The Federal Reserve's Discount Window and TAF Programs: "Pushing on a String?"

Allen N. Berger
University of South Carolina, Columbia, SC 29208 U.S.A.
Wharton Financial Institutions Center, Philadelphia, PA 19104 U.S.A.
European Banking Center, The Netherlands
aberger@moore.sc.edu

Lamont K. Black
DePaul University, Chicago, IL 60604 U.S.A.
lblack6@depaul.edu

Christa H.S. Bouwman
Texas A&M University, College Station, TX 77843 U.S.A.
Wharton Financial Institutions Center, Philadelphia, PA 19104 U.S.A.
cbouwman@mays.tamu.edu

Jennifer Dlugosz
Washington University in St. Louis, St. Louis, MO 63130 U.S.A.
jdlugosz@wustl.edu

January 2016

The Federal Reserve injected unprecedented liquidity into banks during the recent financial crisis using the discount window and Term Auction Facility. We examine these facilities' use and effectiveness and have three main findings. First, small bank users were generally weak, large bank users were not. Second, the funds were weak substitutes for other funding sources. Third, these facilities increased aggregate lending, enhancing lending at expanding banks and reducing declines at contracting banks. Small banks increased small business lending; large banks enhanced large business lending. Loan quality only improved at small banks, while both size classes left loan contract terms unchanged.

JEL Classification Numbers: G21, G28, E58
Keywords: Banks, Discount Window, Term Auction Facility, Central Bank, Lending.

The authors thank Frederic Boissay, Charlie Calomiris, Mark Carlson, John Driscoll, Bob DeYoung, John Duca, Doug Evanoff, Jeff Fuhrer, Radha Gopalan, Ed Kane, Bill Keeton, Paul Koch, Michael Koetter, Arvind Krishnamurthy, Lyle Kumasaka, Pete Kyle, Alex Levkov, Andrew McCallum, Nada Mora, Chuck Morris, Bill Nelson, Evren Ors, Joe Peek, Jordan Rappaport, Tony Saunders, Maureen Savage, Klaus Schaeck, Ken Spong, Haluk Unal, Larry Wall, Christina Wang, Missaka Warusawitharana, John Willis, and seminar and conference participants at the ASSA meetings, Financial Intermediation Research Society meeting, Washington University in St. Louis, Virginia Tech, the Federal Reserve Board, the Chicago Federal Reserve, the Cleveland Federal Reserve, the Kansas City Federal Reserve, the Dutch Central Bank, the Annual FDIC/JFSR Bank Research Conference, the Federal Reserve Bank of Chicago Bank Structure and Competition Conference, and the Financial Management Association meetings for helpful comments and suggestions, Lieu Hazelwood and Kurt Lewis for excellent help with STBL regressions and discount window data, and Raluca Roman for valuable research assistance.

1. Introduction

Since its inception, the Federal Reserve has provided temporary, short-term funds to the banking sector through its discount window. Throughout much of the past century, the discount window played a relatively quiet role of meeting the idiosyncratic liquidity needs of a small number of banks. However, the Federal Reserve took a number of unprecedented steps to increase banks' access to liquidity during the crisis of 2007-2009.[1] Two key innovations were the following. First, on August 17, 2007, the Federal Reserve instituted the Term Discount Window Program, a temporary program that offered discount window funds with maturities beyond overnight. While initially funds were made available for up to 30 days, the maximum maturity was extended later to 90 days. Second, to address a concern that using the discount window may be associated with "stigma" – usage could be perceived as a sign of weakness[2] – the Federal Reserve created the Term Auction Facility (TAF) on December 12, 2007. The TAF was a series of auctions for funds at maturities of either 28 or 84 days available to eligible depository institutions in generally sound financial condition.[3]

Usage of these liquidity facilities during the crisis was extraordinary. While discount window usage averaged $170 million per day from 2003 to 2006, discount window and TAF

[1] See Brave and Genay (2011) for a discussion of all the programs offered by the Federal Reserve during the crisis.

[2] Ennis and Weinberg (2013) model the origin and implications of stigma. Taking stigma related to government program participation as a given, Philippon and Skreta (2012) study the design of optimal government intervention to stabilize financial markets. Acharya, Gromb, and Yorulmazer (2012) show that stigma does not make the discount window useless, but rather limits how much money surplus banks can squeeze out of banks in need. Peristiani (1998), Corbett and Mitchell (2000), and Furfine (2001) provide empirical evidence on stigma using data from before the recent crisis, while Armantier, Krieger, and McAndrews (2011) provide evidence from the recent crisis.

[3] The Chairman of the Federal Reserve made the following remarks (Bernanke, 2009): "In August 2007, … banks were reluctant to rely on discount window credit to address their funding needs. The banks' concern was that their recourse to the discount window, if it became known, might lead market participants to infer weakness – the so-called stigma problem. The perceived stigma of borrowing at the discount window threatened to prevent the Federal Reserve from getting much-needed liquidity into the system. To address this issue, in late 2007, the Federal Reserve established the Term Auction Facility (TAF). The introduction of this facility seems largely to have solved the stigma problem, partly because the sizable number of borrowers provides anonymity, and possibly also because the three-day period between the auction and auction settlement suggests that the facility's users are not relying on it for acute funding needs on a particular day."

usage together averaged a staggering $221 billion per day from August 2007 to December 2009.[4] Around 20% of small U.S. banks and 62% of large U.S. banks used the facilities at some point during the crisis. In addition, some banks used the funds from the Federal Reserve very intensively – one bank (Proficio Bank) funded 48% of its assets this way on one day, while the largest dollar amounts outstanding on a single day were $60 billion by Bank of America and Wells Fargo.[5]

The Federal Reserve's extraordinary liquidity injection into banks raises three key policy questions that we address. While all three questions are interesting and important, we address the first two in a more descriptive way and focus most attention on addressing the third question.

The first question is: Which banks used funds from the Federal Reserve during the crisis? In the classical view of the Lender of Last Resort (LOLR), the central bank should lend to illiquid but solvent banks that the private market considers too risky (henceforth referred to as weak banks for brevity) in order to avoid a banking panic and inefficient liquidation of risky assets (Thornton, 1802).[6] This is especially important during periods of heightened uncertainty about the risk of bank assets, as in the recent crisis.[7] This view of LOLR predicts that weak banks were more likely to use these funds during the crisis. In our empirical analyses, we assess weakness based on bank's capital position, portfolio risk, and liquidity.

[4] Discount window usage alone averaged $30 billion per day during the crisis. We calculate these numbers using the Federal Reserve's H.4.1 statistical release, which provides weekly averages of daily outstanding discount window and TAF funds. We report the average of these averages.

[5] The next largest dollar amounts outstanding by banks on a single day were: $50 billion by Wachovia, $37 billion by Dexia, and around $30 billion each by JPMorgan Chase, Barclays, and Depfa.

[6] Bagehot (1873) argues that central banks should provide funds "freely at a high rate, on good collateral" in their role as LOLR. See Greenbaum and Thakor (2007) and Freixas and Rochet (2008) for discussions on the LOLR and the role of the discount window. Calomiris (1994) provides a historical perspective on the discount window and banking panics. Freixas and Parigi (2015) discuss how the LOLR role changed during the recent financial crisis. An alternative to the classical view advocates temporary assistance to insolvent banks (Solow, 1982; Goodhart, 1985).

[7] Goodfriend and King (1988) argue that central banks should not lend directly to individual banks because private lenders can best identify institutions that are illiquid but solvent. Flannery (1996) finds that this does not hold during financial crises, when informational uncertainties make it hard for private lenders to identify who is solvent and banks may thus find it hard to raise funds.

The second question is: Did the funds from the Federal Reserve substitute for or complement other funding sources? An objective of the Federal Reserve is to provide funds when private sources of funding dry up or banks cannot find alternative funding sources at suitable rates, suggesting that the funds from the Federal Reserve should be substitutes for other sources.[8] However, these funds may also help a bank regain a stable liquidity profile so that the bank can return to other markets, providing a complement to other funding sources.

The third question is: Did banks use the funds from the Federal Reserve to increase their lending? While this is not part of the classical view of the LOLR, the Federal Reserve explicitly intended for their liquidity facilities to encourage bank lending.[9] For example, the Federal Reserve Press Release for expansion of the Term Auction Facility on October 6, 2008 stated that "Together these actions should encourage term lending across a range of financial markets in a manner that eases pressures and promotes the ability of firms and households to obtain credit." It is not clear, however, whether a central bank can increase the flow of credit to firms and households through the banking system during a financial crisis or whether it is merely "pushing on a string."[10]

While the identities of banks that receive funds from the Federal Reserve traditionally have not been revealed due to the concern that this information could cause a liquidity flight, the

[8] The intended substitution effect would occur when private funding is unavailable. An unintended substitution effect would occur when banks view the funds from the Federal Reserve as cheap funds and they decide to dispose of more expensive private funding.

[9] Humphrey (2010) explains that the classical view of the LOLR focuses on the monetary base, not credit availability: "in conducting these policies, all in the name of L[O]LR, the Fed violates the classical model" (p. 355). He indicates that the Federal Reserve's concern with bank lending goes back to Chairman Bernanke's early work, in which he argues that bank failures and the drying up of credit were as important as money contractions in causing the Great Depression (Bernanke, 1983).

[10] This phrase supposedly was used first in relationship to actions by the Federal Reserve during Congressional Hearings on the Banking Act of 1935 (Wood, 2005, p. 231). "Governor Eccles: 'Under present circumstances, there is very little, if any, that can be done.' Congressman Goldsborough: 'You mean you cannot push on a string.' Governor Eccles: 'That is a very good way to put it, one cannot push on a string. We are in the depths of a depression and… beyond creating an easy money situation through reduction of discount rates, there is very little, if anything, that the reserve organization can do to bring about recovery.' "

data we use has the identities of discount window and TAF users during the crisis. Data on discount window usage were released on March 31, 2011, following Freedom of Information Act requests by Bloomberg News and Fox Business Network.[11] The Federal Reserve published data on TAF recipients on December 1, 2010 because the Dodd-Frank Act mandated release of this information.

For ease of exposition, we henceforth refer to the discount window as DW and Term Auction Facility as TAF. At times, we also refer to the combined funding as DWTAF or Federal Reserve funding.

To address our first question, we perform regression analyses to examine which banks received funds from the Federal Reserve during the crisis. We find that small banks receiving DWTAF tended to be weaker than other small banks, as indicated by less capital and higher portfolio risk, suggesting that small banks in greatest need of the funds were the ones that received them. In contrast, large banks receiving Federal Reserve funding generally were not weaker than other large banks. The widespread use of Federal Reserve funding by healthy large banks suggests that the Federal Reserve may not have adhered strictly to the classical view of the LOLR during the crisis. We propose several potential explanations for these large-bank findings.

For our second question about whether DWTAF substitutes for or complements alternative funding sources, we regress changes in DWTAF funding on contemporaneous changes in funding sources such as core deposits, the interbank market (federal funds), hot money in the form of repurchase agreements (repos), other hot money (mostly brokered deposits), and TARP funds. These regressions are not to be viewed as causal, but rather to

[11] The Dodd Frank Act also requires the Federal Reserve to disclose post-crisis discount window usage with a two-year lag.

establish whether Federal Reserve funding tended to move in the opposite direction from or together with other funding sources. On net, for both small and large banks, funds from the Federal Reserve moved in the opposite direction, i.e., were substitutes for other funding sources, but the magnitudes were very small.

Finally, we focus most of our analysis on our third question, whether banks used DWTAF to increase lending. We consider each bank's total lending as well as lending decomposed by maturity and category. OLS regressions of the change in lending (normalized by lagged bank assets) on the change in the average amount of DWTAF (also normalized by lagged bank assets) plus bank and regional controls and bank and time fixed effects suggest that DWTAF usage was indeed associated with increased lending by both small and large banks during the crisis. The results are also economically significant, suggesting that DWTAF accounted for very sizeable percentages of the changes in small and large bank lending during most crisis quarters.

A potential concern is that the control variables and fixed effects do not sufficiently control for loan demand. To address this issue, we employ the innovative two-step matching technique of Carlson, Shan, and Warusawitharana (2013) (henceforth referred to as CSW). This technique utilizes the geographic data on branch networks from the Summary of Deposits to match banks to other banks operating similar business models in the same geographic area. The differences in outcomes we observe between pairs of banks should not be significantly related to differences in market conditions or loan demand. One drawback of this technique is that it is not suited for banks that operate in broader or multiple geographic areas. Consistent with CSW, we only apply this approach to small banks. In order to address the concern about loan demand for both small and large banks, we also use standard nearest neighbor matching. Consistent with our

OLS results, the CSW and nearest neighbor matching results indicate that DWTAF usage is associated with increased lending.

Overall, our lending results suggest that the Federal Reserve was not pushing on a string during the crisis – rather, its actions facilitated an increase in the flow of credit to firms and households.[12] To further substantiate this conclusion, we perform additional tests to examine the breadth of the lending results. We show that the funds enhanced lending of expanding banks and reduced the decline at contracting banks. They boosted lending in quarters in which lending increased and reduced the decline in quarters in which lending decreased. The funds increased small business lending at small banks and large business lending at large banks. Loan quality only improved at small banks, while both size classes left loan contract terms unchanged.

Our paper is closely related to several interesting studies. Drechsler, Drechsel, Marques-Ibanez, and Schnabl (forthcoming) study related issues in Europe. The authors examine four reasons why banks obtained funds from the European Central Bank from 2008-2011: risk-shifting, illiquidity, political pressure by some European governments, and differences in banks' private valuation of risky assets. They find that weakly-capitalized banks obtained more funds and pledged riskier collateral (distressed-sovereign debt), supporting a risk-shifting explanation. Boyson, Helwege, and Jindra (2015) study the usage and effects of Federal Reserve emergency liquidity programs during the crisis, including DW and TAF, focusing on large, publicly-traded financial institutions. Consistent with our large-bank result, they find that both weak and sound banks obtained Federal Reserve funding. Gilbert, Kliesen, Meyer, and Wheelock (2012) find that very weak banks obtained limited funds from the Federal Reserve during the crisis, in line with restrictions on Federal Reserve lending imposed by the Federal Deposit Insurance

[12] These effects may be understated as they do not include any additional lending by institutions that do not fill out Call Reports (mostly agencies and branches of foreign banks), which received a sizeable portion of the DWTAF funds.

Corporation Improvement Act of 1991 (FDICIA). In addition, few banks that failed during 2008-2010 obtained funds from the Federal Reserve during the year prior to failure. None of these studies examines the second and third questions addressed in this paper.[13]

The remainder of the paper is organized as follows. Section 2 describes DW and TAF, shows the amounts outstanding over time, and indicates the banks that used these facilities most. Sections 3, 4, and 5 address our first, second, and third question, respectively. Section 6 concludes.

2. The Design and Usage of the Discount Window and the Term Auction Facility

This section first describes the Federal Reserve's DW and TAF programs. It then shows DW and TAF outstandings over time for different types of banks. Finally, it identifies the top small- and large-bank DW and TAF users during the crisis measured several ways.

2.1. Background on DW and TAF

The discount window is the means by which the Federal Reserve provides funds to banks in need of liquidity. Since 2003, the Federal Reserve has had three permanent discount window programs:[14] i) short-term *primary credit* to eligible depository institutions in generally sound financial condition at a markup above the Federal Open Market Committee's target for the federal funds rate; ii) short-term *secondary credit* to depository institutions that do not qualify for primary credit, at 50 basis points above the primary credit rate; and iii) *seasonal credit* at a market rate of interest for up to 9 months per year to community banks with less than $500 million in total assets that have yearly swings in deposits and loans that persist for at least four

[13] Acharya, Afonso, and Kovner (2013) and Berger, Bouwman, and Kim (2015) examine how banks with asset-backed commercial paper exposure scrambled for liquidity during the freeze in the ABCP market and how this affected corporate borrowing.

[14] Prior to January 2003, its discount window programs included: adjustment credit, extended credit, and seasonal credit. The interest rate for adjustment credit was typically below money market interest rates, generating an incentive to use the discount window to exploit the generally positive spread. To prevent a misallocation of credit, banks were required to first exhaust other available funding sources. See Madigan and Nelson (2002).

weeks.[15] All three are fully collateralized[16] and have no prepayment penalties. While the first two provide short-term (typically overnight) funds, the third provides longer-term funds, but to a very restricted clientele.

Shortly after the recent crisis hit, on August 17, 2007, the Federal Reserve instituted the Term Discount Window Program, a temporary discount window program under which it provided term primary credit with no prepayment penalties.[17] It reduced the spread of the primary credit rate over the FOMC's target federal funds rate to 50 basis points from 100 basis points, and made funds available for up to 30 days. On March 16, 2008, the Federal Reserve lowered the spread to 25 basis points and extended the maximum maturity of term primary credit loans to 90 days.

On December 12, 2007, the Federal Reserve began the Term Auction Facility (TAF), a series of auctions for funds at maturities of either 28 or 84 days available to eligible depository institutions in generally sound financial condition at rates determined by the auction process, with no prepayment option.[18] Collateral eligibility and valuation procedures for the TAF were the same as for the discount window.[19] In some cases, banks used the TAF facility at a higher

[15] The rate on seasonal credit is calculated as the average of the previous two-week average federal funds rate and secondary market rate on 90-day large CDs, rounded to the nearest five basis points. The rate is reset every two weeks and is applied to all outstanding seasonal credit loans on the first day of the reserve maintenance period.

[16] The following types of assets are most commonly pledged: obligations of the U.S. Treasury; obligations of the U.S. government agencies and government sponsored enterprises; obligations of states or political subdivisions of the U.S.; collateralized mortgage obligations; asset-backed securities; corporate bonds; money market instruments; and a broad range of loans (residential and commercial real estate loans; commercial and industrial loans; agricultural loans; and consumer loans). Each pledged asset is assigned a collateral value, calculated as "value x margin." The value is typically a market value with the price supplied by external vendors. If no market value is available, then value is assessed using an internal model. The margin is estimated using a Value-At-Risk analysis, which uses historical price volatility of assets within each collateral category, and is assigned based on asset type and duration. Any asset with an estimated price receives the lowest margin for that asset type. See http://www.frbdiscountwindow.org/FRcollguidelines.pdf.

[17] This was in part in reaction to BNP Paribas freezing redemptions for three of its investment funds on August 9, 2007 ("BNP Paribas suspends funds because of subprime problems," New York Times, August 9, 2007).

[18] Armantier, Krieger, and McAndrews (2008) describe TAF and its operations. Additional information on TAF is available at: http://www.federalreserve.gov/monetarypolicy/taf.htm.

[19] The Federal Reserve has never lost money on discount window or TAF funds.

cost than the discount window and without prepayment privileges, which has been interpreted as evidence of stigma attached to discount window usage (Ashcraft, McAndrews, and Skeie, 2011; Armantier, Ghysels, Sarkar, and Shrader, forthcoming).

Figure 1 Panel A shows the stopout rates for TAF, the lowest accepted bid rate which all awarded institutions pay upon maturity, and the primary credit rate of the discount window. For most of the time period, the TAF rates were slightly below the DW rates, except for the period leading up to the height of the crisis, when the TAF rates exceeded the DW rates, very significantly so in late September 2008.[20] Panel B shows the 3- and 1-month Libor-OIS (Overnight Indexed Swap) spreads, common measures of the health of the banking sector, as well as some turning points in the DW and TAF programs. As can be seen, the spreads often narrowed somewhat after expansionary Federal Reserve actions, indicating an improvement in banking conditions.[21]

2.2. DW and TAF Data and Key Statistics

We employ data on DW and TAF usage during the crisis.[22] As discussed above, discount window data were released following Freedom of Information Act requests and the TAF data release was mandated by the Dodd-Frank Act. The data include the user's name, Federal Reserve District, amount obtained, origination date, and maturity date.

Figure 2 shows the aggregate amount of overnight discount window, term discount window, and TAF outstandings over the crisis, defined to last from August 20, 2007 (the first

[20] The spike in the TAF rate on Sept. 22, 2008 was caused largely by branches of foreign-owned banks (such as Depfa and Dexia), which ended up with the vast majority of the funds. These institutions are not in our regression analyses since they do not fill out Call Reports.

[21] Libor is a filtered average interbank deposit rate calculated through submissions of rates by major banks in London. The Libor-OIS spread may overstate the health of the banking sector during the crisis because major banks allegedly manipulated Libor during this time period to make them appear healthier.

[22] DW and TAF data have also been used by Benmelech (2012), Armantier, Ghysels, Sarkar, and Shrader (2013), Kleymenova (2013), and Boyson, Helwege, and Jindra (2015). McAndrews, Sarkar, and Wang (2008), Taylor and Williams (2009), and Wu (2011) study the effects of TAF introduction on asset market prices.

date for which the Federal Reserve released detailed data) to December 31, 2009. We use the end of 2009 as our end-of-crisis date, consistent with Berger and Bouwman (2013). By that time, most of the bailed-out banks had paid back their TARP funds, and in early 2010, the Federal Reserve began rolling back expansions to the discount window and concluded the TAF auctions, reflecting improvement in financial market conditions.[23]

Panel A shows the aggregate amounts for all users combined. Since portfolio composition and other bank characteristics differ significantly by bank size (e.g., Kashyap, Rajan, and Stein, 2002; Berger, Miller, Petersen, Rajan, and Stein, 2005), we show separate panels for small commercial banks (gross total assets or GTA up to $1 billion) and large commercial banks (GTA over $1 billion).[24] We also show a panel for entities which do not fill out the Call Report and therefore do not have GTA available, mostly agencies and branches of foreign banks. For ease of exposition, we refer to these as non-commercial banks. As shown in Panel B, two highlights emerge for small banks. First, DW was large relative to TAF in the first half of the crisis, but by March 2009, TAF exceeded it. Second, by May 2008, term DW loans exceeded overnight funds for small banks and continued to be larger through the rest of the crisis. Turning to large banks in Panel C, three facts stand out. First, the amounts obtained are much greater than for small banks. Second, the dominance of TAF over DW is much more pronounced. Third, combined usage essentially exploded in October 2008, shortly after the Lehman collapse. While TAF usage continued to rise until March 2009 before falling to much lower levels, DW usage dropped relatively quickly. Finally, for non-commercial banks in Panel D, the patterns of DW and TAF usage show many similarities to those of large commercial

[23] The maximum maturity of primary credit loans was reduced from 90 days to 28 days effective January 14, 2010 (http://www.federalreserve.gov/newsevents/press/monetary/20091117b.htm) and the final TAF auction was conducted on March 8, 2010.

[24] GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans).

banks, with a few important differences. While the time patterns are similar, they are less extreme than those for large commercial banks. As noted above, usage by large commercial banks exploded in October 2008, remained very high until March 2009, and fell off rapidly thereafter. Usage by non-commercial banks peaked around the same time but its rise and fall were more gradual, suggesting that funding problems intensified sooner and took longer to resolve for these banks. Non-commercial banks also made notable use of the overnight discount window, while large commercial banks almost exclusively obtained term funds from the window.

To provide an initial perspective on which banks used funds from the Federal Reserve during the crisis, we list the top 10 users by usage intensity in Table 2 among small commercial banks (Panel 1), large commercial banks (Panel 2), and non-commercial bank recipients (Panel 3). In all cases, we measure the ranks by DWTAF, and separately for DW and TAF. Note that more than 10 banks appear in each list because the top 10 are not necessarily the same for DW and TAF combined, and for DW and TAF separately.

Table 2 shows that for every type of bank, the frequency of DWTAF usage is generally close to that of DW usage, reflecting that there were only a limited number of TAF auctions (in each panel, see Columns (2) and (4)).[25] The top 10 users among small and large commercial banks accessed DWTAF between 113 and 413 times, with higher top frequencies for small banks (see Panels 1 and 2 Column (2)). Some of the most frequent large commercial bank TAF users were fairly large with over $50 billion in GTA (see Panel 2 Columns (5) and (8)). Also, among the frequent users, none of the small banks and only three of the large banks were majority foreign owned (see Panels 1 and 2 Column (8)). However, some of the most frequent users were

[25] There were 58 TAF auctions and the average TAF user accessed the facility 9 times.

branches of very large foreign-owned banks (see Panel 3).[26]

We examine rankings of top 10 users based on three alternative usage intensity measures: outstandings on the most days, the highest average daily outstandings relative to assets, and the highest outstandings relative to assets on a single day during a crisis quarter. While yielding interesting insights, they are shown and discussed in Internet Appendix Table A.1 for brevity.

3. Which banks received funds from the Federal Reserve during the crisis?

This section addresses the first question. It discusses the methodology used to understand which banks received funds from the Federal Reserve during the crisis and presents the results.

3.1 Methodology

To examine the characteristics of bank *i* receiving funds from the Federal Reserve during crisis quarter *t*, we use a panel probit equation:

$$P(\text{bank used funds from Federal Reserve}_{i,t}) = f(\text{bank size}_{i,t}, \text{capital}_{i,t}, \text{portfolio risk}_{i,t}, \text{earnings}_{i,t}, \text{illiquidity}_{i,t}, \text{BHC dummy}_{i,t}, \text{listed dummy}_{i,t}, \text{foreign ownership dummy}_{i,t}, \text{primary federal regulator dummies}_{j,t}, \text{state income growth}_{k,t}, \text{Federal Reserve district dummies}_{l,t}, \text{time fixed effects}_{t}) \quad (1)$$

where P(•) indicates probability and *j, k* and *l* indicate primary federal regulator, state, and Federal Reserve district, respectively. The dependent variable is a dummy that is one if the bank used funds from the Federal Reserve (alternatively: DWTAF, DW separately, and TAF separately) during the particular quarter of the crisis. The explanatory variables include proxies for bank condition, ownership, regulation, and economic environment: bank size (log of GTA),

[26] We distinguish between branches of foreign-owned banks and commercial banks that have majority foreign ownership because only the latter have Call Report data available.

capital (the equity capital ratio or Tier 1 regulatory capital ratio), portfolio risk (standard deviation of ROA, commercial real estate normalized by GTA, and mortgage-backed securities normalized by GTA), earnings (ROE), illiquidity (Berger and Bouwman's (2009) preferred liquidity creation measure normalized by GTA), a bank holding company (BHC) dummy, a listed dummy, a foreign ownership dummy, primary federal regulator dummies (OCC and FDIC dummies; Federal Reserve dummy is dropped), and state income growth. The explanatory variables are contemporaneous to reflect their direct relationship to usage of funds within the quarter. To account for other regional economic conditions and possible differences across individual Reserve Banks in the administration of the discount window program, we also include Federal Reserve district dummies.[27] To control for the business cycle, interest rate cycle, and other macroeconomic events, we include time fixed effects. Definitions and summary statistics for the regression variables (means and medians) are shown in the Data Appendix at the end of the tables. Standard errors are clustered by bank to address potential within-bank serial correlation of the error term.

The analyses here focus on usage of Federal Reserve funds based on a dummy variable. As robustness checks, Internet Appendix Table A.2 alternatively uses the four usage intensity measures introduced in Section 2.2. The results based on those measures are generally consistent with those presented here.

3.2 Results

Table 3 presents the probit regression results for the first question. Panels A, B, and C focus on DWTAF, DW separately, and TAF separately, respectively. The number of observations in the TAF regressions is roughly 10% smaller than those in the DWTAF and DW regressions because

[27] Discount window policies and procedures are standardized across the Federal Reserve System and differences, if any, would be expected to be small. However, Federal Reserve Banks retain discretion over their own window usage.

TAF did not yet exist in 2007:Q3, the first of 10 quarters of our sample period. In each panel, Subpanels 1 and 2 show the results for small and large banks, respectively. For ease of interpretation, we report marginal effects evaluated at the means of the explanatory variables. In each subpanel, the columns represent slightly different specifications with different capital variables (EQRAT and Tier1RAT). Additional regressions (not shown for brevity) also use a third alternative capital ratio (TotalRAT), an alternative portfolio risk variable (ALLOW LLL / GTA in place of Stddev ROA), and an alternative earnings variable (ROA in place of ROE). The results shown in Table 3 are generally robust to the use of these alternative measures of capital, portfolio risk, and earnings.

The results for small banks in Table 3 Subpanel A1 suggest that small banks receiving DWTAF funds were larger, more capital constrained, had more commercial real estate loans (a risky form of lending), more mortgage-backed securities (which were risky during the recent crisis), were more often domestically owned, and were less often supervised by the FDIC (possibly a size effect since the FDIC tends to regulate the very smallest banks). Most of these effects are consistent with expectations that small banks that needed the funds were more likely to get them, although the standard deviation of ROA, profitability, and illiquidity appeared to play only minor roles, if any. The results for DW presented in Table 3 Subpanel B1 are similar. The TAF usage results for small banks in Table 3 Subpanel C1 are somewhat different, suggesting that capital did not play a role, earnings had a positive effect, and banks supervised by the OCC were less likely to use TAF.

The results for large banks in Table 3 Subpanel A2 suggest that those receiving DWTAF funds generally were larger, had less volatile earnings, had more commercial real estate loans and mortgage-backed securities, were more illiquid, and were in states with higher income

growth. Capital did not seem to play a major role. The results based on DW usage by large banks shown in Table 3 Subpanel B2 paint a similar picture except that illiquidity and state income growth did not seem to matter. The results for TAF usage by large banks in Table 3, Subpanel C2 also show little effect of state income growth, but illiquidity did play a role. While earnings volatility did not seem to matter, listed banks were more likely to use TAF. Overall, these results suggest that weak large banks were not more likely to use Federal Reserve funds than their healthy large bank peers, except for those with CRE/MBS exposures and those that may have used TAF to address liquidity problems. These findings and the widespread use of funds by large banks suggest that the Federal Reserve may not have adhered strictly to an LOLR role.

We propose five, non-mutually exclusive potential explanations for our large-bank finding. First, stigma costs may be greater for large banks than small banks. Large banks using DWTAF may be more likely to be discovered since both aggregate DW and TAF usage by Federal Reserve District are made public weekly, and usage by large banks may stand out more. Large banks may also be more susceptible to "runs" by counterparties since they rely more on uninsured interbank borrowing and engage in other activities (e.g., derivatives and other trading) where funding costs are sensitive to counterparty concerns. Second, large banks rely more on funding from capital markets that were disrupted during the crisis, and this may have affected both strong and weak large banks. Third, Reserve Banks may screen large banks more carefully. Fourth, healthy large banks may have been encouraged to use such funds.[28] Finally, healthy

[28] In August 2007, Citigroup, Bank of America, JP Morgan Chase, and Wachovia announced that they had each obtained $500 million from the discount window, reportedly at the behest of the Federal Reserve, in an effort to lessen the stigma of discount window usage. "We participated at the request of the Federal Reserve to help stabilize the global banking system in a period of unprecedented stress," said Jerry Dubrowski, a spokesman for [Bank of America]. "At the time we were participating, we weren't experiencing liquidity issues." See "Big U.S. banks use discount window at Fed's behest," New York Times, August 23, 2007; and "Bank of America kept tapping Fed facility after 2007 show of leadership," Bloomberg News, March 31, 2011.

large banks may prefer to use DWTAF on a term basis in order to obtain longer-maturity funds with certainty, instead of rolling over federal funds which are typically provided only overnight.[29]

The Federal Reserve districts dummies in Table 3 are also often significant for both small and large banks. [30] This could be due to differences in regional economic conditions or Reserve Bank discretion.

4. Did funds from the Federal Reserve substitute for or complement other funding sources?

This section addresses our second question. We first explain the methodology used to examine whether banks used the funds from the Federal Reserve as substitutes for or complements to other sources of funds. We then present the results.

4.1 Methodology

To examine whether funds from the Federal Reserve substituted for or complemented other sources of funding, we regress changes in the proportions of assets funded by DWTAF, DW, and TAF on contemporaneous changes in the proportions of assets funded by other sources. In all cases, we eliminate bank-quarter observations when banks are involved in mergers to rule out that changes in bank funding are due to the mergers. We also drop bank-quarter observations for which the change in DWTAF is zero to avoid bias toward zero in the coefficients from averaging in the numerous zero effects from non-users. We run the following OLS regressions:

[29] Many large banks rely on overnight federal funds as a regular source of funding during normal times. During a crisis they may switch to term financing, which is not available in the federal funds market but is available from the discount window. In contrast, small banks typically do not obtain funds in the federal funds market on a regular basis.

[30] This is consistent with Mitchell and Pearce (1992), who show evidence that discount window usage differs across Federal Reserve districts.

$$\Delta(\text{funds from Federal Reserve}_{i,t})/GTA_{i,t-1}$$

$$= m(\Delta(\text{Core Deposits}_{i,t})/GTA_{i,t-1},\ \Delta(\text{Fed Funds}_{i,t})/GTA_{i,t-1},\ \Delta(\text{Repos}_{i,t})/GTA_{i,t-1},\ \Delta(\text{Other Hot Money}_{i,t})/GTA_{i,t-1},\ \Delta(FHLB_{i,t})/GTA_{i,t-1},\ \Delta(TARP_{i,t})/GTA_{i,t-1},\ \text{bank size}_{i,t-1},\ \text{capital}_{i,t-1},\ \text{portfolio risk}_{i,t-1},\ \text{earnings}_{i,t-1},\ \text{illiquidity}_{i,t-1},\ \text{BHC dummy}_{i,t-1},\ \text{foreign ownership dummy}_{i,t-1},\ \text{listed dummy}_{i,t-1},\ \text{primary federal regulator dummies}_{j},\ \text{state income growth}_{k,t-1},\ \text{bank fixed effects}_{i},\ \text{time fixed effects}_{t})$$

(2)

where $\Delta(\text{funds from Federal Reserve}_{i,t})/GTA_{i,t-1}$ is the change from the previous quarter in the average amount of DWTAF, DW, or TAF outstandings normalized by lagged GTA. The key right-hand-side variables are changes in other sources of bank funding normalized by lagged GTA.

While most of the regression variables are identical to the ones used in regression (1), there are a few important differences. First, they include bank fixed effects control for any constant differences over time for a given bank. Second, we exclude the Federal Reserve district dummies, which would be collinear with the bank fixed effects.

These regressions are not intended to be viewed as causal because the funding choices across the different categories may be made simultaneously or in any order. The purpose is to see if the other funding sources tend to move together or in the opposite direction from DWTAF, DW, and TAF. We would interpret a coefficient on the change in another funding source of -1 as indicating that the funds from the Federal Reserve and the other source of funding are perfect substitutes – as the funding from an alternative source increases, the funding from DWTAF decreases by the same amount, on average, all else equal. Similarly, a coefficient of 1 would be interpreted as revealing perfect complements.

4.2 Results

Table 4 contains the OLS regression results for our second question. Panel A shows the effects using DWTAF for small banks (Subpanel A1) and large banks (Subpanel A2), while Panels B and C show the results for DW and TAF, respectively. For brevity, we show and discuss the key explanatory variables only, and do not show or discuss the results for the control variables or the bank and time fixed effects.

The small-bank results suggest that funds from the Federal Reserve were substitutes for some other funding sources such as core deposits, other hot money, and possibly TARP (not quite significant at the 10% level). On average, when these other funding sources declined, funds from the Federal Reserve increased. Separating DW from TAF, the small-bank results appear to be driven by DW, which is logical since DW usage exceeded TAF usage over most of the crisis for these banks (see Figure 2 Panel B).

The large-bank results also suggest that funding from the Federal Reserve tends to substitute for other sources of funding, primarily other hot money and FHLB advances. Separating DW from TAF reveals that for large banks, the results tend to be driven by TAF, which is intuitive since TAF usage dominated for these banks (see Figure 2 Panel C). Interestingly, for large banks, there is some evidence that TAF complemented TARP.

The coefficients are far smaller in magnitude than -1 or +1. This suggests that while the results are statistically significant, the degree of substitution or complementarity is far less than one for one.

For robustness, we explore two additional specifications. First, we drop the control variables to get closer to the raw correlations (while still controlling for bank and time fixed effects). Second, we combine the changes in other funding sources into one variable in order to

focus on the total change in other funding sources and check whether we find comparable economic significance. These specifications yield results that are similar in significance and magnitude to those presented here and are not shown for brevity.

5. Did banks use the funds from the Federal Reserve to increase lending?

This section addresses our third question. We discuss the methodology used to answer whether banks used the funds from the Federal Reserve to increase lending and present the results.

5.1 Methodology

We first perform standard OLS regressions. We then try to separate loan supply from loan demand using the two-step matching procedure of Carlson, Shan, and Warusawitharana (2013). Since this procedure can only be applied to banks that operate in relatively concentrated geographic areas, i.e., small banks, we also perform analyses for small and large banks using a more standard nearest neighbor matching method.

In all cases, we eliminate observations on banks involved in mergers for the quarters in which the mergers occur to rule out changes in bank activities that are due to the mergers.

5.1.1 Methodology - OLS

To examine how funds from the Federal Reserve affect lending, we run OLS regressions:

$$\Delta(lending_{i,t}) / GTA_{i,t-1}$$

$$= m(\Delta(DWTAF_{i,t}) / GTA_{i,t-1}, [\Delta(Core\ Deposits_{i,t})/GTA_{i,t-1}, \Delta(Fed\ Funds_{i,t})/GTA_{i,t-1}, \Delta(Repos_{i,t})/GTA_{i,t-1}, \Delta(Other\ Hot\ Money_{i,t})/GTA_{i,t-1}, \Delta(FHLB_{i,t})/GTA_{i,t-1}, \Delta(TARP_{i,t})/GTA_{i,t-1},] \text{ bank size}_{i,t-1}, \text{capital}_{i,t-1}, \text{portfolio risk}_{i,t-1}, \text{earnings}_{i,t-1}, \text{illiquidity}_{i,t-1}, \text{BHC dummy}_{i,t-1}, \text{foreign ownership dummy}_{i,t-1}, \text{listed dummy}_{i,t-1}, \text{primary federal}$$

$$regulator\ dummies_{j,t-1},\ state\ income\ growth_{k,t-1},\ bank\ fixed\ effects_i,\ time\ fixed\ effects_t) \quad (3)$$

where $\Delta lending_{i,t} / GTA_{i,t-1}$ is the quarterly change in portfolio loans normalized by lagged GTA. This dependent variable is alternatively measured as the changes in total loans, loans of different maturity (short- or long-term), and different loan categories (commercial and industrial (C&I) loans, commercial real estate (CRE) loans, residential real estate (RRE) loans, consumer loans, or other loans), all normalized by lagged GTA. See the Data Appendix at the end of the tables for definitions and summary statistics on these dependent variables. $\Delta(DWTAF_{i,t}) / GTA_{i,t-1}$ is the change from the previous quarter in the average amount of DWTAF outstanding normalized by lagged GTA.

We alternatively exclude or include the changes in other funding sources (shown in square brackets for clarity) because these are potentially endogenous and it is important to show that our results hold regardless of whether we exclude or include them. The control variables are lagged one quarter to reduce potential endogeneity concerns. We include bank and time fixed effects.[31]

5.1.2 Methodology – Two matching approaches

Our matching problem is somewhat unusual in that we are not focused on the differences between a treated group of banks (those that used DWTAF) and a control group (those that did not use DWTAF). Rather, treatment is continuous in our sample and involves different "dosages," i.e., different quarterly changes in DWTAF/GTA, and we want to estimate their effects on lending. The matching approach needed when treatment involves different dosages is so-called matching without groups, or nonbipartite matching (Rosenbaum, 2009, Chapter 11).

5.1.2.1 Methodology – Carlson, Shan, and Warusawitharana (2013) matching approach

[31] We do not include Federal Reserve district dummies because they would be collinear with the bank fixed effects.

To better control for loan demand, we first employ Carlson, Shan, and Warusawitharana's (2013) two-step matching approach. In Step 1, we limit the sample to banks that operate in the same geographic area and are of similar size. To do so, we first calculate the weighted center of each bank using a spherical geometry formula which uses branch-level FDIC Summary of Deposits inputs: each bank branch's physical address (converted by us into latitude and longitude coordinates) and its deposits. As in CSW, we limit the sample to banks that have 80% of deposits close to the weighted center of each bank's branch network, whereby the distance threshold varies inversely with the population density of the state in which a weighted center is located.[32] For each bank in this smaller sample, we then find neighboring banks, which are those with a weighted center within a specific distance of the weighted center of the reference bank.[33] Neighboring banks must also have GTA between one-third and three times that of the reference bank.

In the second step, we require matched banks to have similar business models, since banks with different models might be differently affected by the economic environment even in the same location. The business model matching variables are the same as in CSW.[34] We standardize these ratios and compute the sum of squared differences between the ratios for each bank and all possible neighboring banks. We then match each bank with one other bank following the procedure in CSW. The procedure for matching iteratively extracts pairs of banks

[32] Since less densely populated areas have banks that are less densely located, the distance cutoff varies with the population density of the bank's state. The cutoff distance for New Jersey, the most densely populated state, is 50 miles. For other states, the radius is scaled by the square root of (New Jersey's population density / population density of the state in which the bank is located). The biggest cutoff distance is 750 miles in Wyoming.

[33] Following CSW, these cutoffs are considerably lower than those used in the previous step (although still varying based on the population density of the state) and range from 10 miles in New Jersey to approximately 150 miles in Wyoming.

[34] These include: (1) C&I loans to total loans; (2) CRE loans to total loans; (3) RRE loans to total loans; (4) consumer loans to total loans; (5) managed liabilities (including large time deposits and federal funds borrowed) to interest-bearing liabilities; (6) securities to (securities and loans); (7) interest income to total income; (8) interest expense to total expenses; and (9) net interest margin.

with the lowest sum of squared differences. Once a bank has been matched to another bank, it is removed from the eligible set of banks so that each bank is matched to at most one other bank. This is a one-sided version of what is generally known as a greedy matching algorithm (Gu and Rosenbaum, 1993). We continue the matching process until the sum of squared differences exceeds the sum of the variances of the (nine) matching variables. Since the matching variables are standardized, this threshold is 9. The matches are refreshed using this process each quarter.[35]

After matching the banks, we run our main specification on data that is differenced among matched pairs. Specifically, we estimate the following model on quarterly data:

$$\left(\frac{\Delta(lending_{i,t})}{GTA_{i,t-1}}\right) - \left(\frac{\Delta(lending_{j,t})}{GTA_{j,t-1}}\right) = \beta_1\left\{\left(\frac{\Delta(DWTAF_{i,t})}{GTA_{i,t-1}}\right) - \left(\frac{\Delta(DWTAF_{j,t})}{GTA_{j,t-1}}\right)\right\}$$

$$+\beta_2\left\{\left(\frac{\Delta(lending_{i,t-1})}{GTA_{i,t-2}}\right) - \left(\frac{\Delta(lending_{j,t-1})}{GTA_{j,t-2}}\right)\right\} + \beta_3\left\{\left(\frac{\Delta(lending_{i,t-2})}{GTA_{i,t-3}}\right) - \left(\frac{\Delta(lending_{j,t-2})}{GTA_{j,t-3}}\right)\right\}$$

$$+ \textit{differenced other controls} + \textit{time fixed effects} + (\varepsilon_{it} - \varepsilon_{jt}) \quad (4)$$

where $\Delta(lending_{i,t})$ is the change in one of the lending variables between *t-1* and *t* for reference bank *i*, $\Delta(lending_{j,t})$ is the change in the same variable between *t-1* and *t* for matched bank *j*. For consistency with CSW, the controls include two lags of the dependent variable. The other controls are the same as in equation (3), but they exclude bank fixed effects since each observations refers to a pair of banks.

5.1.2.2 Methodology – Nearest neighbor matching approach

While the CSW technique arguably controls for loan demand in a robust manner, unfortunately it cannot be applied to large banks. Hence, we also perform standard nearest neighbor matching, in which we match banks based on business model and observable economic conditions in the area

[35] Carlson, Shan, and Warusawitharana (2013) match banks every year since they examine the relationship between bank lending and bank capital using annual data. Matching every quarter makes more sense in our setting since we focus on the financial crisis when conditions were rapidly changing. We obtain similar results, however, using annual matching, whereby matched banks stay in pairs during the next four quarters.

where the bank operates. We present these results separately for small banks (for completeness) and large banks, refreshing the matches every quarter, consistent with the CSW technique above.[36]

Every quarter, we take each bank and find another bank that is the closest in terms of our matching variables. We capture closeness using the Mahalanobis distance, which measures the distance between bank characteristics while taking into account the variance of individual characteristics and the covariances between characteristics, as is standard in the literature. Our matching variables include the variables used in the CSW approach plus *state income growth*$_{k,t-1}$ to control for differences in loan demand. After calculating pairwise distances between a bank and every other sample bank, we use a one-sided greedy matching algorithm (the same type of algorithm used to match banks in CSW) to match banks and generate a paired, differenced dataset.

5.2 Main results

We present the OLS lending results, followed by the results from the two matching approaches.

5.2.1 OLS results

Table 5 contains the OLS lending results. Panel A shows the effects of DWTAF usage on overall lending for small banks (Subpanel A1) and large banks (Subpanel A2). For brevity, we focus on the explanatory variable of interest and do not discuss the results for the control variables.

Both subpanels show the results two ways – without and with changes in other funding sources. The results from both subpanels yield the same signs, but somewhat different magnitudes. We focus on the magnitudes from the specification with the other funding sources included. We believe it is the more appropriate specification since changes in these other

[36] As before, the results are robust to matching at an annual frequency.

funding sources may also affect lending.

The results for small banks in Subpanel A1 suggest that greater usage of funds from the Federal Reserve was associated with a significant increase in lending by the institutions receiving the funds. The statistically significant coefficient of 0.918 in Column (2) suggests that an additional dollar of daily funds over the quarter was associated with an increase in lending of 91.8 cents. The results for large banks in Subpanel A2 Column (2) show a positive and statistically significant coefficient that implies that an additional dollar of daily Federal Reserve funding was associated with about a 99.1 cent increase in lending. Both effects are sizeable and are consistent with the Federal Reserve's goal of increasing bank lending. It is important to point out that these estimates capture the effect of an additional *daily* dollar in funding (an additional dollar every day throughout the quarter), not just an additional dollar in funding on a single day. If the funds are outstanding for less than a quarter, the effect is proportionally less.

We next explore if this lending increase applies to different loan types. It is possible that only short-term lending increased since both funding sources (DW and TAF) are short-term. However, long-term lending may have also increased if the funds provided sufficient assurance of continued access to future funding. To address this, we split total loans by maturity into short-term loans (less than or equal to one year maturity) and long-term loans (over one year maturity). We also want to examine whether key loan categories were affected differently. To address this, we split total loans into C&I, CRE, RRE, and other loans.[37]

Table 5 Panel B contains the results. The small-bank results in Subpanel B1 show that both short-term and long-term lending increased. All of the different loan categories also increased except for RRE and consumer loans. Turning to the large-bank results in Subpanel

[37] We do not split loans by maturity and category together (into short-term C&I loans, long-term C&I loans, etc.) because Call Reports do not provide such detail.

B2, the positive effect on lending holds for all types of lending, but the effect is weakest for other loans.

Table 5 Panel C shows results of OLS regressions that include two lags of the dependent variable. These results are presented because the matching regressions include two lags, following CSW. As can be seen, the results are qualitatively similar to those shown in Panel A (columns (2) and (4)) and Panel B.

5.2.2 Matching results

We now turn to the matching results based on the CSW and nearest neighbor matching approaches.

5.2.2.1 Carlson, Shan, and Warusawitharana (2013) matching results

Table 6 Panel A contains the CSW results. As highlighted above, this matching method can only be applied to small banks. Since each unit of observation in these regressions is a pair of banks, the maximum number of banks in these regressions is half of that included in the OLS regressions. The actual number of observations is less because, as acknowledged by CSW, not every bank can be matched using their matching approach.

The results in column (1) show that greater usage of DWTAF was associated with a significant increase in lending by the institutions receiving the funds, and the size of the effect is comparable with that presented in Table 5 Panel C1 column (1). The results for different loan categories in columns (2) – (8) are also similar to those obtained using OLS (see Table 5 Panel C1 columns (2) – (8)), both in terms of magnitude and significance.

5.2.2.2 Nearest neighbor matching results

Table 6 Panel B shows the nearest neighbor matching results for both small and large banks. The unit of observation in these regressions is again a pair of banks, hence the reduced number

of observations in these regressions.

The results for small banks in Panel B1 are qualitatively similar to those based on OLS and CSW matching. The coefficients are sometimes slightly smaller and sometimes slightly larger than those estimated using the other methodologies but the story remains the same: DWTAF usage is associated with faster gross loan growth and faster loan growth in most loan categories for small banks during the crisis.

Panel B2 of Table 6 displays the results for large banks. While we find a qualitatively similar effect of DWTAF on gross lending as we did using OLS, the loan category results exhibit some differences. In particular, the nearest neighbor matching results show that DWTAF has a weakly positive effect on long term lending and C&I lending, but no effect on short-term lending, CRE lending, RRE lending, or consumer lending, which were all positively associated with DWTAF usage in the OLS analysis. Despite these differences, the nearest neighbor matching results support the OLS and CSW results: greater usage of funds from the Federal Reserve was associated with increased lending.

5.3 Economic significance of the lending results

It is important to know how much lending changed as a result of DWTAF and how this relates to the change in total lending. Table 7 Panels 1 and 2 use the main OLS results to estimate this for small and large banks, respectively. The estimated dollar effect on lending by small and large banks in each quarter is shown in column (3). It is calculated by multiplying the average daily amount of DWTAF outstanding during a quarter for that size class (shown in column (1)) by the coefficient that measures the effect of DWTAF on lending using the full specification in Table 5

Panel A, replicated in Table 7 column (2).[38] Effectively this estimates how much higher lending is than it would have been if DWTAF funds were not available (i.e. were zero) in that quarter. The percentage change in lending due to DWTAF is obtained by dividing column (3) by the actual change in small- or large-bank lending shown in column (4), and is presented in two columns. Column (5) focuses on quarters in which lending increased for that size class and shows the estimated percentage of the increase in lending that is attributable to DWTAF. Column (6) focuses on quarters in which lending decreased for that size class and shows the estimated percentage by which the decrease would have been greater in the absence of DWTAF.

The estimated effects of DWTAF accounted for very sizeable percentages of the increases and decreases in small and large bank lending during most crisis quarters, demonstrating strong economic significance. For example, in Panel 1, the 29.0% in 2008:Q3 in column (5) for small banks indicates that DWTAF was responsible for an estimated 29.0% of the actual increase in small bank lending. The 120.5% estimate in Column (6) for 2009:Q1 suggests that in the absence of DWTAF, the decrease in lending would be 120.5% worse, or more than twice as large in magnitude. Similarly, for large banks in Panel 2, DWTAF accounted for 30.8% of the increase in large-bank lending in 2008:Q3, and prevented the decrease in large-bank lending in 2008:Q4 from being 212.6% worse. The effects in some of the other quarters are even greater in magnitude. The economic magnitudes of the effects of DWTAF on lending are similar using the CSW and nearest neighbor matching approaches at large banks, but smaller at small banks (not shown for brevity).

5.4 Did DWTAF increase loan growth, slow loan contraction, or both?

An interesting question is whether the increase in lending due to DWTAF was in the form of

[38] These amounts are not comparable to those shown in Figure 2. Table 7 column (1) displays the average daily amount of DWTAF outstanding during a quarter, whereas Figure 2 plots the actual daily amount of DWTAF outstanding.

higher loan growth at banks that were increasing lending or less loan contraction at those that were reducing their lending, or both.

To address this, we focus on total lending and run two auxiliary regressions each for small and large banks. In the first regression for each size class, we set all loan growth values to zero except for positive ones: if the coefficient on Δ(DWTAF) / GTA is positive in this regression, then DWTAF increases the rate of loan growth. In the second regression, we set all loan growth values to zero except for negative ones: if the coefficient on Δ(DWTAF) / GTA is positive in this regression, then DWTAF slows the rate of loan contraction. A similar approach is used by Gopalan, Milbourn, Song, and Thakor (2014).[39]

For small banks, we find positive and significant coefficients of 0.537 for expanding banks and 0.381 for contracting banks (which sum to 0.918, the coefficient shown in Table 5 Subpanel A1 Column (2)). For large banks, we find positive and significant coefficients of 0.695 for expanding banks and 0.296 for contacting banks (which sum to 0.991, the coefficient shown in Table 5 Subpanel A2 Column (2)). These results suggest that DWTAF helped both banks that were increasing and decreasing their lending – it enhanced the lending at expanding banks and dampened the decline at contracting banks. For both size classes, DWTAF had a greater effect on those that increased lending.

5.5 Too-Big-To-Fail

Banks that are Too-Big-To-Fail (TBTF) may have driven the increase in lending by large banks that used Federal Reserve funds, since TBTF banks may expect to be bailed out when they are in trouble. To examine this possibility, we use two alternate definitions of banks that might be considered TBTF. The first is banks with GTA exceeding $50 billion, consistent with the Dodd-

[39] They use this technique to examine whether the negative relationship between CEO pay duration and earnings-increasing accruals stems from smaller positive accruals or larger negative accruals.

Frank definition of banks that are systemically important financial institutions. The second is the 19 largest banks in each quarter, inspired by the government's disclosure in early 2009 that the 19 largest banks had to undergo stress tests under the Supervisory Capital Assessment Program (SCAP), and would be assisted with capital injections if they could not raise capital on their own, essentially announcing that they were TBTF.

Table 8 shows the results for large banks excluding TBTF banks based on both definitions.[40] The results are similar to the main large-bank results, suggesting that TBTF banks did not drive the increase in lending by large-bank DWTAF users.

5.6 Listed versus privately-held banks

DWTAF may affect lending differently at listed banks – banks that are individually listed or are part of a listed BHC – than at privately-held banks. For example, listed banks generally have better access to other funding sources, and so may not need DWTAF as much to increase lending. To address this, we run regressions separately for listed and unlisted banks.

Table 9 Panels 1 and 2 show the results for small and large banks, respectively. We find that for banks in both size classes, the results for listed banks are generally weaker than the main lending results, while the results for unlisted banks are similar to the main results. Hence, consistent with our expectations, the main results seem to be driven by privately-held banks that need DWTAF to increase their lending.

5.7 Effects on small and large business lending

Anecdotal evidence suggests that small businesses were particularly hard hit by the recent crisis.[41] We therefore examine whether small and large business lending are differentially

[40] It is not possible to run these regressions separately for TBTF banks because of the small number of observations.
[41] Testimony on small business lending by Governor Elizabeth A. Duke before the Committee on Financial Services and Committee on Small Business, U.S. House of Representatives, Washington, D.C., February 26, 2010 (http://www.federalreserve.gov/newsevents/testimony/duke20100226a.htm).

affected by DWTAF. We can only analyze this imperfectly because Call Report data by loan size is only available in June of each year, and the loans are broken out only by loan size rather than by firm size. Nonetheless, analysis by loan size class should give a rough approximation of whether small or large business lending is most affected.

We collect the dollar amount of small and large business C&I lending (original loan amounts up to $1 million and over $1 million, respectively) in June 2008 and June 2009.[42] The original amount is the maximum of the loan size or the commitment size. We calculate the annual changes in the amounts for the two loan amount sizes, and rerun the lending regressions.

The results in Table 10 indicate that at small banks, loans with amounts up to $1 million significantly increased (coefficient of 0.143), while at large banks, loans with amounts above $1 million increased (coefficient of 0.249).[43] This suggests that DWTAF funds increased small business lending at small banks and large business lending at large banks.

5.8 Effect on credit quality and loan contract terms

It is also interesting to examine whether DWTAF affected the credit quality and contract terms of the loans. Since this cannot be addressed using Call Report data, we turn to an alternative data source: the Federal Reserve's Survey of Terms of Bank Lending (STBL). The STBL is a quarterly survey of about 348 insured commercial banks, which include all of the largest banks and a stratified sample of the smaller banks. It asks surveyed banks about the terms of C&I loans issued during the first business week of the second month in each quarter. The survey is conducted on a voluntary basis and is designed to enable the Federal Reserve to examine loan market developments and the cost of business borrowing.

[42] We cannot include June 2007 because the DWTAF data starts in August 2007.

[43] These coefficients are not directly comparable to the main C&I lending results shown in Table 6 because those regressions use quarterly changes over the entire crisis while the regressions here only use one annual change, which also explains the weaker significance of the results.

We collect several key pieces of information on each loan in the STBL.[44] First, risk rating: banks report each loan's risk rating by mapping their internal ratings to a scale prescribed by the Federal Reserve ranging from 1 (= minimal risk) to 5 (= special mention or classified asset). Loans with a 5 rating usually are refinancings of troubled loans because banks would not normally initiate a loan of such poor quality. Second, interest rate and maturity: these are used to construct the interest rate premium, i.e., the difference between the interest rate charged and the Treasury rate of comparable maturity. Third, collateral status: a dummy that equals 1 if the loan is secured.

For each bank in every quarter, we calculate the quarterly change in the dollar-year weighted average values of the three variables (risk rating, interest rate premium, and collateral status). For the weighting, each of the three variables is multiplied by the number of dollars of the loan times the maturity of the loan in years divided by the total dollar-years of the loans reported by the bank in that quarter. This weighting gives each of the loans the proper representation in the portfolio because a loan that is twice as large or twice as long receives twice the weight.

We first address whether banks receiving DWTAF changed their underwriting standards and began lending to a safer or riskier pool of borrowers.[45] If the borrowers are higher credit quality, the weighted average loan risk ratings would go down, meaning that the quality has improved; and vice versa if the pool becomes riskier.

Table 11 Column (1) shows the results from the loan-level STBL data. The coefficient on the change in DWTAF usage is negative and significant for small banks, suggesting that DWTAF usage is associated with safer loan originations at these banks. DWTAF does not seem

[44] We thank Lieu Hazelwood for excellent help with the STBL regressions.
[45] Our methodology identifies a loan supply effect by analyzing the differential change in loan quality across banks based on DWTAF usage.

to affect the riskiness of loans at large banks.[46]

We next examine the impact of DWTAF usage on loan contract terms: the interest rate premium and collateral usage. We address this two ways: with and without controlling for changes in loan risk ratings and, in the case of the interest rate premium regressions, with and without controlling for collateral.

Table 11 Columns (2) – (5) show that DWTAF usage does not significantly affect either of these loan contract terms. The small-bank result is perhaps surprising because it suggests that while they shift their lending into safer borrowers, they do not give these borrowers better contract terms. The large-bank result of no change in loan terms is consistent with the finding above that DWTAF usage is not associated with any significant change in loan quality.

5.9 Did banks use part of the funds from the Federal Reserve to liquefy their balance sheets?

The popular press often voiced a concern that banks were hoarding liquidity during the crisis,[47] and some research supports this view (Berrospide, 2012). We established above that banks used the funds from the Federal Reserve to increase their lending, but we also briefly address whether they may have used part of the funds to liquefy their balance sheets. To do so, we run regressions that are similar to the lending regressions (equation (3)) except that we replace the dependent variable Δ(lending) / $GTA_{i,t-1}$ alternately with the change in cash normalized by lagged GTA and the change in securities normalized by lagged GTA.

Table 12 shows the results. The results suggest that small banks used DWTAF in part to increase their securities holdings, not their cash holdings. To the extent that securities function

[46] Black and Hazelwood (2013) also use STBL data but focus on banks receiving TARP funds. They find that small banks receiving TARP also reduced the risk of their loans. In contrast, they document that large banks receiving TARP shifted into riskier loans. Duchin and Sosyura (2014) use DealScan and Home Mortgage Disclosure Act (HMDA) data and also fin that large banks receiving TARP increased the risk of their loans.

[47] E.g., "Banks promise loans but hoard cash," Forbes, February 3, 2009.

as liquid assets (Kashyap and Stein, 2000), small banks may have held some DWTAF funds in the form of precautionary liquidity. In contrast, there is no evidence that large banks used DWTAF funds to liquefy their balance sheets.

6. Conclusion

The Federal Reserve provided unprecedented liquidity to banks during the recent financial crisis through the discount window (DW) and Term Auction Facility (TAF). This paper examines which banks obtained funds from these facilities, whether these funds substituted for or complemented other funding sources, and whether such funding encouraged bank lending.

We have three main findings. First, small banks receiving DW and TAF funds tended to be weaker, but this was not the case for large banks. We offer a number of reasons for this difference. Second, funding from the Federal Reserve's liquidity facilities appears to have substituted to a limited degree for other funding sources. Third, banks receiving funds from the Federal Reserve increased their lending overall and across maturities and most loan categories. These results are robust to using two alternative matching approaches to control for differences in loan demand and other differences across banks. Our calculations suggest that DWTAF was responsible for large portions of the increases in lending in quarters in which lending went up, and for keeping lending declines from being much worse in quarters in which lending went down. Our analyses aim to help policymakers understand the important role of central bank liquidity facilities during the recent crisis and potentially during future crises.

References

Acharya, V.A., G. Afonso, and A. Kovner, 2013, How do global banks scramble for liquidity? Evidence from the asset-backed commercial paper freeze of 2007, Working paper.

Acharya, V.A., D. Gromb, and T. Yorulmazer, 2012, Imperfect competition in the interbank market for liquidity as a rationale for central banking, American Economic Journal: Macroeconomics 4: 184-217.

Angrist, J.D., Pischke, J.-S., 2009. Mostly harmless econometrics. Princeton University Press, Princeton, N.J.

Armantier, O., E. Ghysels, A. Sarkar, and J. Shrader, forthcoming, Discount window stigma during the 2007-2008 financial crisis, Journal of Financial Economics.

Armantier, O., S. Krieger, and J. McAndrews, 2008, The Federal Reserve's Term Auction Facility, Current Issues in Economics and Finance 14: 1-10.

Ashcraft, A., J. McAndrews, and D. Skeie, 2011, Precautionary reserves and the interbank market, Journal of Money, Credit and Banking 43: 311-348.

Bagehot, W., 1873, Lombard Street: A description of the money market, London: H.S. King.

Benmelech, E., 2012, An empirical analysis of the Fed's Term Auction Facility, CATO Papers on Public Policy 2: 57-91

Berger, A.N., and C.H.S. Bouwman, 2009, Bank liquidity creation, Review of Financial Studies 22: 3779-3837.

Berger, A.N., and C.H.S. Bouwman, 2013, How does capital affect bank performance during financial crises?, Journal of Financial Economics 109: 146-176.

Berger, A.N., C.H.S. Bouwman, and D. Kim, 2015, Small bank comparative advantages in alleviating financial constraints and providing liquidity insurance over time, Working paper.

Berger, A.N., N.H. Miller, M.A. Petersen, R.G. Rajan, and J.C. Stein, 2005, Does function follow organizational form? Evidence from the lending practices of large and small banks, Journal of Financial Economics 76: 237-269.

Bernanke, B.S., 1983, Non-monetary effects of the financial crisis in the propagation of the great depression, American Economic Review 73: 257-276.

Bernanke, B.S., 2009, The Federal Reserve's balance sheet, speech delivered at the Federal Reserve Bank of Richmond 2009 Credit Markets Symposium on April 3.

Berrospide, J. M., 2012, Bank liquidity hoarding and the financial crisis: An empirical evaluation, FEDS Working Paper No. 2013-03, Board of Governors of the Federal Reserve System.

Black, L. K., and L. N. Hazelwood, 2013, The effect of TARP on bank risk-taking, Journal of Financial Stability 9: 790-803.

Boyson, N.M., J. Helwege, J. Jindra, 2015, Thawing frozen capital markets and backdoor bailouts: Evidence from the Fed's liquidity programs, Working paper.

Brave, S.A., and H. Genay, 2011, Federal Reserve policies and financial market conditions during the crisis, Federal Reserve Bank of Chicago Working Paper.

Calomiris, C., 1994, Is the discount window necessary? A Penn-Central perspective, Federal Reserve Bank of St. Louis Review, 31-55.

Corbett, J., and J. Mitchell, 2000, Banking crises and bank rescues: The effect of reputation,

Journal of Money, Credit and Banking 32: 474-512.

Drechsler, I., T. Drechsel, D. Marques-Ibanez, P. Schnabl, forthcoming, Who borrows from the lender of last resort?, Journal of Finance.

Duchin, R., and D. Sosyura, 2014, Safer ratios, riskier portfolios: Banks' response to government aid, Journal of Financial Economics 113: 1-28.

Ennis, H.M., and J.A. Weinberg, 2013, Over-the-counter loans, adverse selection, and stigma in the interbank market, Review of Economic Dynamics 16: 601-616.

Flannery, M., 1996, Financial crises, payment system problems, and discount window lending, Journal of Money, Credit and Banking 28: 804-824.

Freixas, X., and B.M. Parigi, 2015, Lender of last resort and bank closure policy: A post-crisis perspective, in The Oxford Handbook of Banking 2nd edition (eds: A.N. Berger, P. Molyneux, and J.O.S. Wilson), Oxford University Press, 474-504.

Freixas, X., and J-C. Rochet, 2008, Microeconomics of banking (2nd edition), MIT Press.

Furfine, C., 2001, The reluctance to borrow from the Fed, Economics Letters 72: 209-213.

Gilbert, R.A., K.L. Kliesen, A.P. Meyer, and D.C. Wheelock, 2012, Federal Reserve lending to troubled banks during the financial crisis, 2007-2010, Federal Reserve Bank of St. Louis Review (May/June) 94, 221-242.

Goodfriend, M., and R.G. King, 1988, Financial deregulation, monetary policy, and central banking, in Restructuring banking and financial services in America (eds: W.S. Haraf and R.M. Kushmeider), American Enterprise Institute for Public Policy Research.

Goodhart, C. A. E., 1985, The Evolution of Central Banks, London School of Economics and Political Science.

Gopalan, R., T. Milbourn, F. Song, and A.V. Thakor, 2014, Duration of Executive Compensation, Journal of Finance 69: 2777-2817.

Greenbaum, S.I., and A.V. Thakor, 2007, Contemporary financial intermediation (2nd edition), Academic Press.

Gu, X., and P.R. Rosenbaum, 1993, Comparison of multivariate matching methods: Structures, distances, and algorithms, Journal of Computational and Graphical Statistics 2: 405-420.

Humphrey, T.M., 2010, Lender of last resort: What it is, whence it came, and why the Fed isn't it, Cato Journal 30: 333-364.

Kashyap, A.K., R.G. Rajan, and J.C. Stein, 2002, Banks as liquidity providers: an explanation for the coexistence of lending and deposit-taking, Journal of Finance 57: 33-73.

Kashyap, A.K., and J.C. Stein, 2000, What do a million observations on banks say about the transmission of monetary policy?, American Economic Review 90, 407-428.

Kleymenova, A., 2013, Consequences of mandated bank liquidity disclosures, Working paper.

Levitt, S. D., 1996, The effect of prison population size on crime rates: Evidence from prison overcrowding litigation, Quarterly Journal of Economics 111: 319-351.

Madigan, B.F., and W.R. Nelson, 2002, Proposed revision to the Federal Reserve's discount window lending programs, Federal Reserve Bulletin July: 313-319.

McAndrews, J., A. Sarkar, and Z. Wang, 2008, Effects of the Term Auction Facility on the London Inter-Bank Offered Rate, Federal Reserve Bank of New York Staff Report 335.

Mitchell, K., and D. Pearce, 1992, Discount window borrowing across Federal Reserve districts: Evidence under contemporaneous reserve accounting, Journal of Banking and Finance 16:

771-790.

Peristiani, S., 1998, The growing reluctance to borrow at the discount window: An empirical investigation, Review of Economics and Statistics 80: 611-620.

Philippon, T., and V. Skreta, 2012, Optimal interventions in markets with adverse selection, American Economic Review 102: 1-30.

Solow, R. M., 1982, On the lender of last resort, in Financial Crises: Theory, History and Policy (ed: C. P. Kindleberger and J. P. Larrargue), Cambridge University Press.

Taylor, J.B., and J.C. Williams, 2009, A black swan in the money market, American Economic Journal: Macroeconomics 1: 58-83.

Thornton, H., 1802, An Enquiry into the Nature and Effects of the Paper Credit of Great Britain (ed: F. A. Hayek).

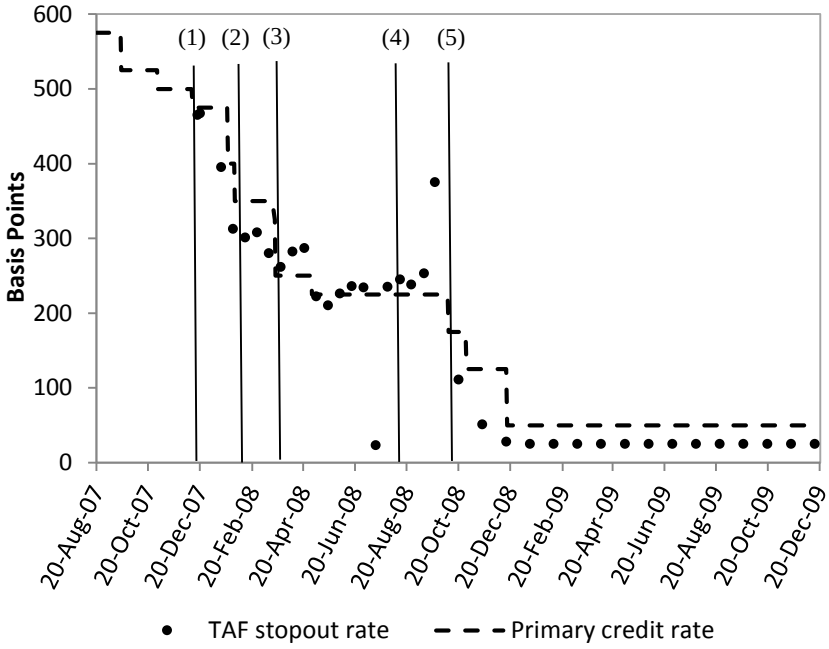
Wood, J.H., 2005, A History of Central Banking in Great Britain and the United States, Cambridge University Press.

Wu, T., 2011, The U.S. money market and the Term Auction Facility in the financial crisis of 2007-2009, Review of Economics and Statistics 93: 617-631.

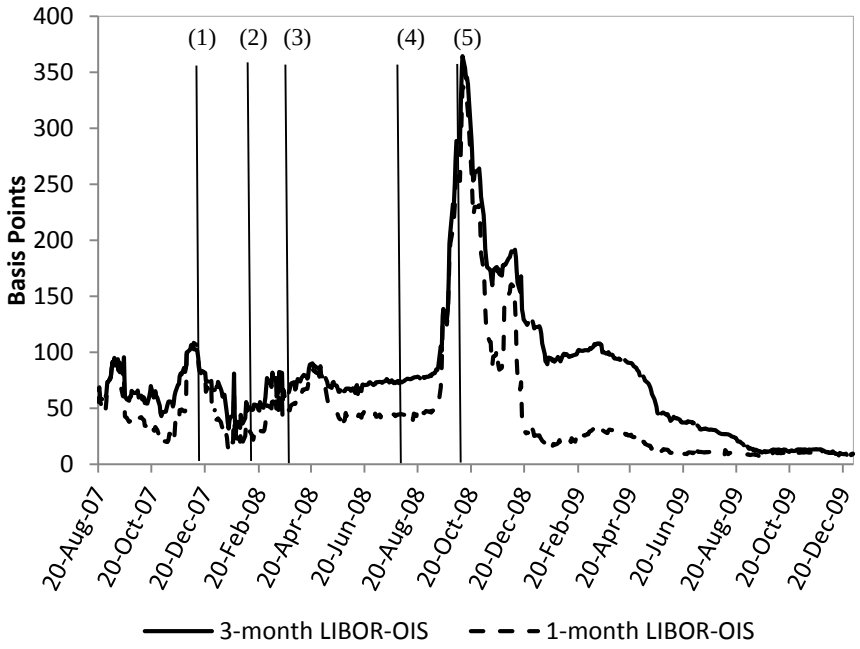
Figure 1: The cost of DW, TAF, and interbank borrowing

Panel A shows the stopout rates for the Term Auction Facility (TAF), the lowest accepted bid rate which all awarded institutions pay upon maturity, and the primary credit rate of the discount window (DW). Panel B presents the 3-month and 1-month Libor-OIS spreads during the crisis, where Libor is the London Interbank Offered Rate and OIS is the Overnight Indexed Swap rate. These spreads are widely considered to be indicators of bank distress. Panels A and B also show the dates of relevant Federal Reserve expansionary policy interventions through the DW and TAF.

Panel A: Cost of TAF vs. primary discount window funds



Panel B: Libor – OIS spread

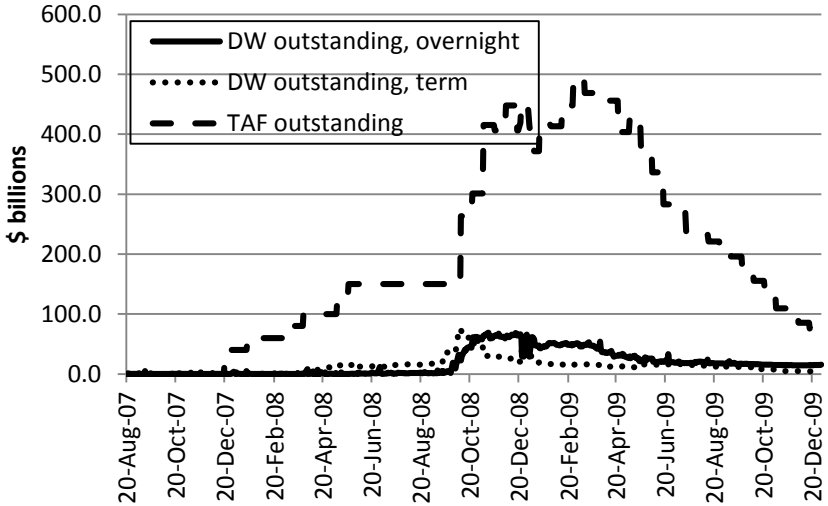


(1) TAF announced (December 12, 2007)
(2) Minimum TAF bid size reduced to $5 million (February 1, 2008)
(3) DW primary credit spread reduced to 25 bps;
maximum term extended to 90 days (March 16, 2008)
(4) 84-day TAF loans introduced (July 30, 2008)
(5) TAF auction size increased to $150 billion (October 6, 2008)

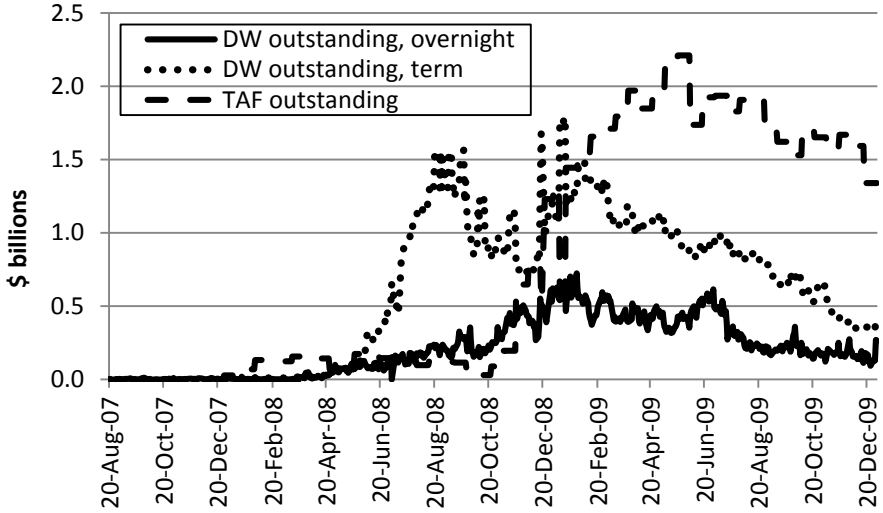
Figure 2: DW and TAF outstandings during the crisis

Panels A, B, C, and D present the dollar amounts outstanding of DW (overnight and term) and TAF during the crisis by all banks, small commercial banks (gross total assets or GTA up to $1 billion), large commercial banks (GTA over $1 billion), and non-commercial banks (banks without Call Reports), respectively, during the crisis. DW is discount window and TAF is the Term Auction Facility. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). The crisis is defined to last from August 20, 2007 – December 31, 2009.

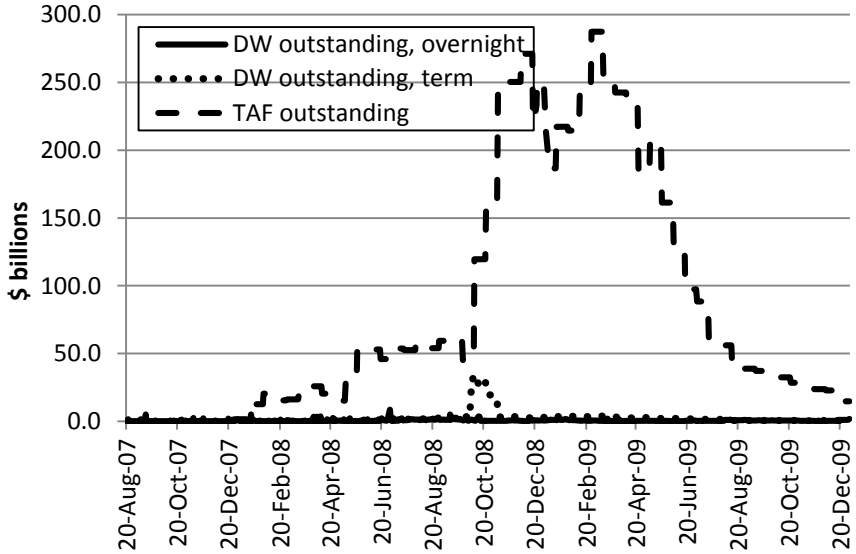
Panel A: All banks



Panel B: Small commercial banks



Panel C: Large commercial banks



Panel D: Non-commercial banks

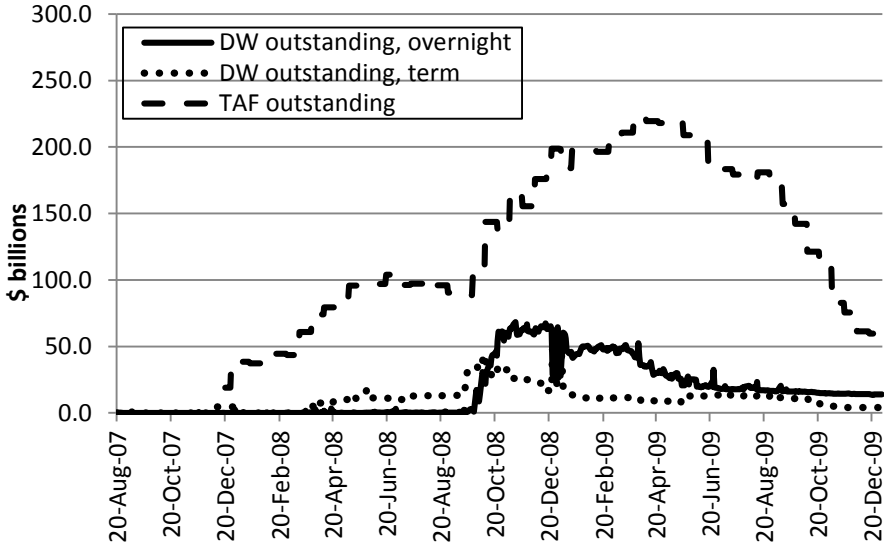


Table 1: DWTAF, DW, and TAF issued during the crisis

This table presents DWTAF, DW, and TAF usage during the crisis (August 20, 2007 – December 31, 2009). DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. The numbers do not represent outstandings, which are shown in Figure 2.

	DWTAF	DW	TAF
Crisis:			
Number of loans	30,332	26,395	3,937
Par value of loans made ($ billions)	14,753.94	10,992.90	3,761.05
Average loan size ($ millions)	486.42	416.48	955.31
Median loan size ($ millions)	8.25	6.01	150.00
Standard deviation of loan size	2,720.72	2,808.58	1,937.22
Number of users	2,121	2,014	404
Number of users with at least one quarter of Call Report data during the crisis	1,804	1,728	283

Table 2: Top 10 users based on usage intensity during the crisis

This table shows the top 10 users ranked alternatively by DWTAF, DW, and TAF. DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. Banks are ranked based on usage intensity, measured as the frequency with which they used these facilities during the crisis. The crisis is defined to last from 2007:Q3 – 2009:Q4. Panels 1, 2, and 3 show results for small banks (GTA up to $1 billion), large banks (GTA exceeding $1 billion), and non-commercial banks (institutions that do not fill out Call Reports), respectively. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans).

Additional statistics: GTA in $ billion; and Foreign own dummy = 1 if the bank has majority foreign ownership.

Panel 1: Small banks that used DWTAF, DW, and TAF most frequently during the crisis

DWTAF		DW		TAF				
Rank	Frequency	Rank	Frequency	Rank	Frequency	User	GTA	Foreign own dummy
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	413	1	413	153	0	UNITED SCTY BK	0.81	0
2	310	2	307	82	3	UNITED NB	0.14	0
3	288	3	288	153	0	JACKSONVILLE BK	0.39	0
4	271	4	242	1	29	PACIFIC CONTINENTAL BK	0.96	0
5	238	5	238	153	0	IDAHO INDEP BK	0.66	0
6	232	6	230	97	2	GOLF SVG BK	0.33	0
7	227	7	227	153	0	TRI PARISH BK	0.15	0
8	222	8	214	35	8	STATE BK OF NEW PRAGUE	0.13	0
9	202	9	202	153	0	BANK OF FAIRFIELD	0.15	0
10	201	10	201	153	0	PROFICIO BK	0.04	0
87	58	125	32	2	26	WEST VIEW SVG BK	0.43	0
138	31	356	5	2	26	AMERICAN BK	0.51	0
152	25	758	1	4	24	COMMUNITY BKR BK	0.14	0
128	33	226	12	5	21	LIBERTY BK	0.78	0
94	47	137	27	6	20	GLACIER BK	0.88	0
160	23	405	4	7	19	CITIZENS BK	0.65	0
117	38	165	21	8	17	FIRST SECURITY BK MISSOULA	0.89	0
200	17	1402	0	8	17	FLATIRONS BK	0.05	0
34	118	42	102	10	16	NEXTIER BK NA	0.50	0
65	77	79	61	10	16	COMMUNITY FIRST BK	0.17	0
167	22	323	6	10	16	INDEPENDENT BK	0.62	0

Panel 2: Large banks that used DWTAF, DW, and TAF most frequently during the crisis

DWTAF		DW		TAF				
Rank	Frequency	Rank	Frequency	Rank	Frequency	User	GTA	Foreign own dummy
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	285	1	278	69	7	BANK OF THE CASCADES	2.45	0
2	216	2	214	102	2	SUN NB	3.50	0
3	174	3	174	132	0	STEARNS BK NA	1.39	0
4	168	4	168	132	0	FIRST NB OF CHESTER CTY	1.00	0
5	167	5	167	132	0	PARK NB	4.00	0
6	126	6	126	132	0	PACIFIC NAT BK	1.41	0
7	115	7	115	132	0	FIRST VICTORIA NB	1.28	0
7	115	7	115	132	0	GATEWAY B&TC	1.84	0
7	115	9	113	102	2	CENTRAL PACIFIC BK	5.87	0
10	113	10	112	111	1	CALIFORNIA NB	5.99	0
30	49	58	15	1	34	FIRST TN BK NA	40.08	0
34	40	91	8	2	32	FIRST MIDWEST BK	8.45	0
49	32	226	1	3	31	ASSOCIATED BK NA	21.67	0
45	33	123	4	4	29	RBS CITIZENS NA	17.65	1
41	34	99	7	5	27	FIFTH THIRD BK	57.88	0
49	32	106	6	6	26	SUSQUEHANNA BK	2.50	0
19	85	27	60	7	25	CASCADE BK	1.42	0
57	28	135	3	7	25	M&I MARSHALL & ILSLEY BK	53.17	0
41	34	76	10	9	24	COMPASS BK	36.81	0
41	34	71	11	10	23	WACHOVIA BK NA	551.89	0
62	27	123	4	10	23	RBC BK USA	26.71	1
64	25	178	2	10	23	REGIONS BK	139.99	0
71	23	328	0	10	23	DORAL BK	8.56	1

Panel 3: Non-commercial banks that used DWTAF, DW, and TAF most frequently during the crisis

DWTAF		DW		TAF		
Rank	Frequency	Rank	Frequency	Rank	Frequency	User
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	460	1	460	122	0	ALASKA USA FCU
2	333	2	315	36	18	DEPFA BK PLC NY BR
3	233	3	209	25	24	DEXIA CREDIT LOCAL NY BR
4	182	4	182	122	0	STATE EMPL CU
5	177	5	177	122	0	SAVINGS BK OF MAINE
6	174	6	174	122	0	HOME FED BK
7	157	7	157	122	0	SCOTT CU
8	141	8	128	51	13	LYDIAN PRIV BK
9	137	9	124	51	13	HOMETRUST BK
10	119	10	119	122	0	FIRST FED BK
25	57	118	4	1	53	MITSUBISHI UFJ TR & BKG NY BR
27	53	118	4	2	49	SUMITOMO MITSUI BKG NY BR
30	48	153	2	3	46	MIZUHO CORPORATE NY BR
12	109	20	65	4	44	ARAB BKG CORP NY BR
34	44	287	0	4	44	DRESDNER BK AG NY BR
37	43	287	0	6	43	BAYERISCHE HYPO VEREINS NY BR
34	44	153	2	7	42	BARCLAYS BK PLC NY BR
22	65	42	26	8	39	BANK OF SCOTLAND PLC NY BR
43	38	287	0	9	38	DZ BK AG DEUTSCHE ZENTRA NY BR
41	39	153	2	10	37	BAYERISCHE LANDESBANK NY BR

Table 3: Characteristics of banks that used funds from the Federal Reserve

This table focuses on the crisis, defined to last from 2007:Q3 – 2009:Q4. It shows the results of probit regressions in which the dependent variable is a dummy = 1 if the bank used DWTAF (Panel A), DW (Panel B), and TAF (Panel C), respectively, during the quarter. DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. Subpanels 1 and 2 show the results for small banks (GTA up to $1 billion) and large banks (GTA exceeding $1 billion), respectively. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans).

Panel C has fewer observations than Panels A and B because TAF did not exist in the first quarter of the sample period (2007:Q3). In Subpanel C1, n/a indicates that the variable (foreign own dummy) dropped out of the regression because there were no small foreign-owned banks that obtained TAF funds.

All independent variables are defined in the Data Appendix at the end of the tables. All regressions include time fixed effects (not shown for brevity) and a constant (not shown due to reporting marginal effects). Coefficients shown are marginal effects evaluated at the means of the explanatory variables. t-statistics based on robust standard errors clustered by bank are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	Panel A: ***Dummy = 1 if the bank used DWTAF during the quarter***				**Panel B:** ***Dummy = 1 if the bank used DW during the quarter***				**Panel C:** ***Dummy = 1 if the bank used TAF during the quarter***			
	Subpanel A1: Small banks		**Subpanel A2: Large banks**		**Subpanel B1: Small banks**		**Subpanel B2: Large banks**		**Subpanel C1: Small banks**		**Subpanel C2: Large banks**	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Log(GTA)	0.019***	0.019***	0.080***	0.080***	0.018***	0.017***	0.029***	0.029***	0.404***	0.398***	0.049***	0.047***
	(14.95)	(14.20)	(10.76)	(10.25)	(14.54)	(13.78)	(4.51)	(4.38)	(7.57)	(7.42)	(8.98)	(8.10)
EQRAT	-0.076***		0.167		-0.093***		0.064		1.510		-0.023	
	(-2.61)		(0.60)		(-3.34)		(0.30)		(1.37)		(-0.17)	
Tier1RAT		-0.087***		-0.044		-0.095***		-0.033		0.265		-0.301*
		(-4.32)		(-0.15)		(-4.87)		(-0.15)		(0.35)		(-1.71)
Stddev ROA	0.346	0.379	-9.561**	-8.822**	0.385	0.398	-6.787**	-6.442**	-14.432	-12.701	-1.255	-0.914
	(0.95)	(1.02)	(-2.55)	(-2.36)	(1.08)	(1.11)	(-2.17)	(-2.06)	(-1.04)	(-0.91)	(-0.59)	(-0.45)
CRE / GTA	0.033***	0.026***	0.311***	0.306***	0.029***	0.021***	0.193***	0.190***	1.237***	1.245***	0.152***	0.130***
	(4.35)	(3.48)	(4.69)	(4.35)	(3.90)	(2.95)	(3.40)	(3.20)	(4.19)	(4.16)	(3.59)	(2.93)
MBS / GTA	0.048***	0.052***	0.395***	0.385***	0.044***	0.049***	0.277***	0.272***	0.918*	0.852	0.162**	0.155**
	(4.15)	(4.53)	(3.32)	(3.28)	(4.09)	(4.57)	(2.78)	(2.74)	(1.66)	(1.56)	(2.30)	(2.22)
ROE	0.004	0.006	-0.038	-0.029	0.003	0.005	-0.022	-0.018	0.534***	0.552***	-0.003	0.006
	(1.02)	(1.58)	(-1.19)	(-0.92)	(0.80)	(1.33)	(-0.82)	(-0.66)	(2.72)	(2.94)	(-0.18)	(0.34)
Illiquidity (LC / GTA)	0.009	0.005	0.019*	0.020*	0.009	0.004	-0.009	-0.009	0.041	0.026	0.022***	0.022***
	(1.52)	(0.82)	(1.66)	(1.92)	(1.54)	(0.77)	(-0.61)	(-0.63)	(0.31)	(0.19)	(2.65)	(2.97)
BHC dummy	0.004*	0.003	0.005	-0.001	0.005**	0.004	0.011	0.008	-0.086	-0.101	-0.012	-0.023
	(1.81)	(1.30)	(0.15)	(-0.04)	(2.11)	(1.59)	(0.42)	(0.29)	(-0.83)	(-0.96)	(-0.51)	(-0.88)
Listed dummy	0.002	0.002	0.035	0.035	0.000	-0.001	0.017	0.017	0.235	0.243	0.037**	0.035**
	(0.37)	(0.32)	(1.62)	(1.62)	(0.03)	(-0.10)	(0.96)	(0.96)	(1.17)	(1.20)	(2.30)	(2.29)
Foreign own dummy	-0.015**	-0.014*	0.005	0.012	-0.013*	-0.012	-0.001	0.002	n/a	n/a	0.025	0.028
	(-2.11)	(-1.85)	(0.11)	(0.28)	(-1.85)	(-1.63)	(-0.04)	(0.05)			(0.82)	(0.93)

OCC dummy	-0.002	-0.002	0.004	0.003	0.000	0.000	-0.005	-0.005	-0.430***	-0.433***	-0.009	-0.009
	(-0.81)	(-0.71)	(0.13)	(0.10)	(0.05)	(0.08)	(-0.20)	(-0.22)	(-3.27)	(-3.28)	(-0.55)	(-0.60)
FDIC dummy	-0.009***	-0.009***	-0.029	-0.030	-0.008***	-0.008***	-0.040*	-0.040*	-0.206*	-0.213**	-0.003	-0.003
	(-3.18)	(-3.19)	(-1.08)	(-1.12)	(-2.83)	(-2.83)	(-1.71)	(-1.74)	(-1.94)	(-2.01)	(-0.22)	(-0.22)
Income growth	0.101	0.097	1.351*	1.306*	0.097	0.093	0.507	0.486	1.265	1.233	0.653	0.641
	(1.55)	(1.52)	(1.84)	(1.76)	(1.54)	(1.51)	(0.79)	(0.75)	(0.46)	(0.44)	(1.50)	(1.49)
Fed district 2	-0.011	-0.011	0.032	0.032	-0.011	-0.011	0.044	0.044	-0.363	-0.365	0.003	0.000
	(-1.54)	(-1.50)	(0.85)	(0.84)	(-1.48)	(-1.44)	(1.63)	(1.63)	(-1.13)	(-1.14)	(0.10)	(0.01)
Fed district 3	0.001	0.000	0.051	0.052	-0.001	-0.002	0.041	0.041	0.283	0.280	0.008	0.001
	(0.13)	(0.06)	(1.04)	(1.06)	(-0.14)	(-0.22)	(1.10)	(1.11)	(1.01)	(1.00)	(0.30)	(0.03)
Fed district 4	-0.013*	-0.013*	0.021	0.020	-0.018***	-0.018***	0.024	0.023	0.610**	0.611**	0.013	0.004
	(-1.94)	(-1.96)	(0.48)	(0.44)	(-2.77)	(-2.79)	(0.76)	(0.73)	(2.28)	(2.29)	(0.48)	(0.16)
Fed district 5	-0.002	-0.002	0.080*	0.080*	-0.007	-0.007	0.075**	0.075**	0.608**	0.606**	0.011	0.005
	(-0.27)	(-0.29)	(1.74)	(1.72)	(-1.08)	(-1.11)	(2.16)	(2.14)	(2.54)	(2.54)	(0.39)	(0.18)
Fed district 6	-0.012*	-0.012*	0.033	0.034	-0.013**	-0.013**	0.018	0.018	0.154	0.155	0.027	0.022
	(-1.93)	(-1.93)	(0.84)	(0.86)	(-2.10)	(-2.10)	(0.62)	(0.63)	(0.64)	(0.65)	(1.05)	(0.84)
Fed district 7	0.001	0.001	0.138***	0.136***	0.000	-0.001	0.121***	0.120***	0.152	0.155	0.037	0.030
	(0.23)	(0.12)	(3.10)	(3.02)	(0.03)	(-0.09)	(3.56)	(3.52)	(0.66)	(0.68)	(1.22)	(0.99)
Fed district 8	-0.006	-0.006	0.091*	0.091*	-0.008	-0.009	0.082**	0.082**	0.347	0.352	0.059	0.054
	(-0.94)	(-0.97)	(1.81)	(1.79)	(-1.28)	(-1.32)	(2.13)	(2.12)	(1.39)	(1.41)	(1.52)	(1.37)
Fed district 9	0.002	0.000	0.036	0.036	-0.002	-0.003	0.045	0.046	0.661***	0.672***	-0.024	-0.029
	(0.23)	(0.06)	(0.57)	(0.57)	(-0.28)	(-0.47)	(0.80)	(0.80)	(2.70)	(2.74)	(-1.24)	(-1.46)
Fed district 10	-0.013**	-0.014**	0.039	0.037	-0.015**	-0.016**	0.029	0.028	0.184	0.193	0.034	0.027
	(-2.10)	(-2.17)	(0.88)	(0.83)	(-2.37)	(-2.45)	(0.96)	(0.93)	(0.73)	(0.76)	(1.01)	(0.81)
Fed district 11	-0.023***	-0.023***	-0.005	-0.004	-0.024***	-0.024***	0.008	0.008	-0.365	-0.362	0.000	-0.004
	(-3.82)	(-3.80)	(-0.12)	(-0.09)	(-3.92)	(-3.90)	(0.23)	(0.24)	(-1.10)	(-1.09)	(0.00)	(-0.18)
Fed district 12	0.028***	0.029***	0.102**	0.103**	0.026***	0.026***	0.131***	0.132***	0.589**	0.605**	0.003	0.001
	(3.11)	(3.19)	(2.46)	(2.48)	(2.88)	(2.94)	(4.07)	(4.10)	(2.44)	(2.50)	(0.12)	(0.02)
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	63301	63301	5101	5101	63301	63301	5101	5101	56780	56780	4546	4546
Pseudo R2	0.16	0.16	0.13	0.13	0.15	0.15	0.08	0.08	0.22	0.22	0.23	0.24

Table 4: Did funds from the Federal Reserve substitute for or complement other funding sources?

This table reports OLS regressions which examine whether funds from DWTAF (Panel A), the DW (Panel B), and the TAF (Panel C), substitute for or complement other funding sources during the crisis. DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. The crisis is defined to last from 2007:Q3 – 2009:Q4. Δ(DWTAF) / GTA is the change in the bank's average amount of DWTAF outstanding during the quarter normalized by lagged GTA. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). Subpanels 1 and 2 show the results for small banks (GTA up to $1 billion) and large banks (GTA exceeding $1 billion), respectively.

All variables are defined in the Data Appendix at the end of the tables. All regressions include all of the independent variables shown in Table 3 (with the exception of the Federal Reserve District dummies), a constant, and bank and time fixed effects (not shown for brevity). t-statistics based on robust standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent variable:	**Panel A:** ***Δ(DWTAF) / GTA***		**Panel B:** ***Δ(DW) / GTA***		**Panel C:** ***Δ(TAF) / GTA***	
	Subpanel A1: Small banks	**Subpanel A2: Large banks**	**Subpanel B1: Small banks**	**Subpanel B2: Large banks**	**Subpanel C1: Small banks**	**Subpanel C2: Large banks**
	(1)	(2)	(1)	(2)	(1)	(2)
Δ(Core Deposits)/GTA	-0.007***	-0.007	-0.003**	-0.002	0.000	0.000
	(-2.92)	(-1.48)	(-2.49)	(-1.33)	(1.26)	(1.10)
Δ(Fed Funds)/GTA	-0.010	-0.011	-0.002	-0.001	0.000	0.000
	(-0.84)	(-0.61)	(-0.50)	(-0.23)	(1.04)	(0.20)
Δ(Repos)/GTA	-0.019	-0.031	0.001	-0.008	-0.001	-0.001
	(-1.18)	(-1.39)	(0.19)	(-1.56)	(-1.64)	(-0.58)
Δ(Other Hot Money/GTA	-0.010**	-0.032***	-0.005***	0.001	0.000	-0.002***
	(-2.16)	(-4.60)	(-2.72)	(0.49)	(1.08)	(-5.45)
Δ(FHLB)/GTA	-0.004	-0.022**	0.001	0.000	-0.001**	-0.001
	(-0.65)	(-2.13)	(0.54)	(0.16)	(-2.52)	(-1.06)
Δ(TARP)/GTA	-0.048	0.036	-0.025**	0.003	0.000	0.003*
	(-1.63)	(1.03)	(-2.20)	(0.30)	(0.39)	(1.95)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank and time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4249	1396	4249	1396	4249	1396
R2	0.28	0.33	0.23	0.19	0.58	0.49

Table 5: Did banks use the funds from the Federal Reserve to increase lending? (*OLS regressions*)

This table reports OLS regressions which examine the effect of using funds from the Federal Reserve on bank lending during the crisis. The crisis is defined to last from 2007:Q3 – 2009:Q4. Δ(DWTAF) / GTA is the change in the bank's average amount of DWTAF outstanding during the quarter normalized by lagged GTA. DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). Panel A examines the effect on total bank lending. Panel B alternatively splits total loans by maturity (short-term and long-term loans) or by loan category (C&I, CRE, RRE, consumer, and other loans). Panel C contains OLS regressions which include two lags of the dependent variable for consistency with the two matching approaches shown in Table 6. Subpanels 1 and 2 show the results for small banks (GTA up to $1 billion) and large banks (GTA exceeding $1 billion), respectively.

All variables are defined in the Data Appendix at the end of the tables. All regressions include a constant and bank and time fixed effects (not shown for brevity). The regressions in Panel B also include the control variables included in Columns (2) in Panel A (not shown for brevity). t-statistics based on robust standard errors clustered by bank are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel A: Effect of DWTAF on bank lending (*OLS results*)

	Subpanel A1: Small banks		**Subpanel A2: Large banks**	
Dependent variable:	***Δ(LOANS)/GTA***	***Δ(LOANS)/GTA***	***Δ(LOANS)/GTA***	***Δ(LOANS)/GTA***
	(1)	(2)	(1)	(2)
Δ(DWTAF) / GTA	0.646***	0.918***	0.518***	0.991***
	(5.05)	(7.26)	(2.66)	(5.03)
Δ(Core Deposits)/GTA		0.088***		0.106***
		(14.22)		(3.83)
Δ(Fed funds)/GTA		0.454***		0.332***
		(25.74)		(5.70)
Δ(Repos)/GTA		0.139***		0.116**
		(6.13)		(2.36)
Δ(Other Hot Money)/GTA		0.251***		0.180***
		(21.43)		(4.29)
Δ(FHLB)/GTA		0.338***		0.264***
		(30.23)		(6.54)
Δ(TARP)/GTA		0.110*		-0.037
		(1.83)		(-0.34)
Log(GTA)	-0.058***	-0.043***	-0.043***	-0.033***
	(13.24)	(-11.29)	(-4.45)	(-3.54)
EQRAT	0.271***	0.179***	0.124***	0.083*
	(7.51)	(5.37)	(3.20)	(1.81)
Stddev ROA	-0.340	-0.307	0.299	0.278
	(-1.07)	(-1.14)	(0.21)	(0.24)
CRE / GTA	-0.069***	-0.085***	-0.014	-0.061**
	(-7.00)	(-8.70)	(-0.54)	(-2.42)
MBS / GTA	0.072***	0.066***	0.064***	0.055***
	(11.08)	(10.70)	(2.76)	(3.15)
ROE	0.017***	0.015***	0.013**	0.012**
	(10.26)	(10.29)	(2.18)	(2.33)
Illiquidity (LC / GTA)	-0.008	-0.025***	0.004	-0.001
	(-1.26)	(-3.12)	(0.30)	(-0.04)

BHC dummy	-0.002	-0.001	0.021	0.014
	(-0.65)	(-0.30)	(1.45)	(1.21)
Listed dummy	0.013	0.010	-0.007	-0.009
	(1.55)	(1.50)	(-1.01)	(-1.26)
Foreign own dummy	0.009	0.009	0.005	0.003
	(0.66)	(0.57)	(0.67)	(0.39)
OCC dummy	-0.001	-0.001	-0.002	0.009
	(-0.09)	(-0.13)	(-0.17)	(0.62)
FDIC dummy	0.002	0.002	-0.004	0.006
	(0.28)	(0.34)	(-0.51)	(0.72)
Income growth	0.020	0.014	0.020	0.033
	(1.28)	(0.94)	(0.33)	(0.57)
Bank and time FEs	Yes	Yes	Yes	Yes
Observations	55959	55889	4258	4255
R2	0.39	0.45	0.42	0.48

Panel B: Effect of DWTAF on different types of lending (*OLS results*)

	Subpanel B1: Small banks						
Dependent variable:	***Δ(ST_LOANS) /GTA***	***Δ(LT_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CRE_LOANS) /GTA***	***Δ(RRE_LOANS) /GTA***	***Δ(CONS_LOANS) /GTA***	***Δ(OTHER_LOANS) /GTA***
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ(DWTAF) / GTA	0.606***	0.349***	0.157***	0.386***	0.028	0.005	0.224***
	(4.66)	(2.70)	(3.20)	(4.43)	(0.66)	(0.47)	(4.78)
Δ Other funding sources	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank and time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	55889	55889	55889	55889	55889	55889	55889
R2	0.15	0.24	0.21	0.40	0.31	0.25	0.12

	Subpanel B2: Large banks						
Dependent variable:	***Δ(ST_LOANS) /GTA***	***Δ(LT_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CRE_LOANS) /GTA***	***Δ(RRE_LOANS) /GTA***	***Δ(CONS_LOANS) /GTA***	***Δ(OTHER_LOANS) /GTA***
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ(DWTAF) / GTA	0.354**	0.679***	0.159**	0.272***	0.098*	0.054**	0.061
	(2.30)	(3.02)	(2.15)	(3.01)	(1.69)	(2.16)	(1.18)
Δ Other funding sources	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank and time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4255	4255	4255	4255	4255	4255	4255
R2	0.21	0.28	0.26	0.51	0.35	0.34	0.14

Panel C: Effect of DWTAF on bank lending (*OLS results with two lags of the dependent variable*)

	Subpanel C1: Small banks							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Δ(LOANS) /GTA	***Δ(ST_LOANS) /GTA***	***Δ(LT_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CRE_LOANS) /GTA***	***Δ(RRE_LOANS) /GTA***	***Δ(CONS_LOANS) /GTA***	***Δ(OTHER_LOANS) /GTA***
Δ(DWTAF) / GTA	0.903***	0.633***	0.416***	0.175***	0.392***	0.041	0.010	0.238***
	(7.30)	(4.56)	(3.02)	(3.53)	(4.57)	(0.95)	(0.91)	(5.28)
2 Lags of dependent variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Δ Other funding sources	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank and time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	55226	55226	55226	55226	55226	55226	55226	55226
R2	0.46	0.20	0.26	0.22	0.42	0.32	0.26	0.29

	Subpanel C2: Large banks							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Δ(LOANS) /GTA	***Δ(ST_LOANS) /GTA***	***Δ(LT_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CRE_LOANS) /GTA***	***Δ(RRE_LOANS) /GTA***	***Δ(CONS_LOANS) /GTA***	***Δ(OTHER_LOANS) /GTA***
Δ(DWTAF) / GTA	0.992***	0.365**	0.750***	0.122	0.313***	0.088	0.053*	0.044
	(4.46)	(2.15)	(3.07)	(1.45)	(2.93)	(1.55)	(1.87)	(0.80)
2 Lags of dependent variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Δ Other funding sources	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank and time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3860	3860	3860	3860	3860	3860	3860	3860
R2	0.49	0.22	0.30	0.27	0.54	0.37	0.35	0.22

Table 6: Did banks use the funds from the Federal Reserve to increase lending? (*CSW and nearest neighbor matching*)

This table examines the effect of using funds from the Federal Reserve on bank lending during the crisis using three alternative approaches. Panel A shows the results of Carlson, Shan, and Warusawitharana (CSW, 2013) matching (for small banks only since large banks cannot be properly matched using this method). Panel B has the results of nearest neighbor matching. The crisis is defined to last from 2007:Q3 – 2009:Q4. Δ(DWTAF) / GTA is the change in the bank's average amount of DWTAF outstanding during the quarter normalized by lagged GTA. DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). Each panel shows the results for total loans and for loans alternatively split by maturity (short-term and long-term loans) or by loan category (C&I, CRE, RRE, consumer, and other loans). Small banks have GTA up to $1 billion and large banks have GTA exceeding $1 billion, respectively.

All variables are defined in the Data Appendix at the end of the tables. All regressions include a constant and bank and time fixed effects (not shown for brevity). t-statistics based on robust standard errors clustered by bank are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel A: Effect of DWTAF on bank lending (*CSW matching results*)

	Small banks							
Dependent variable:	***Δ(LOANS) /GTA***	***Δ(ST_LOANS) /GTA***	***Δ(LT_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CRE_LOANS) /GTA***	***Δ(RRE_LOANS) /GTA***	***Δ(CONS_LOANS) /GTA***	***Δ(OTHER_LOANS) /GTA***
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ(DWTAF) / GTA	0.998***	0.600***	0.430**	0.195***	0.493***	0.107*	-0.029	0.183***
	(6.11)	(3.31)	(2.16)	(2.63)	(3.95)	(1.66)	(-1.53)	(3.27)
2 Lags of dependent variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Δ Other funding sources	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank and time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20594	20594	20594	20594	20594	20594	20594	20594
R2	0.25	0.04	0.06	0.04	0.13	0.08	0.04	0.07

Panel B: Effect of DWTAF on bank lending (*nearest neighbor matching results*)

	Subpanel B1: Small banks							
Dependent variable:	***Δ(LOANS) /GTA***	***Δ(ST_LOANS) /GTA***	***Δ(LT_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CRE_LOANS) /GTA***	***Δ(RRE_LOANS) /GTA***	***Δ(CONS_LOANS) /GTA***	***Δ(OTHER_LOANS) /GTA***
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ(DWTAF) / GTA	0.684***	0.412***	0.490***	0.276***	0.202*	0.060	0.014	0.084*
	(4.28)	(2.62)	(2.91)	(4.19)	(1.89)	(1.07)	(0.85)	(1.68)
2 Lags of dependent variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Δ Other funding sources	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank and time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26596	26596	26596	26596	26596	26596	26596	26596
R2	0.24	0.04	0.06	0.03	0.14	0.09	0.06	0.11

	Subpanel B2: Large banks							
Dependent variable:	***Δ(LOANS) /GTA***	***Δ(ST_LOANS) /GTA***	***Δ(LT_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CRE_LOANS) /GTA***	***Δ(RRE_LOANS) /GTA***	***Δ(CONS_LOANS) /GTA***	***Δ(OTHER_LOANS) /GTA***
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ(DWTAF) / GTA	0.884***	0.320	0.767**	0.151	0.216	0.119	0.054*	0.085
	(3.07)	(1.17)	(2.45)	(1.45)	(1.40)	(1.49)	(1.90)	(1.20)
2 Lags of dependent variable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Δ Other funding sources	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank and time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1678	1678	1678	1678	1678	1678	1678	1678
R2	0.31	0.08	0.11	0.11	0.32	0.18	0.17	0.04

Table 7: Economic significance

This table calculates how much lending changed during the crisis as a result of DWTAF and how this relates to the change in lending by small and large banks. The crisis is defined to last from 2007:Q3 – 2009:Q4. DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. Panels 1 and 2 show the results for small banks (GTA up to $1 billion) and large banks (GTA exceeding $1 billion), respectively.

The estimated dollar effect of DWTAF on small- and large-bank lending is shown in column (3) and is obtained by multiplying average daily amount of DWTAF outstanding during a quarter in column (1) by the coefficient on *Δ(DWTAF) / GTA* obtained using the full specification in Table 5 Panel A, replicated in Table 7 column (2). GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). The percentage change in lending for small and large banks due to DWTAF is obtained by dividing column (3) by the actual quarterly change in lending for that size class shown in column (4), and is shown in two columns. Column (5) focuses on quarters in which lending increased for that size class and shows the percent of the increase in lending that is estimated to be attributable to DWTAF. Column (6) focuses on quarters in which lending decreased for that size class and shows the estimated percent by which the decrease would have been greater in the absence of DWTAF.

Panel 1: Small bank economic significance

	Average daily DWTAF outstandings	**Coefficient on *Δ(DWTAF) / GTA***	**Estimated dollar effect of *DWTAF* on lending**	**Quarterly *Δ(LOANS)***	***DWTAF* was responsible for:**	
					X% of the increase	**Y% of the decrease**
	(1)	(2)	(3)	(4)	(5)	(6)
2007:Q3	4	0.918	4	9,730	0.0%	
2007:Q4	4	0.918	4	18,754	0.0%	
2008:Q1	119	0.918	109	7,642	1.4%	
2008:Q2	345	0.918	316	17,526	1.8%	
2008:Q3	1,454	0.918	1,334	4,602	29.0%	
2008:Q4	1,680	0.918	1,543	12,156	12.7%	
2009:Q1	3,342	0.918	3,068	(2,546)		120.5%
2009:Q2	3,399	0.918	3,120	3,890	80.2%	
2009:Q3	2,895	0.918	2,658	(5,464)		48.6%
2009:Q4	2,219	0.918	2,037	(5,767)		35.3%

Panel 2: Large bank economic significance

	Average daily DWTAF outstandings	**Coefficient on *Δ(DWTAF) / GTA***	**Estimated dollar effect of *DWTAF* on lending**	**Quarterly *Δ(LOANS)***	***DWTAF* was responsible for:**	
					X% of the increase	**Y% of the decrease**
	(1)	(2)	(3)	(4)	(5)	(6)
2007:Q3	1,057	0.991	1,048	193,214	0.5%	
2007:Q4	340	0.991	337	219,436	0.2%	
2008:Q1	14,895	0.991	14,761	2,660	554.9%	
2008:Q2	36,098	0.991	35,773	(61,209)		58.4%
2008:Q3	58,832	0.991	58,303	189,510	30.8%	
2008:Q4	210,014	0.991	208,124	(97,910)		212.6%
2009:Q1	241,609	0.991	239,434	(145,515)		164.5%
2009:Q2	179,386	0.991	177,771	(22,312)		796.8%
2009:Q3	53,520	0.991	53,038	(192,870)		27.5%
2009:Q4	26,298	0.991	26,062	(50,548)		51.6%

Table 8: Did banks use the funds from the Federal Reserve to increase lending? Excluding Too-Big-To-Fail banks

This table reports OLS regressions which examine the effect of using funds from the Federal Reserve on bank lending during the crisis for large banks (GTA exceeding $1 billion) excluding Too-Big-To-Fail banks, alternatively defined as banks with GTA exceeding $50 billion (Panel A) or the 19 largest banks in each quarter (Panel B). The crisis is defined to last from 2007:Q3 – 2009:Q4. Δ(DWTAF) / GTA is the change in the bank's average amount of DWTAF outstanding during the quarter normalized by lagged GTA. DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans).

All variables are defined in the Data Appendix at the end of the tables. All regressions include the control variables included in Columns (2) of Table 5 Panel A, a constant, and bank and time fixed effects (not shown for brevity). t-statistics based on robust standard errors clustered by bank are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel A: Effect of DWTAF usage on lending by large banks excluding Too-Big-To-Fail banks defined as banks with GTA exceeding $50 billion

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Δ(LOANS) /GTA	***Δ(ST_LOANS) /GTA***	***Δ(LT_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CRE_LOANS) /GTA***	***Δ(RRE_LOANS) /GTA***	***Δ(CONS_LOANS) /GTA***	***Δ(OTHER_LOANS) /GTA***
Δ(DWTAF) / GTA	0.981***	0.264	0.778***	0.059	0.327***	0.144**	0.043*	0.056
	4.48	1.60	3.10	0.85	3.03	2.30	1.96	1.13
Δ Other funding sources	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank and time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4013	4013	4013	4013	4013	4013	4013	4013
R2	0.49	0.21	0.29	0.26	0.52	0.35	0.36	0.14

Panel B: Effect of DWTAF usage on lending by large banks excluding Too-Big-To-Fail banks defined as the 19 largest banks each quarter

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Δ(LOANS) /GTA	***Δ(ST_LOANS) /GTA***	***Δ(LT_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CRE_LOANS) /GTA***	***Δ(RRE_LOANS) /GTA***	***Δ(CONS_LOANS) /GTA***	***Δ(OTHER_LOANS) /GTA***
Δ(DWTAF) / GTA	0.982***	0.364**	0.673***	0.131*	0.298***	0.106*	0.063***	0.053
	4.97	2.28	2.89	1.72	3.09	1.73	2.65	1.15
Δ Other funding sources	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank and time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4132	4132	4132	4132	4132	4132	4132	4132
R2	0.49	0.21	0.28	0.26	0.51	0.35	0.35	0.14

Table 9: Did banks use the funds from the Federal Reserve to increase lending? Listed versus unlisted banks

This table reports OLS regressions which examine the effect of using funds from the Federal Reserve on bank lending during the crisis for banks that are listed (or part of a listed BHC) and those that are not. The crisis is defined to last from 2007:Q3 – 2009:Q4. Δ(DWTAF) / GTA is the change in the bank's average amount of DWTAF outstanding during the quarter normalized by lagged GTA. DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). Panels 1 and 2 show the results for small banks (GTA up to $1 billion) and large banks (GTA exceeding $1 billion), respectively. Subpanels A and B show the results for listed and unlisted banks, respectively.

All variables are defined in the Data Appendix at the end of the tables. All regressions include a constant, the control variables included in Columns (2) of Table 5 Panel A, bank and time fixed effects (not shown for brevity). t-statistics based on robust standard errors clustered by bank are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel 1: Small banks

	Effect of DWTAF usage on:							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Δ(LOANS) /GTA	***Δ(ST_LOANS) /GTA***	***Δ(LT_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CRE_LOANS) /GTA***	***Δ(RRE_LOANS) /GTA***	***Δ(CONS_LOANS) /GTA***	***Δ(OTHER_LOANS) /GTA***
Subpanel A1: Listed small banks								
Δ(DWTAF) / GTA	0.547***	1.078*	-0.512	-0.002	0.349	0.243	-0.098*	0.065
	2.86	1.78	-0.92	-0.02	1.17	1.34	-1.70	0.56
Δ Other funding sources	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank and time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	852	852	852	852	852	852	852	852
R2	0.50	0.21	0.26	0.30	0.52	0.35	0.34	0.09
Subpanel A2: Unlisted small banks								
Δ(DWTAF) / GTA	0.932***	0.580***	0.392***	0.163***	0.391***	0.016	0.009	0.229***
	7.07	4.37	2.96	3.20	4.32	0.38	0.86	4.68
Δ Other funding sources	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank and time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	55037	55037	55037	55037	55037	55037	55037	55037
R2	0.45	0.15	0.24	0.21	0.40	0.31	0.25	0.12

Panel 2: Large banks

	Effect of DWTAF usage on:							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Δ(LOANS) /GTA	***Δ(ST_LOANS) /GTA***	***Δ(LT_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CRE_LOANS) /GTA***	***Δ(RRE_LOANS) /GTA***	***Δ(CONS_LOANS) /GTA***	***Δ(OTHER_LOANS) /GTA***
Subpanel B1: Listed large banks								
Δ(DWTAF) / GTA	0.403*	0.19	0.235	0.02	0.123	0.08	0.042	-0.024
	1.88	1.18	1.04	0.34	1.15	1.39	1.00	-0.36
Δ Other funding sources	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank and time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1274	1274	1274	1274	1274	1274	1274	1274
R2	0.61	0.24	0.29	0.35	0.60	0.42	0.41	0.21
Subpanel B2: Unlisted large banks								
Δ(DWTAF) / GTA	1.300***	0.454**	0.919***	0.258**	0.352***	0.114	0.052*	0.117
	4.71	2.02	2.76	2.37	2.72	1.33	1.69	1.62
Δ Other funding sources	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank and time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2981	2981	2981	2981	2981	2981	2981	2981
R2	0.47	0.21	0.29	0.26	0.50	0.35	0.32	0.14

Table 10: Did banks use the funds from the Federal Reserve to increase lending? Effects on small and large business lending

This table reports OLS regressions which examine the effect of using funds from the Federal Reserve on small and large business lending during the crisis. This can only be analyzed imperfectly because Call Report data by loan size are only available in June of each year and the loans are broken out only by loan size rather than by firm size. Small (large) business lending is defined to be C&I lending with original loan amounts of up to (over) $1 million. The crisis is defined to last from 2007:Q3 – 2009:Q4. Δ(DWTAF) / GTA is the annual change in the bank's average amount of DWTAF outstanding from 2008:Q2 to 2009:Q2 normalized by lagged GTA. DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). Panels 1 and 2 show the results for small banks (GTA up to $1 billion) and large banks (GTA exceeding $1 billion), respectively.

All variables are defined in the Data Appendix at the end of the tables. All regressions include control variables that are similar to those included in Columns (2) of Table 5 Panel A (any quarterly changes are replaced by annual changes), a constant, and bank and time fixed effects (not shown for brevity). t-statistics are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	Panel 1: Small banks		***Panel 2: Large banks***	
	Small business lending	***Large business lending***	***Small business lending***	***Large business lending***
Dependent variable:	***Δ(CI_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***
Loan size class:	***≤ $1 million***	***> $1 million***	***≤ $1 million***	***> $1 million***
	(1)	(2)	(1)	(2)
Δ(DWTAF) / GTA	0.143**	0.041	-0.004	0.239**
	2.21	0.73	(-0.07)	2.43
Δ Other funding sources	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Bank and time FEs	Yes	Yes	Yes	Yes
Observations	6071	6071	484	484
R2	0.11	0.14	0.25	0.26

Table 11: The effect of using funds from the Federal Reserve on the credit quality of loans and loan contract terms

This table reports OLS regressions which examine the effect of DWTAF usage on the credit quality of loans and loan contract terms during the crisis. DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. The crisis is defined to last from 2007:Q3 – 2009:Q4. Panels 1 and 2 show the results for small banks (GTA up to $1 billion) and large banks (GTA exceeding $1 billion), respectively. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans).

Credit quality is measured using one variable: Δ(WA credit rating), the quarterly change in the bank's weighted average loan risk rating. Loan contract terms are measured using two variables: Δ(WA interest rate premium), the change in the bank's weighted average interest rate premium, i.e., the difference between the interest rate charged and the Treasury rate of comparable maturity; and Δ(WA collateral status), the change in the bank's weighted average collateral status, where collateral status is a dummy that equals 1 if the loan is secured. For the weighting, the loan credit rating, the interest rate premium, and collateral status are multiplied by the number of dollars of the loan times the maturity of the loan in years divided by the total number of dollar-years of the loans issued by the bank in that quarter. Regressions that focus on loan contract terms are run with and without controlling for changes in loan credit ratings, and in the case of the interest rate premium regressions, also with and without controlling for changes in collateral status.

All variables are defined in the Data Appendix at the end of the tables. All regressions include control variables that are similar to those included in Columns (2) of Table 5 Panel A (any quarterly changes are replaced by annual changes), a constant, and bank and time fixed effects (not shown for brevity). t-statistics based on robust standard errors clustered by bank are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel 1: Small banks

	Effect of DWTAF usage on:				
Dependent variable:	***Δ(WA credit rating)***	***Δ(WA interest rate premium)***	***Δ(WA collateral status)***	***Δ(WA interest rate premium)***	***Δ(WA collateral status)***
	(1)	(2)	(3)	(4)	(5)
Δ(DWTAF) / GTA	-28.673**	1.936	-1.957	1.357	7.751
	(-2.51)	(0.14)	(-0.05)	(0.09)	(0.21)
Control for Δ(WA credit rating)				Yes	Yes
Control for Δ(WA collateral status)				Yes	
Δ Other funding sources	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Bank and time FEs	Yes	Yes	Yes	Yes	Yes
Observations	955	955	955	955	955
R2	0.10	0.07	0.16	0.07	0.19

Panel 2: Large banks

	Effect of DWTAF usage on:				
Dependent variable:	***Δ(WA credit rating)***	***Δ(WA interest rate premium)***	***Δ(WA collateral status)***	***Δ(WA interest rate premium)***	***Δ(WA collateral status)***
	(1)	(2)	(3)	(4)	(5)
Δ(DWTAF) / GTA	4.439	-0.832	-2.115	-0.789	-2.954
	(0.44)	(-0.31)	(-0.13)	(-0.30)	(-0.19)
Control for Δ(WA credit rating)				Yes	Yes
Control for Δ(WA collateral status)				Yes	
Δ Other funding sources	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Bank and time FEs	Yes	Yes	Yes	Yes	Yes
Observations	1013	1013	1013	1013	1013
R2	0.10	0.08	0.18	0.08	0.19

Table 12: Did banks use the funds from the Federal Reserve to liquefy their balance sheets?

This table reports OLS regressions which examine the effect of using funds from the Federal Reserve on cash and securities holdings during the crisis. The crisis is defined to last from 2007:Q3 – 2009:Q4. Δ(DWTAF) / GTA is the change in the bank's average amount of DWTAF outstanding during the quarter normalized by lagged GTA. DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). Panels 1 and 2 show the results for small banks (GTA up to $1 billion) and large banks (GTA exceeding $1 billion), respectively.

All variables are defined in the Data Appendix at the end of the tables. All regressions include the control variables included in Columns (2) of Table 5 Panel A, a constant, and bank and time fixed effects (not shown for brevity). t-statistics based on robust standard errors clustered by bank are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel 1: Small banks

	Effect of DWTAF usage on:	
Dependent variable:	***Δ(CASH) / GTA***	***Δ(SECURITIES) / GTA***
	(1)	(2)
Δ(DWTAF) / GTA	0.109	0.283**
	(1.10)	(2.34)
Δ Other funding sources	Yes	Yes
Controls	Yes	Yes
Bank and time FEs	Yes	Yes
Observations	55889	55889
R2	0.18	0.22

Panel 2: Large banks

	Effect of DWTAF usage on:	
Dependent variable:	***Δ(CASH) / GTA***	***Δ(SECURITIES) / GTA***
	(1)	(2)
Δ(DWTAF) / GTA	0.193	0.044
	(1.00)	(0.25)
Δ Other funding sources	Yes	Yes
Controls	Yes	Yes
Bank and time FEs	Yes	Yes
Observations	4255	4255
R2	0.24	0.27

Data Appendix: Summary statistics of regression variables

This table shows the definitions and means and medians of the regression variables used in Tables 3 – 10 and 12 and Internet Appendix Table A.2. All variables are at a quarterly frequency. The crisis lasts from 2007:Q3 – 2009:Q4 in every regression. DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. GTA is gross total assets, which equals total assets plus the allowance for loan and the lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans).

		Small		Large	
	Definition	**Mean**	**Median**	**Mean**	**Median**
Dependent variables (Table 3 and Internet Appendix Table A.2):					
Usage propensity:					
DWTAF	= 1 if the bank used DWTAF during the quarter	0.047	0	0.223	0
DW	= 1 if the bank used the DW during the quarter	0.043	0	0.163	0
TAF	= 1 if the bank used the TAF during the quarter	0.006	0	0.089	0
Usage intensity:					
Times used DWTAF	Number of times the bank used DWTAF during the quarter	0.27	0	1.11	0
Times used DW	Number of times the bank used the DW during the quarter	0.25	0	0.88	0
Times used TAF	Number of times the bank used the TAF during the quarter	0.01	0	0.27	0
Days outstanding DWTAF	Number of days the bank had DWTAF outstanding during the quarter	0.85	0	5.74	0
Days outstanding DW	Number of days the bank had DW outstanding during the quarter	0.58	0	1.60	0
Days outstanding TAF	Number of days the bank had TAF outstanding during the quarter	0.34	0	4.87	0
Avg daily DWTAF	Average daily amount of DWTAF outstanding during the quarter normalized by the bank's GTA	0.0006	0	0.003	0
Avg daily DW	Average daily amount of DW outstanding during the quarter normalized by the bank's GTA	0.0003	0	0.0008	0
Avg daily TAF	Average daily amount of TAF outstanding during the quarter normalized by the bank's GTA	0.0003	0	0.003	0
Max daily DWTAF	Maximum daily amount of DWTAF outstanding during the quarter normalized by the bank's GTA	0.001	0	0.006	0
Max daily DW	Maximum daily amount of DW outstanding during the quarter normalized by the bank's GTA	0.001	0	0.002	0
Max daily TAF	Maximum daily amount of DW outstanding during the quarter normalized by the bank's GTA	0.0004	0	0.005	0

		Small		Large	
	Definition	**Mean**	**Median**	**Mean**	**Median**
Dependent variables (Tables 4-10, 12):	***(All the dependent variables below are winsorized at the 1st and 99th percentiles)***				
Δ(DWTAF) / GTA	Change in the average amount of DWTAF outstanding during the quarter normalized by lagged GTA	0.0001	0.0000	0.0004	0.0000
Δ(DW) / GTA	Change in the average amount of DW outstanding during the quarter normalized by lagged GTA	0.0000	0.0000	0.0001	0.0000
Δ(TAF) / GTA	Change in the average amount of TAF outstanding during the quarter normalized by lagged GTA	0.0000	0.0000	0.0001	0.0000
Δ(LOANS) / GTA	Change in total loans normalized by lagged GTA	0.0110	0.0051	0.0032	0.0016
Δ(ST_LOANS) / GTA	Change in short-term (maturity ≤1 year) loans normalized by lagged GTA	0.0001	-0.0002	-0.0015	-0.0007
Δ(LT_LOANS) / GTA	Change in long-term (maturity > 1 year) loans normalized by lagged GTA	0.0112	0.0061	0.0046	0.0029
Δ(CI_LOANS) / GTA	Change in commercial and industrial loans normalized by lagged GTA	0.0012	0.0000	-0.0002	-0.0002
Δ(CRE_LOANS) / GTA	Change in commercial real estate loans normalized by lagged GTA	0.0059	0.0017	0.0016	0.0002
Δ(RRE_LOANS) / GTA	Change in residential real estate loans normalized by lagged GTA	0.0035	0.0013	0.0010	0.0003
Δ(CONS_LOANS) / GTA	Change in consumer loans normalized by lagged GTA	-0.0001	-0.0002	-0.0003	-0.0002
Δ(OTHER_LOANS) / GTA	Change in other loans normalized by lagged GTA	0.0003	-0.0001	0.0002	-0.0002
Δ(CASH) / GTA	Change in cash and due from normalized by lagged GTA	0.0043	0.0010	0.0038	0.0003
Δ(SECURITIES) / GTA	Change in securities normalized by lagged GTA	0.0021	-0.0003	0.0014	-0.0006
Independent variables:	***(All the independent variables below are lagged one quarter)***				
Log(GTA)	Natural log of GTA	11.9	11.8	15.1	14.7
EQRAT	Equity capital ratio, calculated as equity capital as a proportion of GTA	0.1118	0.0987	0.1033	0.0942
Tier1RAT	Tier 1 capital normalized by risk-weighted assets, where risk-weighted assets is the weighted sum of assets and off-balance sheet activities, with the weights based on the perceived credit risk of each activity	0.1608	0.1307	0.1161	0.1032
TotalRAT	Total capital divided by risk-weighted assets, where risk-weighted assets is the weighted sum of assets and off-balance sheet activities, with the weights based on the perceived credit risk of each activity	0.1718	0.1416	0.1306	0.1171
Stddev ROA	Standard deviation of ROA over the prior 12 quarters	0.0016	0.0009	0.0018	0.0009
ALLOW LLL / GTA	Allowance for loan and lease losses divided by GTA	0.0091	0.0083	0.0111	0.0092
CRE / GTA	Commercial real estate normalized by GTA	0.2965	0.2789	0.3233	0.3246
MBS / GTA	Mortgage-backed securities normalized by GTA	0.0661	0.0331	0.0946	0.0803
ROE	Return on equity: net income normalized by equity capital	0.0483	0.0751	0.0213	0.0689
ROA	Return on assets: net income normalized by GTA	0.0049	0.0079	0.0031	0.0069

	Definition	Small		Large	
		Mean	Median	Mean	Median
Independent variables (*cont'd*):	***(All the independent variables below are lagged one quarter)***				
Illiquidity (LC / GTA)	Liquidity creation (Berger and Bouwman's (2009) "cat fat" measure normalized by GTA	0.3087	0.3190	0.4842	0.4371
BHC dummy	= 1 if the bank is part of a bank holding company	0.8011	1.0000	0.9057	1.0000
Listed dummy	= 1 if the bank is listed or part of a listed bank holding company	0.0149	0.0000	0.3003	0.0000
Foreign own dummy	= 1 if the bank has at least 50% foreign ownership	0.0031	0.0000	0.0704	0.0000
Federal Reserve dummy	= 1 if the Federal Reserve is the bank's primary regulator (This category is dropped in regressions to avoid multicollinearity)	0.1143	0.0000	0.1573	0.0000
OCC dummy	= 1 if the Office of the Comptroller of the Currency is the primary regulator	0.2033	0.0000	0.3095	0.0000
FDIC dummy	= 1 if the Federal Deposit Insurance Corporation is the primary regulator	0.6824	1.0000	0.5332	1.0000
Income growth	Weighted average income growth in all markets in which a bank has deposits, using the proportion of its deposits in each market as weights	0.0032	0.0038	0.0024	0.0048
Δ(Core Deposits)/GTA	Change in core deposits (transactions deposits plus savings deposits plus small time deposits (< $100K)) normalized by lagged GTA	0.0113	0.0054	0.0074	0.0032
Δ(Fed Funds)/GTA	Change in federal funds purchased normalized by lagged GTA	-0.0001	0.0000	-0.0002	0.0000
Δ(Repos)/GTA	Change in repurchase agreements normalized by lagged GTA	0.0001	0.0000	-0.0001	0.0000
Δ(Other Hot Money)/GTA	Change in other hot money (brokered deposits + liability for short positions + other trading liabilities + other borrowed money with a remaining maturity or next repricing date < 1 year excl. DWTAF) normalized by lagged GTA	0.0015	0.0000	0.0024	0.0000
Δ(FHLB)/GTA	Change in Federal Home Loan Bank borrowings normalized by lagged GTA	0.0012	0.0000	0.0004	0.0000
Δ(TARP)/GTA	Troubled Asset Relief Program funding normalized by lagged GTA	0.0002	0.0000	0.0009	0.0000
Fed district 1	= 1 if the bank is located in Fed district 1 (Boston) (This district is dropped in regressions to avoid multicollinearity)	0.0643	0.0000	0.0325	0.0000
Fed district 2	= 1 if the bank is located in Fed district 2 (New York)	0.1172	0.0000	0.0238	0.0000
Fed district 3	= 1 if the bank is located in Fed district 3 (Philadelphia)	0.0632	0.0000	0.0245	0.0000
Fed district 4	= 1 if the bank is located in Fed district 4 (Cleveland)	0.0509	0.0000	0.0415	0.0000
Fed district 5	= 1 if the bank is located in Fed district 5 (Richmond)	0.0830	0.0000	0.0510	0.0000
Fed district 6	= 1 if the bank is located in Fed district 6 (Atlanta)	0.0945	0.0000	0.1423	0.0000
Fed district 7	= 1 if the bank is located in Fed district 7 (Chicago)	0.1248	0.0000	0.1720	0.0000
Fed district 8	= 1 if the bank is located in Fed district 8 (St. Louis)	0.0608	0.0000	0.0997	0.0000
Fed district 9	= 1 if the bank is located in Fed district 9 (Minneapolis)	0.0284	0.0000	0.1012	0.0000
Fed district 10	= 1 if the bank is located in Fed district 10 (Kansas City)	0.0708	0.0000	0.1455	0.0000
Fed district 11	= 1 if the bank is located in Fed district 11 (Dallas)	0.0577	0.0000	0.0962	0.0000
Fed district 12	= 1 if the bank is located in Fed district 12 (San Francisco)	0.1843	0.0000	0.0700	0.0000

The Federal Reserve's Discount Window and TAF Programs: "Pushing on a String?"

Internet Appendix

Discussion of Internet Appendix Table A.1 Top 10 users by alternative measures of usage intensity

Table 2 in the main text shows the top users of funds from the Federal Reserve among small commercial banks, large commercial banks, and non-commercial bank recipients. Internet Appendix Table A.1 provides additional insights into usage intensity by examining which banks had outstandings on the most days (Panel A), which banks had the highest average daily outstandings relative to GTA (Panel B) and which banks had the highest outstandings relative to assets on a single day (Panel C). In contrast to Table 2 and Panel A, Panels B and C contain only two subpanels because GTA is only available for commercial banks.

Internet Appendix Table A.1 Panel A shows the lists of top banks that had Federal Reserve funding outstanding on the most days. Unlike the results in Table 2 in the main text, there is a big difference between the ranks based on DWTAF versus the DW separately, reflecting the fact that some banks prefer to utilize one facility over the other, and the fact that TAF funds were only offered at relatively long maturities (28 or 84 days at a time) and were not pre-payable. The insights regarding bank size and majority foreign ownership are similar to those in Table 2 in the main text.

Internet Appendix Table A.1 Panel B contains the lists of banks with the highest average daily outstandings relative to GTA. It shows that the top small banks generally had a higher percentage of their assets funded by the Federal Reserve than the top large banks, with a few small banks over 10%, and only a few large banks with over 5%. The very largest banks do not appear on the top lists likely because they would have to obtain very sizeable amounts of funds from the Federal Reserve. As in Panel A, there is little correspondence between the rankings based on DWTAF and the DW separately, again reflecting that TAF funds were outstanding for many days when they were used. As in Table 2 in the main text, none of the top small banks and only a few of the top large banks have majority foreign ownership.

Internet Appendix Table A.1 Panel C lists banks with the highest outstandings relative to assets on a given day. It shows that the top small banks again received more DWTAF funding relative to GTA than large banks, with a maximum of almost 48%, and all top 10 small banks

with over 26%. The top 10 large banks all had over 15%, remarkable since some of these banks were quite large, including Chase Bank, with over $79 billion in assets.

Discussion of Internet Appendix Table A.2 The intensity with which banks used funds from the Federal Reserve

Similar to the first question addressed in the main text about the propensity to use Federal Reserve funds, this portion of the Internet Appendix addresses the intensity with which banks use funds from the Federal Reserve during the crisis. It first explains the methodology and then presents the results.

Methodology

To analyze the intensity with which banks used funds from the Federal Reserve during the crisis, we use four measures of usage intensity during a particular quarter: (1) the number of times the bank obtained funds; (2) the average daily amount outstanding relative to assets; (3) the number of days the bank had funds outstanding; and (4) the maximum daily amount outstanding relative to assets. Measure (1) is introduced in Table 3 in the main text and measures (2) – (4) are introduced in Internet Appendix Table A.1

For each intensity measure, *y*, we use a Tobit specification since most observations for the dependent variable are 0 and the degree of intensity is increasing continuously. The Tobit has the following form:

$$y_{i,t} = \begin{cases} y^*_{i,t} & if \quad y^*_{i,t} > 0 \\ 0 & if \quad y^*_{i,t} \leq 0 \end{cases} \qquad \text{(IA.1)}$$

where

$y^*_{i,t}$ = *h(bank size*$_{i,t}$*, capital*$_{i,t}$*, portfolio risk*$_{i,t}$*, earnings*$_{i,t}$*, illiquidity*$_{i,t}$*, BHC dummy*$_{i,t}$*, listed dummy*$_{i,t}$*, foreign ownership dummy*$_{i,t}$*, primary federal regulator dummies*$_{j,t}$*, state income growth*$_{k,t}$*, Federal Reserve district dummies*$_{l,t}$*, time fixed effects*$_t$*)*

and $y_{i,t}$ is the intensity with which bank *i* obtained funds from the Federal Reserve (alternatively: DWTAF, DW separately, and TAF separately) during quarter *t* of the crisis. Again, the

explanatory variables are contemporaneous and standard errors are clustered by bank to account for potential within-bank correlation in the error terms.

Results

Internet Appendix Table A.2 Panels A – C present the results. Each panel contains the results for small and large banks in Subpanels 1 and 2, respectively. Each subpanel has four columns corresponding to the four usage intensity measures.

The results for small banks in Table A.2 Subpanel A1 suggest that DWTAF usage was more intense (i.e., occurred more often and with higher average balances relative to assets) for institutions that were larger, more capital constrained, with more commercial real estate and mortgage-backed securities investments, with higher earnings, and were not supervised by the FDIC (another indicator of small bank size). Most of these findings suggest that small banks in greater need used the funds more intensively, although it is again notable that illiquidity does not seem to matter. The results for DW and TAF shown in Table A.2 Subpanels B1 and C1 are much the same as those for DWTAF, except that TAF users did not seem to be more capital constrained and were more often supervised by the FED.

The results for large banks in Table A.2 Subpanel A2 suggest that DWTAF usage was more intense for banks that were larger, and had more commercial real estate and mortgage-backed securities. Intensity of usage was not significantly related to capital, profitability, or illiquidity. Thus, these results are generally not consistent with weak large banks using funds from the Federal Reserve more intensively. The results for DW and TAF in Table A.2 Subpanels B2 and B3 are very similar to the DWTAF results, except that the intense users of TAF were in addition more illiquid and more often listed.

Overall, the results based on intensity of usage are consistent with those based on the propensity to use funds from the Federal Reserve shown in Table 3. Small banks in need were more likely to obtain funds and to use the funds more intensively. For large banks, usage and intensity of usage did not seem strongly related to need.

Internet Appendix Table A.1: Top 10 users by alternative measures of usage intensity

This table shows the top 10 users ranked alternatively by DWTAF, DW, and TAF. DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. Banks are ranked based on three alternative usage intensity measures: days outstanding during the crisis (Panel A); their average daily outstandings (normalized by GTA) during the crisis (Panel B); and the highest daily outstandings (normalized by GTA) during the crisis (Panel C). The crisis is defined to last from 2007:Q3 – 2009:Q4. Subpanels 1, 2, and 3 show results for small banks (GTA up to $1 billion), large banks (GTA exceeding $1 billion), and non-commercial banks, respectively. GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans).

Additional statistics: GTA in $ billion; and Foreign own dummy = 1 if the bank has majority foreign ownership.

Panel A: Banks that used DWTAF, DW, and TAF the most days during the crisis

Subpanel A1: Small banks

DWTAF		DW		TAF				
Rank	Days outstanding	Rank	Days outstanding	Rank	Days outstanding	User	GTA	Foreign own dummy
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	460	97	132	4	344	GLACIER BK	0.88	0
2	430	117	116	6	315	FIRST SECURITY BK MISSOULA	0.89	0
3	416	1	409	24	225	GEORGIA CMRC BK	0.20	0
4	415	3	378	56	147	PARK BK	0.70	0
5	402	2	402	153	0	UNITED SCTY BK	0.81	0
6	399	23	242	2	378	PACIFIC CONTINENTAL BK	0.96	0
7	390	183	66	1	390	AMERICAN BK	0.51	0
8	379	129	109	12	272	PLANTERS BK	0.35	0
9	371	140	99	11	275	BIG SKY WESTERN BK	0.31	0
10	370	132	106	8	292	INDEPENDENT BK	0.62	0
10	370	839	1	3	370	COMMUNITY BKR BK	0.14	0
18	334	4	334	153	0	BROWN COUNTY ST BK	0.08	0
20	330	5	330	153	0	BANK OF FAIRFIELD	0.15	0
22	325	6	325	153	0	IDAHO INDEP BK	0.66	0
17	338	7	323	129	58	UNITED NB	0.14	0
25	316	8	316	153	0	PEOPLES BK WI	0.33	0
27	305	9	305	153	0	ENTERPRISE NB OF PALM BEACH	0.27	0
28	300	10	300	153	0	STATE BK OF BELLINGHAM	0.03	0
21	326	528	5	5	321	CITIZENS BK	0.65	0
13	365	166	77	7	302	WEST VIEW SVG BK	0.43	0
16	340	157	81	8	292	BANK OF AMER FORK	0.92	0
24	317	59	164	10	283	CITIZENS & FARMERS BK	0.80	0

Subpanel A2: Large banks

DWTAF		DW		TAF				
Rank	Days outstanding	Rank	Days outstanding	Rank	Days outstanding	User	GTA	Foreign own dummy
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	516	89	15	1	515	FIRST TN BK NA	40.08	0
2	461	34	90	4	448	CASCADE BK	1.42	0
2	461	62	30	2	459	FIRST MIDWEST BK	8.45	0
4	460	239	1	2	459	ASSOCIATED BK NA	21.67	0
5	441	159	3	5	439	M&I MARSHALL & ILSLEY BK	53.17	0
6	413	150	4	6	409	RBS CITIZENS NA	17.65	1
7	409	328	0	6	409	SOUTHERN CMNTY B&TC	1.60	0
8	406	1	406	132	0	FIRST AMER BK	2.74	0
9	404	126	7	8	399	FIFTH THIRD BK	57.88	0
10	400	2	400	132	0	PARK NB	4.00	0
27	328	3	304	79	135	FIRST CHICAGO B&T	1.11	0
34	311	4	278	87	115	BANK OF THE CASCADES	2.45	0
16	371	5	263	89	108	BEAL BK NV	1.58	0
20	354	6	261	53	203	INDEPENDENT BK	1.36	0
44	260	7	260	132	0	MACON BK	1.08	0
27	328	8	240	97	88	BEAL BK	1.41	0
58	229	9	229	132	0	CAPITAL BK	1.52	0
57	231	10	207	115	40	SUN NB	3.50	0
11	391	196	2	9	389	CITIZENS BK OF PA	33.98	1
12	382	159	3	10	381	STATE STREET B&TC	106.33	0

Subpanel A3: Non-commercial banks

DWTAF		DW		TAF		
Rank	Days outstanding	Rank	Days outstanding	Rank	Days outstanding	User
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	516	145	4	1	515	MITSUBISHI UFJ TR & BKG NY BR
1	516	171	2	1	515	NATIXIS NY BR
3	515	1	429	29	340	DEXIA CREDIT LOCAL NY BR
3	515	145	4	1	515	SUMITOMO MITSUI BKG NY BR
3	515	171	2	1	515	MIZUHO CORPORATE NY BR
3	515	286	0	1	515	WESTLB AG NY BR
7	505	286	0	6	505	DZ BK AG DEUTSCHE ZENTRA NY BR
7	505	286	0	6	505	BAYERISCHE HYPO VEREINS NY BR
9	496	9	259	8	496	ARAB BKG CORP NY BR
10	493	4	312	64	204	DEPFA BK PLC NY BR
23	421	2	421	122	0	ALASKA USA FCU
24	418	3	325	58	217	HOMETRUST BK
42	310	5	310	122	0	AMERICAN HOME BK
34	350	6	293	29	340	NORINCHUKIN BK NY BR
48	282	7	282	122	0	HARRINGTON BK FSB
44	299	8	279	103	59	TOWN N BK NV NA
15	484	10	254	32	330	COMMERZBANK AG NY BR
12	489	155	3	9	488	SUMITOMO TR BKG NY BR
13	487	94	20	10	486	BAYERISCHE LANDESBANK NY BR

Panel B: Banks with the highest average daily DWTAF, DW, and TAF outstandings (% bank size) during the crisis

Subpanel B1: Small banks

DWTAF		DW		TAF				
Rank	Avg daily outstanding / GTA	Rank	Avg daily outstanding / GTA	Rank	Avg daily outstanding / GTA	User	GTA	Foreign own dummy
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	0.1457	1	0.1027	12	0.0431	GEORGIA CMRC BK	0.20	0
2	0.1160	82	0.0075	1	0.1084	CONTINENTAL BK	0.09	0
3	0.1099	78	0.0080	2	0.1019	WEST VIEW SVG BK	0.43	0
4	0.0916	25	0.0225	4	0.0691	FIRST SECURITY BK MISSOULA	0.89	0
5	0.0856	13	0.0313	8	0.0542	BIG SKY WESTERN BK	0.31	0
6	0.0838	23	0.0241	6	0.0597	GLACIER BK	0.88	0
7	0.0750	20	0.0243	11	0.0507	WESTERN SECURITY BK	0.59	0
8	0.0708	1394	0.0000	3	0.0708	FLATIRONS BK	0.05	0
9	0.0705	31	0.0186	10	0.0519	VALLEY BK OF HELENA	0.30	0
10	0.0624	7	0.0467	39	0.0157	STATE BK OF NEW RICHLAND	0.07	0
14	0.0564	2	0.0564	153	0.0000	ENTERPRISE NB OF PALM BEACH	0.27	0
16	0.0526	3	0.0526	153	0.0000	UNITED SCTY BK	0.81	0
17	0.0525	4	0.0525	153	0.0000	GRANITE FALLS BK	0.11	0
18	0.0513	5	0.0513	153	0.0000	MACHIAS SVG BK	0.84	0
19	0.0498	6	0.0498	153	0.0000	BURLING BK	0.09	0
20	0.0443	8	0.0443	153	0.0000	PROFICIO BK	0.04	0
15	0.0530	9	0.0438	62	0.0092	UNITED NB	0.14	0
23	0.0412	10	0.0412	153	0.0000	STATE BK OF BELLINGHAM	0.03	0
11	0.0605	503	0.0001	5	0.0604	COMMUNITY BKR BK	0.14	0
12	0.0595	135	0.0035	7	0.0560	NEW TRADITIONS NB	0.07	0
13	0.0583	99	0.0058	9	0.0525	OLDTOWN BK	0.03	0

Subpanel B2: Large banks

DWTAF		DW		TAF				
Rank	Avg daily outstanding / GTA	Rank	Avg daily outstanding / GTA	Rank	Avg daily outstanding / GTA	User	GTA	Foreign own dummy
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	0.0948	1	0.0948	131	0.0000	PARK NB	4.00	0
2	0.0712	9	0.0100	1	0.0612	MOUNTAIN W BK	1.05	0
3	0.0615	2	0.0615	131	0.0000	FIRST AMER BK	2.74	0
4	0.0560	101	0.0001	2	0.0559	FIRST TN BK NA	40.08	0
5	0.0511	69	0.0005	3	0.0506	METLIFE BK NA	7.22	0
6	0.0496	325	0.0000	4	0.0496	BARCLAYS BK DE	6.10	1
7	0.0490	298	0.0000	5	0.0490	COBIZ BK	2.35	0
8	0.0464	142	0.0000	6	0.0464	CITIZENS BK OF PA	33.98	1
9	0.0405	196	0.0000	7	0.0405	BANCO BILBAO VIZCAYA ARGENTARI	6.72	1
10	0.0392	21	0.0052	9	0.0340	CAPMARK BK	6.93	0
11	0.0386	3	0.0294	59	0.0092	BEAL BK NV	1.58	0
16	0.0305	4	0.0238	69	0.0067	FIRST CHICAGO B&T	1.11	0
28	0.0219	5	0.0219	131	0.0000	PACIFIC NAT BK	1.41	0
14	0.0323	6	0.0184	41	0.0139	INDEPENDENT BK	1.36	0
56	0.0119	7	0.0119	131	0.0000	FIRST NB OF CHESTER CTY	1.00	0
62	0.0106	8	0.0100	117	0.0006	CALIFORNIA NB	5.99	0
49	0.0138	10	0.0100	80	0.0039	BANK OF THE CASCADES	2.45	0
12	0.0378	125	0.0000	8	0.0377	RBS CITIZENS NA	17.65	1
13	0.0337	58	0.0007	10	0.0330	FIRST COMMONWEALTH BK	5.99	0

Panel C: Banks with the highest DWTAF, DW, and TAF outstandings (% bank size) on a single day during the crisis

Subpanel C1: Small banks

DWTAF		DW		TAF				
Rank	Max daily outstanding / GTA	Rank	Max daily outstanding / GTA	Rank	Max daily outstanding / GTA	User	GTA	Foreign own dummy
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	0.4783	1	0.4783	153	0.0000	PROFICIO BK	0.04	0
2	0.4249	12	0.2124	1	0.4249	CONTINENTAL BK	0.09	0
3	0.4052	2	0.4052	8	0.1892	BIG SKY WESTERN BK	0.31	0
4	0.3636	3	0.2955	11	0.1684	GEORGIA CMRC BK	0.20	0
5	0.3021	15	0.1948	2	0.3021	WEST VIEW SVG BK	0.43	0
6	0.2931	4	0.2931	153	0.0000	BURLING BK	0.09	0
7	0.2782	7	0.2548	3	0.2782	WESTERN SECURITY BK	0.59	0
8	0.2729	6	0.2561	4	0.2729	FIRST SECURITY BK MISSOULA	0.89	0
9	0.2707	5	0.2707	7	0.1894	GLACIER BK	0.88	0
10	0.2678	1394	0.0000	5	0.2678	FLATIRONS BK	0.05	0
11	0.2414	8	0.2414	153	0.0000	GRANITE FALLS BK	0.11	0
12	0.2227	9	0.2227	153	0.0000	UNITED SCTY BK	0.81	0
13	0.2197	10	0.2197	6	0.2126	VALLEY BK OF HELENA	0.30	0
21	0.1798	106	0.0647	9	0.1798	COMMUNITY BKR BK	0.14	0
25	0.1686	71	0.0783	10	0.1686	NEW TRADITIONS NB	0.07	0

Subpanel C2: Large banks

DWTAF		DW		TAF				
Rank	Max daily outstanding / GTA	Rank	Max daily outstanding / GTA	Rank	Max daily outstanding / GTA	User	GTA	Foreign own dummy
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	0.3135	325	0.0000	1	0.3135	BARCLAYS BK DE	6.10	1
2	0.2693	1	0.2693	2	0.2186	MOUNTAIN W BK	1.05	0
3	0.2117	2	0.2117	131	0.0000	PARK NB	4.00	0
4	0.2092	3	0.2092	131	0.0000	PACIFIC NAT BK	1.41	0
5	0.2088	24	0.0642	3	0.2088	METLIFE BK NA	7.22	0
6	0.1856	325	0.0000	4	0.1856	CHASE BK USA NA	79.62	0
7	0.1762	296	0.0000	5	0.1762	COBIZ BK	2.35	0
8	0.1651	4	0.1651	131	0.0000	FIRST AMER BK	2.74	0
9	0.1614	100	0.0131	6	0.1614	CITIZENS BK OF PA	33.98	1
10	0.1552	5	0.1552	100	0.0156	CALIFORNIA NB	5.99	0
11	0.1547	6	0.1547	53	0.0561	BEAL BK NV	1.58	0
12	0.1521	7	0.1521	101	0.0156	UNION B&TC	1.57	0
19	0.1141	8	0.1141	131	0.0000	FIRST NB OF CHESTER CTY	1.00	0
24	0.1059	9	0.1059	131	0.0000	HORIZON BK NA	1.26	0
26	0.1023	10	0.1023	33	0.0717	INDEPENDENT BK	1.36	0
14	0.1364	195	0.0021	7	0.1364	TEXAS CAP BK NA	4.15	0
16	0.1273	91	0.0165	8	0.1273	RBS CITIZENS NA	17.65	1
15	0.1280	58	0.0291	9	0.1245	CAPMARK BK	6.93	0
17	0.1242	87	0.0178	10	0.1242	FIRST TN BK NA	40.08	0

Internet Appendix Table A.2: The intensity with which banks used funds from the Federal Reserve

This table examines the intensity with which banks used DWTAF (Panel A), DW (Panel B), and TAF (Panel C), during the crisis. DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. The crisis is defined to last from 2007:Q3 – 2009:Q4. Subpanels 1 and 2 show the results for small banks (GTA up to $1 billion) and large banks (GTA exceeding $1 billion), respectively. GTA equals total assets plus the allowance for loan and the lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans).

Panel C has fewer observations than Panels A and B because TAF did not exist in the first quarter of the sample period (2007:Q3).

The dependent variables in the Tobit regressions are four alternative usage intensity measures: (1) the number of times the bank used funds during a crisis quarter; (2) the number of days with funds outstanding during a crisis quarter; (3) the average daily amount outstanding normalized by GTA during a crisis quarter; and (4) the maximum daily amount outstanding normalized by GTA during a crisis quarter. All independent variables are defined in the Data Appendix at the end of the tables in the main text. All regressions include time fixed effects (not shown for brevity) and a constant (not shown due to reporting marginal effects). Coefficients shown are the marginal effects evaluated at the means of the explanatory variables. t-statistics based on robust standard errors clustered by bank are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel A: DWTAF usage intensity

	Subpanel A1: Small banks				Subpanel A2: Large banks			
	# times used during the quarter	***# days with funds outstanding during the quarter***	***Avg daily amount outstanding during the quarter / GTA***	***Max daily amount outstanding during the quarter / GTA***	***# times used during the quarter***	***# days with funds outstanding during the***	***Avg daily amount outstanding during the quarter / GTA***	***Max daily amount outstanding during the quarter / GTA***
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Log(GTA)	0.122***	0.324***	0.000***	0.001***	0.435***	2.491***	0.002***	0.003***
	(10.99)	(12.79)	(8.54)	(9.68)	(8.05)	(11.20)	(7.98)	(8.65)
EQRAT	-0.460**	-1.052**	-0.001*	-0.002*	1.458	9.105	0.007	0.012
	(-2.42)	(-2.00)	(-1.74)	(-1.90)	(0.93)	(1.19)	(1.05)	(1.09)
Stddev ROA	2.097	4.188	0.007	0.015	-50.464*	-198.116*	-0.093	-0.194
	(0.83)	(0.68)	(1.12)	(1.22)	(-1.65)	(-1.81)	(-1.04)	(-1.35)
CRE / GTA	0.187***	0.630***	0.001***	0.001***	2.467***	9.118***	0.006***	0.010***
	(3.38)	(4.32)	(4.10)	(4.05)	(4.23)	(4.83)	(3.39)	(3.63)
MBS / GTA	0.308***	0.837***	0.001***	0.002***	2.283***	10.081***	0.008***	0.012***
	(3.57)	(3.85)	(3.46)	(3.59)	(2.79)	(3.14)	(3.01)	(2.90)
ROE	0.049**	0.170**	0.000**	0.000**	-0.159	-0.906	-0.001	-0.001
	(1.98)	(2.48)	(2.27)	(2.26)	(-0.77)	(-1.06)	(-0.85)	(-1.15)
Illiquidity (LC / GTA)	0.062	0.149	0.000	0.000	0.057	0.512	0.001*	0.001*
	(1.45)	(1.37)	(1.06)	(1.17)	(0.74)	(1.44)	(1.87)	(1.85)
BHC dummy	0.026	0.069	0.000	0.000	0.098	0.207	0.000	0.001
	(1.41)	(1.57)	(1.29)	(1.35)	(0.42)	(0.22)	(0.30)	(0.48)
Listed dummy	0.085	0.128	0.000	0.000	0.231	1.239*	0.001	0.001
	(1.05)	(0.85)	(0.67)	(0.52)	(1.35)	(1.86)	(1.43)	(1.26)
Foreign own dummy	-0.093**	-0.226*	0.000	0.000	-0.034	-0.077	0.001	0.001
	(-2.50)	(-1.93)	(1.14)	(1.31)	(-0.13)	(-0.06)	(0.48)	(0.39)
OCC dummy	-0.016	-0.056	-0.000*	0.000	0.178	0.276	0.000	0.001
	(-0.80)	(-1.11)	(-1.70)	(1.52)	(0.83)	(0.33)	(0.32)	(0.48)
FDIC dummy	-0.056***	-0.140**	-0.000***	-0.000***	-0.173	-0.328	0.000	0.000
	(-2.67)	(-2.48)	(-2.71)	(-2.79)	(-0.92)	(-0.43)	(0.45)	(0.40)
Income growth	0.604	1.698	0.001	0.002	9.017*	32.235*	0.018	0.035
	(1.47)	(1.60)	(1.25)	(1.27)	(1.90)	(1.67)	(1.23)	(1.46)
Fed district 2	-0.073	-0.196	0.000	0.000	0.162	0.571	0.001	0.001
	(-1.47)	(-1.57)	(1.53)	(1.47)	(0.76)	(0.58)	(0.72)	(0.86)
Fed district 3	0.023	-0.003	0.000	0.000	0.704	1.693	0.002	0.003*
	(0.35)	(-0.02)	(0.05)	(0.01)	(1.47)	(1.26)	(1.59)	(1.73)
Fed district 4	-0.086*	-0.196	0.000	0.000	0.154	0.550	0.000	0.001
	(-1.82)	(-1.59)	(1.13)	(1.18)	(0.61)	(0.47)	(0.47)	(0.45)
Fed district 5	-0.004	0.030	0.000	0.000	0.423	1.978	0.001	0.002
	(-0.07)	(0.23)	(0.03)	(0.01)	(1.63)	(1.46)	(1.34)	(1.38)
Fed district 6	-0.062	-0.182*	0.000	0.000	0.109	0.982	0.001	0.001
	(-1.39)	(-1.66)	(1.51)	(1.54)	(0.51)	(0.94)	(0.93)	(1.05)
Fed district 7	0.010	0.017	0.000	0.000	0.919***	3.724***	0.003***	0.005***
	(0.21)	(0.15)	(0.17)	(0.21)	(2.80)	(2.64)	(2.73)	(2.81)

Fed district 8	-0.035	-0.070	0.000	0.000	0.489	2.741*	0.002*	0.003*
	(-0.74)	(-0.58)	(0.62)	(0.60)	(1.56)	(1.81)	(1.74)	(1.81)
Fed district 9	0.029	0.173	0.000	0.000	0.587	0.681	0.000	0.001
	(0.54)	(1.19)	(1.36)	(1.26)	(0.87)	(0.46)	(0.34)	(0.62)
Fed district 10	-0.082*	-0.240**	-0.000**	-0.000**	0.143	0.966	0.001	0.002
	(-1.81)	(-2.19)	(-2.09)	(-2.13)	(0.56)	(0.82)	(1.06)	(1.04)
Fed district 11	-0.137***	-0.359***	-0.000***	-0.001***	0.027	0.150	0.000	0.001
	(-3.10)	(-3.37)	(-3.29)	(-3.32)	(0.09)	(0.13)	(0.24)	(0.39)
Fed district 12	0.267***	0.545***	0.001***	0.001***	0.833***	1.899*	0.002*	0.003*
	(3.16)	(3.04)	(2.86)	(3.13)	(2.78)	(1.74)	(1.80)	(1.95)
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	63301	63301	63257	63257	5101	5101	5074	5074
Pseudo R2	0.09	0.08	0.66	0.40	0.05	0.07	-0.63	-3.10

Panel B: DW usage intensity

	Subpanel B1: Small banks				Subpanel B2: Large banks			
	# times used during the quarter	***# days with funds outstanding during the quarter***	***Avg daily amount outstanding during the quarter / GTA***	***Max daily amount outstanding during the quarter / GTA***	***# times used during the quarter***	***# days with funds outstanding during the***	***Avg daily amount outstanding during the quarter / GTA***	***Max daily amount outstanding during the quarter / GTA***
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Log(GTA)	0.114***	0.228***	0.000***	0.000***	0.193***	0.321***	0.000**	0.001***
	(10.57)	(12.29)	(-8.26)	(9.67)	(3.83)	(3.94)	(2.51)	(3.29)
EQRAT	-0.568***	-1.101***	-0.001***	-0.002***	0.919	4.363	0.004	0.007
	(-3.00)	(-2.71)	(-2.73)	(-2.93)	(0.68)	(1.54)	(1.48)	(1.26)
Stddev ROA	2.390	4.289	0.006	0.015	-42.619	-70.527	-0.017	-0.101
	(0.95)	(0.88)	(1.41)	(1.47)	(-1.47)	(-1.61)	(-0.43)	(-1.26)
CRE / GTA	0.164***	0.412***	0.000***	0.001***	1.830***	2.918***	0.002**	0.004***
	(2.99)	(3.62)	(3.46)	(3.50)	(3.30)	(3.35)	(2.02)	(2.65)
MBS / GTA	0.290***	0.603***	0.000***	0.001***	1.741**	3.128**	0.003**	0.006**
	(3.44)	(3.71)	(3.39)	(3.57)	(2.24)	(2.28)	(1.99)	(2.28)
ROE	0.043*	0.111**	0.000**	0.000**	-0.110	-0.249	0.000	0.000
	(1.76)	(2.17)	(2.14)	(2.22)	(-0.56)	(-0.74)	(0.09)	(0.64)
Illiquidity (LC / GTA)	0.061	0.121	0.000	0.000	-0.101	-0.272	0.000	0.000
	(1.47)	(1.46)	(1.34)	(1.26)	(-0.87)	(-1.23)	(1.08)	(1.21)
BHC dummy	0.029	0.068**	0.000	0.000	0.127	0.194	0.000	0.000
	(1.63)	(2.01)	(1.57)	(1.56)	(0.60)	(0.57)	(0.49)	(0.77)
Listed dummy	0.070	0.060	0.000	0.000	0.105	0.073	0.000	0.000
	(0.91)	(0.58)	(0.57)	(0.29)	(0.68)	(0.29)	(0.30)	(0.25)
Foreign own dummy	-0.086**	-0.150	0.000	0.000	-0.113	-0.391	0.000	-0.001
	(-2.22)	(-1.34)	(0.46)	(0.87)	(-0.50)	(-1.17)	(1.17)	(-1.05)
OCC dummy	-0.003	0.003	0.000	0.000	0.129	0.209	0.000	0.000
	(-0.17)	(0.08)	(0.31)	(0.56)	(0.64)	(0.60)	(0.65)	(0.63)

FDIC dummy	-0.047**	-0.073*	-0.000**	-0.000**	-0.223	-0.282	0.000	0.000
	(-2.34)	(-1.91)	(-2.27)	(-2.54)	(-1.25)	(-0.88)	(0.87)	(0.94)
Income growth	0.597	1.083	0.001	0.002	4.560	2.980	0.002	0.003
	(1.46)	(1.31)	(0.94)	(1.23)	(0.98)	(0.37)	(0.30)	(0.25)
Fed district 2	-0.074	-0.162	0.000	0.000	0.250	0.359	0.000	0.001*
	(-1.42)	(-1.50)	(1.46)	(1.43)	(1.40)	(1.28)	(1.42)	(1.68)
Fed district 3	0.011	-0.048	0.000	0.000	0.594	0.792	0.000	0.001
	(0.17)	(-0.41)	(0.63)	(0.40)	(1.35)	(1.38)	(1.21)	(1.33)
Fed district 4	-0.115**	-0.255***	-0.000**	-0.000**	0.145	0.228	0.000	0.000
	(-2.43)	(-2.69)	(-2.55)	(-2.47)	(0.69)	(0.67)	(0.63)	(0.75)
Fed district 5	-0.035	-0.093	0.000	0.000	0.455**	1.137**	0.001*	0.001**
	(-0.70)	(-0.94)	(1.20)	(1.01)	(1.97)	(1.97)	(1.94)	(2.05)
Fed district 6	-0.071	-0.166*	0.000	-0.000*	0.058	0.034	0.000	0.000
	(-1.52)	(-1.78)	(1.59)	(-1.68)	(0.32)	(0.12)	(0.22)	(0.42)
Fed district 7	0.003	0.003	0.000	0.000	0.876***	1.910***	0.002**	0.003**
	(0.06)	(0.04)	(0.08)	(0.03)	(2.96)	(2.80)	(2.04)	(2.57)
Fed district 8	-0.049	-0.100	0.000	0.000	0.467*	0.746*	0.001*	0.001*
	(-1.00)	(-1.01)	(1.15)	(1.02)	(1.72)	(1.69)	(1.77)	(1.86)
Fed district 9	0.006	0.063	0.000	0.000	0.650	0.770	0.000	0.001
	(0.11)	(0.56)	(0.51)	(0.65)	(0.97)	(0.93)	(0.78)	(0.98)
Fed district 10	-0.094**	-0.230**	-0.000**	-0.000**	0.119	0.184	0.000	0.000
	(-2.00)	(-2.46)	(-2.37)	(-2.41)	(0.59)	(0.58)	(0.64)	(0.68)
Fed district 11	-0.145***	-0.312***	-0.000***	-0.001***	0.096	0.073	0.000	0.000
	(-3.16)	(-3.41)	(-3.17)	(-3.35)	(0.34)	(0.19)	(0.16)	(0.43)
Fed district 12	0.257***	0.391***	0.000**	0.001***	1.045***	1.715***	0.001***	0.003***
	(2.99)	(2.67)	(2.37)	(2.85)	(3.59)	(3.82)	(3.23)	(3.18)
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	63301	63301	63257	63257	5101	5101	5074	5074
Pseudo R2	0.09	0.08	1.06	0.41	0.04	0.04	-0.23	-1.18

Panel C: TAF usage intensity

	Subpanel C1: Small banks				**Subpanel C2: Large banks**			
	# times used during the quarter	***# days with funds outstanding during the quarter***	***Avg daily amount outstanding during the quarter / GTA***	***Max daily amount outstanding during the quarter / GTA***	***# times used during the quarter***	***# days with funds outstanding during the***	***Avg daily amount outstanding during the quarter / GTA***	***Max daily amount outstanding during the quarter / GTA***
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Log(GTA)	0.002***	0.050***	0.000***	0.000***	0.103***	1.872***	0.001***	0.002***
	(4.25)	(4.48)	(4.09)	(4.19)	(8.30)	(8.53)	(6.79)	(6.99)
EQRAT	0.009	0.146	0.000	0.000	-0.069	-0.801	-0.001	-0.002
	(1.35)	(1.08)	(1.07)	(1.11)	(-0.24)	(-0.17)	(-0.38)	(-0.34)
Stddev ROA	-0.086	-1.616	-0.002	-0.002	-2.605	-47.511	-0.027	-0.036
	(-1.04)	(-0.95)	(-0.92)	(-0.92)	(-0.57)	(-0.59)	(-0.48)	(-0.41)

CRE / GTA	0.007***	0.155***	0.000***	0.000***	0.337***	5.729***	0.004***	0.005***
	(3.49)	(3.76)	(3.42)	(3.47)	(3.74)	(3.60)	(2.89)	(2.87)
MBS / GTA	0.006*	0.119*	0.000*	0.000*	0.379***	5.615**	0.004**	0.006*
	(1.69)	(1.73)	(1.73)	(1.75)	(2.61)	(2.18)	(2.06)	(1.91)
ROE	0.003**	0.064**	0.000**	0.000**	0.001	-0.344	0.000	-0.001
	(2.42)	(2.55)	(2.20)	(2.25)	(0.02)	(-0.54)	(0.70)	(-0.78)
Illiquidity (LC / GTA)	0.000	0.004	0.000	0.000	0.046***	0.813***	0.001***	0.001***
	(0.25)	(0.22)	(0.09)	(0.06)	(2.71)	(2.66)	(2.64)	(2.66)
BHC dummy	0.000	-0.009	0.000	0.000	-0.031	-0.497	0.000	0.000
	(0.68)	(-0.63)	(0.56)	(0.55)	(-0.56)	(-0.51)	(0.31)	(0.25)
Listed dummy	0.002	0.038	0.000	0.000	0.092**	1.441**	0.001**	0.001**
	(0.81)	(0.82)	(0.73)	(0.73)	(2.43)	(2.30)	(2.23)	(2.22)
Foreign own dummy	-0.002***	-0.036***	0.000	0.000	0.086	0.820	0.001	0.001
	(-3.76)	(-3.95)	(0.01)	(0.01)	(1.11)	(0.74)	(1.02)	(0.98)
OCC dummy	-0.002***	-0.034***	-0.000***	-0.000***	-0.018	-0.236	0.000	0.000
	(-3.14)	(-3.04)	(-2.92)	(-2.97)	(-0.55)	(-0.41)	(0.45)	(0.44)
FDIC dummy	-0.001	-0.029	-0.000*	-0.000*	-0.013	0.014	0.000	0.000
	(-1.54)	(-1.56)	(-1.66)	(-1.67)	(-0.39)	(0.02)	(0.00)	(0.08)
Income growth	0.006	0.304	0.000	0.000	1.397	20.656	0.011	0.020
	(0.41)	(0.99)	(0.83)	(0.80)	(1.60)	(1.42)	(1.04)	(1.23)
Fed district 2	-0.001	-0.008	0.000	0.000	0.007	0.192	0.000	0.000
	(-0.94)	(-0.61)	(0.57)	(0.57)	(0.14)	(0.21)	(0.30)	(0.32)
Fed district 3	0.001	0.027	0.000	0.000	0.022	0.312	0.001	0.001
	(0.84)	(0.87)	(0.93)	(0.92)	(0.43)	(0.35)	(0.93)	(1.01)
Fed district 4	0.005	0.100	0.000	0.000	0.031	0.394	0.000	0.000
	(1.54)	(1.53)	(1.47)	(1.48)	(0.57)	(0.43)	(0.49)	(0.47)
Fed district 5	0.005**	0.100**	0.000*	0.000*	0.029	0.317	0.000	0.000
	(2.02)	(2.08)	(1.95)	(1.96)	(0.51)	(0.33)	(0.27)	(0.28)
Fed district 6	0.001	0.011	0.000	0.000	0.056	1.259	0.001	0.001
	(0.68)	(0.70)	(0.84)	(0.86)	(1.05)	(1.22)	(1.27)	(1.32)
Fed district 7	0.000	0.007	0.000	0.000	0.092	1.361	0.001	0.001
	(0.74)	(0.52)	(0.65)	(0.66)	(1.37)	(1.17)	(1.30)	(1.33)
Fed district 8	0.002	0.035	0.000	0.000	0.133	2.620	0.002	0.003
	(1.45)	(1.44)	(1.52)	(1.51)	(1.42)	(1.61)	(1.49)	(1.53)
Fed district 9	0.006***	0.123***	0.000**	0.000**	-0.044	-0.826	-0.001	-0.001
	(2.58)	(2.60)	(2.51)	(2.50)	(-1.29)	(-1.28)	(-1.27)	(-1.27)
Fed district 10	0.001	0.010	0.000	0.000	0.080	1.192	0.001	0.002
	(0.76)	(0.59)	(0.71)	(0.70)	(1.07)	(0.95)	(1.11)	(1.12)
Fed district 11	-0.001	-0.011	0.000	0.000	-0.006	0.232	0.000	0.001
	(-0.93)	(-0.85)	(0.83)	(0.83)	(-0.14)	(0.25)	(0.38)	(0.51)
Fed district 12	0.005*	0.104**	0.000*	0.000*	0.012	0.064	0.000	0.000
	(1.95)	(2.04)	(1.83)	(1.88)	(0.29)	(0.08)	(0.36)	(0.35)
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	56936	56936	56892	56892	4546	4546	4520	4520
Pseudo R2	0.17	0.13	0.35	0.32	0.15	0.10	1.32	0.77