), 763–777.

Drechsler, I., Drechsel, T., Marques-Ibanez, D., Schnabl, P., 2016. Who borrows from the lender of last resort? The Journal of Finance 71 (5), 1933–1974.

Ehrmann, M., Tietz, R., Visser, B., 2022. Voting right rotation, behavior of committee members and financial market reactions: Evidence from the US Federal Open Market Committee.

Ennis, H. M., 2021. Who borrows from the discount window in "normal" times? Richmond Fed Economic Brief 21 (09).

Ennis, H. M., Ho, S., Tobin, E., 2019. Recent borrowing from the US discount window: Some cases. Economic Quarterly (4Q), 251–271.

Ennis, H. M., Klee, E., 2021. The Fed's discount window in. FEDS Working Paper.

Fos, V., Xu, N., 2024. Do the voting rights of Federal Reserve Bank presidents matter? Working paper.

Hack, L., Istrefi, K., Meier, M., 2023. Identification of systematic monetary policy-Working paper.

Havrilesky, T., Gildea, J. A., 1991. The policy preferences of FOMC members as revealed by dissenting votes: comment. Journal of Money, Credit and Banking 23 (1), 130–138.

Havrilesky, T. M., Schweitzer, R., 1990. A theory of FOMC dissent voting with evidence from the time series. The Political Economy of American Monetary Policy 197.

Khwaja, A. I., Mian, A., 2008. Tracing the impact of bank liquidity shocks: Evidence from an emerging market. American Economic Review 98 (4), 1413–1442.

Malmendier, U., Nagel, S., Yan, Z., 2021. The making of hawks and doves. Journal of Monetary Economics 117, 19–42.

Meade, E. E., Sheets, D. N., 2005. Regional influences on FOMC voting patterns. Journal of Money, Credit and Banking, 661–677.

Richardson, G., Troost, W., 2009. Monetary intervention mitigated banking panics during the great depression: quasi-experimental evidence from a federal reserve district border, 1929–1933. Journal of Political Economy 117 (6), 1031–1073.

Stojanovic, D., Vaughan, M. D., Yeager, T. J., 2008. Do Federal Home Loan Bank membership and advances increase bank risk-taking? Journal of Banking & Finance 32 (5), 680–698.

Taylor, J. B., 1993. Discretion versus policy rules in practice. Carnegie-Rochester conference series on public policy 39, 195–214.

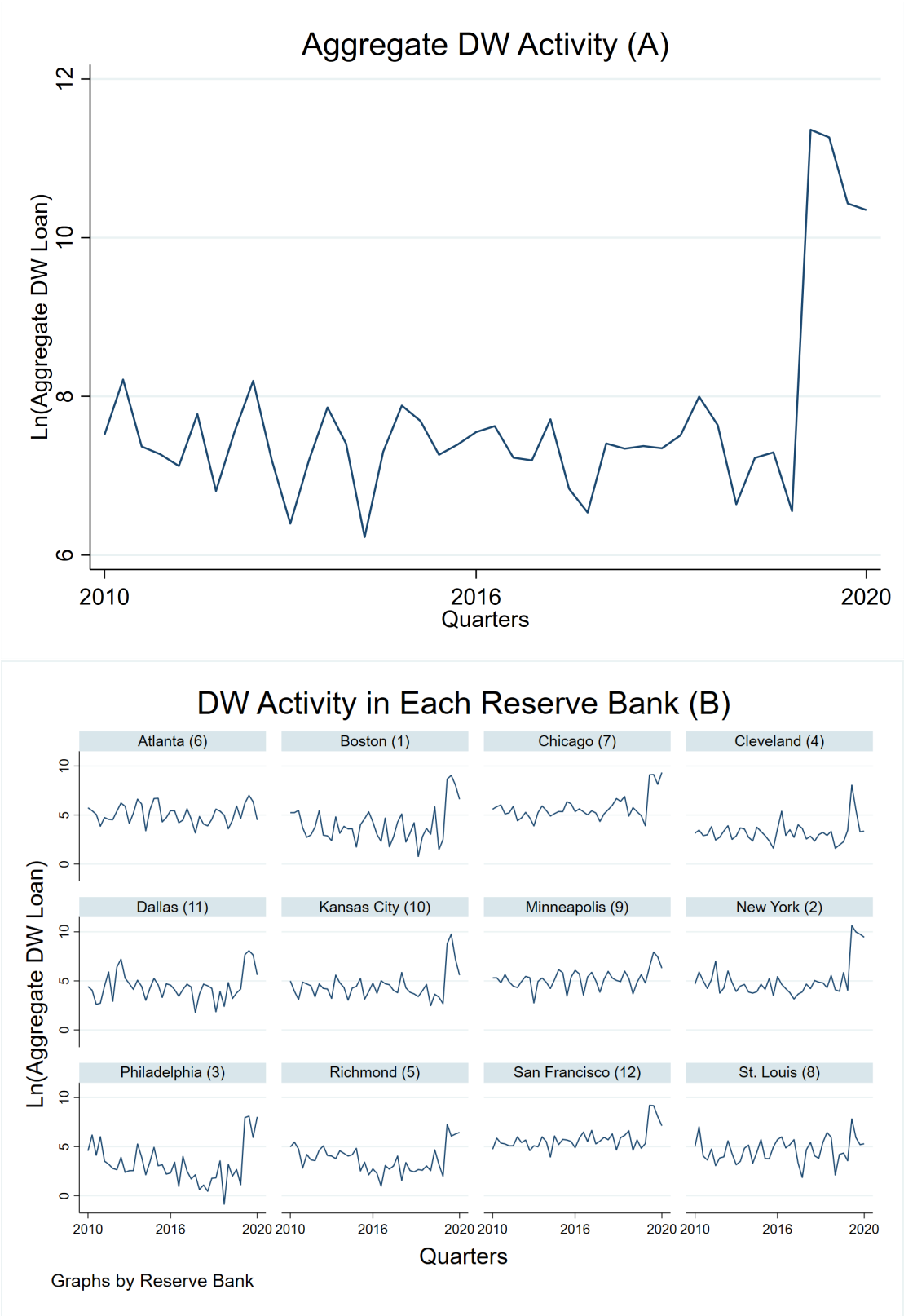



Figure 1: **DW activities at the national level (A) and at the district level (B).** This figure summarizes all Discount Window loans (at a quarterly frequency) and plots the natural logarithm of the total dollar amount for each year-quarter from 2010 to 2020. Panel A depicts the national series and Panel B shows the series for each Reserve Bank district.

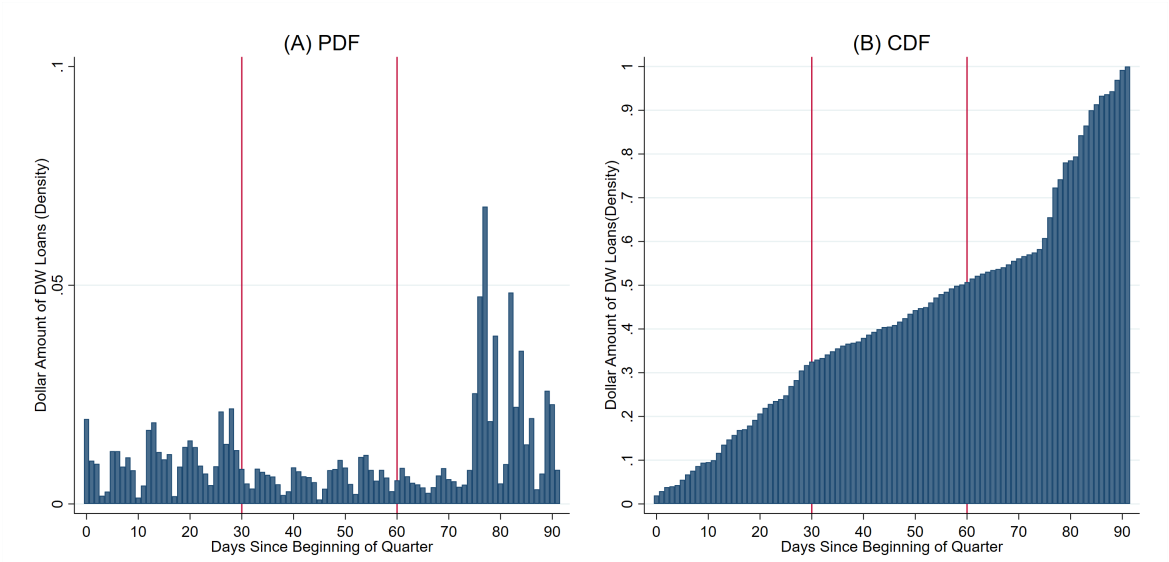
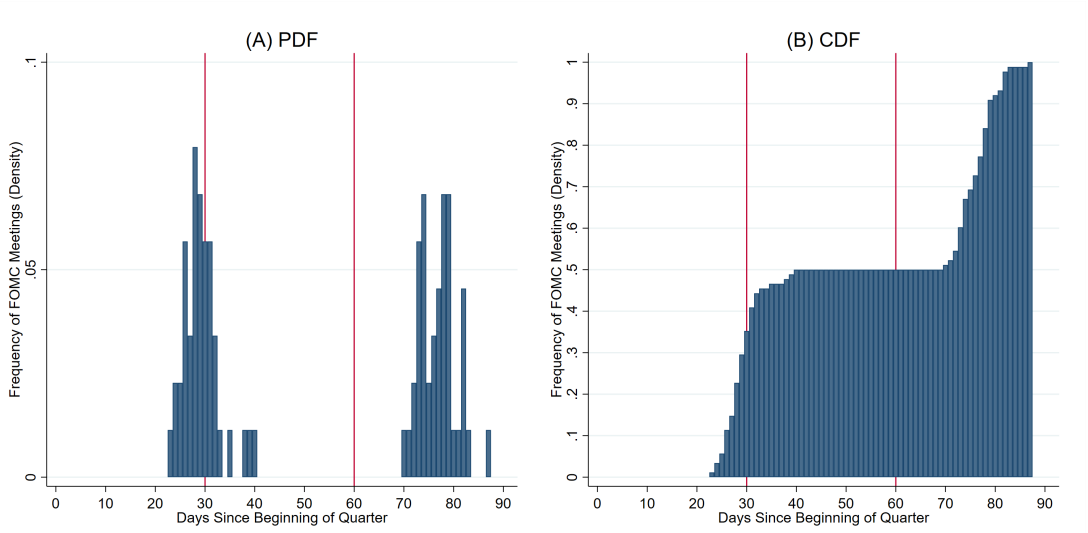
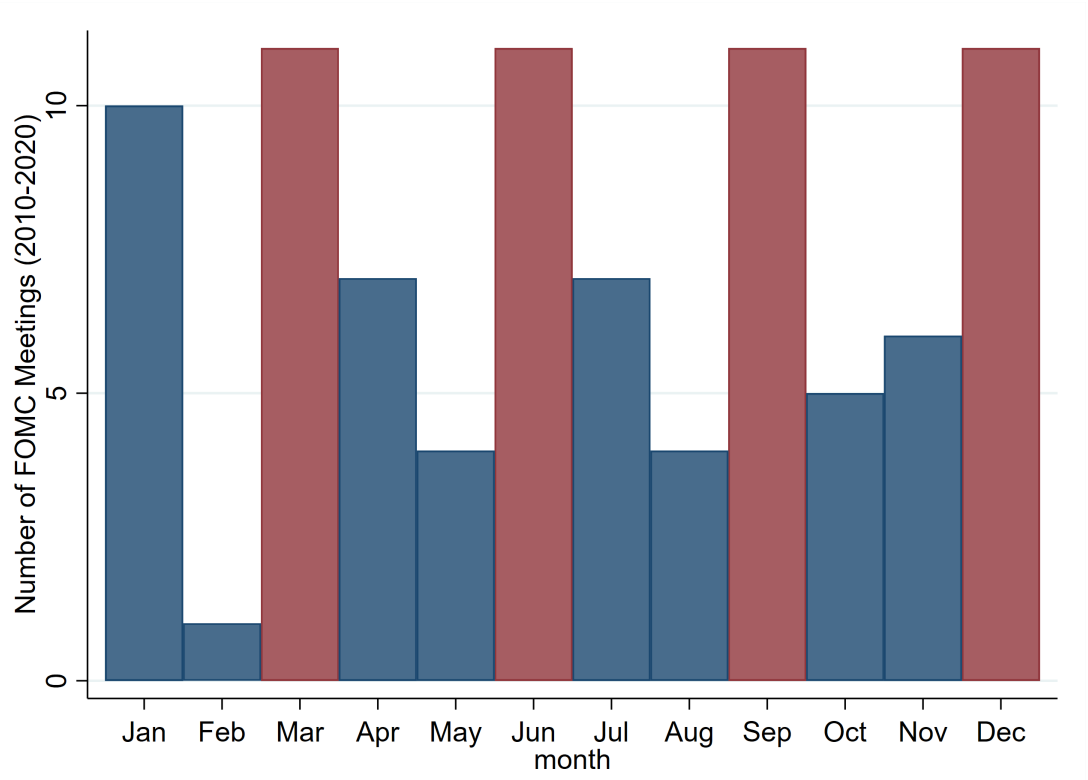



Figure 2: **The timing of Discount Window (DW) loans.** This figure shows the daily fraction of the total dollar amount of Discount Window loans extended in a typical quarter between 2010 and 2020. The y-axis is the partial (panel A) or cumulative (panel B) percentage of quarterly Discount Window credit extended on a given day. The x-axis is the number of days since the beginning of each quarter.




Panel A.




Panel B.

Figure 3: **The timing of FOMC meetings.** Panel A shows the daily fraction of the total number of FOMC meetings held in a typical quarter. The y-axis is the partial (left) or cumulative (right) fraction of the quarterly number of FOMC meetings held on a given day. The x-axis is the number of days since the beginning of each quarter. Panel B shows the number of FOMC meetings held in each calendar month. The sample covers 2010-2020.

Table 1: **Summary statistics.** This table reports summary statistics for the datasets used in this paper. The sample covers all banks that filed Call Reports between 2010-2020. Detailed descriptions of the variables are provided in Section 2. Variables in Panels A and B are used in Tables 3-9. Variables in Panels C and D are used in Table 10. Variables in Panel E is used in Table **??**.

| | COUNT | MEAN | SD | P1 | P5 | P25 | P50 | P75 | P95 | P99 |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| *Panel A(1). Borrower-Quarter level for each loan type that they borrow; All district-quarters* | | | | | | | | | | |
| DW Loan > 100k % Assets | 261282 | 0.105 | 2.589 | 0 | 0 | 0 | 0 | 0 | 0 | 1.173 |
| Chg FHLB % Assets | 260535 | 0.024 | 1.589 | -4.916 | -1.846 | 0 | 0 | 0 | 2.015 | 5.332 |
| Security REPOs % Assets | 261284 | 0.650 | 1.962 | 0 | 0 | 0 | 0 | 0 | 4.061 | 9.269 |
| *Panel A(2). Borrower-Quarter level for each loan type that they borrow; District-quarters without voting rights (60.3%)* | | | | | | | | | | |
| DW Loan > 100k % Assets | 157466 | 0.111 | 2.675 | 0 | 0 | 0 | 0 | 0 | 0 | 1.246 |
| Chg FHLB % Assets | 157090 | 0.027 | 1.603 | -4.969 | -1.831 | 0 | 0 | 0 | 2.043 | 5.432 |
| Security REPOs % Assets | 157466 | 0.637 | 1.936 | 0 | 0 | 0 | 0 | 0 | 3.988 | 9.162 |
| *Panel A(3). Borrower-Quarter level for each loan type that they borrow; District-quarters with voting rights (39.7%)* | | | | | | | | | | |
| DW Loan > 100k % Assets | 103816 | 0.097 | 2.453 | 0 | 0 | 0 | 0 | 0 | 0 | 1.051 |
| Chg FHLB % Assets | 103445 | 0.019 | 1.568 | -4.853 | -1.865 | 0 | 0 | 0 | 1.983 | 5.211 |
| Security REPOs % Assets | 103818 | 0.669 | 2.001 | 0 | 0 | 0 | 0 | 0 | 4.173 | 9.408 |
| *Panel B. Local inflation merged into the Borrower-Quarter level* | | | | | | | | | | |
| Local Inflation, Panel A(1) | 216085 | 0.142 | 0.314 | -0.790 | -0.360 | -0.056 | 0.123 | 0.340 | 0.637 | 0.923 |
| Local Inflation, Panel A(2) | 128487 | 0.127 | 0.305 | -0.790 | -0.360 | -0.052 | 0.111 | 0.318 | 0.620 | 0.850 |
| Local Inflation, Panel A(3) | 87598 | 0.163 | 0.327 | -0.510 | -0.370 | -0.060 | 0.170 | 0.369 | 0.729 | 1.050 |
| *Panel C. Loan-level dataset* | | | | | | | | | | |
| ln(DW Loan) | 38981 | 11.842 | 3.491 | 6.908 | 6.908 | 9.210 | 12.663 | 14.509 | 16.951 | 18.721 |
| ln(Collateral Ratio) | 38981 | 4.393 | 3.459 | 0.031 | 0.299 | 1.652 | 3.174 | 6.964 | 10.873 | 13.222 |
| Local Inflation | 32988 | 0.102 | 0.336 | -0.818 | -0.499 | -0.092 | 0.100 | 0.320 | 0.637 | 0.918 |
| *Panel D. Reserve Bank-Week-level dataset* | | | | | | | | | | |
| DW Loans % Reserve Bank Assets | 10764 | 0.042 | 4.438 | 0 | 0 | 0 | 0.003 | 0.028 | 0.716 | 9.730 |
| Local Inflation | 9200 | 0.167 | 0.389 | -0.980 | -0.440 | -0.050 | 0.170 | 0.406 | 0.772 | 1.020 |
| *Panel E. Borrower-Quarter level for each loan type that they lend out to the economy* | | | | | | | | | | |
| Quarterly Loans Change % Assets | 257094 | 0.981 | 5.956 | -5.648 | -2.802 | -0.591 | 0.447 | 1.809 | 5.594 | 13.657 |
| Quarterly C&I Loans Change % Assets | 257094 | 0.208 | 2.481 | -3.046 | -1.306 | -0.259 | 0.002 | 0.424 | 1.977 | 5.803 |
| Quarterly RRE Loans Change % Assets | 260535 | 0.657 | 4.586 | -4.774 | -2.346 | -0.517 | 0.270 | 1.351 | 4.179 | 9.955 |
| Quarterly Consumer Loans Change % Assets | 260535 | 0.113 | 1.302 | -0.885 | -0.330 | -0.067 | -0.001 | 0.066 | 0.646 | 3.982 |

Table 2: **Exogenous Federal Reserve district voting rotation.** This table reports evidence on the exogeneity of FOMC voting rights with respect to the main explanatory and outcome variables used in our study. Panel A reports the results using only aggregate data from the last quarter of the previous year. Panel B reports the results using cumulative yearly data. "Local Inflation" is the cumulative monthly inflation for a given Reserve Bank district; "DW Activity" ("FHLB Activity") is the aggregate amount of all DW (FHLB) credit extended to commercial banks by a Reserve Bank, scaled by the total amount of commercial banks' assets in that district. The number of observations for column (1) is slightly smaller due to missing local inflation data from several districts prior to 2017. Robust t-statistics are reported in parentheses. ***, p-value <1%; **, <5%; *, <10%.

**Panel A. Last Quarter Information**

| Dependent variable: 1=District Voting Next Year; 0=Otherwise | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Recent Q4 Local Inflation | -0.246 | | | -0.266 | -0.494 |
| | (-0.720) | | | (-0.751) | (-0.669) |
| Recent Q4 DW Activity | | -0.582 | | 0.036 | -0.216 |
| | | (-0.936) | | (0.047) | (-0.231) |
| Recent Q4 FHLB Activity | | | 0.153 | 0.197 | 0.228 |
| | | | (1.163) | (1.478) | (1.591) |
| Observations | 104 | 120 | 120 | 104 | 104 |
| R-squared | 0.18 | 0.16 | 0.17 | 0.20 | 0.21 |
| District FEs | YES | YES | YES | YES | YES |
| Time FEs | NO | NO | NO | NO | YES |

**Panel B. Last Year Information**

| Dependent variable: 1=District Voting Next Year; 0=Otherwise | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Recent Year Local Inflation | -0.008 | | | -0.012 | -0.091 |
| | (-0.115) | | | (-0.176) | (-0.695) |
| Recent Year DW Activity | | -0.388 | | 0.145 | -0.010 |
| | | (-0.587) | | (0.163) | (-0.010) |
| Recent Year FHLB Activity | | | 0.077 | 0.111 | 0.157 |
| | | | (0.863) | (1.145) | (1.380) |
| Observations | 94 | 108 | 108 | 94 | 94 |
| R-squared | 0.17 | 0.16 | 0.16 | 0.18 | 0.20 |
| District FEs | YES | YES | YES | YES | YES |
| Time FEs | NO | NO | NO | NO | YES |

Table 3: **The unconditional relationship between local inflation and liquidity loans.** Panels in this table reports estimates of Equations (1), (2), and (3), respectively. Panel A reports the results of using only quarterly cumulative DW loans as the dependent variable. Panel B reports the results of using only quarterly changes in FHLB advances as the dependent variable. Panel C reports the results of using a stacked sample, where DW becomes a dummy that identifies Discount Window credit. Bank-level control variables include the natural logarithm of a bank's assets, the Tier 1 capital ratio, ROA, total deposits as a fraction of total liabilities, and commercial and industrial loans as a fraction of a bank's assets. All control variables are lagged by one quarter. Standard errors are clustered at the borrower level. $t$-statistics are reported in parentheses. ***, p-value <1%; **, <5%; *, <10%.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| **Panel A: DW Loan ≥ 100k % Assets** | | | | |
| Local Inflation | -0.119*** | -0.118*** | -0.102** | -0.096* |
| | (-3.137) | (-3.092) | (-2.004) | (-1.825) |
| Observations | 216083 | 215990 | 201196 | 191929 |
| R-squared | 0.0014 | 0.23 | 0.23 | 0.24 |
| District FEs | YES | NO | NO | NO |
| Time FEs | YES | YES | YES | YES |
| Borrower FEs | NO | YES | YES | YES |
| Controls | NO | NO | YES | YES |
| NY Excluded | NO | NO | NO | YES |
| **Panel B: Chg FHLB % Assets** | | | | |
| Local Inflation | 0.106*** | 0.105*** | 0.094*** | 0.092*** |
| | (5.148) | (5.097) | (4.335) | (4.092) |
| Observations | 215419 | 215326 | 201196 | 191929 |
| R-squared | 0.0079 | 0.020 | 0.045 | 0.046 |
| District FEs | YES | NO | NO | NO |
| Time FEs | YES | YES | YES | YES |
| Borrower FEs | NO | YES | YES | YES |
| Controls | NO | NO | YES | YES |
| NY Excluded | NO | NO | NO | YES |
| **Panel C: Liquidity Loan % Assets** | | | | |
| DW × Local Inflation | -0.225*** | -0.224*** | -0.200*** | -0.193*** |
| | (-5.189) | (-5.121) | (-3.630) | (-3.388) |
| Local Inflation | 0.106*** | | | |
| | (5.148) | | | |
| Observations | 432170 | 431984 | 402392 | 383858 |
| R-squared | 0.0033 | 0.18 | 0.18 | 0.18 |
| District × Loan Type FEs | YES | NO | NO | NO |
| Time × Loan Type FEs | YES | YES | YES | YES |
| District × Time FEs | NO | YES | YES | YES |
| Borrower × Loan Type FEs | NO | YES | YES | YES |
| Controls | NO | NO | YES | YES |
| NY Excluded | NO | NO | NO | YES |

Table 4: **Liquidity loans and inflation by voting status.** Panel A (B) reports estimation results Equation (3) using the sample of borrower-quarter observations of Reserve Bank regions that have (lack) voting rights in a specific quarter. Bank-level control variables include the natural logarithm of a bank's assets, the Tier 1 capital ratio, ROA, total deposits as a fraction of total liabilities, and commercial and industrial loans as a fraction of a bank's assets. All control variables are lagged as of the previous quarter. Standard errors are clustered at the borrower level. $t$-statistics are reported in parentheses. ***, $p$-value <1%; **, <5%; *, <10%.

**Panel A. Voting district-quarters**

| Dependent variable: Liquidity Loan % Assets | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| DW × Local Inflation | 0.007 | 0.016 | 0.026 | 0.016 | 0.089 | 0.073 |
| | (0.121) | (0.293) | (0.343) | (0.293) | (1.132) | (1.230) |
| Local Inflation | 0.002 | | | | | |
| | (0.061) | | | | | |
| Observations | 175196 | 175042 | 164964 | 175042 | 146430 | 154028 |
| R-squared | 0.0040 | 0.33 | 0.24 | 0.67 | 0.26 | 0.68 |
| District × Loan Type FEs | YES | NO | NO | NO | NO | NO |
| Time × Loan Type FEs | YES | YES | YES | YES | YES | YES |
| District × Time FEs | NO | YES | YES | NO | YES | NO |
| Borrower × Loan Type FEs | NO | YES | YES | YES | YES | YES |
| Borrower × Time FEs | NO | NO | NO | YES | NO | YES |
| Controls | NO | NO | YES | NO | YES | NO |
| NY Excluded | NO | NO | NO | NO | YES | YES |

**Panel B. Non-voting district-quarters**

| Dependent variable: Liquidity Loan % Assets | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| DW × Local Inflation | -0.414*** | -0.425*** | -0.429*** | -0.425*** |
| | (-4.280) | (-4.370) | (-3.937) | (-4.372) |
| Local Inflation | 0.152*** | | | |
| | (4.772) | | | |
| Observations | 256974 | 256802 | 236764 | 256802 |
| R-squared | 0.0035 | 0.20 | 0.20 | 0.60 |
| District × Loan Type FEs | YES | NO | NO | NO |
| Time × Loan Type FEs | YES | YES | YES | YES |
| District × Time FEs | NO | YES | YES | NO |
| Borrower × Loan Type FEs | NO | YES | YES | YES |
| Borrower × Time FEs | NO | NO | NO | YES |
| Controls | NO | NO | YES | NO |

Table 5: **Liquidity loans and inflation: full sample.** This table reports estimates of the empirical setting described in Section 4.2. "DW" is a dummy variable that identifies Discount Window loans and "No Vote" is a dummy variable that identifies quarters in which a regional Reserve Bank *lacks* voting rights. Standard errors are clustered at the borrower level. $t$-statistics are reported in parentheses. ***, $p$-value <1%; **, <5%; *, <10%.

| Dependent variable: Liquidity Loan % Assets | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| DW × No Vote × Local Inflation | -0.259*** | -0.263*** | -0.237*** | -0.498*** |
| | (-4.991) | (-5.087) | (-4.477) | (-4.243) |
| DW × Local Inflation | -0.102*** | -0.098*** | -0.106*** | 0.073 |
| | (-2.739) | (-2.648) | (-2.818) | (1.230) |
| DW × No Vote | 0.013 | 0.017 | 0.014 | |
| | (0.793) | (0.992) | (0.817) | |
| Observations | 432170 | 431984 | 410968 | 410830 |
| R-squared | 0.0046 | 0.59 | 0.59 | 0.62 |
| District × Loan Type FEs | YES | NO | NO | NO |
| Time × Loan Type FEs | YES | YES | YES | YES |
| District × Time FEs | YES | NO | NO | NO |
| Borrower × Loan Type FEs | NO | YES | YES | YES |
| Borrower × Time FEs | NO | YES | YES | YES |
| NY Excluded | NO | NO | YES | YES |
| FEs Interacted with Voting Dummy | NO | NO | NO | YES |

Table 6: **Liquidity loans and inflation: the role of bank size.** This table repeats the analysis in Column (4) of Table 5 for various size-based groups of banks. Standard errors are clustered at the borrower level. *t*-statistics are reported in parentheses. ***, *p*-value <1%; **, <5%; *, <10%.

| *Small vs. big banks:* | *Small* | *Big* |
|---|---|---|
| *Bank asset criterion:* | *≤ $1b* | *> $1b* |
| Dependent variable: Liquidity Loan % Assets | | |
| | (1) | (2) |
| DW × No Vote × Local Inflation | -0.344*** | -0.706 |
| | (-4.004) | (-1.576) |
| DW × Local Inflation | 0.058 | 0.163 |
| | (0.946) | (0.926) |
| Observations | 361754 | 48820 |
| R-squared | 0.64 | 0.60 |
| District × Loan Type FEs | NO | NO |
| Time × Loan Type FEs | YES | YES |
| District × Time FEs | NO | NO |
| Borrower × Loan Type FEs | YES | YES |
| Borrower × Time FEs | YES | YES |
| NY Excluded | YES | YES |
| FEs Interacted with Voting Dummy | YES | YES |

Table 7: **Liquidity loans and inflation: the role of local inflation dispersion.** This table repeats the analysis in Column (4) of Table 5 for high and low local inflation dispersion sub-samples. We consider two inflation dispersion subsamples: (1) absolute distance between local inflation and voting-group average, scaled by the level of US overall inflation in the past 3 years; and (2) max-min spread of local inflation rates across all districts, scaled by the level of US overall inflation in the past 3 years. We refer to the former (latter) "micro wedge" ("macro wedge") in the paper. Median is the cutoff for high versus low subsamples. Standard errors are clustered at the borrower level. *t*-statistics are reported in parentheses. ***, *p*-value <1%; **, <5%; *, <10%.

| *High vs. low inflation dispersion:* | *High* | *Low* | *High* | *Low* |
|---|---|---|---|---|
| *Dispersion variable:* | *Distance to voting-group average (Micro Wedge)* | | *Local inflation max-min (Macro Wedge)* | |
| Dependent variable: Liquidity Loan % Assets | | | | |
| | (1) | (2) | (3) | (4) |
| DW × No Vote × Local Inflation | -0.973*** | -0.310 | -0.658*** | 0.082 |
| | (-4.347) | (-1.021) | (-4.277) | (0.537) |
| DW × Local Inflation | 0.272*** | 0.080 | 0.100 | -0.072 |
| | (3.225) | (0.288) | (1.427) | (-0.552) |
| Observations | 197652 | 210602 | 208684 | 197838 |
| R-squared | 0.67 | 0.63 | 0.65 | 0.63 |
| District × Loan Type FEs | NO | NO | NO | NO |
| Time × Loan Type FEs | YES | YES | YES | YES |
| District × Time FEs | NO | NO | NO | NO |
| Borrower × Loan Type FEs | YES | YES | YES | YES |
| Borrower × Time FEs | YES | YES | YES | YES |
| NY Excluded | YES | YES | YES | YES |
| FEs Interacted with Voting Dummy | YES | YES | YES | YES |

Table 8: **Liquidity loans and inflation: asymmetry.** This table repeats the analysis in Column (4) of Table 5 for possibly high and low DW application sub-samples. Periods of High DW activity are interpreted as periods coinciding with the easing of national monetary policy, or periods of heightened stress in financial markets. In our sample this consists with all observations after August 1st 2019 (our sample ends at the end of 2020). Indeed, August 1st 2019 marks the first reduction in the FFR since the Great Financial Crisis. Standard errors are clustered at the borrower level. $t$-statistics are reported in parentheses. ***, $p$-value <1%; **, <5%; *, <10%.

| *High vs. low DW activity periods:* | *High* | *Low* |
|---|---|---|
| Dependent variable: Liquidity Loan % Assets | (1) | (2) |
| DW × No Vote × Local Inflation | -1.364*** | -0.102 |
| | (-3.826) | (-1.307) |
| DW × Local Inflation | 0.388** | -0.022 |
| | (1.975) | (-0.420) |
| Observations | 40788 | 361824 |
| R-squared | 0.76 | 0.62 |
| District × Loan Type FEs | NO | NO |
| Time × Loan Type FEs | YES | YES |
| District × Time FEs | NO | NO |
| Borrower × Loan Type FEs | YES | YES |
| Borrower × Time FEs | YES | YES |
| NY Excluded | YES | YES |
| FEs Interacted with Voting Dummy | YES | YES |

Table 9: **Liquidity loans and inflation: accessibility to DW, FHLB, and REPO.** This table studies the robustness of our results to various borrower selection criteria. Across columns, we condition the sample on having used various types of credit during the sample period. Panel A focuses on DW and FHLB loans. In Column (1) we report the main result from Table 5, where we use all banks in the U.S. Call Reports. In Column (2), we select borrowers that access either type of loan at least once during the sample period. In Column (3), we require borrowers to access both types of loans during the sample period. Panel B performs similar analyses for DW and REPO loans. Standard errors are clustered at the borrower level. $t$-statistics are reported in parentheses. ***, $p$-value <1%; **, <5%; *, <10%.

**Panel A. DW and FHLB loans**

| *Bank access criterion:* | *Full (paper)* | *Either* | *Both* |
|---|---|---|---|
| Dependent variable: Liquidity Loan % Assets | | | |
| | (1) | (2) | (3) |
| DW × No Vote × Local Inflation | -0.498*** | -0.608*** | -0.911*** |
| | (-4.243) | (-4.242) | (-3.458) |
| DW × Local Inflation | 0.073 | 0.087 | 0.140 |
| | (1.230) | (1.195) | (1.090) |
| Observations | 410830 | 329240 | 131700 |
| R-squared | 0.62 | 0.63 | 0.63 |
| District × Loan Type FEs | NO | NO | NO |
| Time × Loan Type FEs | YES | YES | YES |
| District × Time FEs | NO | NO | NO |
| Borrower × Loan Type FEs | YES | YES | YES |
| Borrower × Time FEs | YES | YES | YES |
| NY Excluded | YES | YES | YES |
| FEs Interacted with Voting Dummy | YES | YES | YES |

**Panel B. DW and REPO loans**

| *Bank access criterion:* | *Full* | *Either* | *Both* |
|---|---|---|---|
| Dependent variable: Liquidity Loan % Assets | | | |
| | (1) | (2) | (3) |
| DW × No Vote × Local Inflation | -0.400*** | -0.666*** | -1.120*** |
| | (-3.782) | (-3.563) | (-2.712) |
| DW × Local Inflation | 0.097** | 0.146* | 0.304* |
| | (2.026) | (1.715) | (1.829) |
| Observations | 410830 | 218876 | 70588 |
| R-squared | 0.74 | 0.73 | 0.78 |
| District × Loan Type FEs | NO | NO | NO |
| Time × Loan Type FEs | YES | YES | YES |
| District × Time FEs | NO | NO | NO |
| Borrower × Loan Type FEs | YES | YES | YES |
| Borrower × Time FEs | YES | YES | YES |
| NY Excluded | YES | YES | YES |
| FEs Interacted with Voting Dummy | YES | YES | YES |

Table 10: **Discount Window activities using more granular evidence.** This table reports estimates of the empirical specification described in Section 5. Panel A, in particular, reflects Equation (4). The unit of observation is a Discount Window loan extended between 2010 and 2020. In Columns (1) to (3) the dependent variable is the natural logarithm of the dollar amount of the DW loan. In Columns (4) to (6) the dependent variable is the natural logarithm of the collateral ratio of the DW loan, calculated as the amount of available collateral on the borrower's balance sheet divided by the dollar amount of the loan. Standard errors are double clustered at the borrower and day-of-the-loan level. A placebo test using Term Auction Facility (TAF) loans is shown in the Appendix Table B.3. Panel B uses a dataset compiled from weekly snapshots of individual Reserve Bank balance sheets (source: https://www.federalreserve.gov/releases/h41/), with the dependent variable being the weekly amount of Discount Window loans outstanding, scaled by the total Reserve Bank assets. Standard errors are clustered at the weekly level. *t*-statistics are reported in parentheses. ***, *p*-value <1%; **, <5%; *, <10%.

**Panel A. Loan-level evidence**

| Dependent variable: | DW Loan (log) | | | Collateral Ratio (log) | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| No Vote × Local Inflation | -0.447** | -0.702*** | -0.699*** | 0.527*** | 0.540*** | 0.540*** |
| | (-2.386) | (-3.548) | (-3.392) | (2.926) | (2.842) | (2.842) |
| Local Inflation | 0.122 | 0.291* | 0.251 | -0.333** | -0.291* | -0.291* |
| | (0.766) | (1.690) | (1.427) | (-2.158) | (-1.714) | (-1.714) |
| No Vote | -0.012 | 0.032 | 0.045 | -0.044 | -0.079 | -0.079 |
| | (-0.128) | (0.383) | (0.520) | (-0.593) | (-1.034) | (-1.034) |
| Observations | 31882 | 22476 | 21199 | 29106 | 21199 | 21199 |
| R-squared | 0.41 | 0.49 | 0.50 | 0.37 | 0.48 | 0.48 |
| District × Loan Type FEs | YES | YES | YES | YES | YES | YES |
| Time × Loan Type FEs | YES | YES | YES | YES | YES | YES |
| Controls | NO | YES | YES | NO | YES | YES |
| NY Excluded | NO | NO | YES | NO | NO | YES |

**Panel B. District-week-level evidence**

| Dependent variable: DW Loans % Reserve Bank Assets | (1) | (2) |
|---|---|---|
| No Vote × Local Inflation | -1.472*** | -1.759*** |
| | (-4.195) | (-4.311) |
| Local Inflation | 0.203 | 0.290 |
| | (1.329) | (1.587) |
| No Vote | 0.594*** | 0.635*** |
| | (4.949) | (4.917) |
| Observations | 9200 | 8303 |
| R-squared | 0.20 | 0.18 |
| District FEs | YES | YES |
| Time FEs | YES | YES |
| NY Excluded | NO | YES |

# Appendices for "Local Monetary Policy"

## A Data Appendix

This appendix section complements and provides more details on the material covered in Section 2.

### A.1 More Details on the Discount Window

The main lending facility is the primary credit facility. To receive a primary loan, a borrower must be in sound financial shape (CAMELS ratings of 1, 2, or 3). Financial borrowers with weaker balance sheets can access funding at a penalty rate using the secondary credit facility (typically 50 basis points over the primary rate). Seasonal credit is the cheapest among the three, and this credit facility is mostly used by small banks who are unable to access more common sources of funding and face recurring liquidity shocks; a typical case would be a small bank in a farming community that has highly seasonal asset and liability flows.

Under the new primary and secondary credit programs approved by the Federal Reserve Board on October 31, 2002 (effective starting 2003), all three rates are set homogeneously across the United States and constitute an upper bound on the Federal Funds Rate. In fact, initially the primary credit rate was explicitly pegged at 100 basis points above the FOMC target rate. The press release on January 6, 2003 (when the new regulation was first implemented) can be found at https://www.federalreserve.gov/boarddocs/press/monetary/2003/20030106/default.htm. The Press Release on October 31, 2002 can be found at https://www.federalreserve.gov/boarddocs/press/bcreg/2002/200210312/default.htm. The main takeaway is as follows:

> The rule replaces adjustment credit, which currently is extended at a below-market rate, with a new type of discount window credit called primary credit that will be broadly similar to credit programs offered by many other major central banks. Primary credit will be available for very short terms as a backup source of liquidity to depository institutions that are in generally sound financial condition in the judgment of the lending Federal Reserve Bank. The Board expects that most depository institutions will qualify for primary credit.
>
> Reserve Banks will extend primary credit at a rate above the federal funds rate, which should eliminate the incentive for institutions to borrow for the purpose of exploiting the positive spread of money market rates over the discount rate. The Board anticipates that the primary credit rate will be set initially at 100 basis points above the FOMC's target federal funds rate.

The 10/31/2002 press release explains that the reason for this regulatory change is to eliminate the stigma and encourage DW usage:

> By employing an above-market rate and restricting eligibility to generally sound institutions, the primary credit program should considerably reduce the need for the Federal Reserve to review the funding situations of borrowers and monitor the use of borrowed funds. This reduced administration in turn should make the discount window a more attractive funding source for depository institutions when money markets tighten.

The secondary credit rate is pegged against the primary credit rate:

> The Board's final rule also establishes a secondary credit program that will be available in appropriate circumstances to depository institutions that do not qualify for primary credit. The Board anticipates that Reserve Banks will initially establish a secondary credit rate at a level 50 basis points above the primary credit rate.

This regulatory change should not change how the FOMC makes decisions about the target rate set for the national open market operations:

> The rule does not entail a change in the stance of monetary policy. The Federal Open Market Committee's target for the federal funds rate will not change as a result of the adoption of these programs, and the level of market interest rates more generally will be unaffected.

In terms of borrower profiles at the DW, commercial banks are the most frequent and most important borrowers, as documented in Ennis (2021). However, there are other financial borrowers that can access the DW, such as credit unions, thrift borrowers, and foreign banking organizations.

## A.2 More Details on Other Liquidity Loans

The Federal Home Loan Bank (FHLB) system is a U.S. government sponsored entity created in 1932. Its main mission is to support the liquidity of the national mortgage market. The FHLB system is structured as 11 FHLB banks, cooperatively owned by their member financial institutions, which include commercial banks, savings and loan associations, credit unions, and insurance companies. The main role of FHLB banks is to provide liquidity to its members in the form of advances. These advances can range from overnight loans to long term credit, maturing over multiple years. They can carry both variable and fixed interest rate schemes. As of 2023, the FHLB system held over $800 billion in outstanding advances, 56.3% of all advances were fixed rate advances, and over 50% had a remaining maturity of less than one year. FHLB advances are financed through the issuance of debt securities to outside investors through the FHLB Office of Finance. Figure A.1 is taken from the 2023 FHLB annual report and outlines the flow of funds inside the FHLB system. Each FHLB bank also raises funds in the

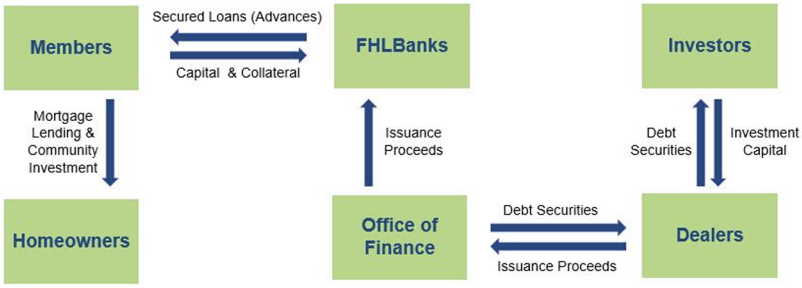



Figure A.1: Flow of Funds within FHLB System. https://www.fhlb-of.com/ofweb_userWeb/pageBuilder/fhlbank-financial-data-36

form of deposits from its member financial institutions, and the issuance of capital stock. While each FHLB operates independently of the other, they are jointly responsible for all obligations issued to investors. There used to be 12 FHLB districts, roughly mirroring the geographical organization of the Federal Reserve system. However, in 2014, the FHLB of Seattle agreed to be acquired by the much larger FHLB of Des Moines, resulting in the current 11 FHLB banks. Figures A.2 and A.3 show the current map of FHLB and Federal Reserve districts.[A.2] More information can be found in Ashcraft et al. (2010), who describe the FHLB system in more detail. Alternatively, one can also consult the FHLB annual reports available at https://www.fhlb-of.com/ofweb_userWeb/pageBuilder/fhlbank-financial-data-36.

## A.3 Alternative DW outcome variables

As mentioned in Section 2.2, we supplement our main analysis with two additional, more granular DW datasets. The first is the previously mentioned loan-level data. The second dataset is derived from the weekly H.4.1 statistical releases, which provide snapshots of local Reserve Banks' balance sheets, including an item that shows the total amount of loans outstanding (i.e., "Loans"). The longest downloadable sample spans from December 2002 to March 2020. To be specific, "March 11, 2020" is the last Wednesday H.4.1 snapshot that reports district-level loan amounts under the "Statement of Condition of Each Federal Reserve Bank." As of the date of this manuscript, the Federal Reserve has not resumed the practice of reporting these district-level "loans" figures as separate items. Source: https://www.federalreserve.gov/datadownload/Choose.aspx?rel=h41. This variable primarily captures the aggregate amount of DW lending activity in each Federal Reserve Bank and excludes special credit facilities such as the Term Auction Facility (TAF). However, it does include several emergency facilities, such as the Primary Dealer Credit Facility (PDCF), which was extended through the New York Reserve Bank. We exclude New York from most of our analysis because it always has the ability to vote at FOMC meetings. Appendix Table B.1 regresses the district-weekly total DW loan amount using the aforementioned loan-level dataset on the "Loans" item from the district-weekly H.4.1 balance sheets, analyzing one district at

[A.2] Our district fixed effects always refer to the borrower's corresponding DW district.

a time. For all non-NY districts, For all non-NY districts, the $R^2$ values are essentially 1, which validates our discussion above that this "Loans" item predominantly captures discount window loans.

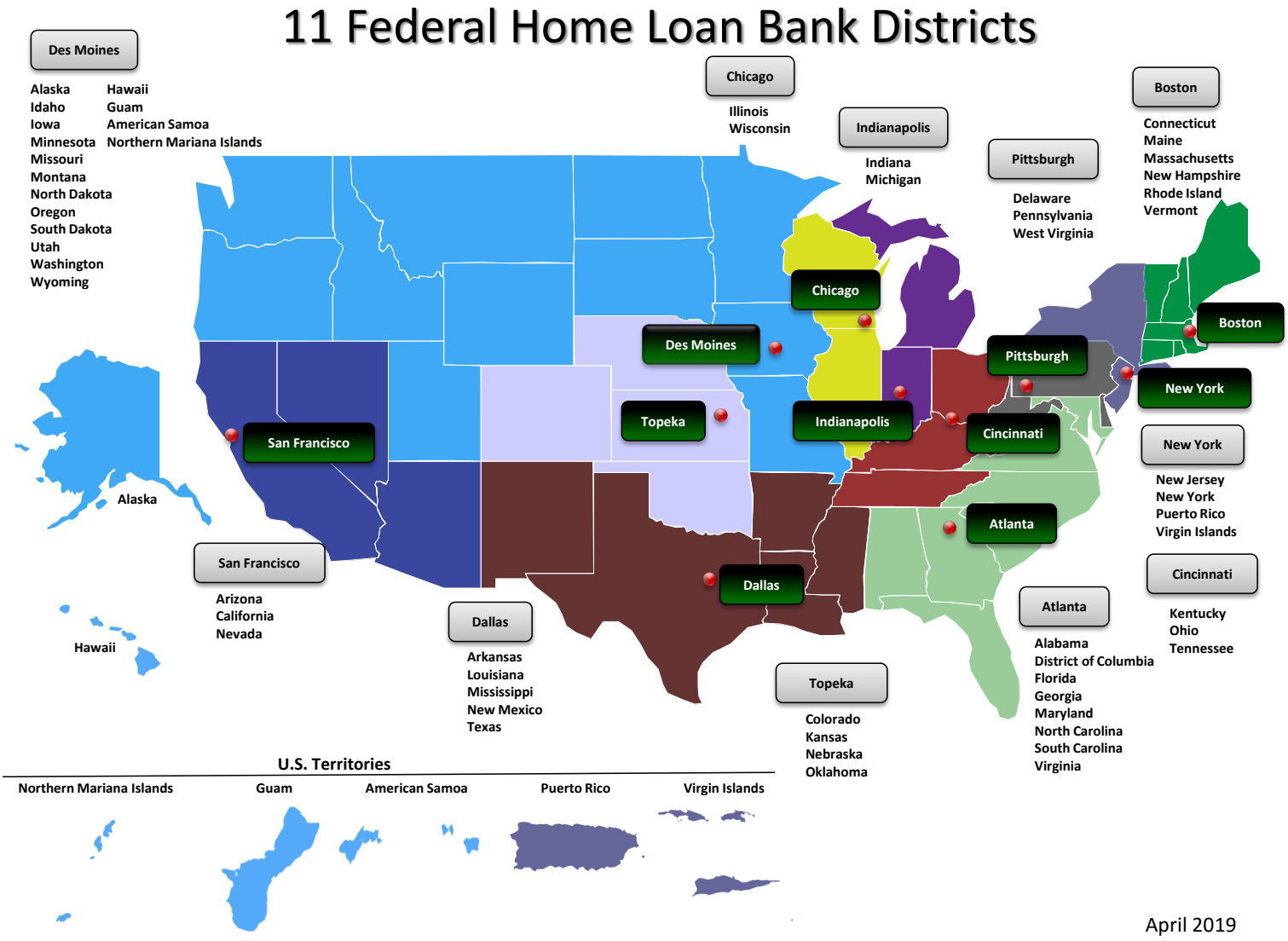



Figure A.2: Map of the 11 FHLB districts. https://www.fhfa.gov/SupervisionRegulation/FederalHomeLoanBanks/Pages/About-FHL-Banks.aspx

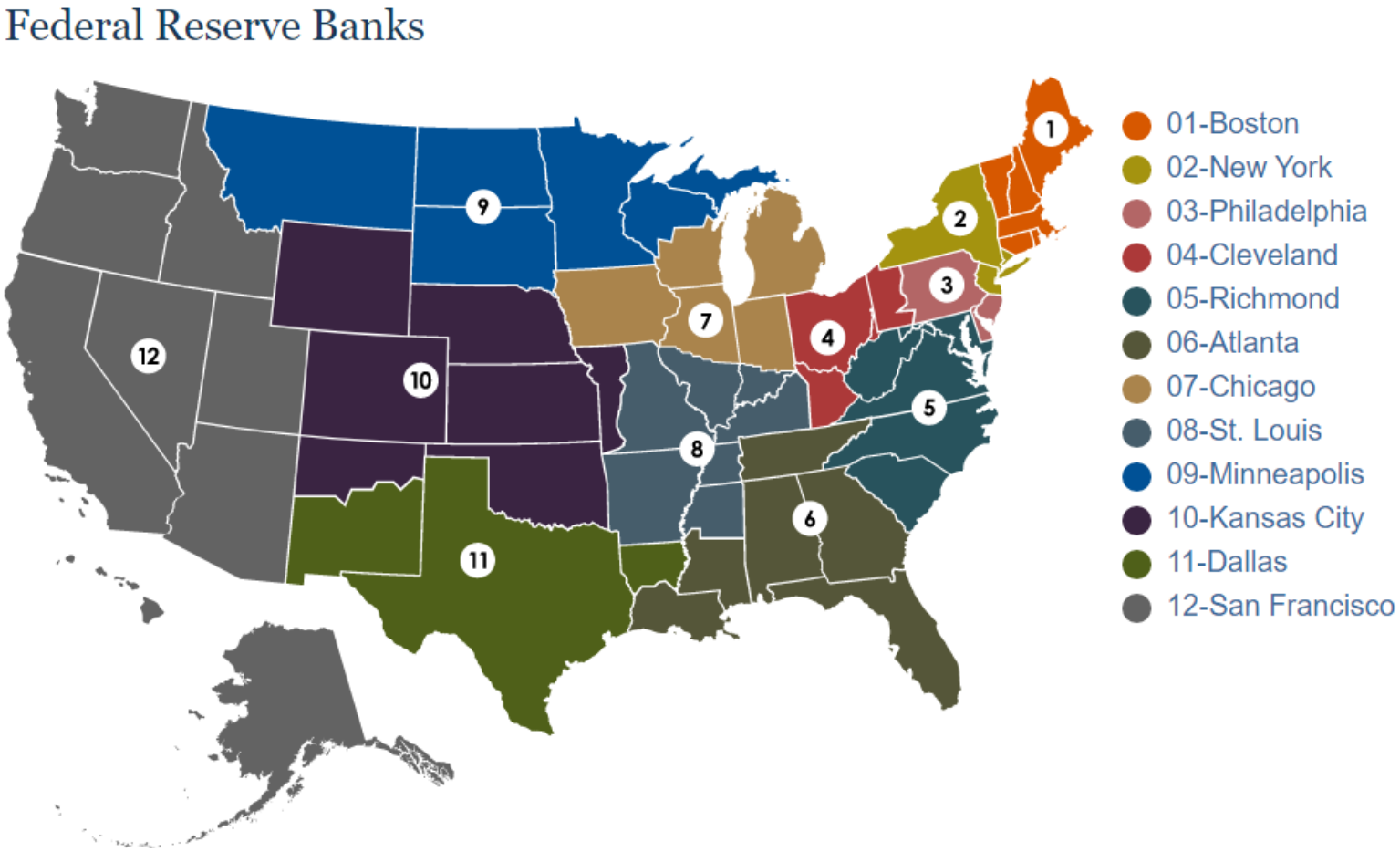



Figure A.3: Map of the 12 Federal Reserve districts. https://www.federalreserve.gov/aboutthefed/federal-reserve-system.htm

Table A.1: Summary of variables.

| Label | Variable Description |
|---|---|
| DW Loan > 100k % Assets | Total amount of DW loans greater than $100,000 extended to a single borrower bank in a given quarter, expressed as a percentage of the borrower's last quarter's assets. |
| Chg FHLB % Assets | Quarterly change in FHLB loan balances expressed as a percentage of the previous quarter's assets. (Includes only FHLB advances maturing in less than one year). |
| Security REPOs % Assets | The amount of securities sold with an agreement to be repurchased that are outstanding at the end of the quarter, scaled by the bank's assets. |
| Local Inflation | Weighted average inflation calculated using inflation in the first and second months of each quarter. |
| No Vote | Dummy variable indicating the lack of an FOMC voting right for a district in a given quarter. |
| Ln(Assets) | The natural logarithm of the assets held on a borrower bank's balance sheet. |
| Tier 1 | Basel III Tier 1 capital ratio expressed as a percentage of risk-weighted assets. |
| ROA | Return on assets expressed as the percentage of net income over assets. |
| Deposits % Liabilities | Total deposits (includes time deposits, savings deposits, etc.) expressed as a percent of total liabilities. |
| C&I Loans % Assets | Commercial and industrial loans outstanding on a bank's balance sheet expressed as a percent of total assets. |
| DW | Dummy variable that identifies a Discount Window loan. |

# B Additional Results

Table B.1: **Validating the "Loans" item from the weekly H.4.1 balance sheets using actual Discount Window loans.** This table regresses the district-weekly total DW loan amount (source: loan-level data and authors' calculation) on the "Loans" item from the district-weekly H.4.1 balance sheets (source: https://www.federalreserve.gov/releases/h41/, "Statement of Condition of Each Federal Reserve Bank") using overlapped sample from 2010 to March 11, 2020 (Wednesday). The sample in this validation exercise starts in 2010 due to the data availability of the DW loan-level dataset. It ends on Wednesday, March 11, 2020, because the Fed ceased reporting the "Loans" item as a separate district-level item. As of the date of this manuscript, the Fed has not resumed this reporting item. Each of the 11 columns in the table reports on one district. The 11 columns below report one district at a time.

| Dependent variable: | Weekly loan amount, aggregated from DW Loan-level data | | | | | |
|---|---|---|---|---|---|---|
| *Non-NY districts:* | *Boston* | *Philadelphia* | *Cleveland* | *Richmond* | *Atlanta* | *Chicago* |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Weekly loan amount, reported in H41 | 1.002*** | 1.000*** | 1.000*** | 1.000*** | 1.003*** | 1.041*** |
| | (0.007) | (0.003) | (0.282) | (0.000) | (0.004) | (0.008) |
| Observations | 503 | 501 | 504 | 504 | 504 | 504 |
| R-squared | 0.98 | 1.00 | 1.00 | 1.00 | 0.99 | 0.97 |
| *Non-NY districts:* | *St Louis* | *Minneapolis* | *Kansas City* | *Dallas* | *San Francisco* | |
| | (7) | (8) | (9) | (10) | (11) | |
| Weekly loan amount, reported in H41 | 1.013*** | 1.058*** | 1.088*** | 1.000*** | 1.000*** | |
| | (0.003) | (0.006) | (0.013) | (0.001) | (0.001) | |
| Observations | 504 | 504 | 504 | 504 | 504 | |
| R-squared | 0.99 | 0.99 | 0.93 | 1.00 | 1.00 | |

Table B.2: **Summary statistics for the bank control variables.** This table reports summary statistics for the datasets used in this paper. The sample covers all banks that filed Call Reports between 2010-2020. Panel A(1) reports summary statistics for the full sample. Panels A(2) and A(3) split the sample between non-voting and voting district quarters, respectively. $Ln(Assets)$ is the natural logarithm of the assets held on a borrower bank's balance sheet. $Tier1$ is Basel III Tier 1capital ratio expressed as a percentage of risk-weighted assets. $ROA$ is return on assets expressed as the percentage of net income over assets. $Deposits\ \%\ Liabilities$ is total deposits (time deposits, savings deposits, etc.) expressed as a percent of total liabilities. $C\&I\ Loans\ \%\ Assets$ is commercial and industrial loans outstanding on a bank's balance sheet expressed as a percent of total assets.

| | COUNT | MEAN | SD | P1 | P5 | P25 | P50 | P75 | P95 | P99 |
|---|---|---|---|---|---|---|---|---|---|---|
| *Panel A(1). Borrower-Quarter level for each loan type; All district-quarters* | | | | | | | | | | |
| ln(Assets) | 261283 | 12.294 | 1.423 | 9.536 | 10.356 | 11.398 | 12.136 | 12.988 | 14.775 | 17.031 |
| Tier 1 | 253914 | 14.053 | 307.806 | 0.072 | 0.108 | 0.152 | 9.737 | 15.336 | 28.829 | 68.188 |
| ROA | 261283 | 0.598 | 7.655 | -2.054 | -0.227 | 0.220 | 0.468 | 0.837 | 1.583 | 3.297 |
| Deposits % Liabilities | 261261 | 93.518 | 11.770 | 6.279 | 80.714 | 91.803 | 96.753 | 99.260 | 99.835 | 99.935 |
| C&I Loans % Assets | 257880 | 8.119 | 6.903 | 0.000 | 0.086 | 3.577 | 6.627 | 10.822 | 20.832 | 32.985 |
| *Panel A(2). Borrower-Quarter level for each loan type; District-quarters without voting rights (60.3%)* | | | | | | | | | | |
| ln(Assets) | 157466 | 12.262 | 1.383 | 9.537 | 10.352 | 11.387 | 12.116 | 12.952 | 14.652 | 16.801 |
| Tier 1 | 152022 | 13.774 | 301.664 | 0.068 | 0.108 | 0.15 | 1.032 | 15.118 | 28.339 | 65.458 |
| ROA | 157466 | 0.6 | 2.92 | -2.274 | -0.269 | 0.22 | 0.471 | 0.842 | 1.593 | 3.334 |
| Deposits % Liabilities | 157459 | 93.66 | 11.572 | 11.896 | 81.154 | 91.975 | 96.839 | 99.28 | 99.838 | 99.937 |
| C&I Loans % Assets | 155801 | 8.226 | 6.91 | 0 | 0.198 | 3.704 | 6.718 | 10.906 | 20.945 | 33.146 |
| *Panel A(3). Borrower-Quarter level for each loan type; District-quarters with voting rights (39.7%)* | | | | | | | | | | |
| ln(Assets) | 103817 | 12.343 | 1.479 | 9.534 | 10.361 | 11.414 | 12.164 | 13.041 | 14.965 | 17.390 |
| Tier 1 | 101892 | 14.470 | 316.748 | 0.080 | 0.110 | 0.155 | 10.578 | 15.664 | 29.590 | 73.727 |
| ROA | 103817 | 0.594 | 11.600 | -1.722 | -0.169 | 0.220 | 0.464 | 0.830 | 1.567 | 3.242 |
| Deposits % Liabilities | 103802 | 93.301 | 12.062 | 1.130 | 80.025 | 91.557 | 96.606 | 99.229 | 99.832 | 99.934 |
| C&I Loans % Assets | 102079 | 7.956 | 6.888 | 0.000 | 0.010 | 3.382 | 6.475 | 10.689 | 20.621 | 32.700 |

Table B.3: **Discount Window activities using more granular evidence.** This table complements Table 10 using Ln(TAF loan) as a placebo for Ln(DW loan). The unit of observation is a Term Auction Facility (TAF) loan extended between December 12, 2007 and March 8, 2010. The dependent variable is the natural logarithm of the dollar amount of the TAF loan. Standard errors are double clustered at the borrower and day-of-the-loan level. *t*-statistics are reported in parentheses. ***, *p*-value <1%; **, <5%; *, <10%.

| Dependent variable: | TAF Loan (log) |
|---|---|
| No Vote × Local Inflation | -0.024 |
| | (-0.168) |
| Local Inflation | -0.117 |
| | (-1.079) |
| No Vote | -0.129 |
| | (-0.700) |
| Observations | 2293 |
| R-squared | 0.24 |
| District FEs | YES |
| Time FEs | YES |
| NY Excluded | YES |