The Federal Reserve’s Discount Window and TAF Programs: “Pushing on a String?”

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The Federal Reserve injected unprecedented liquidity into banks during the crisis using the discount window and Term Auction Facility. We examine these facilities’ use and effectiveness. We find: small bank users were generally weak, large bank users were not; the funds substituted to a limited degree for other funds; these facilities increased aggregate lending which would have decreased in their absence. The funds enhanced lending of expanding banks and reduced the decline at contracting banks. Small banks increased small-firm lending, while large banks enhanced large-firm lending. Loan quality only improved at small banks, while both left loan contract terms unchanged.

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“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.”

Federal Reserve Press Release for expansion of the Term Auction Facility on October 6, 2008

1. Introduction

Since its inception in 1913, the Federal Reserve has served as a lender of last resort (LOLR) to the U.S. banking sector by providing temporary, short-term funds through the discount window.¹ 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 funding during the crisis of 2007-2009, as interbank and money markets experienced trouble.² 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 weakness³⁴ – 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.⁵

¹ Bagehot (1873) argued 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 (2010) discuss how the LOLR role changed during the recent financial crisis.
² See Brave and Genay (2011) for a discussion of all the programs offered by the Federal Reserve during the crisis.
³ Ennis and Weinberg (2011) for a discussion of all the programs offered by the Federal Reserve during the crisis.
⁵ Proficio Bank, a bank that funded 48% of assets using the discount window on one day, denied having used the discount window when interviewed by a reporter following the public release of the data in 2011, supporting the notion of a stigma. See “Utah banks borrowed billions during financial crisis,” Salt Lake Tribune, April 25, 2011.
⁶ 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.”
While from 2003 to 2006, discount window usage averaged $170 million per day, discount window and TAF usage together averaged a staggering $221 billion per day from August 2007 through December 2009. Over the crisis, the Federal Reserve extended more than 30,000 loans with a par value of close to $15 trillion (see Table 1) through these facilities. Around 20% of small U.S. banks and 62% of large U.S. banks used the facilities at some point during the crisis. 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.

The Federal Reserve’s extraordinary liquidity injection into banks raises three important policy questions that we address in this paper. First: Which banks used funds from the Federal Reserve during the crisis? The theory behind the LOLR role prescribes that weak banks should be able to borrow from the central bank in order to avoid a banking panic and the inefficient liquidation of risky assets. This is especially important during periods of heightened uncertainty about the risks of bank assets, as in the recent crisis. This theory predicts that weak banks were more likely to use these funds during the crisis.

The second question is: Did the funds from the Federal Reserve substitute for or complement other funding sources? The objective of the Federal Reserve is to provide funds when private sources of funding have dried up and banks cannot find alternative funding sources. This suggests that the funds from the Federal Reserve should be substitutes for other sources. However, these funds may also help a bank regain a stable liquidity profile so that the bank can return to other markets. In this case, the funds from the Federal Reserve complement other funding sources.

The third question is: Did banks use the funds from the Federal Reserve to increase their lending?

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6 The Federal Reserve’s H.4.1 statistical release provides weekly averages of daily outstanding discount window and TAF funds. We report the average of these weekly averages, which amounts to the daily average. Discount window usage alone averaged $30 billion per day during the crisis.

7 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.

8 In the classical view of the LOLR, the target recipients are solvent banks that the private market considers too risky (Thornton, 1802). An alternative view advocates temporary assistance to insolvent banks (Solow, 1982; Goodhart, 1985). 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.

9 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.
While this is not a traditional role of the LOLR, the Federal Reserve explicitly intended for their liquidity facilities to encourage bank lending. For example, the February 2009 Monetary Policy Report to the Congress states: “By increasing the access of depository institutions to funding, the TAF has supported the ability of such institutions to meet the credit needs of their customers.” 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.”

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, we employ data on discount window and TAF usage during the crisis that were later made public. Data on discount window usage were released on March 31, 2011, following Freedom of Information Act requests by Bloomberg News and Fox Business Network. The Federal Reserve published data on TAF recipients on December 1, 2010 because the Dodd-Frank Act mandated the release of this information.

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

To address our first question, we perform two regression analyses. First, we examine which banks received funds from the Federal Reserve during the crisis. We find that small banks receiving DW TAF 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 large banks suggests that the Federal Reserve may not have adhered strictly to an LOLR role during the crisis. We propose several potential explanations for these large-bank findings. A second analysis focuses on the intensity of usage (e.g., number of times used and average daily amount outstanding relative to assets)

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11 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).

12 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.”
and produces results broadly consistent with our findings on the propensity of usage.

We next examine the extent to which DWTAF substitutes for or complements alternative funding sources. To address this, 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 repos, other hot money (mostly brokered deposits), and TARP funds.13 These regressions are not to be viewed as causal, but rather to establish whether Federal Reserve funding tends 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 are very small.

Finally, we examine whether DWTAF usage increased bank lending. We examine overall lending as well as lending decomposed by maturity (short-term versus long-term) and by loan category (commercial and industrial (C&I), commercial real estate (CRE), residential real estate (RRE), and other loans). Specifically, we perform OLS regressions of the change in lending (normalized by lagged bank assets) on the change in the average amount of DWTAF (normalized by lagged bank assets), and a standard set of controls for bank and regional conditions plus bank and time fixed effects. We also perform instrumental variables (IV) regressions to control for potential endogeneity arising from reverse causality or common omitted variables that affect both a bank’s decision to obtain funds from the Federal Reserve and its decision to lend. The results suggest that for both small and large banks, an increase in DWTAF usage is associated with increased total lending, increased short-term and long-term lending, and increases in all of the loan types with the exception of residential real estate loans. Additional tests show that the funds enhanced lending of expanding banks and reduced the decline at contracting banks. The results are robust to dropping Too-Big-To-Fail (TBTF) banks and seem to be driven by privately-held rather than listed banks. These 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. Our calculations suggest that these funds increased lending by U.S. commercial banks by 139% of the actual increase in aggregate lending, or equivalently, that these facilities reversed what would have otherwise been a decline in overall lending by the banking sector. This effect is likely understated because it does not include any additional lending by institutions that do not fill out Call Reports (mostly agencies and

13 We restrict the sample to bank-quarter observations in which DWTAF usage changed in order to avoid averaging in numerous zeros from non-users. We alternatively include and exclude control variables.
branches of foreign banks), which received a substantial portion of the DWTAf funds.

We next analyze whether loans to small and large firms are affected differently by DWTAf. We do so using data from June Call Reports, the only publicly-available data source that has information on C&I lending by loan size class for all banks. We find that DWTAf increased small-firm lending at small banks and large-firm lending at large banks.

We also address whether DWTAf affected the credit quality of the loans and loan contract terms. For these analyses, we use the Federal Reserve’s Survey of Terms of Bank Lending (STBL), a quarterly survey of the terms of commercial and industrial loans by about 348 insured commercial banks including all of the largest banks. We find that DWTAf is associated with safer loans for small banks and no significant change in loan quality for large banks. We also find no change in loan contract terms for either bank size class. The small-bank contract-term result is surprising because it suggests that while they shifted their lending into safer borrowers, they did not give these borrowers better contract terms. The large-bank result is entirely consistent with the finding that DWTAf usage is not associated with any significant change in loan quality.

We briefly examine whether banks used part of the funds from the Federal Reserve to liquefy their balance sheets. The results suggest that small banks used DWTAf to some extent to enhance liquidity – they increased their securities holdings, but not their cash holdings. In contrast, we find no evidence that large banks used DWTAf funding to liquefy their balance sheets.

We pay special attention to the collapse of Lehman Brothers on September 15, 2008, which triggered the most dramatic period of market illiquidity during the crisis. We show how our main results differ during the height of the crisis (immediately after the collapse), and during the first and second halves of the crisis (before and after the collapse). We find that during the height of the crisis, weaker small and large banks were more likely to obtain Federal Reserve funding, and banks seemed to use the funds for lending during this period. Similarly, weakness became a more important determinant of DWTAf usage during the second half of the crisis, but DWTAf usage had similar effects on lending per dollar of DWTAf in both halves.

Our paper is closely related to interesting contemporaneous working papers by Drechsler, Drechsel, Marques-Ibanez, and Schnabl (2013) and Boyson, Helwege, and Jindra (2013). Drechsler et al. 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 et al. 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 funds from the Federal Reserve. Neither of these studies examines the second and third questions addressed in this paper.

The insights from our analyses may be helpful for policymakers to understand the importance of central bank liquidity facilities during the recent crisis and potentially during future crises. The theory of the LOLR has a long history, but there is limited empirical evidence on how the LOLR functions during a crisis. Our paper aims to fill this void. Our results also suggest that the Federal Reserve did not push on a string – its liquidity facilities increased the availability of credit to households and firms during the crisis.14

The remainder of the paper is organized as follows. Section 2 describes the discount window and TAF, shows graphs of the amounts outstanding under these facilities over time and their cost, and includes lists of banks that used these facilities most during the crisis. Section 3 deals with the first question: Which banks used DW and TAF funds? Section 4 addresses the second question: Did banks use funds from the Federal Reserve as substitutes for or complements to other funding sources? Section 5 focuses on the third question: Did DWTAF increase bank lending? Section 6 contains subsample analyses. Section 7 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.

14 Outside the U.S., the interest of central banks in affecting credit availability has most recently been demonstrated by the Bank of England’s “Funding for Lending” scheme which was announced on July 12, 2012. This scheme attempts to boost lending to U.K. households and businesses by tying the cost of the funds to banks’ loan growth. See: http://www.bankofengland.co.uk/publications/Pages/news/2012/067.aspx.
Since 2003, the Federal Reserve has had three permanent discount window programs: 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 weeks. All three are fully collateralized and have no prepayment penalties. While the first two programs 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. 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 on a term basis 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. Collateral

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).

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.

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.

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).

eligibility and valuation procedures for the TAF were the same as for the discount window. In some cases, banks used the TAF facility at a higher 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, 2011).

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. Panel B shows the 3- and 1-month Libor-OIS (Overnight Indexed Swap) spreads, commonly-used 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.

2.2. DW and TAF Data and Key Statistics
We employ data on DW and TAF usage during the crisis. As discussed above, data on discount window usage 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 outstanding over the crisis, defined to last from August 20, 2007 (the first 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.

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20 The Federal Reserve has never lost money on any discount window or TAF funds.
21 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.
22 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.
23 DW and TAF data have also been used by Armantier, Ghysels, Sarkar, and Shrader (2011), Benmelech (2012), Boyson, Helwege, and Jindra (2013), and Kleymenova (2013). McAndrews, Sarkar, and Wang (2008), Taylor and Williams (2009), and Wu (2011) study the effects of TAF introduction on asset market prices.
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.\footnote{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.}

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\footnote{GTA equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans).} up to $1 billion) and large commercial banks (GTA over $1 billion). 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 banks, with a few important differences. While the time patterns are similar, they are less extreme than those of 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 when they used 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 of funds measured two ways in Table 2 – by frequency of usage (Panel A) and average outstanding relative to GTA (Panel B). Panel A contains three subpanels with the rankings for small
commercial banks, large commercial banks, and non-commercial bank recipients, respectively. Panel B contains only two subpanels because GTA is only available for commercial banks. In all cases, we measure the ranks by DW TAF, 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 Panel A shows that for every type of bank, the frequency of DW TAF usage is generally close to that of DW usage, reflecting that there were only a limited number of TAF auctions.26 The top 10 users among small and large commercial banks accessed DW TAF between 113 and 413 times, with higher top frequencies for small banks. Some of the most frequent large commercial bank TAF users were fairly large with over $50 billion in GTA. Also, among the frequent users, none of the small banks and only three of the large banks were majority foreign owned. However, some of the most frequent users were branches of very large foreign-owned banks (see Subpanel A3).27

In Table 2 Panel B, the lists of banks with the highest average daily DW TAF financing relative to GTA show 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%. Perhaps not surprisingly, the very largest banks do not appear on the top lists. There is a big difference between the ranks of the financing percentages based on DW TAF 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. As above, none of the top small banks and only a few of the top large banks have majority foreign ownership.

We also examine which banks had funding outstanding on the most days and which banks had the highest outstandings relative to assets on a single day. While yielding interesting additional insights, they are shown and discussed in Internet Appendix Table A.1 only 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, including usage intensity, and presents the results.

26 There were 58 TAF auctions and the average TAF user accessed the facility 9 times.
27 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.
3.1 Methodology

We use regression analyses to examine the characteristics of banks that used DW and TAF during the crisis and the intensity with which they used these funds. Regressions are run separately for small and large banks.

The explanatory variables used in every regression include: bank size (log of GTA), 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. These variables capture bank condition, ownership, regulation, and economic environment. We also include Federal Reserve district dummies to account for other regional economic conditions and possible differences across individual Reserve Banks in the administration of the discount window program. In addition, we include time fixed effects to control for the business cycle, interest rate cycle, and other macroeconomic events. Definitions and summary statistics for the regression variables (means and medians) are shown in the Data Appendix at the end of the tables (before the Internet Appendix).

3.1.1 Methodology – Usage

To examine which banks received funds during the crisis, we use a panel probit equation to identify the probability of bank $i$ using funds from the Federal Reserve during quarter $t$ of the financial crisis:

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

where $P(\bullet)$ 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 financial crisis.

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28 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.
crisis. All of the explanatory variables are discussed in Section 3.1. Standard errors are clustered by bank to address potential within-bank serial correlation of the error term.

3.1.2 Methodology – Usage intensity

To analyze the intensity with which banks used funds from the Federal Reserve during the crisis, we focus on the number of times the bank obtained funds and the average daily amount outstanding relative to assets. In the Internet Appendix, we also examine the number of days the bank had funds outstanding and the maximum daily amount outstanding relative to assets.

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:

\[
y_{i,t}^* = \begin{cases} 
y_{i,t}^* & \text{if } y_{i,t}^* > 0 \\
0 & \text{if } y_{i,t}^* \leq 0 \end{cases}
\]

(2)

where

\[
y_{i,t}^* = h(\text{bank size}_i, \text{capital}_i, \text{portfolio risk}_i, \text{earnings}_i, \text{illiquidity}_i, \text{BHC dummy}_i, \text{listed dummy}_i, \\
\text{foreign ownership dummy}_i, \text{primary federal regulator dummies}_i, \text{state income growth}_i, \text{Federal Reserve district dummies}_i, \text{time fixed effects}_i)
\]

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

3.2 Results

This section discusses the results of investigating the first question. We highlight whether banks with the greatest need for liquidity received funds during the crisis and used such funds most intensively. By way of preview, the answer seems to be yes for small banks. In contrast, large banks seem to have received funds mostly irrespective of need.

The results are presented in Tables 3 and 4. In both cases, Panels A, B, and C present the results for 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 TAF did not yet
exist in 2007:Q3, the first quarter (out of ten) of our sample period. In each panel, Subpanels 1 and 2 show the results for small and large banks, respectively. The regression variables are all defined and summary statistics are provided in the Data Appendix at the end of the tables (before the Internet Appendix).

3.2.1 Results – Usage
Table 3 shows the probit regression results for which banks received funds during the crisis (equation 1). To make the results easier to interpret, 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 DW TAF funds were larger, more capital constrained, had more commercial real estate loans (a risky form of lending), more mortgage-backed securities (securities which appeared to be risky during the recent crisis), were more often domestically owned, and were less often supervised by the FDIC (which may be 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. The first reason is stigma. All else equal, stigma costs may be greater for large banks than small banks. This may be because large banks using DWTAFT 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. It could also be because large banks may be more susceptible to “runs” by counterparties since they rely more on interbank borrowing which is uninsured and engage in other activities (e.g., derivatives and other trading) where funding costs are sensitive to counterparty concerns. A second reason why weakness may be less correlated with usage for large banks is that they rely more on funding from capital markets that were disrupted during the crisis. A third reason is that Reserve Banks may screen large banks more carefully. A fourth reason is that healthy large banks may have been encouraged to use such funds.29 A final reason is that healthy large banks may prefer to use DWTAFT at a premium on a term basis in order to obtain longer-maturity funds with certainty, instead of rolling over federal funds which typically are provided overnight.

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.

3.2.2 Results – Usage intensity
Table 4 presents the results on the intensity of DWTAFT usage. All estimations use the Tobit specification in equation (2). In each panel, Columns (1) and (2) show the results for the number of times the bank obtained

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29 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.

30 This is consistent with Mitchell and Pearce (1992), who show evidence that discount window usage differs across Federal Reserve districts.
funds and the average daily amount outstanding relative to GTA during the quarter, respectively. The results are generally consistent with each other across the two columns, so we discuss them together. In Internet Appendix Table A.2, we show additional results for the number of days the bank had funds outstanding and the maximum daily amount outstanding relative to GTA during the quarter, and the results are also consistent with those shown here.

The results for small banks in Table 4 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 4 Subpanels B1 and C1 are much the same as those for DWTAF, except that TAF users did not seem to be more capital constrained.

The results for large banks in Table 4 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 4 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. 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.

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. By way of preview, we find limited evidence that Federal Reserve funds substituted for other funding sources.
4.1 Methodology

To examine the extent to which 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:

\[
\Delta(\text{funds from Federal Reserve}_{i,t})/\text{GTA}_{i,t-1} = m(\Delta(\text{Core Deposits}_{i,t})/\text{GTA}_{i,t-1}, \Delta(\text{Fed Funds}_{i,t})/\text{GTA}_{i,t-1}, \Delta(\text{Repos}_{i,t})/\text{GTA}_{i,t-1}, \Delta(\text{Other Hot Money}_{i,t})/\text{GTA}_{i,t-1}, \Delta(\text{FHLB}_{i,t})/\text{GTA}_{i,t-1}, \Delta(\text{TARP}_{i,t})/\text{GTA}_{i,t-1}, \text{bank size}_{i,t-1}, \text{capital}_{i,t-1}, \text{portfolio risk}_{i,t-1}, \text{earnings}_{i,t-1}, \text{illiquidity}_{i,t-1}, \text{BHC dummy}_{i,t-1}, \text{foreign ownership dummy}_{i,t-1}, \text{listed dummy}_{i,t-1}, \text{state income growth}_{j,t-1}, \text{primary federal regulator dummies}, \text{bank fixed effects}, \text{time fixed effects})
\] (3)

where \(\Delta(\text{funds from Federal Reserve}_{i,t})/\text{GTA}_{i,t-1}\) is the change from the previous quarter in the average amount of DWTAF, DW, or TAF outstanding normalized by lagged GTA. The key right-hand-side variables are the changes in other sources of bank funding normalized by lagged GTA. The regressions include control variables and bank and time fixed effects. The controls include all the independent variables used above except for the Federal Reserve district dummies. Banks typically do not change Federal Reserve districts, so these dummies would be collinear with the bank fixed effects. This is a particularly strong specification, as the bank fixed effects control for any constant differences over time for a given bank and the time fixed effects control for any differences over time that affect all banks equally. In addition, standard errors are clustered by bank.

Importantly, 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 5 contains the OLS regression results for our second question. Panel A shows the effects using DW TAF 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 of interest only, and do not show or discuss the results for the control variables.

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 not surprising 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 unsurprising since TAF usage dominated for these banks (see Figure 2 Panel C). Interestingly, for large banks, there is some evidence that TAF complemented TARP. This is consistent with the possibility that some banks used the higher capital ratios resulting from TARP to gain access to TAF funds.

It is important to point out that the coefficients are far smaller in magnitude than -1 or 1. This suggests that while the results are statistically significant, the degree of substitution is far less than one for one.

To examine robustness, we explore two additional specifications. First, we drop the control variables to get closer to the raw correlations (while still controlling for time and bank 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 thus not shown for brevity.

5. Did banks use the funds from the Federal Reserve to increase lending?
This section addresses our third question. We start by discussing the methodology used to answer whether banks used the funds from the Federal Reserve to increase their lending. We then present the results.
5.1 Methodology

We perform two types of analyses in this section: OLS regressions and IV regressions. In both 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 the following OLS regressions which include the same independent variables as those used above:

\[
\frac{\Delta \text{lending}_{i,t}}{\text{GTA}_{i,t-1}} = m\left( \frac{\Delta \text{DWTAF}_{i,t}}{\text{GTA}_{i,t-1}}, \frac{\Delta \text{Fed Funds}_{i,t}}{\text{GTA}_{i,t-1}}, \frac{\Delta \text{ Repos}_{i,t}}{\text{GTA}_{i,t-1}}, \frac{\Delta \text{ Core Deposits}_{i,t}}{\text{GTA}_{i,t-1}}, \frac{\Delta \text{ TARP}_{i,t}}{\text{GTA}_{i,t-1}}, \text{ bank size}_{i,t-1}, \text{ capital}_{i,t-1}, \text{ portfolio risk}_{i,t-1}, \text{ earnings}_{i,t-1}, \text{ illiquidity}_{i,t-1}, \text{ BHC dummy}_{i,t-1}, \text{ foreign ownership dummy}_{i,t-1}, \text{ listed dummy}_{i,t-1}, \text{ state income growth}_{i,t-1}, \text{ primary federal regulator dummies}_{i,k,t-1}, \text{ bank fixed effects}_i, \text{ time fixed effects}_t \right)
\]

(4)

where \( \Delta \text{lending}_{i,t} / \text{GTA}_{i,t-1} \) is the quarterly change in portfolio loans normalized by lagged GTA. This dependent variable is alternatively measured as the change in total loans, loans of different maturity (short-term or long-term), and different loan categories (commercial and industrial (C&I) loans, commercial real estate (CRE) loans, residential real estate (RRE) loans, or other loans), all normalized by lagged GTA. See the Data Appendix at the end of the tables (before the Internet Appendix) for definitions and summary statistics on these dependent variables. \( \Delta \text{DWTAF}_{i,t} / \text{GTA}_{i,t-1} \) is the change from the previous quarter in the average amount of DWTAF outstanding normalized by lagged GTA. We alternately exclude or include the changes in other funding sources shown in square brackets because these are potentially endogenous and it is important to show that our results hold regardless of whether we exclude or include them. We include virtually all the control variables used previously as well as time and bank fixed effects. We exclude Federal Reserve district dummies, which are collinear with the bank fixed effects.\(^{31}\) Standard errors are clustered by bank.

\(^{31}\) It was important to include Federal Reserve district dummies in the usage regressions above since the individual Federal Reserve Banks have some discretion as to who receives funds. The lending regressions, however, focus on what banks do with the funds, and thus it seems more appropriate to include bank fixed effects.
5.1.2 Methodology - IV

OLS is a naïve approach that does not address potential endogeneity arising from reverse causality or common omitted variables that affect both a bank’s decision to obtain funds from the Federal Reserve and its decision to lend. For example, instead of the funding decision driving lending, the lending decision could drive funding. We therefore also run IV regressions, treating the change in the average amount of funds obtained from the Federal Reserve normalized by lagged GTA as a potentially endogenous right-hand-side variable.

We use two instruments: the average of prior Δ(DWTAf)/GTA for the bank itself and the average of prior Δ(DWTAf)/GTA for other banks in the same Federal Reserve district. The first instrument seems relevant, even though the sign of the coefficient is not clear a priori since there are two countervailing forces. The average change in the bank’s own prior usage may be positively correlated with the endogenous variable because previous usage signifies that the bank has already overcome any stigma of obtaining funds from the Federal Reserve or it may be negatively related because previous usage could result in the bank having to repay the funds. We view the first stage coefficient on this instrument to be the net effect of these two forces. We expect the coefficient on the second instrument to be positive, because a bank should face lower stigma costs after other banks in its district have already used funds from the district Federal Reserve Bank. This effect should be stronger for small banks than for large banks since it is easier for small banks to hide their usage. These instruments should not have a direct effect on the change in lending in this quarter, and hence meet the exclusion restriction.

In the first stage, we regress the potentially endogenous variable, Δ(DWTAf) / GTA, on the two instruments and all of the exogenous variables plus fixed effects used in the OLS regressions. In the second stage, we regress Δ(lending) / GTA on the predicted value for Δ(DWTAf) / GTA from the first stage and all the exogenous variables plus bank and time fixed effects.

5.2 Main results

We present the OLS lending results, followed by the IV results. By way of preview, the key takeaway from

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32 This is similar in spirit to Roberts and Tybout’s argument (1997). They find that firms that have experience with exporting are more likely to export in the future and attribute this to those firms having already borne the sunk costs associated with exporting. Sunk costs in their story are similar to stigma in our story.

33 As noted above, banks access DW and TAF funds through their district Federal Reserve Bank. Weekly amounts of DW and TAF usage at each district bank are reported in the Federal Reserve’s weekly H.4.1 statistical release.
these regressions is that DWTA usage increased lending by both small and large banks.

5.2.1 OLS results

Table 6 contains the OLS regression results for lending. Panel A shows the effects of DWTA usage on overall lending for small banks (Subpanel A1) and large banks (Subpanel A2). For brevity, we discuss only 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 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 approximately 0.92 in Column (2) suggests that an additional dollar of daily funds over the quarter was associated with an increase in lending of about 92 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 94 cent increase in lending. Both effects seem 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.

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).34 We also want to examine whether key loan categories were affected differently. For example, banks may have been reluctant to expand into real estate loans given the problems

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34 Since DW and TAF funding are available for up to 90 and 84 days, respectively, it would make sense to define ST loans as loans with a maturity up to three months instead of one year as we do. Unfortunately, those data are not available.
with such loans during the crisis. To address this, we split total loans into C&I, CRE, RRE, and other loans.\textsuperscript{35}

Table 6 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 loans. Turning to the large-bank results in Subpanel B2, the positive effect on lending holds for all types of lending, but – consistent with the small-bank results – the effect is weakest for RRE loans.

\subsection{IV results}

Table 7 contains the IV regression results for lending.\textsuperscript{36} Panel A shows Hausman endogeneity tests which suggest that endogeneity is an issue for small and large banks’ total lending and some loan types (where the statistic has p-values of 0.10 or less). We also test whether the instruments are weak (the correlation with the endogenous regressors is low). We calculate the Angrist-Pischke first-stage F-statistic of excluded instruments to test the hypothesis that the instrument coefficient is zero in all cases (Angrist and Pischke, 2009). The associated p-values are 0.00 for small and large banks, suggesting we do not have a weak instrument problem.

Panel B shows the results of the first stage of the IV estimations. The first-stage regressions are identical for all lending types, so we only show the result once for small and large banks. For both groups of banks, the coefficient on the change in the bank’s previous DWTAF usage is negative and statistically significant. This suggests that the positive effect on DWTAF usage from previously having overcome the stigma of obtaining funds from the Federal Reserve is more than offset by the negative effect of having to repay these funds. In contrast, the coefficient on previous usage by other banks in the district is positive as expected, and significant only for small banks. This suggests that a small bank faces lower stigma costs after other banks in its district have already obtained funds from the district Federal Reserve Bank.

Panel C shows the results of the second-stage estimations. The columns show the full set of results for overall lending as well as the different types of lending. The results in Subpanel C1 suggest that all types of small banks’ lending other than RRE (overall / short-term / long-term / C&I / CRE / other loans) increased when small banks obtained more funds from the Federal Reserve, mostly consistent with the OLS results. The results in Subpanel C2 show that large banks’ overall lending also increased with use of funds, with the increase

\begin{footnotesize}
\begin{itemize}
\item\textsuperscript{35} 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.
\item\textsuperscript{36} The number of observations is smaller because the instruments are based on prior usage.
\end{itemize}
\end{footnotesize}
being primarily attributable to increased short-term and C&I lending. The magnitudes of the IV borrowing coefficients for small and large banks are generally about 2 to 3 times larger than the OLS coefficients. This suggests that the OLS results may underestimate the effect of DWTAf usage on bank lending.\textsuperscript{37}

\textbf{5.3 Economic significance of the lending results}

It is important to know by how much lending increased as a result of DWTAf and how this relates to the change in overall lending by the banking sector. To do so, we focus on the period from 2007:Q3 (the first quarter in which we have DWTAf data) to 2009:Q1 (the quarter in which DWTAf outstandings peaked). This was arguably the period during which the funds were most needed.\textsuperscript{38}

From 2007:Q3 to 2009:Q1, small-bank DWTAf usage rose from $0.02 billion to $3.34 billion and large-bank DWTAf usage went from $0.49 billion to $240.96 billion. Multiplying these DWTAf increases by the small- and large-bank OLS regression coefficients of 0.919 and 0.941, respectively, yields estimated increases in lending due to DWTAf of $3.07 billion for small banks and $226.28 billion for large banks, for a total of $229.35 billion. This estimated increase in total lending is likely understated because it does not include additional lending by institutions that did not fill out Call Reports.\textsuperscript{39} Using the IV regression coefficients would also result in larger increases in lending due to DWTAf.

Over this same period, lending by all small and large banks (including both DWTAf users and non-users) increased by $58.22 billion and $106.97 billion, respectively, for a total of $165.19 billion. Thus, the estimated increase in lending due to DWTAf appeared to account for about 5\% of the actual increase in small-bank lending, 212\% of the actual increase in large-bank lending, and 139\% of the actual increase in total lending. This suggests that more than the entire aggregate increase in lending by the U.S. banking sector was due to DWTAf, or equivalently, that overall lending would have decreased in the absence of these facilities.

\textbf{5.4 Did DWTAf increase loan growth, slow loan contraction, or both?}

We have shown thus far that DWTAf led to higher loan growth for its recipients than for those that did not

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\textsuperscript{37} Documenting a much larger coefficient estimate for IV compared to OLS is consistent with Levitt (1996) and Berger and Bouwman (2009).

\textsuperscript{38} After this time period, DWTAf funds started to be repaid on net and hence no longer supported aggregate lending.

\textsuperscript{39} Institutions that did not fill out Call Reports received a substantial portion of the DWTAf funds, but we cannot estimate the impact on their lending because of a lack of detailed financial statement information.
receive such funds. An interesting question is whether the programs led to higher loan growth for banks that were increasing lending or less loan contraction for those that were reducing their lending, or both.

To address this question, we focus on total lending and run two auxiliary regressions each for small and large banks. In the first regression, we set all loan growth values to zero except for positive ones: if the coefficient on $\Delta(DWTA)/GTA$ is positive in this regression, then DWTA 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 $\Delta(DWTA)/GTA$ is positive in this regression, then DWTA slows the rate of loan contraction. A similar approach is used by Gopalan, Milbourn, Song, and Thakor (2014).40

For small banks, we find positive and significant coefficients of 0.534 and 0.385 (which add up to 0.919, the coefficient shown in Table 6 Subpanel A1 Column (2)). For large banks, we find positive and significant coefficients of 0.642 and 0.299 (which add up to 0.941, the coefficient shown in Table 6 Subpanel A2 Column (2)). These results suggest that DWTA 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 it 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-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.41 The results are similar to the main large-bank results, suggesting that TBTF banks did not drive the increase in

40 Gopalan, Milbourn, Song, and Thakor (2014) 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.
41 It is not possible to run these regressions separately for TBTF banks because of the small number of observations.
lending by large-bank DWTA users.

5.6 Listed versus privately-held banks

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

Table 9 shows the results. We find that for both small and large banks, the results for listed banks are generally weaker (and not significant) than the main lending results, while the results for unlisted banks are similar to the main results (see Table 9 Panels 1 and 2). Hence, consistent with our expectations, the main results seem to be driven by privately-held banks that need DWTA to increase their lending.

5.7 Effect on loans to small and large firms

Anecdotal evidence suggests that small businesses were particularly hard hit by the recent crisis. We therefore examine whether C&I lending to small and large firms are affected differently by DWTA. 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, the analysis by loan size class should give a rough approximation of whether loans to small or large firms are most affected by DWTA.

We collect the dollar amount of C&I loans for four original loan amount sizes (less than $100K, $100K - $250K, $250K - $1 million, and over $1 million) in June 2008 and June 2009. The original amount is the maximum of the loan size or the commitment size. We calculate the (annual) changes in the amounts for all four loan amount sizes, and rerun the lending regressions.

Table 10 shows the results split by loan size. They indicate that at small banks, loans with sizes between $100K and $250K, and between $250K and $1 million went up (coefficients of 0.035 and 0.110,

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43 We cannot include June 2007 because the DWTA data starts in August 2007.
respectively), while at large banks, loans with sizes above $1 million increased (coefficient of 0.215).\textsuperscript{44} This suggests that DWTAf funds increased small-firm lending at small banks and large-firm lending at large banks.

### 5.8 Effect on credit quality and loan contract terms

The results so far suggest that DWTAf usage supported bank lending. It is also interesting to examine whether DWTAf affected the credit quality of the loans and their contract terms. Since this cannot be addressed using Call Report data, we now 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 was designed to enable the Federal Reserve to examine loan market developments and the cost of business borrowing.

We collect several key pieces of information on each loan in the STBL.\textsuperscript{45} First, its risk rating: banks report each loan’s risk rating by mapping their internal ratings to a scale prescribed by the Federal Reserve. Loan risk ratings range 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, its 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, its collateral status: this is 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 number of dollar-years of the loans issued 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

\textsuperscript{44} 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.

\textsuperscript{45} We thank Lieu Hazelwood for excellent help with the STBL regressions.
lending to a safer or riskier pool of borrowers. If the borrowers are higher credit quality, we would expect the weighted average loan risk ratings to 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 for these banks. DWTAF does not seem to affect the riskiness of loans for large banks.

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 entirely 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, 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 want to 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 (4)) except that we replace the dependent variable $\Delta(lending) / GTA_{i,t-1}$ 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 as liquid assets (Kashyap

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46 Our methodology identifies a loan supply effect by analyzing the differential change in loan quality across banks based on DWTAF usage.

47 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 (forthcoming) use Home Mortgage Disclosure Act (HMDA) data and find similar results for large banks receiving TARP.

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. **Subsample analyses: height of the crisis and the first and second halves of the crisis**

Our analyses to this point have focused on the entire crisis (August 2007 – December 2009). It is well-known, however, that the collapse of Lehman Brothers on September 15, 2008 was a critical event that triggered a period of unprecedented turmoil. During this time period, hot money funding sources like repos and brokered deposits were highly affected and market liquidity was difficult for banks to access. This is apparent from the extraordinary DW and TAF usage during the height of the crisis (September 15, 2008 – December 31, 2008): the Federal Reserve extended 5,650 DW and TAF loans combined with a total par value of $4.4 trillion (19% of the number of loans and 30% of the total par value of loans extended during the entire crisis, respectively).

This raises the interesting possibility that DWTAF usage, the extent of substitution, and the effect on lending differ during the height of the crisis immediately after Lehman Brothers collapsed, and more generally, during the first and second halves of the crisis (i.e., before and after Lehman Brothers collapsed). We therefore rerun our main analyses for these time periods.

6.1 **Height of the crisis – the period immediately after Lehman Brothers collapsed**

To evaluate which banks used funds from the Federal Reserve during the height of the crisis, we use a specification that is similar to equation (1) above, but restrict the sample to a cross-sectional analysis of funds usage over this period. We define the height of the crisis to last from September 15, 2008 (the day Lehman Brothers collapsed) until the end of the following quarter, i.e., December 31, 2008. Internet Appendix Table A.3 Panel A shows that among both small and large banks, the weaker ones were more likely to obtain Federal Reserve funding during the height of the crisis. In particular, small banks with lower capital ratios and riskier portfolios were more likely to use DWTAF; and large banks that were less profitable and had riskier and more illiquid portfolios tended to use such funds. This small-bank result is similar to the overall crisis result, whereas the large-bank result suggests that need became a more important determinant of large-bank DWTAF usage during the height of the crisis. Only a few Federal Reserve district dummies are significant in the small- and large-bank regressions, suggesting that usage was geographically widespread during this period.
To address whether DWTA substituted for or complemented other funding sources during this period, we rerun equation (2) while limiting the sample period to the height of the crisis. We define this period here as 2008:Q4 (instead of September 15, 2008 – December 31, 2008) because Call Report data used in the regressions are only available quarterly. The results are in Internet Appendix Table A.4 Panel A. For small banks, we only find weak evidence of substitution during this period. In contrast, for large banks, DWTA did substitute primarily for hot money in the form of repos and other hot money (mostly brokered deposits). This is not surprising since large banks are more affected by these markets.

To examine whether banks used DWTA to increase their lending, we rerun the lending regressions (using a specification similar to equation (3) above) while again limiting the sample period to the height of the crisis (2008:Q4). Internet Appendix Table A.5 Panel A shows that banks did seem to use the funds for lending during the height of the crisis. While the overall effect on lending is similar to that during the full crisis for small banks, it is greater for large banks. Interestingly, both small and large banks seem to have used the funds to boost their short-term lending during the height of the crisis. In contrast to the overall crisis results, the funds did not affect long-term lending during this period.

6.2 First and second halves of the crisis
We first analyze which banks obtained funds from the Federal Reserve during the first and second halves of the crisis (approximately before and after Lehman Brothers’ collapse). We run our regressions separately for the first half (2007:Q3 – 2008:Q3) and the second half (2008:Q4 – 2009:Q4) (see Internet Appendix Table A.3 Panels B and C). For small banks, capitalization played a role in both periods, while portfolio risk had a big and significant effect on DWTA usage only in the second half. For large banks, portfolio risk was important in both periods, but seemed to have had a greater effect in the second half, and illiquidity was only a significant predictor of DWTA usage during this latter period. Thus, for both small and large banks, weakness seemed to have become a more important determinant of DWTA usage during the second half of the crisis.

Next, we address whether DWTA acted as a substitute for other funding sources in both time periods. We find that it did not (see Internet Appendix Table A.4 Panels B and C). Rather, the substitution effects are driven by the second half for both small and large banks.

Finally, we examine whether banks used these funds to increase their lending during both time periods.
Interestingly, we find that they did (see Internet Appendix Table A.5 Panels B and C). DWTAF usage seemed to have had similar effects on lending for both small and large banks in the first and second half of the crisis.

7. Conclusion

The Federal Reserve provided an unprecedented amount of 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 during the recent crisis, 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 more capital constrained and riskier. Thus, weaker small banks were more likely to get these funds. Large banks receiving Federal Reserve funding were generally not weaker than other 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 an instrumental variable (IV) approach that takes into account potential endogeneity of the decision to use funds from the Federal Reserve. Our calculations suggest that these funds increased lending by users by more than the actual aggregate increase in lending by the U.S. banking sector, or put another way, that these facilities reversed what would have otherwise been a decline in overall lending.

Additional tests suggest that the funds enhanced lending of expanding banks and reduced the decline at contracting banks. Small banks used the funds to increase lending to small firms, while large banks used them to enhance lending to large firms. Small banks improved loan quality while large banks did not; both groups of banks left loan contract terms unchanged.

In terms of policy implications, our findings suggest that the Federal Reserve went beyond the traditional role of LOLR in two dimensions. First, instead of providing liquidity access to only the weakest banks, the Federal Reserve also made this liquidity available to healthier banks. Second, the Federal Reserve set an additional goal of increasing the flow of credit to firms and households through increased bank lending and our findings indicate that it was able to do so through its extraordinary liquidity provision.
References


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.

<table>
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<th>Crisis:</th>
<th>DWTAf</th>
<th>DW</th>
<th>TAF</th>
</tr>
</thead>
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<tr>
<td>Number of loans</td>
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<td>26,395</td>
<td>3,937</td>
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<td>14,753.94</td>
<td>10,992.90</td>
<td>3,761.05</td>
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<tr>
<td>Average loan size ($ millions)</td>
<td>486.42</td>
<td>416.48</td>
<td>955.31</td>
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<tr>
<td>Median loan size ($ millions)</td>
<td>8.25</td>
<td>6.01</td>
<td>150.00</td>
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<tr>
<td>Standard deviation of loan size</td>
<td>2,720.72</td>
<td>2,808.58</td>
<td>1,937.22</td>
</tr>
<tr>
<td>Number of users</td>
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<td>2,014</td>
<td>404</td>
</tr>
<tr>
<td>Number of users with at least one quarter of Call Report data during the crisis</td>
<td>1,804</td>
<td>1,728</td>
<td>283</td>
</tr>
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</table>
Table 2: Top 10 users
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: how frequently they used these facilities during the crisis (Panel A); and their average daily outstandings (normalized by GTA) during the crisis (Panel B). 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 (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 A: Banks that used DWTAF, DW, and TAF most frequently during the crisis

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<th>DW Frequency</th>
<th>TAF Frequency</th>
<th>User</th>
<th>GTA</th>
<th>Foreign own dummy</th>
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<td>2</td>
<td>307</td>
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### Subpanel A2: Large banks

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### Subpanel A3: Non-commercial banks

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

#### Subpanel B1: Small banks

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<th>Rank</th>
<th>Avg daily outstanding / GTA</th>
<th>Rank</th>
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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.

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<th>Subpanel A2: Large banks</th>
<th>Subpanel B1: Dummy = 1 if the bank used DW during the quarter</th>
<th>Subpanel B2: Large banks</th>
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</tr>
<tr>
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<td>0.005</td>
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<tr>
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</tr>
<tr>
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<td>(1.62)</td>
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<td>0.012</td>
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<td>-0.012</td>
</tr>
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<td></td>
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<tr>
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<td>0.000</td>
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<tr>
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</tr>
<tr>
<td>(0.012)</td>
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</tr>
<tr>
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<td>-0.009***</td>
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<td>-0.008***</td>
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<td>Income growth</td>
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<td>1.306*</td>
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<td>(1.52)</td>
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<td>(1.76)</td>
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<td>(1.51)</td>
<td>(0.79)</td>
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<td></td>
</tr>
<tr>
<td>Fed district 3</td>
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<td>(1.06)</td>
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<td>-0.013*</td>
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<td>0.020</td>
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<td>-0.018***</td>
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<td>(0.48)</td>
<td>(0.44)</td>
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<td>(-2.79)</td>
<td>(0.76)</td>
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<td>Fed district 5</td>
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<td>0.080*</td>
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<td>-0.007</td>
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<td>(-0.27)</td>
<td>(-0.29)</td>
<td>(1.74)</td>
<td>(1.72)</td>
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</tr>
<tr>
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<td>-0.012*</td>
<td>0.033</td>
<td>0.034</td>
<td>-0.013**</td>
<td>-0.013**</td>
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<td>(-1.93)</td>
<td>(-1.93)</td>
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<td>(0.86)</td>
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<td>(0.62)</td>
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<tr>
<td>Fed district 7</td>
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<td>0.001</td>
<td>0.138***</td>
<td>0.136***</td>
<td>0.000</td>
<td>-0.001</td>
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<td>(0.23)</td>
<td>(0.12)</td>
<td>(3.10)</td>
<td>(3.02)</td>
<td>(0.03)</td>
<td>(-0.09)</td>
<td>(3.56)</td>
</tr>
<tr>
<td>Fed district 8</td>
<td>-0.006</td>
<td>-0.006</td>
<td>0.091*</td>
<td>0.091*</td>
<td>-0.008</td>
<td>-0.009</td>
</tr>
<tr>
<td>(-0.94)</td>
<td>(-0.97)</td>
<td>(1.81)</td>
<td>(1.79)</td>
<td>(-1.28)</td>
<td>(-1.32)</td>
<td>(2.13)</td>
</tr>
<tr>
<td>Fed district 9</td>
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<td>0.000</td>
<td>0.036</td>
<td>0.036</td>
<td>-0.002</td>
<td>-0.003</td>
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<tr>
<td>(0.23)</td>
<td>(0.06)</td>
<td>(0.57)</td>
<td>(0.57)</td>
<td>(-0.28)</td>
<td>(-0.47)</td>
<td>(0.80)</td>
</tr>
<tr>
<td>Fed district 10</td>
<td>-0.013***</td>
<td>-0.014***</td>
<td>0.039</td>
<td>0.037</td>
<td>-0.015**</td>
<td>-0.016**</td>
</tr>
<tr>
<td>(-2.1)</td>
<td>(-2.17)</td>
<td>(0.88)</td>
<td>(0.83)</td>
<td>(-2.37)</td>
<td>(-2.45)</td>
<td>(0.96)</td>
</tr>
<tr>
<td>Fed district 11</td>
<td>-0.023***</td>
<td>-0.023***</td>
<td>-0.005</td>
<td>-0.004</td>
<td>-0.024***</td>
<td>-0.024***</td>
</tr>
<tr>
<td>(-3.82)</td>
<td>(-3.80)</td>
<td>(-0.12)</td>
<td>(-0.09)</td>
<td>(-3.92)</td>
<td>(-3.90)</td>
<td>(0.23)</td>
</tr>
<tr>
<td>Fed district 12</td>
<td>0.028***</td>
<td>0.029***</td>
<td>0.102**</td>
<td>0.103**</td>
<td>0.026***</td>
<td>0.026***</td>
</tr>
<tr>
<td>(3.11)</td>
<td>(3.19)</td>
<td>(2.46)</td>
<td>(2.48)</td>
<td>(2.88)</td>
<td>(2.94)</td>
<td>(4.07)</td>
</tr>
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<td>5101</td>
<td>5101</td>
<td>63301</td>
<td>63301</td>
</tr>
<tr>
<td>Pseudo R2</td>
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<td>0.16</td>
<td>0.13</td>
<td>0.13</td>
<td>0.15</td>
<td>0.15</td>
</tr>
</tbody>
</table>
Table 4: 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).

Two sets of Tobit regressions are used. The dependent variables in these regressions are: (1) the number of times the bank used funds during the quarter; and (2) the average daily amount outstanding normalized by GTA during the quarter. 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 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.

<table>
<thead>
<tr>
<th>Panel A: DWTAF usage</th>
<th>Panel B: DW usage</th>
<th>Panel C: TAF usage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subpanel A1:</strong> Small banks</td>
<td><strong>Subpanel A2:</strong> Large banks</td>
<td><strong>Subpanel B1:</strong> Small banks</td>
</tr>
<tr>
<td># times used during the quarter</td>
<td>Avg daily amount outstanding / GTA during the quarter</td>
<td># times used during the quarter</td>
</tr>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(1)</td>
</tr>
<tr>
<td>Log(GTA)</td>
<td>0.122***</td>
<td>0.000***</td>
</tr>
<tr>
<td>(10.99)</td>
<td>(8.54)</td>
<td>(8.05)</td>
</tr>
<tr>
<td>EQRAT</td>
<td>-0.460***</td>
<td>-0.001*</td>
</tr>
<tr>
<td>(-2.42)</td>
<td>(-1.74)</td>
<td>(0.93)</td>
</tr>
<tr>
<td>Stddev ROA</td>
<td>2.097</td>
<td>0.007</td>
</tr>
<tr>
<td>(0.83)</td>
<td>(1.12)</td>
<td>(-1.65)</td>
</tr>
<tr>
<td>CRE / GTA</td>
<td>0.187***</td>
<td>0.001***</td>
</tr>
<tr>
<td>(3.38)</td>
<td>(4.10)</td>
<td>(4.23)</td>
</tr>
<tr>
<td>MBS / GTA</td>
<td>0.308***</td>
<td>0.001***</td>
</tr>
<tr>
<td>(3.57)</td>
<td>(3.46)</td>
<td>(2.79)</td>
</tr>
<tr>
<td>ROE</td>
<td>0.049**</td>
<td>0.000**</td>
</tr>
<tr>
<td>(1.98)</td>
<td>(2.27)</td>
<td>(-0.77)</td>
</tr>
<tr>
<td>Illiquidity (LC / GTA)</td>
<td>0.062</td>
<td>0.000</td>
</tr>
<tr>
<td>(1.45)</td>
<td>(1.06)</td>
<td>(0.74)</td>
</tr>
<tr>
<td>BHC dummy</td>
<td>0.026</td>
<td>0.000</td>
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<tr>
<td>(1.41)</td>
<td>(1.29)</td>
<td>(0.42)</td>
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<tr>
<td>Listed dummy</td>
<td>0.085</td>
<td>0.000</td>
</tr>
<tr>
<td>(1.05)</td>
<td>(0.67)</td>
<td>(1.35)</td>
</tr>
<tr>
<td>Foreign own dummy</td>
<td>-0.093**</td>
<td>0.000</td>
</tr>
<tr>
<td>(-2.50)</td>
<td>(1.14)</td>
<td>(-0.13)</td>
</tr>
<tr>
<td>OCC dummy</td>
<td>-0.016</td>
<td>-0.000*</td>
</tr>
<tr>
<td>------------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>(0.80)</td>
<td>(-1.70)</td>
<td>(0.83)</td>
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<tr>
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<td>-0.056***</td>
<td>-0.000***</td>
</tr>
<tr>
<td>(-2.67)</td>
<td>(-2.71)</td>
<td>(-0.92)</td>
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<tr>
<td>Income growth</td>
<td>0.604</td>
<td>0.001</td>
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<tr>
<td>(1.47)</td>
<td>(1.25)</td>
<td>(1.90)</td>
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<tr>
<td>Fed district 2</td>
<td>-0.073</td>
<td>0.000</td>
</tr>
<tr>
<td>(-1.47)</td>
<td>(1.53)</td>
<td>(0.76)</td>
</tr>
<tr>
<td>Fed district 3</td>
<td>0.023</td>
<td>0.000</td>
</tr>
<tr>
<td>(0.35)</td>
<td>(0.05)</td>
<td>(1.47)</td>
</tr>
<tr>
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</tr>
<tr>
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<td>(1.13)</td>
<td>(0.61)</td>
</tr>
<tr>
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<td>0.000</td>
</tr>
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<td>(-0.07)</td>
<td>(0.03)</td>
<td>(1.63)</td>
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<tr>
<td>Fed district 6</td>
<td>-0.062</td>
<td>0.000</td>
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<tr>
<td>(-1.39)</td>
<td>(1.51)</td>
<td>(0.51)</td>
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<tr>
<td>Fed district 7</td>
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<td>0.000</td>
</tr>
<tr>
<td>(0.21)</td>
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<td>0.000</td>
</tr>
<tr>
<td>(-0.74)</td>
<td>(0.62)</td>
<td>(1.56)</td>
</tr>
<tr>
<td>Fed district 9</td>
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<td>0.000</td>
</tr>
<tr>
<td>(0.54)</td>
<td>(1.36)</td>
<td>(0.87)</td>
</tr>
<tr>
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<td>-0.082*</td>
<td>-0.000***</td>
</tr>
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<td>-0.137***</td>
<td>-0.000***</td>
</tr>
<tr>
<td>(-3.10)</td>
<td>(-3.29)</td>
<td>(0.09)</td>
</tr>
<tr>
<td>Fed district 12</td>
<td>0.267***</td>
<td>0.001***</td>
</tr>
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<td>63257</td>
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<tr>
<td>Pseudo R2</td>
<td>0.09</td>
<td>0.66</td>
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</table>
Table 5: Did funds from the Federal Reserve substitute for or complement other funding sources?

This table reports OLS regressions which examine whether funds from DW TAF (Panel A), the DW (Panel B), and the TAF (Panel C), substitute for or complement other funding sources during the crisis. DW TAF 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. \( \Delta (DWTAF) / GTA \) 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 control variables shown in Table 4 (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.

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>Panel A: ( \Delta (DWTAF) / GTA )</th>
<th>Panel B: ( \Delta (DW) / GTA )</th>
<th>Panel C: ( \Delta (TAF) / GTA )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Subpanel A1: Small banks</td>
<td>Subpanel A2: Large banks</td>
<td>Subpanel B1: Small banks</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(1)</td>
</tr>
<tr>
<td>( \Delta (Core Deposits) / GTA )</td>
<td>-0.007***</td>
<td>-0.007</td>
<td>-0.003**</td>
</tr>
<tr>
<td></td>
<td>(-2.92)</td>
<td>(-1.48)</td>
<td>(-2.49)</td>
</tr>
<tr>
<td>( \Delta (Fed Funds) / GTA )</td>
<td>-0.010</td>
<td>-0.011</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td>(-0.84)</td>
<td>(-0.61)</td>
<td>(-0.50)</td>
</tr>
<tr>
<td>( \Delta (Repos) / GTA )</td>
<td>-0.019</td>
<td>-0.031</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(-1.18)</td>
<td>(-1.39)</td>
<td>(0.19)</td>
</tr>
<tr>
<td>( \Delta (Other Hot Money) / GTA )</td>
<td>-0.010**</td>
<td>-0.032***</td>
<td>-0.005***</td>
</tr>
<tr>
<td></td>
<td>(-2.16)</td>
<td>(-4.60)</td>
<td>(-2.72)</td>
</tr>
<tr>
<td>( \Delta (FHLB) / GTA )</td>
<td>-0.004</td>
<td>-0.022**</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(-0.65)</td>
<td>(-2.13)</td>
<td>(0.54)</td>
</tr>
<tr>
<td>( \Delta (TARP) / GTA )</td>
<td>-0.048</td>
<td>0.036</td>
<td>-0.025**</td>
</tr>
<tr>
<td></td>
<td>(-1.63)</td>
<td>(1.03)</td>
<td>(-2.20)</td>
</tr>
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<td>1396</td>
<td>4249</td>
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<tr>
<td>R2</td>
<td>0.28</td>
<td>0.33</td>
<td>0.23</td>
</tr>
</tbody>
</table>
**Table 6: 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, and other 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 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)**

<table>
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<tr>
<th>Dependent variable:</th>
<th>A(LOANS)/GTA</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Subpanel A1: Small banks</td>
<td>Subpanel A2: Large banks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(1)</td>
<td>(2)</td>
<td></td>
</tr>
<tr>
<td>Δ(DWTAf) / GTA</td>
<td>0.653***</td>
<td>0.919***</td>
<td>0.487***</td>
<td>0.941***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(5.25)</td>
<td>(7.45)</td>
<td>(2.63)</td>
<td>(5.04)</td>
<td></td>
</tr>
<tr>
<td>Δ(Core Deposits)/GTA</td>
<td>0.083***</td>
<td></td>
<td>0.101***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(14.52)</td>
<td></td>
<td>(4.14)</td>
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<tr>
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<td>Δ(Repos)/GTA</td>
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<td>Δ(Other Hot Money)/GTA</td>
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<td>CRE / GTA</td>
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<td>( \Delta(\text{LT_LOANS})/\text{GTA} )</td>
<td>( \Delta(\text{CI_LOANS})/\text{GTA} )</td>
<td>( \Delta(\text{CRE_LOANS})/\text{GTA} )</td>
<td>( \Delta(\text{RRE_LOANS})/\text{GTA} )</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>( \Delta(\text{DWTAF}) / \text{GTA} )</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
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<tr>
<td>MBS / GTA</td>
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<td>0.066***</td>
<td>0.063***</td>
<td>0.054***</td>
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<td></td>
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<td>(11.06)</td>
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<td>ROE</td>
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<td>Illiquidity (LC / GTA)</td>
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<td>-0.023***</td>
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<td>0.000</td>
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<td>(0.74)</td>
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<td>Income growth</td>
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<td>0.018</td>
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<td>(1.33)</td>
<td>(1.02)</td>
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<tr>
<td>Observations</td>
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<td>56011</td>
<td>4258</td>
<td>4255</td>
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<tr>
<td>R2</td>
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Panel B: Effect of DWTAF on different types of lending (OLS results)

### Subpanel B1: Small banks

<table>
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<tr>
<th>Dependent variable:</th>
<th>( \Delta(\text{ST_LOANS})/\text{GTA} )</th>
<th>( \Delta(\text{LT_LOANS})/\text{GTA} )</th>
<th>( \Delta(\text{CI_LOANS})/\text{GTA} )</th>
<th>( \Delta(\text{CRE_LOANS})/\text{GTA} )</th>
<th>( \Delta(\text{RRE_LOANS})/\text{GTA} )</th>
<th>( \Delta(\text{OTHER_LOANS})/\text{GTA} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta(\text{DWTAF}) / \text{GTA} )</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
<tr>
<td>MBS / GTA</td>
<td>0.599***</td>
<td>0.344***</td>
<td>0.153***</td>
<td>0.386***</td>
<td>0.028</td>
<td>0.230***</td>
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<tr>
<td></td>
<td>(4.73)</td>
<td>(2.74)</td>
<td>(3.20)</td>
<td>(4.54)</td>
<td>(0.67)</td>
<td>(4.63)</td>
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<tr>
<td>Observations</td>
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<td>56011</td>
<td>56011</td>
<td>56011</td>
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<td>56011</td>
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<td>R2</td>
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### Subpanel B2: Large banks

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<th>( \Delta(\text{ST_LOANS})/\text{GTA} )</th>
<th>( \Delta(\text{LT_LOANS})/\text{GTA} )</th>
<th>( \Delta(\text{CI_LOANS})/\text{GTA} )</th>
<th>( \Delta(\text{CRE_LOANS})/\text{GTA} )</th>
<th>( \Delta(\text{RRE_LOANS})/\text{GTA} )</th>
<th>( \Delta(\text{OTHER_LOANS})/\text{GTA} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta(\text{DWTAF}) / \text{GTA} )</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
<tr>
<td>MBS / GTA</td>
<td>0.349**</td>
<td>0.643***</td>
<td>0.155**</td>
<td>0.276***</td>
<td>0.092*</td>
<td>0.186***</td>
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<td></td>
<td>(2.31)</td>
<td>(2.99)</td>
<td>(2.17)</td>
<td>(3.10)</td>
<td>(1.66)</td>
<td>(2.77)</td>
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<td>R2</td>
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<td>0.28</td>
<td>0.26</td>
<td>0.51</td>
<td>0.35</td>
<td>0.21</td>
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</table>
Table 7: Did banks use the funds from the Federal Reserve to increase lending? (IV regressions)

This table reports instrumental variable 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. Panel A contains the Hausman endogeneity test results. Panels B and C show the first- and second-stage regression results, respectively. 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). \( \Delta(DWTAF) / GTA \) is the change in the bank’s average amount of DWTAF outstanding during the quarter normalized by lagged GTA. This variable is instrumented by two instruments: the average of prior \( \Delta(DWTAF) / GTA \) for the bank and the average of prior \( \Delta(DWTAF) / GTA \) for other banks in the same Federal Reserve district. DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility.

All independent variables are defined in the Data Appendix at the end of the tables. The first-stage regressions in Panels A and B include the two instruments, all of the exogenous variables included in the second stage, a constant, and bank and time fixed effects (not shown for brevity). The second-stage regressions in Panels C 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: Hausman endogeneity test

<table>
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<tr>
<th>Subpanel A1: Small banks</th>
<th>( \Delta(LOANS) / GTA )</th>
<th>( \Delta(ST_LOANS) / GTA )</th>
<th>( \Delta(LT_LOANS) / GTA )</th>
<th>( \Delta(CL_LOANS) / GTA )</th>
<th>( \Delta(CRE_LOANS) / GTA )</th>
<th>( \Delta(RRE_LOANS) / GTA )</th>
<th>( \Delta(OTHER_LOANS) / GTA )</th>
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<td>Hausman endogeneity test</td>
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<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
</tr>
<tr>
<td>p-value</td>
<td>0.00</td>
<td>0.18</td>
<td>0.00</td>
<td>0.25</td>
<td>0.01</td>
<td>0.30</td>
<td>0.01</td>
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<table>
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<th>Subpanel A2: Large banks</th>
<th>( \Delta(LOANS) / GTA )</th>
<th>( \Delta(ST_LOANS) / GTA )</th>
<th>( \Delta(LT_LOANS) / GTA )</th>
<th>( \Delta(CL_LOANS) / GTA )</th>
<th>( \Delta(CRE_LOANS) / GTA )</th>
<th>( \Delta(RRE_LOANS) / GTA )</th>
<th>( \Delta(OTHER_LOANS) / GTA )</th>
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</thead>
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<tr>
<td>Hausman endogeneity test</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
</tr>
<tr>
<td>p-value</td>
<td>0.06</td>
<td>0.17</td>
<td>0.61</td>
<td>0.03</td>
<td>0.91</td>
<td>0.37</td>
<td>0.53</td>
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### Panel B: Effect of DWTAF usage on bank lending (1st-stage IV results)

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<th>Subpanel B1: Small banks</th>
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<td>Avg. of prior ( \Delta(DWTAF) / GTA ) for bank</td>
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<td>(-11.45)</td>
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<td>Avg. of prior ( \Delta(DWTAF) / GTA ) for other banks in same Fed district</td>
<td>0.032***</td>
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<td>(-11.45)</td>
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<td>Avg. of prior ( \Delta(DWTAF) / GTA ) for other banks in same Fed district</td>
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### Panel C: Effect of DWTAf usage on bank lending (2nd-stage IV results)

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<th>Δ(ST_LOANS) / GTA</th>
<th>Δ(LT_LOANS) / GTA</th>
<th>Δ(CL_LOANS) / GTA</th>
<th>Δ(REC_LOANS) / GTA</th>
<th>Δ(REE_LOANS) / GTA</th>
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<td>(1)</td>
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<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
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<tr>
<td>Δ(DWTAf) / GTA (instr.)</td>
<td>2.690***</td>
<td>1.092***</td>
<td>1.665***</td>
<td>0.314***</td>
<td>1.126***</td>
<td>0.164</td>
<td>0.800***</td>
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<tr>
<td>∆(Fed Funds)/GTA</td>
<td>0.083***</td>
<td>0.019***</td>
<td>0.066***</td>
<td>0.012***</td>
<td>0.057***</td>
<td>0.013***</td>
<td>-0.006***</td>
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<td>∆(Fed Funds)/GTA</td>
<td>(14.72)</td>
<td>(3.45)</td>
<td>(12.56)</td>
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<td>(17.82)</td>
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<td>(10.90)</td>
<td>(13.33)</td>
<td>(10.66)</td>
<td>(16.10)</td>
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<td>(11.87)</td>
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<td>∆(Fed Funds)/GTA</td>
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<td>0.078***</td>
<td>0.001</td>
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<td>0.044***</td>
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<td>(10.79)</td>
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<td>(19.40)</td>
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<td>0.023</td>
<td>0.042**</td>
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<td>(1.12)</td>
<td>(1.01)</td>
<td>(2.23)</td>
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<tr>
<td>Log(GTA)</td>
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<td>-0.020***</td>
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<td>-0.007***</td>
<td>-0.019***</td>
<td>-0.006***</td>
<td>-0.007***</td>
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<tr>
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<td>MBS / GTA</td>
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<td>-0.071***</td>
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<tr>
<td>MBS / GTA</td>
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<td>(-7.31)</td>
<td>(8.57)</td>
<td>(-20.17)</td>
<td>(9.07)</td>
<td>(-4.45)</td>
</tr>
<tr>
<td>MBS / GTA</td>
<td>0.066***</td>
<td>0.036***</td>
<td>0.030***</td>
<td>0.011***</td>
<td>0.015***</td>
<td>0.015***</td>
<td>0.019***</td>
</tr>
<tr>
<td>MBS / GTA</td>
<td>(10.21)</td>
<td>(6.43)</td>
<td>(4.77)</td>
<td>(4.11)</td>
<td>(3.04)</td>
<td>(6.69)</td>
<td>(7.40)</td>
</tr>
<tr>
<td>ROE</td>
<td>0.013***</td>
<td>0.006***</td>
<td>0.007***</td>
<td>0.003***</td>
<td>0.009***</td>
<td>0.001***</td>
<td>0.000</td>
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<tr>
<td>ROE</td>
<td>(9.22)</td>
<td>(4.31)</td>
<td>(4.23)</td>
<td>(4.99)</td>
<td>(9.09)</td>
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<td>(0.22)</td>
</tr>
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<td>Illiquidity (LC) / GTA</td>
<td>-0.030***</td>
<td>-0.025***</td>
<td>-0.006</td>
<td>-0.031***</td>
<td>0.044***</td>
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<td>0.000</td>
<td>0.000</td>
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<td>(0.09)</td>
</tr>
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<td>0.003</td>
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<tr>
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<td>0.000</td>
<td>0.000</td>
<td>0.001</td>
<td>0.010</td>
<td>0.001</td>
<td>-0.004</td>
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<td>0.000</td>
<td>0.000</td>
<td>0.001</td>
<td>0.001</td>
<td>-0.001</td>
</tr>
<tr>
<td>Income growth</td>
<td>0.009</td>
<td>0.056***</td>
<td>-0.046***</td>
<td>0.016***</td>
<td>-0.012</td>
<td>-0.023***</td>
<td>0.019***</td>
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<td>0.00</td>
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</tr>
<tr>
<td>---------------------</td>
<td>-------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Δ(LOANS)/GTA</td>
<td>Δ(ST_LOANS)/GTA</td>
<td>Δ(LT_LOANS)/GTA</td>
<td>Δ(CL_LOANS)/GTA</td>
<td>Δ(CRE_LOANS)/GTA</td>
<td>Δ(RRE_LOANS)/GTA</td>
<td>Δ(OTHER_LOANS)/GTA</td>
</tr>
<tr>
<td>Δ(DWTAF)/GTA (instr.)</td>
<td>1.968***</td>
<td>1.079***</td>
<td>0.923</td>
<td>0.509***</td>
<td>0.233</td>
<td>0.238</td>
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<td>(3.36)</td>
<td>(2.16)</td>
<td>(1.49)</td>
<td>(2.70)</td>
<td>(0.59)</td>
<td>(1.30)</td>
<td>(1.43)</td>
</tr>
<tr>
<td>Δ(Core Deposits)/GTA</td>
<td>0.096***</td>
<td>0.017</td>
<td>0.085***</td>
<td>0.015*</td>
<td>0.028**</td>
<td>0.016***</td>
<td>0.019**</td>
</tr>
<tr>
<td></td>
<td>(4.14)</td>
<td>(0.99)</td>
<td>(3.60)</td>
<td>(1.82)</td>
<td>(2.40)</td>
<td>(2.72)</td>
<td>(2.55)</td>
</tr>
<tr>
<td>Δ(Fed Funds)/GTA</td>
<td>0.331***</td>
<td>0.207***</td>
<td>0.146***</td>
<td>0.065***</td>
<td>0.086***</td>
<td>0.067***</td>
<td>0.061**</td>
</tr>
<tr>
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<td>(5.75)</td>
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<td>(2.98)</td>
<td>(4.99)</td>
<td>(3.49)</td>
<td>(2.26)</td>
</tr>
<tr>
<td>Δ(Repo's)/GTA</td>
<td>0.124**</td>
<td>-0.067</td>
<td>0.196***</td>
<td>0.004</td>
<td>0.042</td>
<td>0.036**</td>
<td>0.037*</td>
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<td>(2.46)</td>
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<td>(1.47)</td>
<td>(2.56)</td>
<td>(1.66)</td>
</tr>
<tr>
<td>Δ(Other Hot Money)/GTA</td>
<td>0.173***</td>
<td>0.139***</td>
<td>0.048</td>
<td>0.039***</td>
<td>0.065***</td>
<td>-0.001</td>
<td>0.035**</td>
</tr>
<tr>
<td></td>
<td>(4.14)</td>
<td>(4.76)</td>
<td>(1.24)</td>
<td>(3.22)</td>
<td>(3.90)</td>
<td>(-0.15)</td>
<td>(2.13)</td>
</tr>
<tr>
<td>Δ(FHLB)/GTA</td>
<td>0.259***</td>
<td>0.073***</td>
<td>0.195***</td>
<td>0.033***</td>
<td>0.093***</td>
<td>0.061***</td>
<td>0.031***</td>
</tr>
<tr>
<td></td>
<td>(6.83)</td>
<td>(2.60)</td>
<td>(4.57)</td>
<td>(3.36)</td>
<td>(6.54)</td>
<td>(4.11)</td>
<td>(3.37)</td>
</tr>
<tr>
<td>Δ(TARP)/GTA</td>
<td>-0.072</td>
<td>0.128</td>
<td>-0.189</td>
<td>-0.025</td>
<td>-0.033</td>
<td>-0.001</td>
<td>-0.006</td>
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<tr>
<td></td>
<td>(-0.69)</td>
<td>(1.21)</td>
<td>(-1.35)</td>
<td>(-0.57)</td>
<td>(-0.76)</td>
<td>(-0.02)</td>
<td>(-0.14)</td>
</tr>
<tr>
<td>Log(GTA)</td>
<td>-0.038***</td>
<td>0.003</td>
<td>-0.035***</td>
<td>-0.005</td>
<td>-0.012**</td>
<td>-0.003</td>
<td>-0.004*</td>
</tr>
<tr>
<td></td>
<td>(-4.09)</td>
<td>(0.38)</td>
<td>(-3.86)</td>
<td>(-1.35)</td>
<td>(-2.41)</td>
<td>(-1.42)</td>
<td>(-1.71)</td>
</tr>
<tr>
<td>EQRAT</td>
<td>0.060*</td>
<td>-0.004</td>
<td>0.062</td>
<td>-0.015</td>
<td>-0.052*</td>
<td>0.048**</td>
<td>0.028**</td>
</tr>
<tr>
<td></td>
<td>(1.67)</td>
<td>(-1.14)</td>
<td>(1.37)</td>
<td>(-0.96)</td>
<td>(-1.66)</td>
<td>(2.07)</td>
<td>(1.58)</td>
</tr>
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<td>Stddev ROA</td>
<td>0.6</td>
<td>0.35</td>
<td>0.939</td>
<td>0.255</td>
<td>-0.670**</td>
<td>0.309**</td>
<td>0.309**</td>
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<tr>
<td></td>
<td>(0.64)</td>
<td>(0.52)</td>
<td>(1.00)</td>
<td>(0.75)</td>
<td>(-2.07)</td>
<td>(0.08)</td>
<td>(1.86)</td>
</tr>
<tr>
<td>CRE / GTA</td>
<td>-0.072***</td>
<td>0.008</td>
<td>-0.082***</td>
<td>0.007</td>
<td>-0.090***</td>
<td>0.004</td>
<td>0.007</td>
</tr>
<tr>
<td></td>
<td>(-2.81)</td>
<td>(0.41)</td>
<td>(-2.21)</td>
<td>(0.68)</td>
<td>(-4.23)</td>
<td>(0.75)</td>
<td>(0.77)</td>
</tr>
<tr>
<td>MBS / GTA</td>
<td>0.061***</td>
<td>0.033**</td>
<td>0.028</td>
<td>0.020**</td>
<td>-0.01</td>
<td>0.011**</td>
<td>0.026**</td>
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<tr>
<td></td>
<td>(3.04)</td>
<td>(2.10)</td>
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<td>(-0.61)</td>
<td>(1.99)</td>
<td>(3.63)</td>
</tr>
<tr>
<td>ROE</td>
<td>0.011***</td>
<td>0.004</td>
<td>0.010**</td>
<td>0.001</td>
<td>0.012***</td>
<td>-0.001</td>
<td>0.000</td>
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<tr>
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<td>(2.80)</td>
<td>(1.37)</td>
<td>(2.33)</td>
<td>(0.34)</td>
<td>(6.44)</td>
<td>(-1.48)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>Illiquidity (LC) / GTA</td>
<td>-0.001</td>
<td>-0.005</td>
<td>0.001</td>
<td>0.004</td>
<td>-0.004**</td>
<td>-0.003***</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(-0.12)</td>
<td>(-1.51)</td>
<td>(0.11)</td>
<td>(0.74)</td>
<td>(-2.50)</td>
<td>(-3.30)</td>
<td>(0.95)</td>
</tr>
<tr>
<td>BHC dummy</td>
<td>0.017*</td>
<td>0.000</td>
<td>0.013</td>
<td>0.006</td>
<td>0.003</td>
<td>-0.001</td>
<td>0.003*</td>
</tr>
<tr>
<td></td>
<td>(1.66)</td>
<td>(0.03)</td>
<td>(1.19)</td>
<td>(0.99)</td>
<td>(0.92)</td>
<td>(-0.32)</td>
<td>(1.75)</td>
</tr>
<tr>
<td>Listed dummy</td>
<td>-0.007</td>
<td>0.001</td>
<td>-0.009</td>
<td>0.001</td>
<td>-0.004</td>
<td>-0.004*</td>
<td>-0.001</td>
</tr>
<tr>
<td></td>
<td>(-0.96)</td>
<td>(0.17)</td>
<td>(-1.51)</td>
<td>(0.29)</td>
<td>(-0.88)</td>
<td>(-1.85)</td>
<td>(-0.34)</td>
</tr>
<tr>
<td>Foreign own dummy</td>
<td>-0.004</td>
<td>0.001</td>
<td>-0.007</td>
<td>0.004</td>
<td>0.002</td>
<td>-0.001</td>
<td>-0.007</td>
</tr>
<tr>
<td></td>
<td>(-0.48)</td>
<td>(0.22)</td>
<td>(-0.71)</td>
<td>(1.15)</td>
<td>(0.50)</td>
<td>(-0.76)</td>
<td>(-1.14)</td>
</tr>
<tr>
<td>OCC dummy</td>
<td>0.016</td>
<td>0.008</td>
<td>0.006</td>
<td>0.006</td>
<td>0.004</td>
<td>-0.001</td>
<td>0.0008</td>
</tr>
<tr>
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<td>(0.94)</td>
<td>(0.63)</td>
<td>(0.34)</td>
<td>(1.15)</td>
<td>(0.81)</td>
<td>(-0.65)</td>
<td>(0.86)</td>
</tr>
<tr>
<td>FDIC dummy</td>
<td>0.004</td>
<td>-0.012</td>
<td>0.015</td>
<td>0.030</td>
<td>-0.001</td>
<td>-0.002</td>
<td>-0.005</td>
</tr>
<tr>
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<td>(0.39)</td>
<td>(-1.31)</td>
<td>(1.18)</td>
<td>(0.92)</td>
<td>(-0.14)</td>
<td>(-1.30)</td>
<td>(0.72)</td>
</tr>
<tr>
<td>Income growth</td>
<td>0.013</td>
<td>0.029</td>
<td>-0.006</td>
<td>0.039*</td>
<td>0.045*</td>
<td>-0.040**</td>
<td>-0.009</td>
</tr>
<tr>
<td></td>
<td>(0.24)</td>
<td>(0.59)</td>
<td>(-0.10)</td>
<td>(1.93)</td>
<td>(1.74)</td>
<td>(-2.40)</td>
<td>(-0.33)</td>
</tr>
<tr>
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<td>3738</td>
<td>3738</td>
<td>3738</td>
<td>3738</td>
<td>3738</td>
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<tr>
<td>Angrist-Fischke weak instr. test: p-value</td>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
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</tr>
</tbody>
</table>
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. \( \Delta(\text{DWTAF}) / \text{GTA} \) 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 6 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**

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>( \Delta(\text{LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{ST_LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{LT_LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{CI_LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{CRE_LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{RRE_LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{OTHER_LOANS}) / \text{GTA} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta(\text{DWTAF}) / \text{GTA} )</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
</tr>
<tr>
<td>0.936***</td>
<td>0.258</td>
<td>0.742***</td>
<td>0.059</td>
<td>0.332***</td>
<td>0.138**</td>
<td>0.169***</td>
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</tr>
<tr>
<td>(4.51)</td>
<td>(1.60)</td>
<td>(3.08)</td>
<td>(0.86)</td>
<td>(3.13)</td>
<td>(2.29)</td>
<td>(2.74)</td>
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<td>Observations</td>
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<td>4013</td>
<td>4013</td>
<td>4013</td>
<td>4013</td>
<td>4013</td>
</tr>
<tr>
<td>R2</td>
<td>0.49</td>
<td>0.21</td>
<td>0.29</td>
<td>0.26</td>
<td>0.52</td>
<td>0.35</td>
<td>0.22</td>
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</table>

**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**

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>( \Delta(\text{LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{ST_LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{LT_LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{CI_LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{CRE_LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{RRE_LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{OTHER_LOANS}) / \text{GTA} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta(\text{DWTAF}) / \text{GTA} )</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
</tr>
<tr>
<td>0.947***</td>
<td>0.359**</td>
<td>0.645***</td>
<td>0.129*</td>
<td>0.303***</td>
<td>0.100*</td>
<td>0.207***</td>
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</tr>
<tr>
<td>(5.01)</td>
<td>(2.28)</td>
<td>(2.89)</td>
<td>(1.73)</td>
<td>(3.19)</td>
<td>(1.70)</td>
<td>(3.53)</td>
<td></td>
</tr>
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<td>4132</td>
<td>4132</td>
<td>4132</td>
<td>4132</td>
<td>4132</td>
</tr>
<tr>
<td>R2</td>
<td>0.49</td>
<td>0.21</td>
<td>0.28</td>
<td>0.26</td>
<td>0.52</td>
<td>0.35</td>
<td>0.22</td>
</tr>
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</table>
### 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 6 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

<table>
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<tr>
<th>Dependent variable: Δ(DWTAF) / GTA</th>
<th>Δ(LOANS) /GTA</th>
<th>Δ(ST_LOANS) /GTA</th>
<th>Δ(LT_LOANS) /GTA</th>
<th>Δ(CI_LOANS) /GTA</th>
<th>Δ(CRE_LOANS) /GTA</th>
<th>Δ(RRE_LOANS) /GTA</th>
<th>Δ(OTHER_LOANS) /GTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subpanel A1: Listed small banks</td>
<td>0.542***</td>
<td>1.085*</td>
<td>-0.49</td>
<td>0.000</td>
<td>0.348</td>
<td>0.244</td>
<td>-0.034</td>
</tr>
<tr>
<td></td>
<td>(2.93)</td>
<td>(1.82)</td>
<td>(-0.89)</td>
<td>(0.00)</td>
<td>(1.18)</td>
<td>(1.36)</td>
<td>(-0.24)</td>
</tr>
<tr>
<td>Observations</td>
<td>852</td>
<td>852</td>
<td>852</td>
<td>852</td>
<td>852</td>
<td>852</td>
<td></td>
</tr>
<tr>
<td>R2</td>
<td>0.51</td>
<td>0.21</td>
<td>0.26</td>
<td>0.30</td>
<td>0.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>Subpanel B1: Unlisted small banks</td>
<td>0.934***</td>
<td>0.574***</td>
<td>0.387***</td>
<td>0.159***</td>
<td>0.390***</td>
<td>0.016</td>
<td>0.240***</td>
</tr>
<tr>
<td></td>
<td>(7.25)</td>
<td>(4.43)</td>
<td>(3.00)</td>
<td>(1.19)</td>
<td>(4.43)</td>
<td>(0.38)</td>
<td>(4.62)</td>
</tr>
<tr>
<td>Observations</td>
<td>55159</td>
<td>55159</td>
<td>55159</td>
<td>55159</td>
<td>55159</td>
<td>55159</td>
<td></td>
</tr>
<tr>
<td>R2</td>
<td>0.45</td>
<td>0.15</td>
<td>0.24</td>
<td>0.21</td>
<td>0.40</td>
<td></td>
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<tr>
<td></td>
<td>0.31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.15</td>
<td></td>
</tr>
</tbody>
</table>

#### Panel 2: Large banks

<table>
<thead>
<tr>
<th>Dependent variable: Δ(DWTAF) / GTA</th>
<th>Δ(LOANS) /GTA</th>
<th>Δ(ST_LOANS) /GTA</th>
<th>Δ(LT_LOANS) /GTA</th>
<th>Δ(CI_LOANS) /GTA</th>
<th>Δ(CRE_LOANS) /GTA</th>
<th>Δ(RRE_LOANS) /GTA</th>
<th>Δ(OTHER_LOANS) /GTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subpanel A2: Listed large banks</td>
<td>0.379*</td>
<td>0.191</td>
<td>0.219</td>
<td>0.02</td>
<td>0.119</td>
<td>0.081</td>
<td>0.065</td>
</tr>
<tr>
<td></td>
<td>(1.94)</td>
<td>(1.19)</td>
<td>(1.02)</td>
<td>(0.35)</td>
<td>(1.12)</td>
<td>(1.41)</td>
<td>(0.67)</td>
</tr>
<tr>
<td>Observations</td>
<td>1274</td>
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<td>1274</td>
<td>1274</td>
<td>1274</td>
<td>1274</td>
<td></td>
</tr>
<tr>
<td>R2</td>
<td>0.62</td>
<td>0.25</td>
<td>0.29</td>
<td>0.35</td>
<td>0.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.31</td>
<td></td>
</tr>
<tr>
<td>Subpanel B2: Unlisted large banks</td>
<td>1.253***</td>
<td>0.445**</td>
<td>0.880***</td>
<td>0.253**</td>
<td>0.358***</td>
<td>0.105</td>
<td>0.246***</td>
</tr>
<tr>
<td></td>
<td>(4.76)</td>
<td>(2.02)</td>
<td>(2.76)</td>
<td>(2.40)</td>
<td>(2.83)</td>
<td>(1.28)</td>
<td>(2.77)</td>
</tr>
<tr>
<td>Observations</td>
<td>2981</td>
<td>2981</td>
<td>2981</td>
<td>2981</td>
<td>2981</td>
<td>2981</td>
<td>2981</td>
</tr>
<tr>
<td>R2</td>
<td>0.47</td>
<td>0.21</td>
<td>0.29</td>
<td>0.26</td>
<td>0.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.20</td>
<td></td>
</tr>
</tbody>
</table>
Table 10: Did banks use the funds from the Federal Reserve to increase lending? Effects on lending to small and large firms

This table reports OLS regressions which examine the effect of using funds from the Federal Reserve on bank lending to small and large firms 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. The crisis is defined to last from 2007:Q3 – 2009:Q4. \( \Delta(DWTA F) / GTA \) is the annual change in the bank’s average amount of DWTA F outstanding from 2008:Q2 to 2009:Q2 normalized by lagged GTA. DWTA F 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 6 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

<table>
<thead>
<tr>
<th>Loan size class:</th>
<th>( \Delta(CI_LOANS) / GTA )</th>
<th>( \Delta(CI_LOANS) / GTA )</th>
<th>( \Delta(CI_LOANS) / GTA )</th>
<th>( \Delta(CI_LOANS) / GTA )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; $100K</td>
<td>$100K - $250K</td>
<td>$250K - $1 million</td>
<td>&gt; $1 million</td>
</tr>
<tr>
<td>( \Delta(DWTA F) / GTA )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>0.028</td>
<td>0.035*</td>
<td>0.110**</td>
<td>0.027</td>
</tr>
<tr>
<td>(1.11)</td>
<td>(1.78)</td>
<td>(2.05)</td>
<td>(0.43)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>6096</td>
<td>5494</td>
<td>5494</td>
<td>5494</td>
</tr>
<tr>
<td>R2</td>
<td>0.03</td>
<td>0.05</td>
<td>0.06</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Panel 2: Large banks

<table>
<thead>
<tr>
<th>Loan size class:</th>
<th>( \Delta(CI_LOANS) / GTA )</th>
<th>( \Delta(CI_LOANS) / GTA )</th>
<th>( \Delta(CI_LOANS) / GTA )</th>
<th>( \Delta(CI_LOANS) / GTA )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; $100K</td>
<td>$100K - $250K</td>
<td>$250K - $1 million</td>
<td>&gt; $1 million</td>
</tr>
<tr>
<td>( \Delta(DWTA F) / GTA )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>0.003</td>
<td>-0.011</td>
<td>-0.011</td>
<td>0.215**</td>
</tr>
<tr>
<td>(0.13)</td>
<td>(-0.85)</td>
<td>(-0.25)</td>
<td>(2.20)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>486</td>
<td>483</td>
<td>483</td>
<td>483</td>
</tr>
<tr>
<td>R2</td>
<td>0.12</td>
<td>0.25</td>
<td>0.23</td>
<td>0.25</td>
</tr>
</tbody>
</table>
**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 DWTA F usage on the credit quality of loans and loan contract terms during the crisis. DWTA F 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 6 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**

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Effect of DWTA F usage on:</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ(DWTA F) / GTA</td>
<td>Δ(WA credit rating)</td>
<td>-28.673**</td>
<td>1.936</td>
<td>-1.957</td>
<td>1.357</td>
<td>7.751</td>
</tr>
<tr>
<td></td>
<td>Δ(WA interest rate premium)</td>
<td>(-2.51)</td>
<td>(0.14)</td>
<td>(-0.05)</td>
<td>(0.09)</td>
<td>(0.21)</td>
</tr>
<tr>
<td>Control for Δ(WA credit rating)</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control for Δ(WA collateral status)</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>955</td>
<td>955</td>
<td>955</td>
<td>955</td>
<td>955</td>
<td>955</td>
</tr>
<tr>
<td>R2</td>
<td>0.10</td>
<td>0.07</td>
<td>0.16</td>
<td>0.07</td>
<td>0.19</td>
<td></td>
</tr>
</tbody>
</table>

**Panel 2: Large banks**

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Effect of DWTA F usage on:</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ(DWTA F) / GTA</td>
<td>Δ(WA credit rating)</td>
<td>4.439</td>
<td>-0.832</td>
<td>-2.115</td>
<td>-0.789</td>
<td>-2.954</td>
</tr>
<tr>
<td></td>
<td>Δ(WA interest rate premium)</td>
<td>(0.44)</td>
<td>(-0.31)</td>
<td>(-0.13)</td>
<td>(-0.30)</td>
<td>(-0.19)</td>
</tr>
<tr>
<td>Control for Δ(WA credit rating)</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control for Δ(WA collateral status)</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>1013</td>
<td>1013</td>
<td>1013</td>
<td>1013</td>
<td>1013</td>
<td>1013</td>
</tr>
<tr>
<td>R2</td>
<td>0.10</td>
<td>0.08</td>
<td>0.18</td>
<td>0.08</td>
<td>0.19</td>
<td></td>
</tr>
</tbody>
</table>
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. \( \Delta(\text{DWTAF}) / \text{GTA} \) 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 6 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

<table>
<thead>
<tr>
<th>Effect of DWTAF usage on:</th>
<th>( \Delta(\text{CASH}) / \text{GTA} )</th>
<th>( \Delta(\text{SEcurities}) / \text{GTA} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta(\text{DWTAF}) / \text{GTA} )</td>
<td>0.115</td>
<td>0.279**</td>
</tr>
<tr>
<td></td>
<td>(1.15)</td>
<td>(2.33)</td>
</tr>
</tbody>
</table>

| Observations | 56011 | 56011 |
| R2           | 0.18  | 0.22  |

Panel 2: Large banks

<table>
<thead>
<tr>
<th>Effect of DWTAF usage on:</th>
<th>( \Delta(\text{CASH}) / \text{GTA} )</th>
<th>( \Delta(\text{SEcurities}) / \text{GTA} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta(\text{DWTAF}) / \text{GTA} )</td>
<td>0.213</td>
<td>0.055</td>
</tr>
<tr>
<td></td>
<td>(1.09)</td>
<td>(0.32)</td>
</tr>
</tbody>
</table>

| 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 – 12 and Internet Appendix Tables A.2 – A.5. All variables are at a quarterly frequency. The crisis lasts from 2007:Q3 – 2009:Q4 in every regression. The height of the crisis lasts from September 15, 2008 – December 31, 2008 in the regressions in Internet Appendix Table A.3, and consists of 2008:Q4 in the regressions in Internet Appendix Tables A.4 and A.5. DWTA F 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).

<table>
<thead>
<tr>
<th>Dependent variables (Tables 3-4 and Internet Appendix Tables A.2-A.3):</th>
<th>Definition</th>
<th>Small</th>
<th></th>
<th></th>
<th>Large</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DWTA F</td>
<td>= 1 if the bank used DWTA F during the quarter</td>
<td>0.047</td>
<td>0</td>
<td>0.223</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DW</td>
<td>= 1 if the bank used the DW during the quarter</td>
<td>0.043</td>
<td>0</td>
<td>0.163</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TAF</td>
<td>= 1 if the bank used the TAF during the quarter</td>
<td>0.006</td>
<td>0</td>
<td>0.089</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height of crisis DWTA F</td>
<td>= 1 if the bank used DWTA F during the height of the crisis</td>
<td>0.08</td>
<td>0</td>
<td>0.52</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height of crisis DW</td>
<td>= 1 if the bank used the DW during the height of the crisis</td>
<td>0.08</td>
<td>0</td>
<td>0.40</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height of crisis TAF</td>
<td>= 1 if the bank used the TAF during the height of the crisis</td>
<td>0.00</td>
<td>0</td>
<td>0.21</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Times used DWTA F</td>
<td>Number of times the bank used DWTA F during the quarter</td>
<td>0.27</td>
<td>0</td>
<td>1.11</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Times used DW</td>
<td>Number of times the bank used the DW during the quarter</td>
<td>0.25</td>
<td>0</td>
<td>0.88</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Times used TAF</td>
<td>Number of times the bank used the TAF during the quarter</td>
<td>0.01</td>
<td>0</td>
<td>0.27</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days outstanding DWTA F</td>
<td>Number of days the bank had DWTA F outstanding during the quarter</td>
<td>0.85</td>
<td>0</td>
<td>5.74</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days outstanding DW</td>
<td>Number of days the bank had DW outstanding during the quarter</td>
<td>0.58</td>
<td>0</td>
<td>1.60</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days outstanding TAF</td>
<td>Number of days the bank had TAF outstanding during the quarter</td>
<td>0.34</td>
<td>0</td>
<td>4.87</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avg daily DWTA F</td>
<td>Average daily amount of DWTA F outstanding during the quarter normalized by the bank’s GTA</td>
<td>0.0006</td>
<td>0</td>
<td>0.003</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avg daily DW</td>
<td>Average daily amount of DW outstanding during the quarter normalized by the bank’s GTA</td>
<td>0.0003</td>
<td>0</td>
<td>0.0008</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avg daily TAF</td>
<td>Average daily amount of TAF outstanding during the quarter normalized by the bank’s GTA</td>
<td>0.0003</td>
<td>0</td>
<td>0.003</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max daily DWTA F</td>
<td>Maximum daily amount of DWTA F outstanding during the quarter normalized by the bank’s GTA</td>
<td>0.001</td>
<td>0</td>
<td>0.006</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max daily DW</td>
<td>Maximum daily amount of DW outstanding during the quarter normalized by the bank’s GTA</td>
<td>0.001</td>
<td>0</td>
<td>0.002</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max daily TAF</td>
<td>Maximum daily amount of TAF outstanding during the quarter normalized by the bank’s GTA</td>
<td>0.0004</td>
<td>0</td>
<td>0.005</td>
<td>0</td>
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<td></td>
</tr>
</tbody>
</table>
### Dependent variables (Tables 5-10, 12, Internet Appendix Tables A.4-A.5):

<table>
<thead>
<tr>
<th>Definition</th>
<th>Small Mean</th>
<th>Small Median</th>
<th>Large Mean</th>
<th>Large Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ(DWTAF) / GTA</td>
<td>0.0001</td>
<td>0.0000</td>
<td>0.0004</td>
<td>0.0000</td>
</tr>
<tr>
<td>Δ(DW) / GTA</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0001</td>
<td>0.0000</td>
</tr>
<tr>
<td>Δ(TAF) / GTA</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0001</td>
<td>0.0000</td>
</tr>
<tr>
<td>Δ(LOANS) / GTA</td>
<td>0.0110</td>
<td>0.0051</td>
<td>0.0032</td>
<td>0.0016</td>
</tr>
<tr>
<td>Δ(ST_LOANS) / GTA</td>
<td>0.0001</td>
<td>-0.0002</td>
<td>-0.0015</td>
<td>-0.0007</td>
</tr>
<tr>
<td>Δ(LT_LOANS) / GTA</td>
<td>0.0112</td>
<td>0.0061</td>
<td>0.0046</td>
<td>0.0029</td>
</tr>
<tr>
<td>Δ(CL_LOANS) / GTA</td>
<td>0.0012</td>
<td>0.0000</td>
<td>-0.0002</td>
<td>-0.0002</td>
</tr>
<tr>
<td>Δ(CRE_LOANS) / GTA</td>
<td>0.0059</td>
<td>0.0017</td>
<td>0.0016</td>
<td>0.0002</td>
</tr>
<tr>
<td>Δ(RRE_LOANS) / GTA</td>
<td>0.0035</td>
<td>0.0013</td>
<td>0.0010</td>
<td>0.0003</td>
</tr>
<tr>
<td>Δ(OTHER_LOANS) / GTA</td>
<td>0.0003</td>
<td>-0.0001</td>
<td>0.0002</td>
<td>-0.0002</td>
</tr>
<tr>
<td>Δ(CASH) / GTA</td>
<td>0.0043</td>
<td>0.0010</td>
<td>0.0038</td>
<td>0.0003</td>
</tr>
<tr>
<td>Δ(SECURITIES) / GTA</td>
<td>0.0021</td>
<td>-0.0003</td>
<td>0.0014</td>
<td>-0.0006</td>
</tr>
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### Independent variables:

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<thead>
<tr>
<th>Definition</th>
<th>Small Mean</th>
<th>Small Median</th>
<th>Large Mean</th>
<th>Large Median</th>
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</thead>
<tbody>
<tr>
<td>Log(GTA)</td>
<td>11.9</td>
<td>11.8</td>
<td>15.1</td>
<td>14.7</td>
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<td>EQRAT</td>
<td>0.1118</td>
<td>0.0987</td>
<td>0.1033</td>
<td>0.0942</td>
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<td>Tier1RAT</td>
<td>0.1608</td>
<td>0.1307</td>
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<tr>
<td>TotalRAT</td>
<td>0.1718</td>
<td>0.1416</td>
<td>0.1306</td>
<td>0.1171</td>
</tr>
<tr>
<td>Stddev ROA</td>
<td>0.0016</td>
<td>0.0009</td>
<td>0.0018</td>
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<tr>
<td>ALLOW LLL / GTA</td>
<td>0.0091</td>
<td>0.0083</td>
<td>0.0111</td>
<td>0.0092</td>
</tr>
<tr>
<td>CRE / GTA</td>
<td>0.2965</td>
<td>0.2789</td>
<td>0.3233</td>
<td>0.3246</td>
</tr>
<tr>
<td>MBS / GTA</td>
<td>0.0661</td>
<td>0.0331</td>
<td>0.0946</td>
<td>0.0803</td>
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<tr>
<td>ROE</td>
<td>0.0483</td>
<td>0.0751</td>
<td>0.0213</td>
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<tr>
<td>ROA</td>
<td>0.0049</td>
<td>0.0079</td>
<td>0.0031</td>
<td>0.0069</td>
</tr>
<tr>
<td>Illiquidity (LC / GTA)</td>
<td>0.3087</td>
<td>0.3190</td>
<td>0.4842</td>
<td>0.4371</td>
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<tr>
<td>BHC dummy = 1 if the bank is part of a bank holding company</td>
<td>0.8011</td>
<td>1.0000</td>
<td>0.9057</td>
<td>1.0000</td>
</tr>
<tr>
<td>Listed dummy = 1 if the bank is listed or part of a listed bank holding company</td>
<td>0.0149</td>
<td>0.0000</td>
<td>0.3003</td>
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<td>Independent variables (cont’d):</td>
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<td>Small</td>
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<td>--------------------------------</td>
<td>------------</td>
<td>-------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>Foreign own dummy</td>
<td>= 1 if the bank has at least 50% foreign ownership</td>
<td>0.0031</td>
<td>0.0000</td>
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<td>Federal Reserve dummy</td>
<td>= 1 if the Federal Reserve is the bank’s primary regulator</td>
<td>0.1143</td>
<td>0.0000</td>
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<tr>
<td>OCC dummy</td>
<td>= 1 if the Office of the Comptroller of the Currency is the primary regulator</td>
<td>0.2033</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>FDIC dummy</td>
<td>= 1 if the Federal Deposit Insurance Corporation is the primary regulator</td>
<td>0.6824</td>
<td>1.0000</td>
<td></td>
</tr>
<tr>
<td>Income growth</td>
<td>Weighted average income growth in all markets in which a bank has deposits, using the proportion of its deposits in each market as weights</td>
<td>0.0032</td>
<td>0.0038</td>
<td></td>
</tr>
<tr>
<td>Δ(Core Deposits)/GTA</td>
<td>Change in core deposits (transactions deposits plus savings deposits plus small time deposits (&lt; $100K)) normalized by lagged GTA</td>
<td>0.0113</td>
<td>0.0054</td>
<td></td>
</tr>
<tr>
<td>Δ(Fed Funds)/GTA</td>
<td>Change in federal funds purchased normalized by lagged GTA</td>
<td>-0.0001</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Δ(Other Hot Money)/GTA</td>
<td>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 &lt; 1 year excl. DWTAF) normalized by lagged GTA</td>
<td>0.0015</td>
<td>0.0000</td>
<td></td>
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<tr>
<td>Δ(FHLB)/GTA</td>
<td>Change in Federal Home Loan Bank borrowings normalized by lagged GTA</td>
<td>0.0012</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Δ(TARP)/GTA</td>
<td>Troubled Asset Relief Program funding normalized by lagged GTA</td>
<td>0.0002</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Fed district 1</td>
<td>= 1 if the bank is located in Fed district 1 (Boston)</td>
<td>0.0643</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Fed district 2</td>
<td>= 1 if the bank is located in Fed district 2 (New York)</td>
<td>0.1172</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Fed district 3</td>
<td>= 1 if the bank is located in Fed district 3 (Philadelphia)</td>
<td>0.0632</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Fed district 4</td>
<td>= 1 if the bank is located in Fed district 4 (Cleveland)</td>
<td>0.0509</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Fed district 5</td>
<td>= 1 if the bank is located in Fed district 5 (Richmond)</td>
<td>0.0830</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Fed district 6</td>
<td>= 1 if the bank is located in Fed district 6 (Atlanta)</td>
<td>0.0945</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Fed district 7</td>
<td>= 1 if the bank is located in Fed district 7 (Chicago)</td>
<td>0.1248</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Fed district 8</td>
<td>= 1 if the bank is located in Fed district 8 (St. Louis)</td>
<td>0.0608</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Fed district 9</td>
<td>= 1 if the bank is located in Fed district 9 (Minneapolis)</td>
<td>0.0284</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Fed district 10</td>
<td>= 1 if the bank is located in Fed district 10 (Kansas City)</td>
<td>0.0708</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Fed district 11</td>
<td>= 1 if the bank is located in Fed district 11 (Dallas)</td>
<td>0.0577</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Fed district 12</td>
<td>= 1 if the bank is located in Fed district 12 (San Francisco)</td>
<td>0.1843</td>
<td>0.0000</td>
<td></td>
</tr>
</tbody>
</table>

**Instruments (Table 7):**

<table>
<thead>
<tr>
<th>Avg. of prior Δ(DWTAF)/GTA for bank</th>
<th>Average prior change in the amount of DWTAF outstanding at the bank itself during the quarter normalized by its lagged GTA</th>
<th>Small</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. of prior Δ(DWTAF)/GTA for other banks in same Fed district</td>
<td>Average of prior change in the amount of DWTAF outstanding at other banks in the same Federal Reserve District during the quarter normalized by their lagged GTA</td>
<td>0.0001</td>
<td>0.0004</td>
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</tbody>
</table>
Internet Appendix
**Discussion of Internet Appendix Table A.1 Top 10 users by alternative measures of usage intensity**

Internet Appendix Table A.1 Panel A shows the lists of top banks that had Federal Reserve funding outstanding on the most days. As in Table 2 Panel B, there is little correspondence between the total days outstanding based on DWTAF and the DW separately, again reflecting that TAF funds were outstanding for many days when they were used. The insights regarding bank size and majority foreign ownership are similar to those discussed under Table 2 Panel A in the main text.

In Internet Appendix Table A.1 Panel B, the lists of banks with the highest outstandings relative to assets on a given day show that the top small banks again received more DWTAF funding (relative to assets) 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%, which is remarkable since some of these banks were quite large, including Chase Bank, with over $79 billion in assets.

**Internet Appendix Table A.2 is discussed in Section 3.2.2**

**Internet Appendix Tables A.3 – A.5 are discussed in Section 6**
Internet Appendix Table A.1: Top 10 users by alternative measures of usage intensity

This table shows the top 10 users ranked alternatively by DW\textsuperscript{TAF}, DW, and TAF. DW\textsuperscript{TAF} is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. Banks are ranked based on: days outstanding during the crisis (Panel A); and the highest daily outstandings (normalized by GTA) during the crisis (Panel B). 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 DW\textsuperscript{TAF}, DW, and TAF the most days during the crisis

<table>
<thead>
<tr>
<th>Rank</th>
<th>DW Days outstanding</th>
<th>DW Rank</th>
<th>TAF Days outstanding</th>
<th>TAF Rank</th>
<th>User</th>
<th>GTA</th>
<th>Foreign own dummy</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
<td>(8)</td>
</tr>
<tr>
<td>1</td>
<td>460</td>
<td>97</td>
<td>132</td>
<td>4</td>
<td>344</td>
<td>GLACIER BK</td>
<td>0.88</td>
</tr>
<tr>
<td>2</td>
<td>430</td>
<td>117</td>
<td>116</td>
<td>6</td>
<td>315</td>
<td>FIRST SECURITY BK MISSOULA</td>
<td>0.89</td>
</tr>
<tr>
<td>3</td>
<td>416</td>
<td>1</td>
<td>409</td>
<td>24</td>
<td>225</td>
<td>GEORGIA CMRC BK</td>
<td>0.20</td>
</tr>
<tr>
<td>4</td>
<td>415</td>
<td>3</td>
<td>378</td>
<td>56</td>
<td>147</td>
<td>PARK BK</td>
<td>0.70</td>
</tr>
<tr>
<td>5</td>
<td>402</td>
<td>2</td>
<td>402</td>
<td>153</td>
<td>0</td>
<td>UNITED SCTY BK</td>
<td>0.81</td>
</tr>
<tr>
<td>6</td>
<td>399</td>
<td>23</td>
<td>242</td>
<td>2</td>
<td>378</td>
<td>PACIFIC CONTINENTAL BK</td>
<td>0.96</td>
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<tr>
<td>7</td>
<td>390</td>
<td>183</td>
<td>66</td>
<td>1</td>
<td>390</td>
<td>AMERICAN BK</td>
<td>0.51</td>
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<tr>
<td>8</td>
<td>379</td>
<td>129</td>
<td>109</td>
<td>12</td>
<td>272</td>
<td>PLANTERS BK</td>
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<tr>
<td>9</td>
<td>371</td>
<td>140</td>
<td>99</td>
<td>11</td>
<td>275</td>
<td>BIG SKY WESTERN BK</td>
<td>0.31</td>
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<tr>
<td>10</td>
<td>370</td>
<td>132</td>
<td>106</td>
<td>8</td>
<td>292</td>
<td>INDEPENDENT BK</td>
<td>0.62</td>
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<tr>
<td>10</td>
<td>370</td>
<td>839</td>
<td>1</td>
<td>3</td>
<td>370</td>
<td>COMMUNITY BKR BK</td>
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<tr>
<td>18</td>
<td>334</td>
<td>4</td>
<td>334</td>
<td>153</td>
<td>0</td>
<td>BROWN COUNTY ST BK</td>
<td>0.08</td>
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<tr>
<td>20</td>
<td>330</td>
<td>5</td>
<td>330</td>
<td>153</td>
<td>0</td>
<td>BANK OF FAIRFIELD</td>
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<td>22</td>
<td>325</td>
<td>6</td>
<td>325</td>
<td>153</td>
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<td>17</td>
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<td>323</td>
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<td>58</td>
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<td>316</td>
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<td>305</td>
<td>153</td>
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<tr>
<td>28</td>
<td>300</td>
<td>10</td>
<td>300</td>
<td>153</td>
<td>0</td>
<td>STATE BK OF BELLINGHAM</td>
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<tr>
<td>21</td>
<td>326</td>
<td>528</td>
<td>5</td>
<td>5</td>
<td>321</td>
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<td>13</td>
<td>365</td>
<td>166</td>
<td>77</td>
<td>7</td>
<td>302</td>
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<td>81</td>
<td>8</td>
<td>292</td>
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<tr>
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<td>317</td>
<td>59</td>
<td>164</td>
<td>10</td>
<td>283</td>
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## Subpanel A2: Large banks

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<tr>
<th>Rank</th>
<th>Days outstanding</th>
<th>Rank</th>
<th>Days outstanding</th>
<th>Rank</th>
<th>Days outstanding</th>
<th>User</th>
<th>GTA</th>
<th>Foreign own dummy</th>
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<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
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<td>(9)</td>
</tr>
<tr>
<td>1</td>
<td>516</td>
<td>89</td>
<td>15</td>
<td>1</td>
<td>515</td>
<td>FIRST TN BK NA</td>
<td>40.08</td>
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<tr>
<td>2</td>
<td>461</td>
<td>34</td>
<td>90</td>
<td>4</td>
<td>448</td>
<td>CASCADE BK</td>
<td>1.42</td>
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<td>3</td>
<td>461</td>
<td>62</td>
<td>30</td>
<td>2</td>
<td>459</td>
<td>FIRST MIDWEST BK</td>
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<td>4</td>
<td>460</td>
<td>239</td>
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<td>2</td>
<td>459</td>
<td>ASSOCIATED BK NA</td>
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<td>159</td>
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<td>5</td>
<td>439</td>
<td>M&amp;I MARSHALL &amp; ILSLEY BK</td>
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<td>0</td>
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<tr>
<td>6</td>
<td>413</td>
<td>150</td>
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<td>6</td>
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<td>RBS CITIZENS NA</td>
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<td>409</td>
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<td>406</td>
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<td>8</td>
<td>399</td>
<td>FIFTH THIRD BK</td>
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<tr>
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<td>400</td>
<td>2</td>
<td>400</td>
<td>132</td>
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<td>PARK NB</td>
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<td>0</td>
</tr>
<tr>
<td>27</td>
<td>328</td>
<td>3</td>
<td>304</td>
<td>79</td>
<td>135</td>
<td>FIRST CHICAGO B&amp;T</td>
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<tr>
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<td>4</td>
<td>278</td>
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<td>115</td>
<td>BANK OF THE CASCADES</td>
<td>2.45</td>
<td>0</td>
</tr>
<tr>
<td>16</td>
<td>371</td>
<td>5</td>
<td>263</td>
<td>89</td>
<td>108</td>
<td>BEAL BK NV</td>
<td>1.58</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td>354</td>
<td>6</td>
<td>261</td>
<td>53</td>
<td>203</td>
<td>INDEPENDENT BK</td>
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<td>260</td>
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Panel B: Banks with the highest DWTAFT, DW, and TAF outstanding (% bank size) on a single day during the crisis

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### 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 funds from DWTAFT (Panel A), the DW (Panel B), and the TAF (Panel C), during the crisis. DWTAFT 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 lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans).

Two sets of Tobit regressions are used. The dependent variables in these regressions are: (1) the number of days with funds outstanding during the quarter; and (2) the maximum daily amount outstanding normalized by GTA during the quarter. All independent variables are defined in the Data Appendix at the end of the tables (before the Internet Appendix). 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.

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61
| OCC dummy | -0.056 | 0.000 | 0.276 | 0.001 | 0.003 | 0.000 | 0.209 | 0.000 | -0.034*** | -0.000*** | -0.236 | 0.000 |
| -1.11 | (1.52) | (0.33) | (0.48) | (0.08) | (0.56) | (0.60) | (0.63) | (-3.04) | (-2.97) | (-0.41) | (0.44) |
| FDIC dummy | -0.140** | -0.000*** | -0.328 | 0.000 | -0.073* | -0.000*** | -0.282 | 0.000 | -0.029 | -0.000* | 0.014 | 0.000 |
| -2.48 | (-2.79) | (-0.43) | (0.40) | (-1.91) | (-2.54) | (-0.88) | (0.94) | (-1.56) | (-1.67) | (0.02) | (0.08) |
| Income growth | 1.698 | 0.002 | 32.235* | 0.035 | 1.083 | 0.002 | 2.980 | 0.003 | 0.304 | 0.000 | 20.656 | 0.020 |
| (1.60) | (1.27) | (1.67) | (1.46) | (1.31) | (1.23) | (0.37) | (0.25) | (0.99) | (0.80) | (1.42) | (1.23) |
| Fed district 2 | -0.196 | 0.000 | 0.571 | 0.001 | -0.162 | 0.000 | 0.359 | 0.001* | -0.008 | 0.000 | 0.192 | 0.000 |
| (-1.57) | (1.47) | (0.58) | (0.86) | (-1.50) | (1.43) | (1.28) | (1.68) | (-0.61) | (0.57) | (0.21) | (0.32) |
| Fed district 3 | -0.003 | 0.000 | 1.693 | 0.003* | -0.048 | 0.000 | 0.792 | 0.001 | 0.027 | 0.000 | 0.312 | 0.001 |
| (-0.02) | (0.01) | (1.26) | (1.73) | (-0.41) | (0.40) | (1.38) | (1.33) | (0.87) | (0.92) | (0.35) | (1.01) |
| Fed district 4 | -0.196 | 0.000 | 0.550 | 0.001 | -0.255*** | -0.000*** | 0.228 | 0.000 | 0.100 | 0.000 | 0.394 | 0.000 |
| (-1.59) | (1.18) | (0.47) | (0.45) | (-2.69) | (-2.47) | (0.67) | (0.75) | (1.53) | (1.48) | (0.43) | (0.47) |
| Fed district 5 | 0.030 | 0.000 | 1.978 | 0.002 | -0.093 | 0.000 | 1.137** | 0.001** | 0.100** | 0.000* | 0.317 | 0.000 |
| (0.23) | (0.01) | (1.46) | (1.38) | (-0.94) | (1.01) | (1.97) | (2.05) | (2.08) | (1.96) | (0.33) | (0.28) |
| Fed district 6 | -0.182* | 0.000 | 0.982 | 0.001 | -0.166* | -0.000* | 0.034 | 0.000 | 0.011 | 0.000 | 1.259 | 0.001 |
| (-1.66) | (1.54) | (0.94) | (1.05) | (-1.78) | (-1.68) | (0.12) | (0.42) | (0.70) | (0.86) | (1.22) | (1.32) |
| Fed district 7 | 0.017 | 0.000 | 3.724*** | 0.005*** | 0.003 | 0.000 | 1.910*** | 0.003*** | 0.007 | 0.000 | 1.361 | 0.001 |
| (0.15) | (0.21) | (2.64) | (2.81) | (0.04) | (0.03) | (2.80) | (2.57) | (0.52) | (0.66) | (1.17) | (1.33) |
| Fed district 8 | -0.070 | 0.000 | 2.741* | 0.003* | -0.100 | 0.000 | 0.746* | 0.001* | 0.035 | 0.000 | 2.620 | 0.003 |
| (-0.58) | (0.60) | (1.81) | (1.81) | (-1.01) | (1.02) | (1.69) | (1.86) | (1.44) | (1.51) | (1.61) | (1.53) |
| Fed district 9 | 0.173 | 0.000 | 0.681 | 0.001 | 0.063 | 0.000 | 0.770 | 0.001 | 0.123*** | 0.000*** | -0.826 | -0.001 |
| (1.19) | (1.26) | (0.46) | (0.62) | (0.56) | (0.65) | (0.93) | (0.98) | (2.60) | (2.50) | (-1.28) | (-1.27) |
| Fed district 10 | -0.240** | -0.000*** | 0.966 | 0.002 | -0.230** | -0.000*** | 0.184 | 0.000 | 0.010 | 0.000 | 1.192 | 0.002 |
| (-2.19) | (-2.13) | (0.82) | (1.04) | (-2.46) | (-2.41) | (0.58) | (0.68) | (0.59) | (0.70) | (0.95) | (1.12) |
| Fed district 11 | -0.359*** | -0.001*** | 0.150 | 0.001 | -0.312*** | -0.001*** | 0.073 | 0.000 | -0.011 | 0.000 | 0.232 | 0.001 |
| (-3.37) | (-3.32) | (0.13) | (0.39) | (-3.41) | (-3.35) | (0.19) | (0.43) | (-0.85) | (0.83) | (0.25) | (0.51) |
| Fed district 12 | 0.545*** | 0.001*** | 1.899* | 0.003* | 0.391*** | 0.001*** | 1.715*** | 0.000*** | 0.104*** | 0.000* | 0.064 | 0.000 |
| (3.04) | (3.13) | (1.74) | (1.95) | (2.67) | (2.85) | (3.82) | (3.18) | (2.04) | (1.88) | (0.08) | (0.35) |
| Observations | 63301 | 63257 | 5101 | 5074 | 63301 | 63257 | 5101 | 5074 | 56936 | 56892 | 4546 | 4520 |
| Pseudo R2 | 0.08 | 0.40 | 0.07 | -3.10 | 0.08 | 0.41 | 0.04 | -1.18 | 0.13 | 0.32 | 0.10 | 0.77 |
### Internet Appendix Table A.3: Characteristics of banks that used funds from the Federal Reserve. Subsample results: height of the crisis and the first and second halves of the crisis

This table shows the results of probit regressions in which the dependent variable is a dummy = 1 if the bank used DWTAF during the height of the crisis (Panel A), during the 1st half of the crisis (Panel B), and during the 2nd half of the crisis (Panel C). DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. The height of the crisis is here defined to last from September 15, 2008 – December 31, 2008. The first and second halves of the crisis are defined to run from 2007:Q3 – 2008:Q3 and from 2008:Q4 – 2009:Q4, respectively. 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).

All independent variables are defined in the Data Appendix at the end of the tables (before the Internet Appendix). 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 are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

<table>
<thead>
<tr>
<th></th>
<th>Panel A: Dummy = 1 if the bank used DWTAF during the height of the crisis</th>
<th>Panel B: Dummy = 1 if the bank used DWTAF during the quarter during the 1st half of the crisis</th>
<th>Panel C: Dummy = 1 if the bank used DWTAF during the quarter during the 2nd half of the crisis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small banks</td>
<td>Large banks</td>
<td>Small banks</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Log(GTA)</td>
<td>0.034***</td>
<td>0.165***</td>
<td>0.008***</td>
</tr>
<tr>
<td>EQRAT</td>
<td>(9.41)</td>
<td>(7.38)</td>
<td>(9.10)</td>
</tr>
<tr>
<td></td>
<td>-0.199**</td>
<td>0.455</td>
<td>-0.075***</td>
</tr>
<tr>
<td>Stddev ROA</td>
<td>3.022**</td>
<td>-33.720**</td>
<td>0.155</td>
</tr>
<tr>
<td></td>
<td>(2.20)</td>
<td>(-2.37)</td>
<td>(-3.27)</td>
</tr>
<tr>
<td>CRE / GTA</td>
<td>0.061***</td>
<td>0.500***</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>(2.75)</td>
<td>(3.17)</td>
<td>(0.47)</td>
</tr>
<tr>
<td>MBS / GTA</td>
<td>0.106***</td>
<td>0.914***</td>
<td>0.014**</td>
</tr>
<tr>
<td></td>
<td>(3.25)</td>
<td>(2.89)</td>
<td>(1.98)</td>
</tr>
<tr>
<td>ROE</td>
<td>0.011</td>
<td>-0.269**</td>
<td>-0.005</td>
</tr>
<tr>
<td></td>
<td>(0.73)</td>
<td>(-2.24)</td>
<td>(-1.21)</td>
</tr>
<tr>
<td>Illiquidity (LC / GTA)</td>
<td>0.015</td>
<td>0.202***</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>(1.15)</td>
<td>(2.60)</td>
<td>(1.60)</td>
</tr>
<tr>
<td>BHC dummy</td>
<td>0.023***</td>
<td>-0.012</td>
<td>0.004**</td>
</tr>
<tr>
<td></td>
<td>(3.40)</td>
<td>(-0.15)</td>
<td>(2.46)</td>
</tr>
<tr>
<td>Listed dummy</td>
<td>0.032</td>
<td>0.003</td>
<td>-0.001</td>
</tr>
<tr>
<td></td>
<td>(1.33)</td>
<td>(0.06)</td>
<td>(-0.45)</td>
</tr>
<tr>
<td>Foreign own dummy</td>
<td>-0.040**</td>
<td>-0.194**</td>
<td>-0.006**</td>
</tr>
<tr>
<td></td>
<td>(-2.19)</td>
<td>(-2.49)</td>
<td>(-4.92)</td>
</tr>
<tr>
<td>OCC dummy</td>
<td>0.009</td>
<td>0.062</td>
<td>-0.003**</td>
</tr>
<tr>
<td></td>
<td>(0.91)</td>
<td>(0.87)</td>
<td>(-2.00)</td>
</tr>
<tr>
<td>FDIC dummy</td>
<td>-0.013</td>
<td>-0.001</td>
<td>-0.006**</td>
</tr>
<tr>
<td></td>
<td>(-1.51)</td>
<td>(-0.02)</td>
<td>(-2.90)</td>
</tr>
<tr>
<td>Income growth</td>
<td>-1.265*</td>
<td>-1.668</td>
<td>0.004</td>
</tr>
<tr>
<td>---------------</td>
<td>---------</td>
<td>--------</td>
<td>-------</td>
</tr>
<tr>
<td>Fed district 2</td>
<td>-0.025</td>
<td>0.012</td>
<td>-0.006</td>
</tr>
<tr>
<td>Fed district 3</td>
<td>0.031</td>
<td>0.019</td>
<td>0.002</td>
</tr>
<tr>
<td>Fed district 4</td>
<td>-0.040**</td>
<td>-0.091</td>
<td>-0.009</td>
</tr>
<tr>
<td>Fed district 5</td>
<td>0.016</td>
<td>0.102</td>
<td>-0.009</td>
</tr>
<tr>
<td>Fed district 6</td>
<td>-0.022</td>
<td>0.053</td>
<td>-0.008</td>
</tr>
<tr>
<td>Fed district 7</td>
<td>0.019</td>
<td>0.179</td>
<td>-0.005</td>
</tr>
<tr>
<td>Fed district 8</td>
<td>-0.011</td>
<td>0.038</td>
<td>-0.007</td>
</tr>
<tr>
<td>Fed district 9</td>
<td>0.016</td>
<td>0.009</td>
<td>-0.005</td>
</tr>
<tr>
<td>Fed district 10</td>
<td>-0.015</td>
<td>0.054</td>
<td>-0.007</td>
</tr>
<tr>
<td>Fed district 11</td>
<td>-0.036*</td>
<td>-0.036</td>
<td>-0.012**</td>
</tr>
<tr>
<td>Fed district 12</td>
<td>0.080***</td>
<td>0.114</td>
<td>0.018**</td>
</tr>
</tbody>
</table>

| Observations | 6325 | 504 | 31756 | 2648 | 31545 | 2453 |
| Pseudo R2     | 0.11 | 0.14 | 0.15  | 0.21  | 0.10  | 0.07 |
Internet Appendix Table A.4: Did funds from the Federal Reserve substitute for or complement other funding sources? Subsample results: height of the crisis and the first and second halves of the crisis

This table reports OLS regressions which examine whether DWTAF substitutes for or complements other funding sources during the height of the crisis (Panel A), during the 1st half of the crisis (Panel B), and during the 2nd half of the crisis (Panel C). DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. The height of the crisis is here defined to be 2008:Q4. The first and second halves of the crisis are defined to run from 2007:Q3 – 2008:Q3 and from 2008:Q4 – 2009:Q4, respectively. \( \Delta(\text{DWTAF}) / \text{GTA} \) 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 (before the Internet Appendix). All regressions include all of the variables included in Table 5. t-statistics based on robust standard errors clustered by bank are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>Panel A: ( \Delta(\text{DWTAF}) / \text{GTA} ) during the height of the crisis</th>
<th>Panel B: ( \Delta(\text{DWTAF}) / \text{GTA} ) during the 1st half of the crisis</th>
<th>Panel C: ( \Delta(\text{TAF}) / \text{GTA} ) during the 2nd half of the crisis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(1)</td>
</tr>
<tr>
<td>( \Delta(\text{Core Deposits})/\text{GTA} )</td>
<td>-0.004</td>
<td>-0.002</td>
<td>-0.003</td>
</tr>
<tr>
<td></td>
<td>(-1.01)</td>
<td>(-0.26)</td>
<td>(-0.41)</td>
</tr>
<tr>
<td>( \Delta(\text{Fed Funds})/\text{GTA} )</td>
<td>-0.016</td>
<td>-0.012</td>
<td>-0.001</td>
</tr>
<tr>
<td></td>
<td>(-1.04)</td>
<td>(-0.48)</td>
<td>(-0.02)</td>
</tr>
<tr>
<td>( \Delta(\text{Repos})/\text{GTA} )</td>
<td>0.014</td>
<td>-0.077**</td>
<td>0.011</td>
</tr>
<tr>
<td></td>
<td>(0.54)</td>
<td>(-1.82)</td>
<td>(0.33)</td>
</tr>
<tr>
<td>( \Delta(\text{Other Hot Money})/\text{GTA} )</td>
<td>-0.005</td>
<td>-0.027**</td>
<td>0.007</td>
</tr>
<tr>
<td></td>
<td>(-0.59)</td>
<td>(-2.42)</td>
<td>(0.51)</td>
</tr>
<tr>
<td>( \Delta(\text{FHLB})/\text{GTA} )</td>
<td>0.015</td>
<td>-0.022</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>(1.49)</td>
<td>(-1.09)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>( \Delta(\text{TARP})/\text{GTA} )</td>
<td>-0.010</td>
<td>0.012</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>(-0.35)</td>
<td>(0.35)</td>
<td>(0.00)</td>
</tr>
<tr>
<td>Observations</td>
<td>580</td>
<td>212</td>
<td>740</td>
</tr>
<tr>
<td>R2</td>
<td>0.08</td>
<td>0.30</td>
<td>0.77</td>
</tr>
</tbody>
</table>
Internet Appendix Table A.5: Did banks use the funds from the Federal Reserve to increase lending? Subsample results: height of the crisis and the first and second halves of the crisis

This table reports OLS regressions which examine the effect of DWTAF on bank lending during the height of the crisis (Panel A), during the 1st half of the crisis (Panel B), and during the 2nd half of the crisis (Panel C). DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility. The height of the crisis is here defined to be 2008:Q4. The first and second halves of the crisis are defined to run from 2007:Q3 – 2008:Q3 and from 2008:Q4 – 2009:Q4, respectively. \( \Delta(\text{DWTAF}) / \text{GTA} \) 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 the lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). Each panel examines the effect on total bank lending, and alternatively splits total loans by maturity (short-term and long-term loans) or by loan category (C&I, CRE, RRE, and other 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 (before the Internet Appendix). All regressions include the same variables included in Columns (2) in Panel (A) of Table 6. 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: Height of the crisis

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>( \Delta(\text{LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{ST LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{LT LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{C&amp;I LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{CRE LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{RRE LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{OTHER LOANS}) / \text{GTA} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta(\text{DWTAF}) / \text{GTA} )</td>
<td>0.901*** (3.02)</td>
<td>1.082*** (3.69)</td>
<td>-0.223 (-0.84)</td>
<td>0.295** (2.31)</td>
<td>0.324* (1.76)</td>
<td>-0.008 (-0.08)</td>
<td>0.082 (0.63)</td>
</tr>
<tr>
<td>Observations</td>
<td>6196</td>
<td>6196</td>
<td>6196</td>
<td>6196</td>
<td>6196</td>
<td>6196</td>
<td>6196</td>
</tr>
<tr>
<td>R2</td>
<td>0.19</td>
<td>0.05</td>
<td>0.08</td>
<td>0.05</td>
<td>0.10</td>
<td>0.06</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Subpanel A2: Large banks

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>( \Delta(\text{LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{ST LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{LT LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{C&amp;I LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{CRE LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{RRE LOANS}) / \text{GTA} )</th>
<th>( \Delta(\text{OTHER LOANS}) / \text{GTA} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta(\text{DWTAF}) / \text{GTA} )</td>
<td>1.431*** (2.82)</td>
<td>0.883* (1.92)</td>
<td>0.463 (0.74)</td>
<td>-0.008 (-0.08)</td>
<td>0.287 (1.23)</td>
<td>0.107 (0.81)</td>
<td>0.433** (2.45)</td>
</tr>
<tr>
<td>Observations</td>
<td>466</td>
<td>466</td>
<td>466</td>
<td>466</td>
<td>466</td>
<td>466</td>
<td>466</td>
</tr>
<tr>
<td>R2</td>
<td>0.31</td>
<td>0.13</td>
<td>0.16</td>
<td>0.18</td>
<td>0.21</td>
<td>0.16</td>
<td>0.12</td>
</tr>
</tbody>
</table>
### Panel B: First half of the crisis

#### Subpanel B1: Small banks

**Effect of DWTAF usage on:**

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>$\Delta(LOANS)/GTA$</th>
<th>$\Delta(ST_LOANS)/GTA$</th>
<th>$\Delta(LT_LOANS)/GTA$</th>
<th>$\Delta(CI_LOANS)/GTA$</th>
<th>$\Delta(CRE_LOANS)/GTA$</th>
<th>$\Delta(RRE_LOANS)/GTA$</th>
<th>$\Delta(OTHER_LOANS)/GTA$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta(DWTAF)/GTA$</td>
<td>0.911</td>
<td>0.905</td>
<td>0.088</td>
<td>0.096</td>
<td>0.155</td>
<td>-0.075</td>
<td>0.484**</td>
</tr>
<tr>
<td></td>
<td>(1.88)*</td>
<td>(1.48)</td>
<td>(0.17)</td>
<td>(0.66)</td>
<td>(0.49)</td>
<td>(-0.49)</td>
<td>(2.14)</td>
</tr>
<tr>
<td>Observations</td>
<td>24983</td>
<td>24983</td>
<td>24983</td>
<td>24983</td>
<td>24983</td>
<td>24983</td>
<td>24983</td>
</tr>
<tr>
<td>R2</td>
<td>0.58</td>
<td>0.26</td>
<td>0.36</td>
<td>0.33</td>
<td>0.56</td>
<td>0.45</td>
<td>0.23</td>
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</tbody>
</table>

#### Subpanel B2: Large banks

**Effect of DWTAF usage on:**

<table>
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<tr>
<th>Dependent variable:</th>
<th>$\Delta(LOANS)/GTA$</th>
<th>$\Delta(ST_LOANS)/GTA$</th>
<th>$\Delta(LT_LOANS)/GTA$</th>
<th>$\Delta(CI_LOANS)/GTA$</th>
<th>$\Delta(CRE_LOANS)/GTA$</th>
<th>$\Delta(RRE_LOANS)/GTA$</th>
<th>$\Delta(OTHER_LOANS)/GTA$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta(DWTAF)/GTA$</td>
<td>0.881**</td>
<td>0.113</td>
<td>0.925*</td>
<td>-0.019</td>
<td>0.303</td>
<td>0.191*</td>
<td>0.223*</td>
</tr>
<tr>
<td></td>
<td>(2.26)</td>
<td>(0.32)</td>
<td>(1.76)</td>
<td>(-0.14)</td>
<td>(1.16)</td>
<td>(1.89)</td>
<td>(1.67)</td>
</tr>
<tr>
<td>R2</td>
<td>0.58</td>
<td>0.30</td>
<td>0.42</td>
<td>0.41</td>
<td>0.63</td>
<td>0.50</td>
<td>0.33</td>
</tr>
</tbody>
</table>

### Panel C: Second half of the crisis

#### Subpanel C1: Small banks

**Effect of DWTAF usage on:**

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>$\Delta(LOANS)/GTA$</th>
<th>$\Delta(ST_LOANS)/GTA$</th>
<th>$\Delta(LT_LOANS)/GTA$</th>
<th>$\Delta(CI_LOANS)/GTA$</th>
<th>$\Delta(CRE_LOANS)/GTA$</th>
<th>$\Delta(RRE_LOANS)/GTA$</th>
<th>$\Delta(OTHER_LOANS)/GTA$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta(DWTAF)/GTA$</td>
<td>0.765***</td>
<td>0.571***</td>
<td>0.205</td>
<td>0.144**</td>
<td>0.323***</td>
<td>0.025</td>
<td>0.182***</td>
</tr>
<tr>
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<td>0.32</td>
<td>0.31</td>
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#### Subpanel C2: Large banks

**Effect of DWTAF usage on:**

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<th>Dependent variable:</th>
<th>$\Delta(LOANS)/GTA$</th>
<th>$\Delta(ST_LOANS)/GTA$</th>
<th>$\Delta(LT_LOANS)/GTA$</th>
<th>$\Delta(CI_LOANS)/GTA$</th>
<th>$\Delta(CRE_LOANS)/GTA$</th>
<th>$\Delta(RRE_LOANS)/GTA$</th>
<th>$\Delta(OTHER_LOANS)/GTA$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta(DWTAF)/GTA$</td>
<td>0.708***</td>
<td>0.312</td>
<td>0.340</td>
<td>0.108</td>
<td>0.145</td>
<td>0.035</td>
<td>0.165**</td>
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<td>(2.90)</td>
<td>(1.61)</td>
<td>(1.17)</td>
<td>(1.42)</td>
<td>(1.34)</td>
<td>(0.44)</td>
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<tr>
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<td>0.33</td>
<td>0.38</td>
<td>0.64</td>
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