

NO. 1137
NOVEMBER 2024

Discount Window Stigma After the Global Financial Crisis

Olivier Armantier | Marco Cipriani | Asani Sarkar

Discount Window Stigma After the Global Financial Crisis

Olivier Armantier, Marco Cipriani, and Asani Sarkar

Federal Reserve Bank of New York Staff Reports, no. 1137

November 2024

<https://doi.org/10.59576/sr.1137>

Abstract

We study Discount Window (DW) stigma, the reluctance to access the Federal Reserve's lender-of-last-resort facility, between 2014 and 2024. Despite increased usage since 2020, we find conclusive evidence that the DW is stigmatized, especially among smaller banks and when financial markets experience disruptions. In particular, evidence of DW stigma emerged months before the 2023 banking turmoil and had not subsided a year later. We also identify new determinants and consequences of DW stigma. The implications of these results for the provision of emergency liquidity are discussed.

JEL classification: E52, G21, G28

Key words: discount window, lender of last resort, stigma

Cipriani, Sarkar: Federal Reserve Bank of New York (emails: marco.cipriani@ny.frb.org, asani.sarkar@ny.frb.org). Armantier: Economic Science Institute at Chapman University (email: olast1@gmail.com). The authors thank Joseph Delehanty, Martin Hiti, Nathan Kaplan, and Jessica Li for outstanding research assistance. They also thank Vincent Arnold, Stephen Kelly, and Stephan Luck for their help in assembling data on FHLB lending, and are particularly grateful to Patrick Dwyer and Helene Lee for their guidance and valuable suggestions. They thank Gara Afonso, Caren Cox, Thomas Eisenbach, Brian Gowen, Anna Kovner, Gabriele La Spada, Stephan Luck, Antoine Martin, Adam Minson, Will Riordan, and Joshua Younger for comments and suggestions.

This paper presents preliminary findings and is being distributed to economists and other interested readers solely to stimulate discussion and elicit comments. The views expressed in this paper are those of the author(s) and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System. Any errors or omissions are the responsibility of the author(s).

To view the authors' disclosure statements, visit
https://www.newyorkfed.org/research/staff_reports/sr1137.html.

1 Introduction

A core responsibility of central banks is to act as “lender of last resort” to the financial system. In the U.S., the Federal Reserve (the Fed) has been operating as a lender of last resort through its “Discount Window” (DW) for more than a century. Because it aims to address liquidity concerns before they have systemic consequences, the DW is the Fed’s first line of defense against financial crises. Historically, however, the DW has suffered from stigma, the banks’ reluctance to use the DW out of concerns that it could be interpreted as a sign of weakness by market participants and regulators. In this paper, we study DW stigma between 2014 and 2024, with special focus on the last three major disruptions to the financial system, the September 2019 temporary disruption in repo markets, the onset of the COVID-19 pandemic in 2020, and the March 2023 U.S. banking turmoil.

The DW is a standing facility that provides sound depository institutions backup funding against a broad range of collateral. Over the years, DW policies have been modified with the explicit objective of promoting DW borrowing and mitigating stigma.¹ This was the case in 2003 when the Fed fundamentally changed the DW policy by introducing a tiered credit program with advantageous terms for strong and well-capitalized institutions (the primary credit program), a “no question asked” lending approach, and a penal rate (i.e., with a spread over the Federal Open Market Committee’s target rate). DW policies were also amended in 2007 at the onset of the global financial crisis (GFC) when the penalty spread was cut in half, from 100 to 50 basis points (bps), and the loans’ terms were temporarily extended from overnight to 30, and then 90 days. Finally, on March 15, 2020, at the onset of the COVID-19 pandemic, the Fed suspended the penalty spread, cut the primary credit rate 150bps to 0.25% (the lowest rate in the DW history), extended the term of DW loans back to 90 days, publicly encouraged DW borrowing and changed the disclosure policy.²

¹ For details see e.g. Carlson and Rose (2017), Ennis and Price (2020), or McLaughlin (2024a,b).

² Total DW borrowing used to be reported weekly at the district level, which could help identify individual DW borrowers. They are now aggregated and reported weekly at the national level.

The aftermath of the 2023 banking turmoil saw renewed interest in reforming the DW.³ The rapid collapse of Silicon Valley Bank made it clear that modern bank runs can unfold in a matter of hours (through social media and online banking), instead of days or weeks as in the past.⁴ To prevent these runs, banks need the ability to access emergency funding as fast as depositors can withdraw cash. Policy makers believe that the DW should be uniquely positioned to provide ready access to liquidity (Barr 2023a, Hsu 2024).⁵ To achieve this objective, several reforms have been proposed, such as streamlining DW operations (Logan 2023, Scott 2024), requiring banks to preposition enough collateral at the DW to cover a run on their assets (G30 2024, Hsu 2024), and requiring regular DW access to ensure banks' operational readiness (Logan 2023, Barr 2023a, Hsu 2024). As pointed by Nelson (2024), however, these reforms will be ineffective if banks shun the DW because of stigma.

While compelling evidence of DW stigma has been found during the GFC (see e.g. Ennis and Haltom 2010, Armantier et al. 2015, or Klee 2021), the extent to which stigma has remained an impediment to the Fed's lender of last resort responsibilities is unclear. At the onset of the COVID-19 pandemic, along with the Fed's suspension of the DW penal pricing, the eight U.S. "global systemically important banks" (G-SIBs) announced that they had tapped the DW and that, going forward, they intended to make the DW part of their contingency liquidity plans.⁶ The stated goal of the announcement was to "break the stigma" and encourage others to use the facility,⁷ which led to improved sentiments about DW

³ See e.g. the December 6, 2023 Senate Banking Committee hearing "Annual Oversight of Wall Street Firms," or the February 15, 2024 Congressional hearing "lender of last resort: Issues with the Fed Discount Window and Emergency lending."

⁴ Silicon Valley Bank experienced an outflow of \$42 billion (or 25% of deposits) in a single day (Barr 2023b). During the run on Washington Mutual in 2008, the outflow of \$19 billion (or 10% of deposits) took 16 days (see e.g. Rose 2023 or Cipriani 2024).

⁵ In particular, the Federal Home Loan Banks (FHLB) system, a common source of funding when liquidity markets are strained, noted in a recent report that it is "*not designed or equipped to take on the function of the lender of last resort*," and that going forward it no longer intended to act as one (FHLB 2024).

⁶ See e.g. "Shedding 2008 Stigma, Biggest U.S. Banks Borrow Straight from the Fed," Wall Street Journal, March 16, 2020, or "JPMorgan Won't Shun the Fed's Discount Window Anymore," Wall Street Journal, February 25, 2020.

⁷ When announcing the plan, Jennifer Piepszak, JPMorgan Chase CFO, stated "*We think this is an important step for us to take to break the stigma*," see "JPMorgan Eyes Plan to Break Stigma of Fed's Discount Window," Bloomberg February 25, 2020. Similarly, when asked why they intend to use the DW more regularly, James Dimon, JPMorgan Chase CEO, stated "*We think it would be good to remove the stigma*,"

stigma.⁸ Commentators also noted that the unusual increase in DW borrowing in the second half of 2022 suggested that stigma concerns had receded and possibly vanished.⁹ Finally, because many of the banks that faced severe liquidity strains in March 2023 borrowed or attempted to borrow at the DW, some questioned whether stigma is really a consideration in times of crisis (Scott 2024). In contrast, others have argued that DW stigma surged after the GFC because borrowing in 2008-2010 was perceived by many as having received a bailout, and because the 2010's Dodd-Frank Act made DW borrowing less opaque (see e.g. Fischer 2016, Bernanke 2018, Ennis and Price 2020, McLaughlin 2024a, Nelson 2024).¹⁰ So, to what extent did banks suffer from DW stigma in recent years?

The answer to this question is critical to assess whether the Fed's new objective of making banks "*willing to use the Discount Window in good times and bad*" (Barr 2023a) is realistic. Answering the question, however, is difficult because stigma cannot be observed directly, as explained in Section 2. One way to establish the existence of DW stigma is through one of its manifestations: to avoid stigma, banks should be willing to pay higher rates for loans with terms similar to those at the DW. For instance, Furfine (2001, 2003) and Klee (2021) interpret a bank purchasing federal funds above the DW rate as evidence of stigma. We follow a similar approach and use transaction level data from the federal funds market to establish the presence of DW stigma between April 1, 2014 and July 1, 2024.

We find clear evidence of DW stigma, especially around the last three major disruptions to the financial system. The patterns surrounding the 2023 banking turmoil, however, differ markedly. During the September 2019 repo markets disruption and at the onset of the

see "JPMorgan Won't Shun the Fed's Discount Window Anymore," Wall Street Journal, February 25, 2020.

⁸ The minutes from the March 15, 2020 Federal Open Market Committee meeting reflects this improvement: "*A few other participants noted that discount window stigma should be less of a concern than it was previously.*" Fed's vice president Randal Quarles, also pointed out that banks would not go to the trouble of pledging \$1.6 trillion in collateral to the DW if they did not intend to use the facility (Quarles 2020). See also "U.S. Banks Borrow at Discount Window after Fed Offers Stigma Relief," Reuter, March 26, 2020.

⁹ "*Some even believe rising usage of what the Fed calls the Discount Window could show the waning of persistent stigmas that have long kept banks away from an easily accessible source of short-term loans,*" from "Fed Discount Window Borrowing Is Edging Up, but Is it a Problem?" Reuters, December 9, 2022.

¹⁰ Whereas the Fed did not release the identity of DW borrowers before 2010, the Dodd-Frank Act now requires such disclosure after a two years lag.

COVID-19 pandemic, evidence of stigma surged and receded rapidly. In contrast, stigma surfaced eight months prior to the 2023 banking turmoil and had not faded substantially a year later. During that period, stigma has been prevalent among federal funds borrowers. Notably, in the year that followed the failure of First Republic Bank on May 31, 2023, as liquidity markets seemingly returned to normal, small domestic banks (with less than \$50B in assets) purchased more than half of their federal funds (\$1.3B daily on average) at 13bps above the DW rate, costing them a total of nearly \$0.5B in excess interest payments.

We also identify new determinants and consequences of DW stigma. In particular, we find that stigma is highly persistent. All else equal, a bank that experiences stigma is about 40% more likely to do so again the next month. In contrast, banks that visit the DW are significantly less likely to suffer subsequently from stigma. Finally, banks are significantly more susceptible to stigma when they become financially weaker. In fact, our results suggest that experiencing stigma is more informative about a bank's failure risk than DW borrowing.

This paper belongs to the growing literature concerned with DW operations and stigma. Recent studies on liquidity provision through the DW include Ackon and Ennis (2017), Ennis and Klee (2023), Beyhaghi and Gerlach (2024), and Armantier et al. (2024). Empirical evidence of stigma associated with backstop facilities like the DW have been brought forward by Peristiani (1998), Furfine (2001), Ennis and Haltom (2010), Armantier et al. (2015), Anbil (2018), Vossmeier (2019), Anbil and Vossmeier (2019), Klee (2021), and Beyhaghi and Gerlach (2024). Formal models of emergency lending with stigma have been proposed by Ennis and Weinberg (2013), La'O (2014), Ennis (2019), Gorton and Ordonez (2020), Hu and Zhang (2023), and Che et al. (2024). Finally, Armantier and Holt (2020, 2024) use laboratory methods to test various policies that have been proposed to curb DW stigma.

This paper contributes to this literature in several ways. First, while previous papers provided evidence of DW stigma between 2001 and 2010, we show that the DW has remained stigmatized after the GFC. Second, unlike previous literature which used proxies for federal funds rates to study stigma, we leverage novel data and use actual observations of federal

funds transactions. Third, finding that stigma was resilient in recent years despite the measures that have been enacted to promote DW borrowing is informative for the literature studying how DW stigma can be broken. This is particularly important for the current debate on how the DW should be reformed to make banks borrow regularly, in good times and bad. Finally, the new determinants and consequences of DW stigma we identify are a necessary step in the quest to better understand and mitigate the problem.

The paper is structured as follows. The empirical methodology is described in Section 2. Recent patterns in DW borrowing are summarized in Section 3. We provide evidence of DW stigma between 2014 and 2024 in Section 4. Specific facts about stigma are reported in Section 5. We study determinants of stigma in Section 6. Evidence of stigma in other funding markets are reported in Section 7. Finally, we discuss in Section 8 the implications of our results for the provision of emergency liquidity.

2 Empirical Methodology

Stigma versus realized stigma. Following Armantier et al. (2015), we define a bank’s DW stigma as the highest spread over the DW primary credit rate the bank is willing to pay to avoid borrowing at the DW.¹¹ A bank’s stigma, however, is unobservable—because its highest willingness to pay is unobservable. Instead, we observe “realized stigma:” when a bank actually pays a premium above the primary credit rate to avoid the DW.

Although *realized stigma* is evidence of *stigma*, the two notions are not equivalent for at least two reasons. First, realized stigma only provides a lower bound on a bank’s DW stigma. In particular, a bank can have DW stigma (i.e., it is willing to pay a premium to avoid the DW) even when it does not have realized stigma (e.g., because the bank is able to borrow on the interbank market below the DW rate). Second, stigma and realized stigma

¹¹ As explained [here](#), the DW has three lending programs, primary, secondary and seasonal, each with their own rate. Consistent with the literature, we focus on the main DW program, the primary credit program, and we use “DW rate” to refer to the “primary credit rate.” We also use the term “bank” to refer to domestic banks and branches of Foreign Bank Organizations (FBOs hereafter). Credit unions and thrifts are excluded from the analysis.

may vary over time independently of each other. For instance, counterparties may require a bank to pay higher spreads above the DW rate when its credit risk deteriorates (leading to an increase in the bank’s realized stigma), even when the bank’s willingness to pay to avoid the DW (its stigma) remains unchanged. Conversely, during a financial crisis, a bank may become more concerned about signaling weakness. In this case, the bank’s willingness to pay to avoid the DW (its stigma) would increase. However, if the rates at which the bank fulfills its liquidity needs in the interbank market do not change or remain below the DW rate, then the bank’s realized stigma is unchanged.

Note also that DW borrowing cannot be used to identify stigma. A bank’s absence of DW borrowing may simply reflect a lack of emergency funding needs, regardless of whether the bank has stigma or not. Conversely, having stigma does not preclude a bank from borrowing at the DW. In particular, a bank with stigma will access the DW if the rates it gets on the interbank market exceed the highest rate the bank is willing to pay to avoid the DW.

Measuring realized stigma. Consistent with previous literature, most of our analysis of DW stigma relies on transactions in the federal funds market, the over-the-counter-overnight U.S. interbank market for funds held by banks at the Fed.¹² Following Furfine (2001, 2003) and Klee (2021), we interpret a bank purchasing federal funds above the DW rate as evidence of stigma. This approach assumes that federal funds and DW loans are close substitutes. There is, however, an important difference between the two funding sources.

Unlike federal funds transactions, DW borrowing is secured. However, two-third of the collateral used to secure DW loans in 2023 consisted of illiquid assets, such as non-mortgage consumers loans and commercial loans, which are difficult to use as collateral in private markets.¹³ Hence, at least for banks with loan-intensive balance sheets, the opportunity cost

¹² The federal funds market plays a critical role in the implementation of monetary policy because the median rate on the market, the “effective federal funds rate,” is the gauge for the Fed’s target rate. Although transaction numbers have declined after the GFC, the federal funds market remains active with around \$110B in daily trading volume in 2023, as compared to \$150B in 2008 (see Afonso et al. 2023).

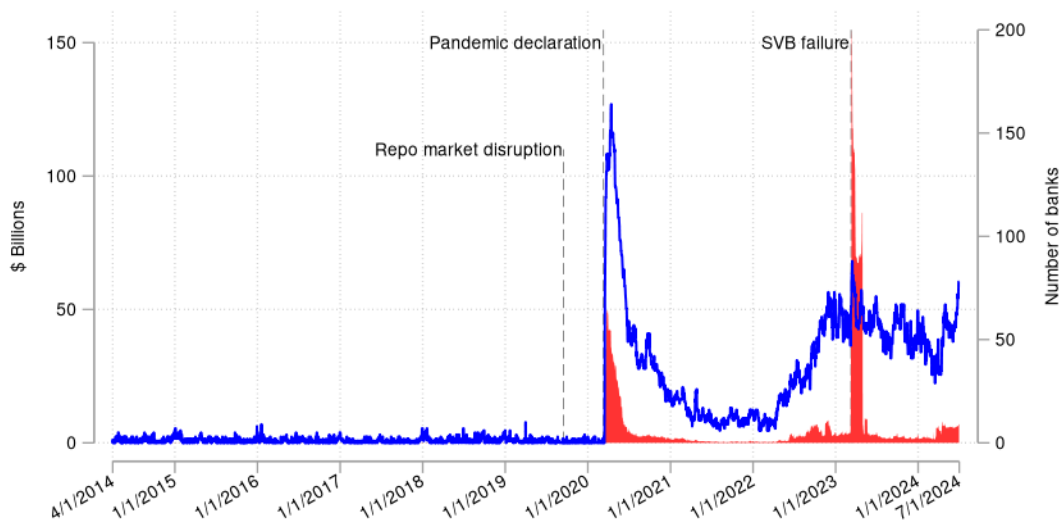
¹³ See the report from the Board of Governors of the Federal Reserve System available [here](#). See also Plassman and Rosa (2023) who find a similar ratio of illiquid collateral in 2021.

of using such illiquid collateral is negligible, and the difference in securitization should not be sufficient to justify borrowing federal funds above the DW rate. Nevertheless, to address this concern, we will highlight the proportion of federal funds purchased at rates substantially higher than the DW rate (i.e., from 5 to 50bps higher).

3 Discount Window Borrowing after 2014

Before studying DW stigma, we first look at recent DW activity.¹⁴ Figure 1 plots the daily number of institutions with a loan outstanding at the DW (blue line) and the daily total amount of loans outstanding at the DW (red area) between April 1, 2014 and July 1, 2024.¹⁵ Table 1 provides summary statistics for different time periods and bank types.¹⁶

Figure 1: Discount Window Activity



Notes: The figure shows the number of banks with a loan outstanding at the DW (blue line, right axis) and the total amount of loans outstanding at the DW (red area, left axis) daily between April 1, 2014 and July 1, 2024. The start of the last three major financial disruptions (the September 2019 repo markets disruption, the onset of the COVID-19 pandemic, and the March 2023 banking turmoil) are indicated by dotted lines.

¹⁴ The data used in the paper are described in Appendix A. For analyses of DW borrowing post GFC between 2010 and 2014 see Ennis and Klee (2023), and Beyhaghi and Gerlach (2024).

¹⁵ In the remainder of the paper, we call a bank with a loan outstanding at the DW a “DW borrower.”

¹⁶ We distinguish four types of banks: G-SIBs; other “Large Domestic” banks, that is banks with assets greater or equal to \$50B; “Small Domestic” banks, that is banks with assets less than \$50B; and branches and agencies of FBOs. Hence, we exclude credit unions and thrifts from the analysis.

Table 1: Discount Window Activity

	Pre-pandemic		Pandemic declaration	Post pandemic declaration	Pre banking turmoil	2023 Banking turmoil	Post banking turmoil
	4/1/2014 - 3/10/2020	16 & 17 Sep. 2019	3/11/20 - 3/31/20	4/1/20 - 6/30/22	7/1/22 - 3/8/23	3/9/23 - 5/31/23	6/1/23 - 7/1/24
Daily average							
Total amount outstanding (\$M)	12	169	28,975	3,373	4,002	54,772	3,036
Institutions with amount outstanding	1.1	1.0	88.7	30.1	48.6	63.3	52.0
Per bank amount outstanding (\$M)	10	169	279	64	85	810	59
Daily average of share							
G-SIBs	0.0	0.0	20.9	5.1	0.0	0.0	0.0
Large Domestic	0.8	0.0	16.0	0.6	2.7	54.2	13.2
Small Domestic	95.8	100.0	24.3	37.0	73.8	41.3	65.2
FBOs	3.4	0.0	38.8	57.2	23.5	4.5	21.6

Notes: The table shows daily averages between April 1, 2014 and July 1, 2024 broken down by time periods. The top panel focuses on the total amount outstanding at the DW, the number of institutions with a loan outstanding at the DW, and the per bank amount outstanding among DW borrowers. The bottom panel focuses on shares of the total amount outstanding at the DW broken down by bank type: G-SIBs; other “Large Domestic” banks (with assets greater or equal to \$50B); “Small Domestic” banks (with assets less than \$50B); and branches and agencies of FBOs. In the first row, the three major financial disruptions are indicated in bold.

DW activity was scant before COVID-19 was declared a pandemic on March 11, 2020, with a little more than one DW borrower and \$12M in outstanding loans on average per day, drawn almost exclusively by small domestic banks—see Table 1. Notably, the disruption in repo markets on September 16-17, 2019 did not generate a noticeable spike in DW take-up in Figure 1. This absence of DW borrowing may reflect the Fed’s rapid response to these events (Afonso et al. 2021), but we will see that stigma played a substantial role as well.

DW borrowing rose dramatically at the onset of the COVID-19 pandemic when the daily amount outstanding peaked at \$49.8B and the daily number of DW borrowers reached 165 institutions. Table 1 shows that DW borrowing during the *pandemic declaration* period (March 11 to 31, 2020) was fairly broad-based across bank types, but dominated by FBOs.¹⁷

In the months that followed the pandemic declaration, DW activity first fell rapidly and continued to trend down until mid-2022. The number of DW borrowers and the amounts borrowed, however, remained elevated by historical standards during the *post-pandemic* period (April 1, 2020 to June 30, 2022). During the pandemic and the post pandemic period,

¹⁷ The unusually high DW borrowing by G-SIBs during this period should be interpreted with caution. Indeed, recall that G-SIBs announced on March 17, 2020 that they collectively took out DW loans to encourage other institutions to tap the DW. The data show that between March 17 and December 10, 2020, G-SIBs carried a positive balance at the DW, with total daily outstanding amounts varying between \$0.5B and \$12B. Most if not all of this borrowing likely reflects signaling, rather than a need for emergency liquidity.

the distribution of DW borrowers also shifted with FBOs accounting for about half of the volume outstanding, in sharp contrast with the pre-pandemic period when they accounted for only 3.4%—see Table 1.

The negative trend in DW borrowing reversed in the second half of 2022 when DW activity started to increase steadily—see Figure 1. As explained in Lee and Sarkar (2023), this increase in DW borrowing likely results from a reduction in reserves in the financial system, combined with an increase in the rates of alternative funding sources such as FHLB advances. The composition of DW borrowers also changed during the *pre-banking turmoil period* (July 1, 2022 to March 8, 2023, the day before Silicon Valley Bank failed), with almost three-quarters of DW loans contracted by small domestic banks and no borrowing from G-SIBs, similar to the pre-pandemic period.

Figure 1 shows that DW borrowing surged in response to the March 2023 banking turmoil. The total amount outstanding at the DW rose to \$155B on March 15, substantially above the GFC’s peak of \$110B. DW borrowing was also much higher than at the onset of the COVID-19 pandemic. In particular, during the *banking turmoil* period (March 9 to May 31, 2023 when First Republic Bank failed), the average daily amount outstanding at the DW was almost twice as large than between March 11 to 31, 2020 (\$55B versus \$29B), while the average number of daily DW borrowers was in fact lower (63 versus 89)—see Table 1. DW borrowing was highly concentrated among large domestic banks during the banking turmoil period. Notably, First Republic Bank borrowed as much as \$109B overnight during the week of March 6, 2023, and it had \$63.5B in outstanding DW loans weeks before it failed.¹⁸

The amount outstanding at the DW dropped precipitously after the failure of First Republic Bank. As documented in Armantier et al. (2024), the introduction of the Bank Term Funding Program (BTFP) on March 12, 2023, also contributed to the decline in DW loans, as borrowing from the Fed shifted gradually to this less expensive facility. The number

¹⁸ The \$109B loan was reported in OIG (2023) and Labonte (2024); see also “\$30 Billion First Republic Bank Rescue Plan Isn’t Quelling Investors’ Fears,” *Forbes*, March 17, 2023. To date, it is the largest overnight DW loan ever extended to a single institution. During its quarterly earning call on April 24, 2023, First Republic Bank disclosed it had \$63.5B in outstanding DW loans as of March 31, 2023.

of banks with DW loans, however, declined only marginally after May 31, 2023 and borrowing was again dominated by small domestic banks, similar to the pre-pandemic period.

To sum up, this brief analysis of DW borrowing reveals three points relevant to the study of stigma. First, except for the 2019 repo markets disruption, the DW was used extensively when financial markets were stressed. Hence, DW stigma, to the extent it prevailed, did not totally prevent the Fed from acting as a lender of last resort. Second, the pattern of DW activity in times of crisis is not homogenous: DW usage was nonexistent in September 2019 and relatively short lived during the COVID-19 pandemic. In contrast, the DW was unusually active in the months before, during, and after the March 2023 banking turmoil. Third, the number of DW borrowers since 2020 has been high by historical standards, consistent with a possible reduction in stigma.

4 Evidence of DW stigma

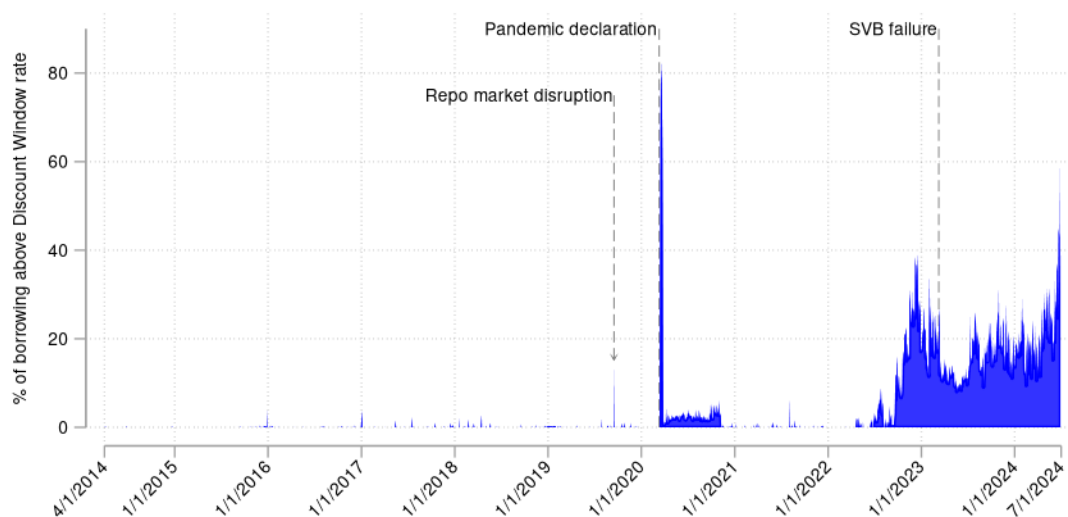
We now look for possible evidence of stigma using individual federal funds transactions in the FR2420 Report of Selected Money Market Rates.¹⁹ Figure 2 plots the proportion of federal funds volume purchased by domestic banks above the primary credit rate.²⁰ Tables 2 and 3 provide summary statistics for each bank type and time period.

With no more than 0.1% of federal funds purchased above the DW rate by any type of banks, we find little evidence of DW stigma before the COVID-19 pandemic—see Table 2. There is, however, a notable exception: On September 16 and 17, 2019, \$5B (or about 10%) of federal funds were purchased above the DW rate on average. As shown in Table 2, this increase was driven mostly by small domestic banks and FBOs which purchased 13% and 11% of their federal funds above the DW rate during those two days. The average

¹⁹ Under the FR2420 initiative launched in April 2014, banks must report daily information (amount, rate, maturity, counterparties) on each of their federal funds, Eurodollar and selected deposits transactions. For details on the FR2420 program see [here](#). Note that using transaction level data from the FR2420 report is a substantial improvement over earlier DW stigma studies that had to rely on proxies or aggregate data (see e.g. Furfine 2003 or Klee 2021).

²⁰ We exclude FBOs in Figure 2 because they mask the patterns pertaining to domestic banks. Figure 1 in Appendix plots the proportion of federal funds volume purchased above the primary credit rate by FBOs.

Figure 2: Evidence of Discount Window Stigma



Notes: The figure shows the proportion of federal funds volume purchased by domestic banks above the DW rate daily between April 1, 2014 and July 1, 2024. A positive value can be interpreted as evidence of DW stigma. The start of the last three major financial disruptions (the September 2019 repo markets disruption, the onset of the COVID-19 pandemic, and the March 2023 banking turmoil) are indicated by dotted lines.

“realized stigma spread” (the volume weighted spread above the DW rate actually paid to settle these transactions) was substantial (43bps), and nearly identical to the realized stigma spread measured during the GFC (44bps) by Armandier et al. (2015). In fact, during each of those two days \$3.6B (or almost three-quarter of the federal funds purchased above the DW rate) were settled at rates at least 25bps above the DW rate—see Table 3. Hence, we find compelling evidence that the absence of DW borrowing during the September 2019 repo markets disruption was due in part to DW stigma.

The onset of the pandemic saw a sharp rise in realized stigma. In particular, on March 20, 2020, domestic banks purchased almost all of their federal funds (83% or \$22B) above the DW rate. So, the DW policy changes the Fed implemented on March 15, and the G-SIBs public encouragements on March 17,²¹ did not immediately quell stigma concerns. Interestingly, G-SIBs did not purchase any federal funds above the DW rate on March 20, 2020. In fact, although G-SIBs purchased federal funds on more than two-thirds of the days in our sample, only a single G-SIB did so once above the DW rate (on March 16, 2020).

²¹ See the references in Footnotes 6 and 7.

Table 2: Federal Funds Borrowing above the Discount Window Rate

	Pre-pandemic		Pandemic declaration	Post pandemic declaration	Pre banking turmoil	2023 Banking turmoil	Post banking turmoil
	4/1/2014 - 3/10/2020	16 & 17 Sep. 2019	3/11/20 - 3/31/20	4/1/20 - 6/30/22	7/1/22 - 3/8/23	3/9/23 - 5/31/23	6/1/23 - 7/1/24
Daily share (%)							
All Domestic Banks	0.0	6.6	38.0	0.8	14.6	12.0	19.0
GSIBs	0.0	0.0	2.9	0.0	0.0	0.0	0.0
Large Domestic	0.1	2.2	35.6	0.2	9.7	2.2	4.8
Small Domestic	0.1	13.1	43.1	1.1	27.2	34.8	48.6
FBOs	0.0	10.8	23.9	0.0	0.1	0.1	0.1
All Banks	0.0	9.7	28.1	0.1	2.1	1.7	1.6
Daily amount (\$M)							
All Domestic Banks	7.6	1,267.5	9,907.3	50.0	1,955.6	1,605.4	1,470.7
GSIBs	0.0	0.0	12.4	0.0	0.0	0.0	0.0
Large Domestic	4.1	232.5	6,096.7	3.6	889.4	195.8	176.4
Small Domestic	3.6	1,035.0	3,798.2	46.4	1,066.2	1,409.6	1,294.4
FBOs	16.1	3,727.5	14,776.3	12.0	42.1	52.1	47.4
All Banks	23.8	4,995.0	24,683.6	62.0	1,997.7	1,657.5	1,518.1
Realized stigma spread (bps)							
All Domestic Banks	14.0	36.4	4.4	9.0	9.5	21.7	12.8
GSIBs	3.5	.	13.0
Large Domestic	9.5	29.2	3.9	36.5	8.7	21.5	7.7
Small Domestic	16.8	39.3	4.1	5.8	10.2	21.7	13.2
FBOs	29.8	57.7	12.0	37.1	37.1	24.3	20.9
All Banks	22.5	42.6	6.0	15.2	10.0	21.7	12.9

Notes: The table shows daily averages between April 1, 2014 and July 1, 2024 broken down by time periods. The top panel focuses on shares of federal funds purchased above the DW rate. The middle panel focuses on amounts of federal funds purchased above the DW rate. The bottom panel focuses on realized stigma spreads, the volume weighted spread above the DW rate actually paid to settle federal funds transactions above the DW rate. Each panel is broken down by bank type: Domestic banks—G-SIBs, other “Large Domestic” banks (with assets greater or equal to \$50B) and “Small Domestic” banks (with assets less than \$50B)—branches and agencies of FBOs, and all banks. In the first row, the last three major financial disruptions are indicated in bold.

Hence, G-SIBs essentially never show evidence of DW stigma—which of course does not imply they have no stigma.

Table 2 shows that the share of federal funds purchased above the DW rate during the pandemic declaration period (March 11 to March 31, 2020) was substantial: 28% or \$24.7B daily on average. Every type of banks experienced realized stigma at the onset of the pandemic. In particular, FBOs purchased almost a quarter of their federal funds (\$14.8B daily on average) above the DW rate. Although DW stigma was prevalent during that period, the average realized stigma spread was relatively small (6bps). Nevertheless, an average of \$12.1B of federal funds was purchased daily at least 10bps above the DW rate at the onset of the pandemic—see Table 3.

Figure 2 shows that evidence of DW stigma faded in the months that followed the pan-

Table 3: Daily Volume of Federal Funds Purchased at Different Stigma Spreads (in \$M)

	Pre-pandemic		Pandemic declaration	Post pandemic declaration	Pre banking turmoil	2023 Banking turmoil	Post banking turmoil
	4/1/2014 - 3/10/2020	16 & 17 Sep. 2019	3/11/20 - 3/31/20	4/1/20 - 6/30/22	7/1/22 - 3/8/23	3/9/23 - 5/31/23	6/1/23 - 7/1/24
> 0 bps spread	24.0	4,995.0	24,716.9	62.9	2,000.2	1,657.5	1,524.6
≥ 5 bps spread	16.7	3,630.0	13,451.1	27.1	1,492.2	1,633.7	1,230.0
≥ 10 bps spread	15.6	3,630.0	12,088.7	13.1	1,127.0	1,621.0	887.3
≥ 25 bps spread	11.3	3,630.0	6,614.7	7.4	27.8	39.7	14.1
≥ 50 bps spread	2.4	450.0	6.1	4.9	10.6	6.2	2.6

Notes: The table shows the average total amount (in \$M) of federal funds transactions settled daily above different stigma spreads (i.e., spreads above the DW rate) between April 1, 2014 and July 1, 2024 broken down by time periods. In the first row, the last three major financial disruptions are indicated in bold.

demic declaration, but did not return to its pre-pandemic levels until mid-November 2020. However, the average realized stigma spread was negligible during that period (2bps). Hence, the evidence of stigma post-pandemic declaration is weak.

Consistent evidence of stigma resurfaced months before the 2023 banking turmoil. Between July 1, 2022 and March 8, 2023, after the Fed’s tightening cycle started, and as DW borrowing was picking up (see Figure 1), an increasing share of federal funds was purchased by domestic banks above the DW rate (14.6% or \$2B daily on average).

Perhaps surprisingly, and certainly in contrast with what we observed at the onset of the pandemic, realized stigma did not surge after the failure of Silicon Valley Bank. In fact, the post-pandemic peak in realized stigma occurred before the banking turmoil period, on December 16, 2022, when domestic banks purchased 39% (or \$2.5B) of their federal funds above the DW rate.²² The average realized stigma spread, however, more than doubled from 10bps in the pre-banking turmoil period, to 22bps in the weeks that followed the failure of Silicon Valley Bank—see Table 2. Further, Table 3 shows that nearly all the federal funds purchased above the DW rate during the 2023 banking turmoil, occurred at rates at least 10bps above the DW rate. Finally, observe in Table 2 that FBOs purchased a small amount of federal funds above the DW rate during the March 2023 banking turmoil, in contrast with the previous two financial market disruptions when they had substantial realized stigma.

Realized stigma subsided after the failure of First Republic Bank on May 31, 2023 but

²² These patterns do not change when we exclude the banks that failed in the first half of 2023.

remained elevated until the end of our sample period. Similarly, the average realized stigma spread in Table 2 was relatively high (13bps) during the year that followed the 2023 banking turmoil. Notably, after June 1, 2023, small domestic banks purchased more than half of their federal funds (or \$1.3B daily on average) 13bps above the DW rate—see Table 2.

To sum up, we find clear evidence that the DW has remained stigmatized after the GFC, especially when financial markets experienced disruptions. Further, other than G-SIBs, every type of banks has shown consistent evidence of DW stigma at some point during our sample period. Small domestic banks, however, seem to be the most susceptible to realized stigma. Finally, the patterns surrounding the 2023 banking turmoil differ markedly from those observed around the repo market and pandemic disruptions. In 2019 and 2020, stigma evidence surged and receded rapidly. In contrast, realized stigma surfaced eight months prior to the 2023 banking turmoil and had not faded substantially a year later.

5 Additional Facts about Discount Window Stigma

Realized stigma has been prevalent since mid-2022. More than half (54%) of the banks that borrowed federal funds between July 1, 2022 and July 1, 2024 suffered from realized stigma at some point during that period. Among these banks, 20% settled more than 110 transactions each above the DW rate during those two years, while half conducted almost two-third of their federal funds transactions above the DW rate—see columns 1 and 2 in Table 4. Finally, 10% of the banks that experienced realized stigma after July 1, 2022 did so on at least nearly one-third of the days during that period—column 3 in Table 4. Hence, realized stigma was a regular occurrence for many banks

Realized stigma is common among troubled banks. The FDIC reports that 49 banks failed during our sample period. Hence, the failure rate among the banks in our sample is 0.7% between April 1, 2014 and July 1, 2024. However, conditional on having experienced realized stigma, the failure rate more than tripled to 2.4%. This is substantially higher than

Table 4: Frequency of Discount Window Stigma

Deciles	Number of transactions above DW rate	Share of transactions above DW rate (%)	Share of all days transacting above DW rate (%)
10	1.0	1.6	0.2
20	2.0	12.1	0.4
30	3.0	32.7	0.4
40	5.0	46.7	0.8
50	14.5	66.4	2.2
60	27.0	82.7	3.4
70	67.0	93.3	8.0
80	110.0	100.0	13.8
90	660.0	100.0	32.2

Notes: The table shows the distribution of different stigma variables among banks that have experienced stigma (i.e., purchased federal funds above the DW rate) during our sample period (April 1, 2014 to July 1, 2024). The first column focuses on the total number of transactions conducted by a bank above the DW rate. The second column focuses on the share of federal funds transactions a bank conducted above the DW rate. The last column focuses on the share of days between April 1, 2014 and July 1, 2024 during which a bank purchased federal funds above the DW rate.

the failure rate among DW borrowers (0.4%).²³ Similarly, Cipriani et al. (2024) report that 22 banks suffered a run during the March 2023 banking turmoil. Our data show that in the 90 days that preceded those runs, 9 of those banks experienced realized stigma, when only a single one borrowed at the DW.²⁴ Taken together, these results suggests that realized stigma may be a stronger signal of a bank’s financial weakness than DW borrowing, both in normal times and when financial markets are stressed.

Most realized stigma is not due to a lack of prepositioned DW collateral.

Before they failed in 2023, Silicon Valley Bank and Signature Bank were unable to meet their liquidity needs at the DW because they had limited collateral prepositioned at the facility (Barr 2023b, McLaughlin 2024a, Metrick 2024).²⁵ In such cases, banks may resort to purchasing federal funds above the DW rate. Our evidence of realized stigma could then simply reflect a lack operational readiness. We find little evidence to support this hypothesis. In particular, a bank that purchased federal funds above the DW rate on a given day during the 2023 banking turmoil period (March 9 to May 31, 2023) could have obtained on average 76% of those funds at the DW based on the amount of available collateral it had positioned

²³ Incidentally, no bank failed among the federal funds borrowers that never experienced realized stigma during our sample period.

²⁴ Put differently, the probability that a bank in our sample incurred a run in March 2023 was 0.31%. Conditional on having experienced stigma (respectively, borrowed at the DW) between July 1, 2022 and March 7, 2023, the run probability increases to 20% (respectively, 1.5%).

²⁵ See “How the Last-Ditch Effort to Save Silicon Valley Bank Failed,” Wall Street Journal, March 22, 2023.

at the DW at the beginning of that day.²⁶ Similarly, among the banks for which we have collateral information, 98% (respectively, 83%) of the federal funds they purchased above the DW rate during the repo market disruption on September 16-17, 2019 (respectively, at the onset of the COVID-19 pandemic on March 11-27, 2020) could have been obtained at the DW. Hence, it appears that in these times of liquidity stains, banks deliberately chose to pay a premium to borrow on the federal funds market instead of the DW.

The cost of realized stigma. Following Armantier et al. (2015), we measure the opportunity cost of DW stigma by calculating the interest payments banks could have saved by going to the DW instead of borrowing federal funds at higher rates. Over the 10 years covered by our sample, the total cost of DW stigma was \$1.6B. Perhaps surprisingly, more than a quarter of that total cost (nearly \$0.5B) was incurred by small domestic banks in the year that followed the failure of First Republic Bank on May 31, 2023, when market liquidity strains seemingly eased after the conclusion of the 2023 banking turmoil. When expressed in relative terms, we find that stigma banks would have saved 10.1% in interest payments if they had borrowed at the DW instead of purchasing federal funds above the DW rate. This relative cost of DW stigma is in fact higher than the 7.5% measured by Armantier et al. (2015) during the GFC. Hence, the cost of DW stigma is substantial, especially for small domestic banks.

6 The Determinants of Realized Stigma

We first explore whether realized stigma is persistent and the extent to which it is related to a bank's past DW activity. We report in column 1 of Table 5 the outcome of a panel regression at the bank-day level in which we control for bank and time fixed effects. The results reveal

²⁶ For each day between March 9 and May 31, 2023, we observe the lendable value of the collateral (i.e., the value the Fed assigns to the collateral minus the relevant haircut) pledged by banks at the DW. The lendable value represents how much a bank can borrow at the DW on that day. For the repo market disruption and pandemic period, we only observe the lendable value for a subset of banks. These banks accounted for more than half of the federal funds purchased above the DW rate during those two financial disruptions.

a highly statistically and economically significant persistence in realized stigma. All else equal, banks that borrow federal funds above the DW rate are about 40% more likely to do so again the following month. Consistent with DW stigma, we also find that banks that do not visit the DW are significantly more likely to experience subsequently realized stigma.

These results are confirmed in column 2 when we control for the balance sheet characteristics of banks that file Call Reports.²⁷ As explained in Appendix A, the specification is based on Ennis and Klee (2023), and we control for a bank’s characteristics in the previous quarter to avoid possible endogeneity issues. The results reveal additional determinants of stigma. We find that a bank is significantly more likely to experience realized stigma after increasing in size, after becoming financially weaker (i.e., when its ratio of U.S. Treasuries decreases, or when its ratio of hold to maturity assets losses increases), or when its share of alternative funding sources declines (i.e., its FHLB borrowing as a percent of liabilities becomes lower). To the best of our knowledge, these results are new to the literature.

Columns 3 and 4 focus on the post July 2022 period, when realized stigma and DW borrowing became more prevalent. The results in column 3 confirm the persistence of realized stigma and its negative association with past DW activity. Column 4 suggests that some of the determinants of stigma have evolved during the period surrounding the 2023 banking turmoil. In particular, banks that experience a drop in cash deposit and an increase in uninsured deposits became more likely to experience realized stigma between July 1, 2022 and July 1, 2024. This result is consistent with the fact that uninsured deposits became an important determinant of banks’ fragility during the Fed’s tightening cycle.

These results appear to be robust. In particular, we find that they hold when we restrict the sample to banks that purchased federal funds during our sample period and when we do not include a bank fixed effect (see Tables 1 and 2 in Appendix).

²⁷ As part of the regulatory process, domestic commercial banks file the Consolidated Reports of Condition and Income (the so-called Call Reports) to the FDIC at the end of each quarter.

Table 5: Stigma Determinants

	Post 4/1/2014		Post 7/1/2022	
	(1)	(2)	(3)	(4)
Accessed DW in previous month	-0.208*** (0.063)	-0.297*** (0.087)	-0.192** (0.096)	-0.407*** (0.130)
Purchased FF in previous month	2.278*** (0.611)	2.676*** (0.927)	5.045*** (1.703)	7.303*** (2.217)
Had realized stigma in previous month	37.405*** (4.136)	43.675*** (5.843)	28.054*** (4.068)	32.985*** (4.422)
Size				
Log(Assets)		0.205*** (0.077)		-0.124 (0.262)
Assets Distribution				
Cash (% assets)		-0.001 (0.001)		-0.025** (0.010)
Commercial Real Estate Loans (% assets)		-0.003 (0.003)		0.005 (0.011)
Residential Real Estate Loans (% assets)		0.002 (0.004)		0.010 (0.014)
Commercial & Industrial loans (% assets)		-0.005 (0.005)		-0.010 (0.031)
U.S. Treasury (% assets)		-0.010*** (0.003)		-0.009 (0.009)
Liabilities Distribution				
Uninsured deposits (% liabilities)		-0.002 (0.002)		0.033** (0.014)
FHLB borrowing (% liabilities)		-0.013*** (0.005)		-0.005 (0.014)
Repo sold (% liabilities)		-0.012 (0.007)		0.057 (0.044)
Capital/other				
Hold to Maturity losses (% assets)		0.111** (0.046)		-0.128 (0.096)
Tier-1 capital ratio		0.000 (0.000)		0.000** (0.000)
Unused commitments (% assets)		0.000 (0.000)		-0.000 (0.000)
Constant	0.065*** (0.010)	-2.339** (0.960)	0.230*** (0.027)	1.103 (3.410)
Observations	656,046	423,353	110,668	61,100
Adjusted R^2	0.293	0.320	0.592	0.622
Bank FEs	✓	✓	✓	✓
Day FEs	✓	✓	✓	✓

Notes: The panel data model is estimated by OLS at the bank-day level. The dependent variable is a dummy variable equal to 100 if bank i borrows federal funds above the discount rate on day t . The sample period is April 1, 2014 to July 1, 2024 in columns (1) and (2), and July 1, 2022 to July 1, 2024 in columns (3) and (4). Columns (1) and (3) use all banks in our sample, while columns (2) and (4) use only banks that file Call Reports. For a definition of the variables see Appendix A. To avoid possible endogeneity issues, Call Report variables are measured in the calendar quarter preceding day t . Standard errors (in parentheses) are robust and clustered at the bank level. The superscripts *, ** and *** indicate an estimated parameter significant at the 10%, 5%, and 1% level, respectively.

7 Evidence of DW Stigma in other Funding Markets

As explained earlier, we chose to focus on the federal funds market to measure realized stigma for three reasons. First, absent stigma, the federal funds market is a close substitute to the DW. Second, it is the main funding market for which we have transaction level data, including rates and volumes. Third, most of the empirical literature on DW stigma relied on similar federal funds data (see e.g. Furfine 2001, 2003, or Klee 2021). Nevertheless, one may wonder whether evidence of stigma can be found in other funding markets.

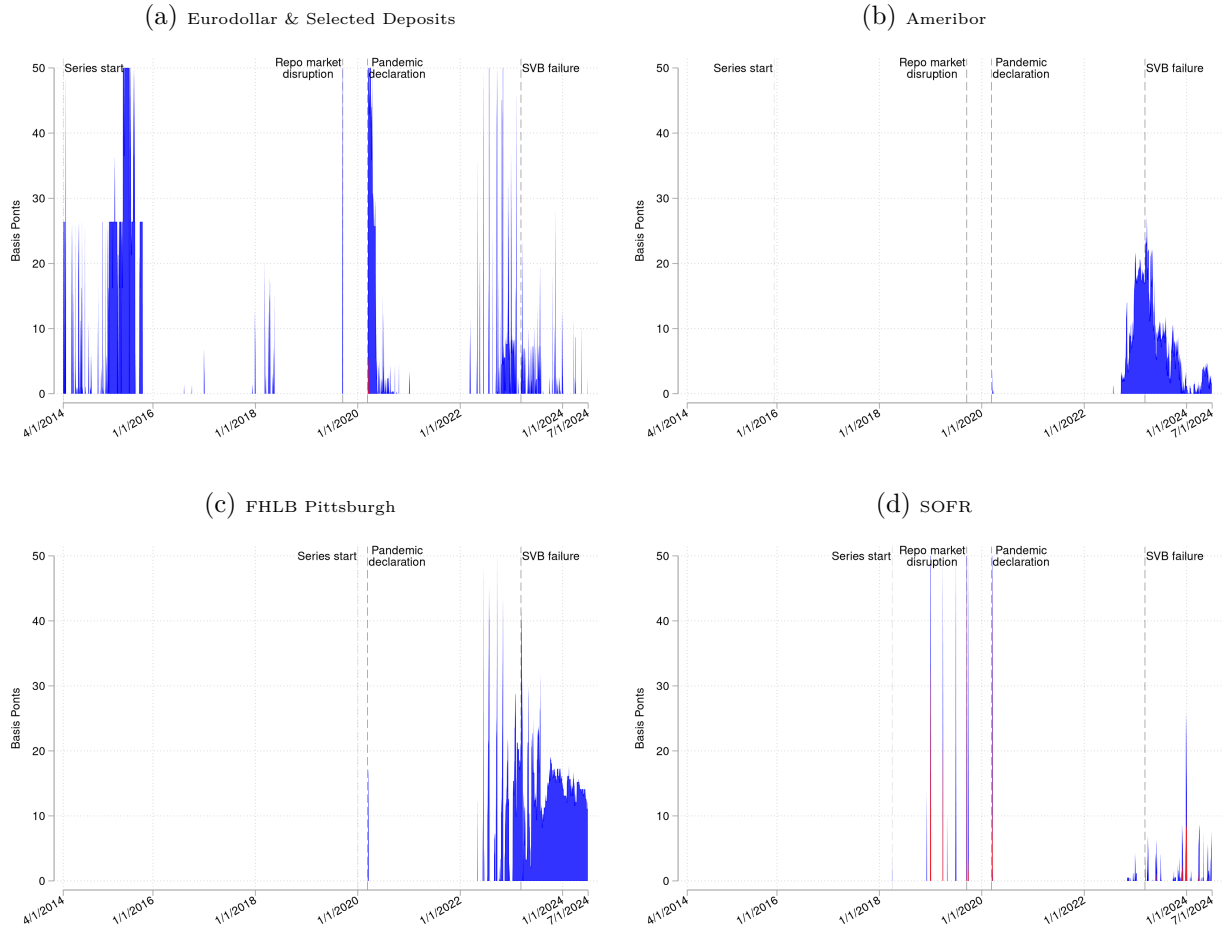
We plot in Figure 3 daily DW stigma spreads (the difference between a market rate and the DW rate when the former exceeds the latter) for various overnight funding markets. The top panels focus on unsecured lending, similar to federal funds. In the top-left panel, the stigma spread is calculated using the sum of Eurodollar and selected deposits transactions, and in the top-right panel, it is calculated with the American Interbank Offered Rate (Ameribor).²⁸ The bottom panels focus on secured lending markets. In the bottom-left panel, the stigma spread is calculated with the posted rate at FHLB Pittsburgh, and in the bottom-right panel, it is calculated with the Secured Overnight Financing Rate (SOFR).²⁹

Three points are worth noting in Figure 3. First, there is evidence of DW stigma in every funding market. Second, consistent with intuition, realized stigma is slightly more frequent in unsecured markets (top panels) than in secured markets (bottom panels), since secured lending typically commands lower rates. Third, consistent with the results presented in Section 4, there is clear evidence of DW stigma around the last three financial market disruptions. In particular, Figure 3 confirms that realized stigma emerged months before

²⁸ Eurodollars and selected deposits are unsecured U.S. dollar deposits. Eurodollars are held at banks offices outside of the U.S., while selected deposits are booked at bank offices in the U.S. (see Cipriani and Gouny 2015, or Afonso et al. 2023). Launched in 2015 as a substitute to LIBOR, Ameribor is the transaction-volume-weighted average interest rate for overnight unsecured loans in the American Financial Exchange (AFX) market and captures the short-term funding rates of smaller and regional banks.

²⁹ FHLB Pittsburgh is the only bank in the FHLB system that provides a time series of its overnight lending rate. Because of the FHLB unique funding and membership system, its rate must be adjusted to make it comparable to other funding markets. To do so, we follow the adjustment procedure of Cooperman et al. (2024). SOFR is a broad measure of the cost of borrowing against Treasury securities published by the Federal Reserve Bank of New York (see <https://www.newyorkfed.org/markets/reference-rates/sofr>).

Figure 3: Evidence of Stigma in other Overnight Funding Markets



Notes: The figure shows the daily stigma spread (the difference between a market rate and the DW rate when the former exceeds the latter) in different overnight funding markets between April 1, 2014 and July 1, 2024. In panel (a) the stigma spread is calculated with the volume-weighted 75th (red area) and 99th (blue area) percentiles of Eurodollar and Selected Deposit transactions reported in FR2420. In panel (b) the stigma spread is calculated with the American Interbank Offered Rate (Ameribor), the volume-weighted average interest rate for overnight unsecured loans in the American Financial Exchange (AFX) market. In panel (c) the stigma spread is calculated with the dividend-adjusted rate on overnight advances at FHLB Pittsburgh (see Cooperman et al. 2024 for details on the dividend adjustment procedure). In panel (d) the stigma spread is calculated with the volume-weighted 75th (red area) and 99th (blue area) percentiles of transactions used in calculating the Secured Overnight Financing Rate (SOFR). In each panel, a positive value can be interpreted as evidence of DW stigma. The start of the data series and the start of the last three major financial disruptions (the September 2019 repo markets disruption, the onset of the COVID-19 pandemic, and the March 2023 banking turmoil) are indicated by dotted lines. In all panels the stigma spread is capped at 50bps.

the 2023 banking turmoil, and lasted long after that crisis ended.³⁰

8 Conclusion

Using transaction level data from the federal funds market, we find evidence of DW stigma after the GFC, especially around the last three major disruptions to the financial system, the September 2019 repo markets disruption, the onset of the COVID-19 pandemic in 2020 and the March 2023 banking turmoil. While stigma evidence surged and receded rapidly during the first two disruptions, realized stigma surfaced eight months prior to the 2023 banking turmoil and had not faded substantially a year later. We show that these results are not due to banks' lack of operational readiness to access the DW, and that similar evidence of stigma is visible in other funding markets. While every type of banks experienced stigma between 2014 and 2024, realized stigma is more prevalent and costly in small domestic banks. In particular, small domestic banks (with less than \$50B in assets) have purchased more than half of their federal funds (\$1.3B daily on average) above the DW rate since June 2023, costing them nearly \$0.5B in excess interest payments. Finally, we find stigma to be persistent and driven by a bank's financial weakness. Importantly, our results suggest that experiencing stigma is more informative about a bank's failure risk than DW borrowing, both in normal times and when financial markets are stressed. We conclude with some observations about the implications of our results and the provision of emergency liquidity.

Recent evidence of DW stigma is puzzling. As discussed in Armantier et al (2015), evidence of stigma should emerge only when financial markets are stressed. In normal times, the DW generally provides an effective ceiling on overnight rates, and banks should obtain better terms from private counterparties. Indeed, between 2014 and 2022 we only observe stigma for brief periods of time around the September 2019 repo markets disruption and at the onset of the COVID-19 pandemic. In this context, finding persistent evidence of

³⁰ As shown in Figure 2 in Appendix, these results are confirmed when we consider term lending.

stigma a year after the conclusion of the 2023 banking turmoil is not only unusual, but it is also perplexing for at least two reasons. First, regulators took several steps to encourage DW borrowing after the 2023 banking turmoil, including a July 2023 interagency updated guidance on liquidity management (see [here](#)). Second, stigma evidence is highly concentrated among small domestic banks, but perhaps paradoxically, the DW was used actively and predominantly by small domestic banks during and after the 2023 banking turmoil. We leave it to future research to understand why many small domestic banks started borrowing at or above the DW rate to meet their liquidity needs after the 2023 banking turmoil.

Our results are informative for theory. A necessary condition for stigma to emerge in equilibrium is that DW borrowing is a signal of financial weakness (see e.g. Ennis and Weinberg 2013, or Che et al. 2024). That is, if a bank is detected at the DW, then it should be weaker than an otherwise equivalent bank that did not borrow at the DW. Our results suggest the opposite. In particular, we find that DW borrowing is less informative about a bank failure risk than experiencing realized stigma. Further, during the 10 years covered by our sample, the probability of failure among DW borrowers was in fact lower than the (unconditional) failure probability among all banks. This result is inconsistent with stigma as an equilibrium in current theory models. In fact, if taken at face value, our results suggest the opposite of stigma should occur: Instead of being stigmatized, a DW borrower should be given advantageous terms because it is less likely to fail than the average bank. More generally, our results suggest that DW stigma may not be an equilibrium outcome in practice, or that other factors (e.g., psychological, historical inertia) not currently accounted in the theory models may be at play.

Our results contribute to the current debate on how to reform the DW. Recognizing that banks may need ready access to liquidity to prevent modern runs that can unfold in a matter of hours, the Fed has decided to promote regular access to the DW “in good times and bad.” Our results suggest that the persistent stigma that is still associated with DW operations may present a challenge in achieving this objective. Over the past 25 years,

the Fed’s has introduced several reforms, including recently a suspension of the penalty rate and public encouragements, which have failed to eliminate stigma fully (McLaughlin 2024b). Which additional measures could be implemented and whether they would be successful seem unclear. In fact, results from Armantier and Holt (2024) indicate that it may be difficult to redress a DW once it has become stigmatized. Instead, the Fed may consider using new or existing facilities designed to be stigma-proof. One such example is the Standing Repo Facility introduced by the Fed in 2021, where primary dealers and banks can obtain overnight liquidity. This facility was designed specifically to mitigate stigma concerns. In particular, it accepts only high quality collateral (Treasuries and agency securities) and its rate is determined competitively by auction (Andolfatto and Ihrig 2019). Although it has been little used, interest in the facility as a possible complement to the DW has grown in the aftermath of the 2023 banking turmoil.³¹

Emergency lending, resolution, and stigma. Standard theory, including Bagehot’s famous dictum, stipulates that emergency lending should be extended only to solvent banks in order to prevent stigma. Orderly resolution, however, often requires backstop funding for failing banks. To address this dilemma, the Fed designed a tiered facility in 2003 with primary credit available to adequately capitalized banks, and secondary credit aimed for the recovery or resolution of weaker banks (Madigan and Nelson 2002). Following the 2023 banking turmoil, several observers (e.g., Barr 2023b, Baer et al. 2023) pointed to the relatively orderly resolution of First Republic Bank after it received large amounts of primary credit, and contrasted it with the sudden demise of Silicon Valley Bank and Signature Bank which did not access the DW and required emergency guarantees of uninsured deposits. While some concluded from these events that the DW should play a more explicit role in the resolution process (G30), other raised concerns about the precedent set with First Republic Bank, and how lending primary credit to a failing bank could further stigmatize the

³¹ See e.g., “Banks warily warm up to Fed repo backstop, ” Reuters, February 27, 2024, or “The Fed tells banks not to be shy about asking it for money,” Bloomberg, January 26, 2024.

DW (Labonte 2024). To eliminate this risk and prevent stigma by association, McLaughlin (2024b,c) argues that the emergency lending facility for adequately capitalized banks should be explicitly separated from the backstop liquidity facility for banks in resolution, similar to what many other countries do. For instance, Ennis et al. (2022) discuss how the Standing Repo Facility could be used in the resolution of large financial institutions.

References

- Ackon F. and H. Ennis (2017) “The Fed’s Discount Window: An overview of recent data,” *Federal Reserve Bank of Richmond Economic Quarterly*, 103, 37–79.
- Afonso G., Cipriani M., Copeland A., Kovner A., La Spada G. and A. Martin (2021) “The market events of mid-September 2019,” *Economic Policy Review*, 27(2).
- Afonso G., Cisternas G., Gowen B., Miu J. and J. Younger (2023) “Who’s borrowing and lending in the Fed Funds market today?” Liberty Street Economics blog, available [here](#).
- Anbil S. (2018) “Managing stigma during a financial crisis,” *Journal of Financial Economics*, 130, 166-181.
- Anbil S. and A. Vossmeier (2019) “The quality of banks at stigmatized lending facilities,” *American Economic Association: Papers and Proceedings*, 109, 506-10.
- Andolfatto D. and J. Ihrig (2019) “Why the Fed should create a standing repo facility,” Saint Louis Fed, On the Economy.
- Armantier O., Cipriani M and A. Sarkar (2024) “Banks’ borrowing from the Discount Window and the BTFP,” Working paper, Federal Reserve Bank of New York.
- Armantier O., Ghysels E., Sarkar A. and J. Shrader (2015) “Discount Window stigma during the 2007-2008 financial crisis,” *Journal of Financial Economics*, 118(2), 317-335.
- Armantier O. and C. Holt (2020) “Overcoming Discount Window stigma: An experimental investigation,” *The Review of Financial Studies*, 33(12), 5630–5659.
- Armantier O. and C. Holt (2024) “Can Discount Window stigma be cured? An experimental investigation,” Working paper, Federal Reserve Bank of New York.
- Ashcraft A., Bech M. and S. Frame (2010) “The Federal Home Loan Bank system: The Lender of Next-to-Last Resort?” *Journal of Money, Credit, and Banking*, 42(4), 551-583.
- Baer G., Nelson B., Parkinson P. and B. Waxman (2023) “Improving the government’s lender of last resort function: Lessons from SVB and Signature Bank,” mimeo Bank Policy Institute, available [here](#).

- Barr S., Federal Reserve Vice Chair (2023a) “The importance of effective liquidity risk management,” remarks delivered at the European Central Bank Forum on Banking Supervision, December 1, 2023, available [here](#).
- Barr S., Federal Reserve Vice Chair (2023b) “Review of the Federal Reserve’s Supervision and Regulation of Silicon Valley Bank,” available [here](#).
- Bernanke B. (2018) “The real effects of disrupted credit: Evidence from the Global Financial Crisis,” *Brookings Papers on Economic Activity*, 49(2), 251--342.
- Beyhaghi M. and J. Gerlach (2024) “Discount Window borrowing 2003-2019,” SSRN working paper 4507612.
- Carlson M. and J. Rose (2017) “Stigma and the Discount Window,” *FEDS Notes*.
- Che Y-K., Choe C. and K. Rhee (2024) “Bailout stigma,” *Journal of Finance*, 79(5), 2993–3039.
- Cipriani M., Eisenbach T. and A. Kovner (2024) “Tracing bank runs in real time,” Federal Reserve Bank of New York Staff Report No. 1104, available [here](#).
- Cipriani M. and J. Gouny (2015) “The Eurodollar market in the United States,” Liberty Street Economics blog, available [here](#).
- Cooperman H., Duffie D., Luck S., Wang Z. and Y. Yang (2024) “Bank funding risk, reference rates, and credit supply,” NBER working paper 30907, available [here](#).
- Ennis H. (2019) “Interventions in markets with adverse selection: Implications for discount window stigma,” *Journal of Monetary Economics*, 51, 1737-1764.
- Ennis H. and R. Haltom (2010) “Is there stigma associated with Discount Window borrowing?” Federal Reserve Bank of Richmond Economic Brief, 10-05.
- Ennis H., Jarque A. and H. Malek (2022) “Bank Resolution and the Fed’s New Standing Repo Facility,” Federal Reserve Bank of Richmond Economic Brief 22-06.
- Ennis H. and E. Klee (2023) “The Fed’s Discount Window in ‘normal’ times,” Federal Reserve Bank of Richmond Working Paper No. 21-01.
- Ennis H. and D. Price (2020) “Understanding Discount Window stigma,” Federal Reserve Bank of Richmond Economic Brief 20-04.
- Ennis H. and J. Weinberg (2013) “Over-the-counter loans, adverse selection, and stigma in the interbank market,” *Review of Economic Dynamics*, 16(4), 601-616.
- Fischer S. (2016), “The lender of last resort Function in the United States,” speech given at “The lender of last resort: An International Perspective,” available [here](#).
- Furfine C. (2001) “The reluctance to borrow from the Fed,” *Economics Letters*, 72(2), 209-213.
- Furfine C. (2003) “Standing facilities and interbank borrowing: evidence from the Federal Reserve’s new Discount Window,” *International Finance*, 6(3), 329–348.
- FHLB (2024) “FHLBank system at 100, focussing on the future,” available [here](#).

- G30 (2024) “Bank failures and contagion: Lender of last resort, liquidity and risk management,” available [here](#).
- Gorton G. and G. Ordóñez (2020) “Fighting crises with secrecy,” *American Economic Journal: Macroeconomics*, 12(4), 218-245.
- Hsu M., Acting Comptroller of the currency (2024) “Building better brakes for a faster financial world,” Remarks delivered at the Columbia Law School on January 18, 2024, available [here](#).
- Hu Y. and H. Zhang (2023) “Overcoming borrowing stigma: The design of lending-of-last-resort policies,” *Journal of Financial and Quantitative Analysis*, forthcoming.
- Klee E. (2021) “The first line of defense: The Discount Window during the early stages of the financial crisis,” *International Journal of Central Banking*, 17(1), 143–190.
- La’O J. (2014) “Predatory trading, stigma and the Fed’s Term Auction Facility,” *Journal of Monetary Economics*, 65, 57-75.
- Labonte M. (2024) “Federal Reserve’s Discount Window: Policy issues,” Congressional Research Service Report, available [here](#).
- Lee H. and A. Sarkar (2023) “The recent rise in Discount Window borrowing,” Liberty Street Economics blog, available [here](#).
- Logan L., President of the Federal Reserve Bank of Dallas, (2023) “Remarks on liquidity provision and on the economic outlook and monetary policy,” remarks delivered at the Texas Banker Association on May 18, 2023, available [here](#).
- McLaughlin S. (2024a) “Lessons from the discount window from the March 2023 bank failures,” *Journal of Financial Crises*, 6(2), 72–84.
- McLaughlin S. (2024b) “Discount Window stigma: What’s design got to do with it,” mimeo Yale University, Program on Financial Stability available [here](#).
- McLaughlin S. (2024c) “Eliminating Discount Window stigma: What can we learn from abroad?” mimeo Yale University, Program on Financial Stability available [here](#).
- Madigan B. and W. Nelson (2002) “Proposed revision to the Federal Reserve’s Discount Window lending program,” *Federal Reserve Bulletin*, 313-319.
- Mester L., President of the Federal Reserve Bank of Cleveland, (2024) “Building financial system resilience,” keynote address delivered at Columbia University/Bank Policy Institute on February 29, 2024, available [here](#).
- Metrick A. (2024) “The failure of Silicon Valley Bank and the Panic of 2023,” *Journal of Economic Perspectives*, 38(1), 133-152.
- Nelson B. (2024) “Lender of last resort: Issues with the Fed Discount Window and emergency lending,” testimony before the U.S. House Financial Services Committee, available [here](#).

- OIG (2023) “Material loss review of First Republic Bank,” Office of Inspector General Report No. EVAL-24-03, available [here](#).
- Peristiani S. (1998) “The growing reluctance to borrow at the Discount Window: An empirical investigation,” *Review of Economics and Statistics*, 80(4), 611-620.
- Plassman L. and F. Rosa (2023) “Statistics on collateral pledged to the Discount Window,” Bank Policy Institute Blog, available [here](#).
- Quarles R., Federal Reserve Vice Chair, (2020) “The economic outlook, Monetary policy and the demand for reserves,” remarks delivered the Money Marketeters of New York University on February 6, 2020, available [here](#).
- Rose J. (2023) “Understanding the speed and size of bank runs in historical comparison,” *Economic Synopses*, 12.
- Scott H. (2024) “Lender of last resort: Issues with the Fed Discount Window and emergency lending,” testimony before the U.S. House Financial Services Committee, available [here](#).
- Vossmeyer A. (2019) “Analysis of stigma and bank credit provision,” *Journal of Money, Credit and Banking*, 51(1), 163-194.

Appendix A: Data Description

Discount Window data. Our DW data include every primary credit loan extended by all Federal Reserve banks between April 1, 2014 and July 1, 2024. We observe the date a loan was taken, the prevailing rate during the term of the loan,³² and the borrower’s repayment schedule. We exclude from the analysis other types of DW loans (from the secondary and seasonal programs), as well as loans extended by the Fed through other backstop facilities such as the Standing Repo Facility launched in July 2021, or the Bank Term Funding Program (BTFP) operated between March 11, 2023 and March 11, 2024.³³

To calculate the total value of loans a bank has outstanding at the DW on a given day, we consolidate all individual loans, both opened and repaid, by the bank up to that day. In doing so, we exclude “test loans,” that is, small loans banks take to ensure operational readiness. While there is no way to assess which loans are test loans, we follow Ennis and Klee (2023) and exclude loans below \$1M. During our sample period, these loans represented 52.5% of all DW transactions, but only 0.1% of volume.³⁴ We also exclude from the analysis DW loans associated with bridge banks, that is, banks placed under the receivership of the Federal Deposit Insurance Corporation (FDIC) after they failed (see [here](#) for details).

FR2420 data. In April 2014, the Fed launched the FR2420 initiative under which transaction level data (amount, rate, maturity, counterparties) are collected for federal funds, Eurodollar and selected deposits (certificates of deposits, time deposits, and selected deposits). While small banks are not required to report, the FR2420 panel covers most of the banking sector.³⁵ Note that using transaction level data from the FR2420 program to

³² Since 2008, the primary credit rate has been set equal to the top of the Federal Open Market Committee (FOMC) target range plus a penalty spread ranging from 50bps in 2008 to 0bps since March 2020. Whenever the FOMC modifies the range or the spread, the DW rate is adjusted both for new and for existing loans.

³³ See Armantier et al. (2024) for a joint analysis of borrowing from the DW and BTFP.

³⁴ The patterns of DW borrowing we document in Section 3 are qualitatively unchanged when we use different thresholds for test loans (e.g., \$100k). Further, note that our analysis of DW stigma in Section 4 does not use data on outstanding DW borrowing and is therefore unaffected by the threshold used for test loans.

³⁵ Banks with less than \$18B in assets and less than \$200M of federal funds purchased on at least two days in the past quarter are exempt from reporting. For details on the FR2420 program see [here](#).

identify stigma is a substantial improvements over earlier studies that had to rely on proxies or aggregate data (see e.g. Furfine 2003 or Klee 2021).

Call Report data. As part of the regulatory process, domestic commercial banks file the Consolidated Reports of Condition and Income (the so-called Call Reports) to the FDIC at the end of each quarter. The Call Reports contain bank’s balance sheet data, from which we observe detail information on a bank’s end of the quarter assets and liabilities. Our regression analysis uses the following variables:

- “Log(Assets)” is the log of a bank’s reported assets.
- “Cash (% assets)” is the sum of the banks’s interest-bearing balances and non-interest-bearing balances, expressed as a percentage of assets.
- “Commercial Real Estate loans (% assets)” is the value of the bank’s commercial real estate loans expressed as a percentage of assets.
- “Residential Real Estate Loans (% assets)” is the value of the bank’s 1-4 family residential real estate (i.e., with fewer than five individual dwelling units) loans expressed as a percentage of assets.
- “Commercial & Industrial loans (% assets)” is the value of the bank’s commercial and industrial loans expressed as a percentage of assets.
- “U.S. Treasuries (% of assets)” is the value of the U.S. Treasury holdings on the bank’s balance sheet expressed as a percentage of assets
- “Uninsured deposits (% liabilities)” is sum of all uninsured deposits expressed as a percentage of the bank’s liabilities.
- “FHLB borrowing (% liabilities)” is the sum of all Federal Home Loan Bank advances expressed as a percentage of the bank’s liabilities.

- “Repo sold (% liabilities)” is the dollar value of all securities sold under a repurchase agreement expressed as a percentage of the bank’s liabilities.
- “Hold to Maturity losses (% assets)” is the amortized cost of of all held-to-maturity securities minus the fair value of all held-to-maturity securities, expressed as a percentage of assets.
- “Tier-1 capital ratio” is the ratio of tier-1 risk-based capital (Basel III) against the total risk-weighted assets, expressed in percentage terms.
- “Unused commitments (% assets)” is the undrawn portions of credit lines extended to consumers and firms, expressed as a percentage of assets. These off-balance sheet items include revolving open-end loans secured by 1-4 family residential properties (i.e., with fewer than five individual dwelling units); unused credit card lines; commitments to fund commercial real estate, construction, and land development loans; and unused securities underwriting commitments.

For descriptive statistics of the variables used in the regressions see Tables 1 and 2.

Table 1: Descriptive Statistics (April 1, 2014 to July 1, 2024)

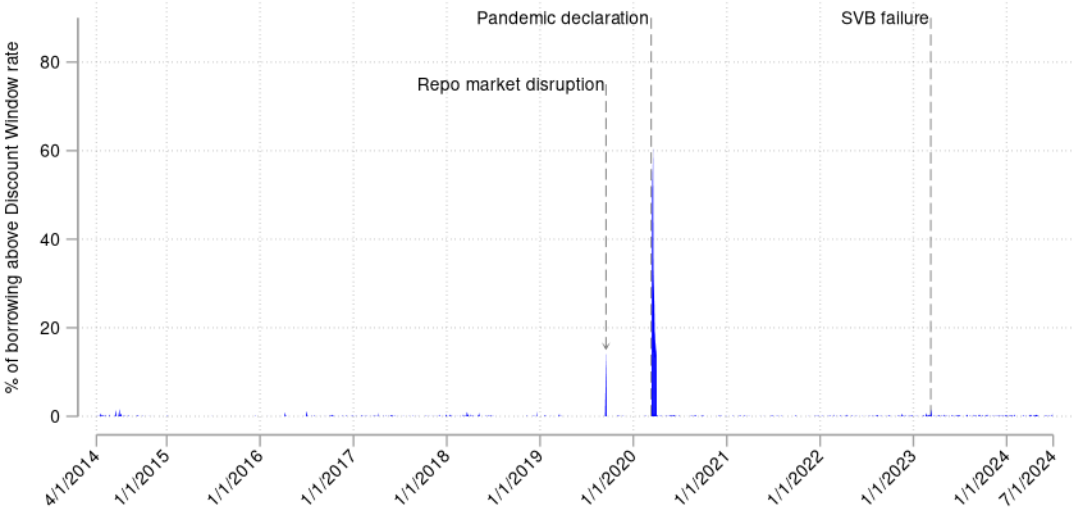
	Post Apr. 2014				
	mean	sd	p25	p50	p75
Had realized stigma in previous month	0.00	0.04	0.00	0.00	0.00
Accessed DW in previous month	0.03	0.16	0.00	0.00	0.00
Purchased FF in previous month	0.01	0.11	0.00	0.00	0.00
Log(Assets)	12.56	1.46	11.63	12.37	13.24
Cash % assets	10.14	10.10	3.64	7.04	13.03
CRE Loans % assets	22.98	15.60	9.85	21.32	33.55
RRE Loans % assets	15.88	10.93	7.91	14.18	21.68
C&I loans % assets	9.07	7.20	4.38	7.38	11.67
UST % assets	1.45	4.30	0.00	0.00	0.70
Unins. deposits % liabilities	21.57	12.88	12.66	19.18	27.83
FHLB borrowing % liabilities	2.77	4.43	0.00	0.27	4.19
Repo sold % liabilities	0.64	1.96	0.00	0.00	0.00
HTM losses % assets	0.03	0.41	0.00	0.00	0.00
Tier-1 capital ratio	22.63	415.49	12.34	14.63	18.54
Unused commitments % assets	18.68	315.39	5.81	9.88	14.84

Table 2: Descriptive Statistics (July 1, 2022 to July 1, 2024)

	Post Jul. 2022				
	mean	sd	p25	p50	p75
Had realized stigma in previous month	0.00	0.06	0.00	0.00	0.00
Accessed DW in previous month	0.05	0.22	0.00	0.00	0.00
Purchased FF in previous month	0.01	0.12	0.00	0.00	0.00
Log(Assets)	12.91	1.51	11.93	12.72	13.62
Cash % assets	9.08	10.03	3.01	5.84	11.33
CRE Loans % assets	24.18	16.13	10.63	22.79	35.25
RRE Loans % assets	15.62	11.22	7.35	13.69	21.63
C&I loans % assets	8.35	6.93	3.97	6.66	10.67
UST % assets	3.60	6.32	0.00	0.97	4.54
Unins. deposits % liabilities	25.79	12.89	16.95	23.95	32.43
FHLB borrowing % liabilities	2.73	4.35	0.00	0.19	4.17
Repo sold % liabilities	0.47	1.66	0.00	0.00	0.00
HTM losses % assets	0.27	0.86	0.00	0.00	0.04
Tier-1 capital ratio	17.90	45.73	12.03	13.96	17.67
Unused commitments % assets	22.59	413.14	6.50	10.89	16.35

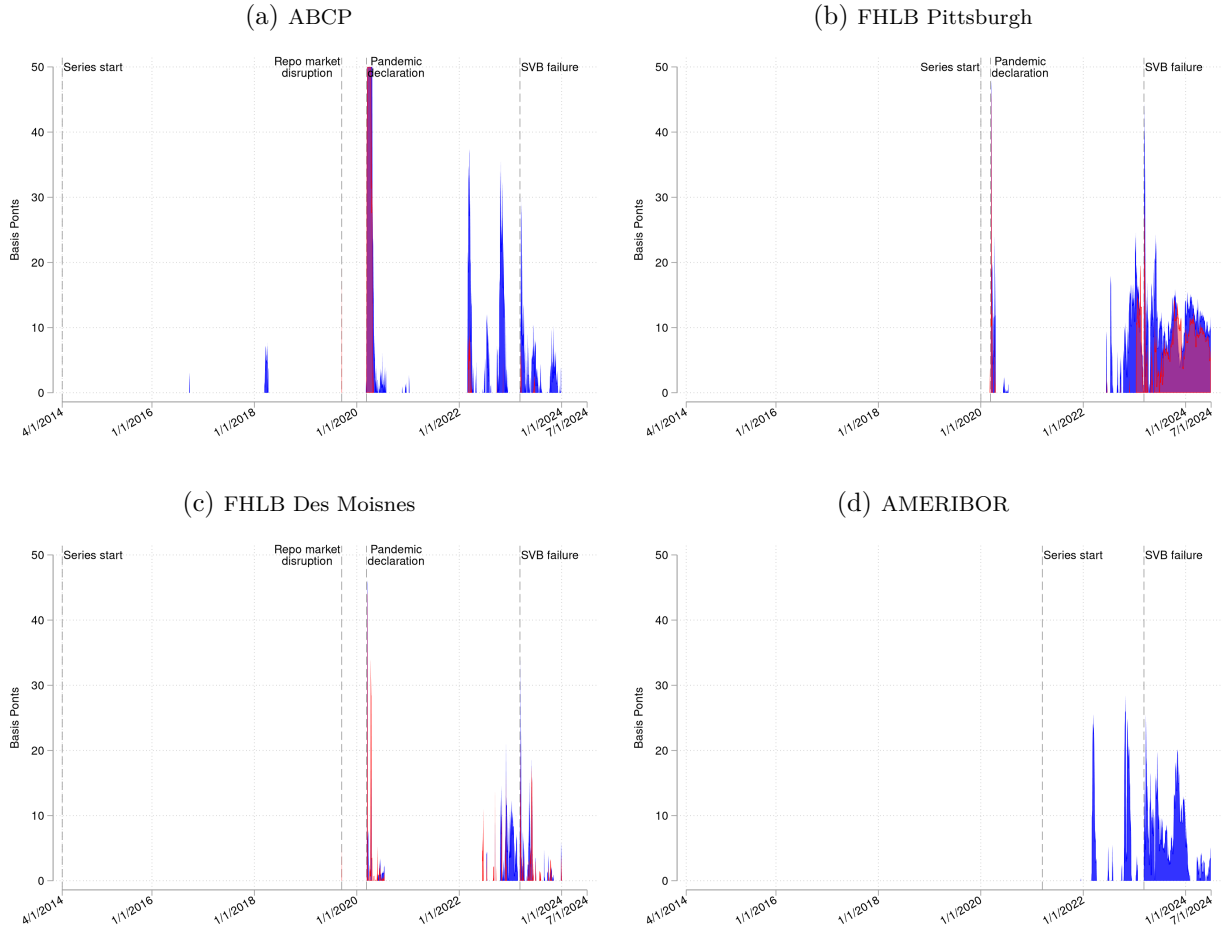
Appendix B: Additional Figures and Tables

Figure 1: Evidence of Discount Window Stigma Among FBOs



Notes: The figure shows the proportion of federal funds volume purchased by FBOs above the DW rate daily between April 1, 2014 and July 1, 2024. A positive value can be interpreted as evidence of DW stigma. The start of the last three major financial disruptions (the September 2019 repo markets disruption, the onset of the COVID-19 pandemic, and the March 2023 banking turmoil) are indicated by dotted lines.

Figure 2: Evidence of Stigma in Term Funding Markets



Notes: The figure shows the daily stigma spread (the difference between a market rate and the “term adjusted” DW rate when the former exceeds the latter) in different term funding markets between April 1, 2014 and July 1, 2024. In all panels, the DW rate is term adjusted using the corresponding overnight index swap (OIS) rate and the effective federal funds rate (EFFR). For instance, the 3-month term adjusted DW rate = DW rate + (3 months OIS - EFFR). In panel (a) the stigma spread is calculated using the rate on 30-day and 90-day AA Asset-Backed Commercial Paper. In panels (b) and (c) the stigma spread is calculated with the dividend-adjusted rate on 1-month (red area) and 3-month (blue area) advances at FHLB Pittsburgh and FHLB Des Moines, respectively. See Cooperman et al. (2024) for details on the dividend adjustment procedure. In Panel (d) the stigma spread is calculated with the 30-day (blue area) and 90-day (red area) American Interbank Offered Rate (Ameribor), the volume-weighted average interest rate for unsecured loans in the American Financial Exchange (AFX) market. In each panel, a positive value can be interpreted as evidence of DW stigma. The start of the data series and the start of the last three major financial disruptions (the September 2019 repo markets disruption, the onset of the COVID-19 pandemic, and the March 2023 banking turmoil) are indicated by dotted lines. In all panels the stigma spread is capped at 50bps.

Table 1: Stigma Determinants among Federal Funds Borrowers

	Post 4/1/2014		Post 7/1/2022	
	(1)	(2)	(3)	(4)
Accessed DW in previous month	-2.919*** (0.812)	-4.650*** (1.247)	-3.430** (1.723)	-5.690*** (2.123)
Purchased FF in previous month	2.623*** (0.593)	2.635*** (1.000)	4.538** (1.742)	5.292** (2.364)
Had realized stigma in previous month	35.869*** (3.860)	40.109*** (5.157)	28.915*** (4.069)	30.371*** (4.797)
Size				
Log(Assets)		7.494*** (2.276)		-11.362 (17.493)
Assets				
Cash (% assets)		-0.059 (0.092)		-0.984*** (0.201)
Commercial Real Estate Loans (% assets)		0.183 (0.139)		1.412 (1.029)
Residential Real Estate Loans (% assets)		0.175 (0.243)		1.951 (1.794)
Commercial & Industrial loans (% assets)		-0.061 (0.113)		-0.591 (0.557)
U.S. Treasury (% assets)		-0.103 (0.163)		1.125 (0.924)
Liabilities				
Uninsured deposits (% liabilities)		0.082 (0.052)		0.895*** (0.240)
FHLB borrowing (% liabilities)		-0.220 (0.145)		0.601 (0.449)
Repo sold (% liabilities)		-0.278 (0.417)		1.323 (0.882)
Capital/other				
Hold to Maturity losses (% assets)		-1.229 (0.935)		-10.182*** (3.641)
Tier-1 capital ratio		0.094 (0.076)		0.988 (1.308)
Unused commitments (% assets)		0.031 (0.023)		-0.296*** (0.096)
Constant	2.094*** (0.343)	-138.456*** (42.232)	9.367*** (1.079)	139.026 (324.929)
Observations	19,567	9,895	2,747	1,599
Adjusted R^2	0.296	0.335	0.518	0.545
Bank FEs	✓	✓	✓	✓
Day FEs	✓	✓	✓	✓

Notes: The sample is restricted to banks that have borrowed federal funds at some point between April 1, 2014 to July 1, 2024. The panel data model is estimated by OLS at the bank-day level. The dependent variable is a dummy variable equal to 100 if bank i borrows federal funds above the discount rate on day t . The sample period is April 1, 2014 to July 1, 2024 in columns (1) and (2), and July 1, 2022 to July 1, 2024 in columns (3) and (4). Columns (1) and (3) use all federal funds borrowers in our sample, while columns (2) and (4) use only federal funds borrowers that file Call Reports. For a definition of the variables see Appendix A. To avoid possible endogeneity issues, Call Report variables are measured in the calendar quarter preceding day t . Standard errors (in parentheses) are robust and clustered at the bank level. The superscripts *, ** and *** indicate an estimated parameter significant at the 10%, 5%, and 1% level, respectively.

Table 2: Stigma Determinants without Bank Fixed Effects

	Post 4/1/2014		Post 7/1/2022	
	(1)	(2)	(3)	(4)
Accessed DW in previous month	-0.205*** (0.059)	-0.327*** (0.077)	-0.239*** (0.089)	-0.557*** (0.135)
Purchased FF in previous month	3.213*** (0.348)	3.756*** (0.461)	3.793*** (0.832)	7.375*** (1.722)
Had realized stigma in previous month	46.535*** (4.267)	50.111*** (5.415)	67.307*** (4.039)	66.727*** (4.375)
Size				
Log(Assets)		0.051*** (0.019)		0.127*** (0.036)
Assets				
Cash (% assets)		-0.001 (0.001)		-0.005*** (0.002)
Commercial Real Estate Loans (% assets)		0.001 (0.001)		0.003 (0.002)
Residential Real Estate Loans (% assets)		0.000 (0.001)		0.001 (0.002)
Commercial & Industrial loans (% assets)		0.000 (0.001)		-0.001 (0.004)
U.S. Treasury (% assets)		-0.005*** (0.001)		-0.001 (0.002)
Liabilities				
Uninsured deposits (% liabilities)		-0.000 (0.001)		-0.000 (0.002)
FHLB borrowing (% liabilities)		-0.002 (0.002)		-0.007 (0.005)
Repo sold (% liabilities)		-0.009*** (0.003)		-0.031** (0.014)
Capital/other				
Hold to Maturity losses (% assets)		0.079** (0.033)		0.021 (0.022)
Tier-1 capital ratio		0.000** (0.000)		0.000 (0.000)
Unused commitments (% assets)		0.000 (0.000)		0.000*** (0.000)
Constant	0.040*** (0.007)	-0.608*** (0.220)	0.098*** (0.015)	-1.567*** (0.402)
Observations	656,046	423,353	110,668	61,100
Adjusted R^2	0.252	0.297	0.493	0.548
Bank FEs	✗	✗	✗	✗
Day FEs	✓	✓	✓	✓

Notes: The panel data model is estimated by OLS at the bank-day level. The dependent variable is a dummy variable equal to 100 if bank i borrows federal funds above the discount rate on day t . The sample period is April 1, 2014 to July 1, 2024 in columns (1) and (2), and July 1, 2022 to July 1, 2024 in columns (3) and (4). Columns (1) and (3) use all banks in our sample, while columns (2) and (4) use only banks that file Call Reports. For a definition of the variables see Appendix A. To avoid possible endogeneity issues, Call Report variables are measured in the calendar quarter preceding day t . Standard errors (in parentheses) are robust and clustered at the bank level. The superscripts *, ** and *** indicate an estimated parameter significant at the 10%, 5%, and 1% level, respectively.