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

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

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

Christa H.S. Bouwman
Case Western Reserve University, Cleveland, OH 44106 U.S.A.
Wharton Financial Institutions Center, Philadelphia, PA 19104 U.S.A.
christa.bouwman@case.edu

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

November 2013

The Federal Reserve provided an unprecedented amount of liquidity to the U.S. banking sector during the recent financial crisis. This paper focuses on two of the main programs, the discount window and Term Auction Facility (TAF). Using novel data that were recently made public, we examine which banks used the funds, how the use of other funding sources changed, and whether the use of these funds affected bank lending. We have three main findings: small banks receiving funds were weak banks whereas large banks generally were not; the funds substituted to a limited degree for other funding sources; and banks receiving funds increased their lending relative to other banks. Additional analyses examine the height of the crisis, subsamples of banks, and whether banks used some of the funds to liquefy their balance sheets. The findings provide insights into role of the lender of last resort and suggest that the Federal Reserve was successful in its goal of increasing the flow of credit during the crisis.

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

The authors thank Frederic Boissay, Charles Calomiris, Robert DeYoung, Jeff Fuhrer, Lyle Kumasaka, Pete Kyle, Alex Levkov, Andrew McCallum, Bill Nelson, Joe Peek, Maureen Savage, Klaus Schaeck, Christina Wang, and seminar and conference participants at the Financial Intermediation Research Society meeting, Washington University, Virginia Tech, the Federal Reserve Board, Chicago Federal Reserve, the Annual FDIC/JFSR Bank Research Conference, and the Financial Management Association meetings for helpful comments and suggestions, and Raluca Roman for valuable research assistance.

"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

The Federal Reserve has been providing overnight discount window funding to the U.S. banking sector since its inception in 1913. Throughout much of the past century, the liquidity facility played a relatively quiet role of meeting the idiosyncratic liquidity needs of a small number of banks. However, the financial crisis of 2007-2009 brought about a dramatic redefinition of the Federal Reserve's role as lender of last resort (LOLR).[1] As interbank and money markets experienced trouble, the Federal Reserve attempted to relieve funding problems and keep credit flowing through the use of various facilities. This paper examines which banks received funds from the Federal Reserve, how banks' use of other funding sources changed, and whether the funds ultimately flowed to firms and households through increased bank lending.

The Federal Reserve took a number of unprecedented steps to increase banks' access to funding during the crisis. Two key innovations were the following.[2] First, on August 17, 2007, it instituted the Term Discount Window Program, a temporary program which offered discount window funds with maturities beyond overnight. While initially funds were made available for up to 30 days, on March 16, 2008, it extended the maximum maturity to 90 days. Second, to address a concern that using the discount window may be associated with a "stigma" – usage could be perceived as a sign of weakness[3,4] – the Federal Reserve

[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 an 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 recent financial crisis.

[3] Ennis and Weinberg (2012) model the origin and implications of stigma. Taking stigma related to government program participation as a given, Philippon and Skreta (2012) study the design of optimal government intervention to stabilize financial markets. Acharya, Gromb, and Yorulmazer (2012) show that stigma does not make the discount window useless, but rather limits the surplus banks can squeeze out of banks in need. Peristiani (1998), Corbett and Mitchell (2000), and Furfine (2005) provide empirical evidence on stigma using data from before the recent crisis, while Armantier, Krieger, and McAndrews (2011) provide evidence from the recent crisis.

[4] A small bank that borrowed almost 48% of assets on one day, Proficio Bank, later 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.

created liquidity auctions.[5] On December 12, 2007, it 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.

The amount of liquidity injected into the banking sector by the Federal Reserve during the crisis was extraordinary from a historical perspective. While from 2003 to 2006, discount window usage averaged $170 million each week, it averaged a staggering $30.8 billion per week from August 2007 through December 2009.[6] Over the crisis, the Federal Reserve extended more than 30,000 discount window and TAF loans combined with a total par value of close to $15 trillion (see Table 1). Over 20% of small U.S. banks and 60% of large U.S. banks used the discount window or the TAF at some point during the crisis. Some banks used the funds from the Federal Reserve very intensively. The maximum dollar amount outstanding for a bank on a single day was $60 billion each by Bank of America and Wells Fargo, with Wachovia close behind with $50 billion.[7]

This extraordinary liquidity injection 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 lender-of-last-resort role is 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.[8] This is especially important during periods of heightened uncertainty about the risks of bank assets, as in the recent crisis.[9] This theory predicts that weak banks were more likely to use funds from the Federal Reserve during the financial crisis.

[5] 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."

[6] Average weekly outstanding primary plus secondary and seasonal credit from the Federal Reserve's H.4.1 statistical release.

[7] The next largest daily outstanding amounts were to Dexia ($37 billion), JPMorgan Chase, Barclays, and Depfa (around $30 billion each).

[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 exists which advocates temporary assistance to insolvent banks (Solow, 1982; Goodhart, 1985).

[9] 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) shows that this does not hold during financial crises when informational uncertainties make it hard for private lenders to identify who is solvent.

The second question is: Did these funds substitute for or complement other funding sources? The objective of the LOLR is to provide funds when private sources of funding have dried up and banks cannot find alternative funding sources. This suggests that the funds should be substitutes.[10] However, funds from the LOLR may help a bank regain a stable liquidity profile so that the bank can return to other markets. So the funds may complement other funds as well.

The third question is: Did banks use these funds to increase their lending? While this is not a classical role of the LOLR, the Federal Reserve explicitly intended for their liquidity facilities to encourage bank lending.[11] 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."[12] While addressing this question, we also examine an additional hypothesis: that banks used some of the funds from the Federal Reserve to liquefy their balance sheets.

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 novel data on discount window and TAF usage during the crisis that were recently made public. Data on discount window usage were released following Freedom of Information Act requests by Bloomberg News and Fox Business Network on March 31, 2011. The Federal Reserve published data on banks that received TAF loans on December 1, 2010 because the Dodd-Frank Act mandated it to release 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 DWTAF or Federal Reserve funding.

---

[10] 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 funding sources.

[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 was supposedly 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."

To address our first question, we perform three sets of regression analyses. First, we examine which banks received funds from the Federal Reserve during the crisis. We find that small banks receiving DW and TAF funds tended to be weaker than other small banks, as indicated by less capital and higher portfolio risk, suggesting that small banks that needed the funds were more likely to get them. In contrast, large banks receiving Federal Reserve funding generally were not weaker than other large banks. We propose five potential explanations for these large-bank findings, including: greater stigma for large banks, greater reliance on funding from disrupted capital markets for large banks, possibly better screening of weak large banks by the Federal Reserve, encouragement of healthy large banks to use the funds, and a preference of healthy large banks to obtain term funds at a premium instead of rolling over overnight federal funds. A second analysis focuses on the propensity to borrow during the height of the crisis (September 15, 2008 to December 31, 2008) and produces similar small-bank findings but somewhat different large-bank results. Our third analysis focuses on the *intensity* of usage (e.g., number of times used and average daily amount outstanding relative to assets) and yields results broadly consistent with our findings on the propensity of usage. The large-bank finding suggests that the Federal Reserve did not adhere strictly to an LOLR role in that it did not only provide funds to weak banks.

We next examine the extent to which DWTAF funding substitutes for or complements funding from other sources (such as core deposits, federal funds, other hot money, and TARP). To do so, we regress changes in DWTAF funding on contemporaneous changes in other types of funding, as well as a set of control variables. These regressions are not intended to be viewed as causal, but rather to establish whether Federal Reserve funding tends to move together with or in the opposite direction from other funding sources. On net, for both small and large banks, funds from the Federal Reserve were mostly very weak substitutes for other funding sources. We cannot rule out the possibility that some banks used the funds as substitutes for other funding sources while other banks used them as complements.

Finally, we examine whether DWTAF usage was successful in increasing bank lending. We examine overall lending as well as lending decomposed by type on two dimensions: maturity (short-term versus long-term) and loan category ((commercial and industrial (C&I) loans, commercial real estate (CRE) loans, residential real estate (RRE) loans, 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 fixed effects. We also perform instrumental variables (IV) regressions to control for potentially 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 lending, and this result holds for both short-term and long-term lending, and for all of the loan types with the exception of RRE loans. These results are robust to dropping Too-Big-To-Fail (TBTF) banks and hold for public and private banks alike. For small banks, the effect on overall lending during the height of the crisis (2008: Q4) is similar to the effect for the entire crisis period. For large banks, DWTAF borrowing appears to have a more stimulative effect on overall lending during the height of the crisis than over the crisis period as a whole. These results suggest that the Federal Reserve was not pushing on a string during the crisis – rather, it was successful in increasing the flow of credit to firms and households.

We also 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 for liquidity hoarding – 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 suggesting that these funds were primarily focused on lending.

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 by analyzing data on borrowing from the ECB from 2008 to 2011. The authors examine four reasons why banks obtained funds from the central bank: risk-shifting, illiquidity, political pressure by some European governments, and differences in banks' private valuation of risky assets. They find that weakly-capitalized banks obtain more funds and pledge riskier collateral (distressed-sovereign debt) over time, supporting a risk-shifting explanation. Our analysis looks more generally at the characteristics of banks that obtain funds from the central bank, and in addition studies the relationship to other sources of funding, the effect on lending, and balance sheet liquefaction. 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 two studies addresses the effects on bank lending.

The insights from our analyses may be helpful for policy makers 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 financial crisis. Our paper provides an important contribution in this area. Our results also suggest that the Federal Reserve is not pushing on a string – it can use its liquidity facilities as a policy tool to increase the availability of credit to households and firms during a financial crisis.[13]

The paper is organized in the following sections. Section 2 describes the discount window and TAF, shows graphs of the amounts outstanding under these liquidity facilities over time and their cost, and includes lists of banks that used these facilities the most during the crisis. Section 3 confronts 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 sources of funding? Section 5 focuses on the third question: did DWTAF borrowing increase bank lending? Section 6 concludes.

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

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

2.1. Background on DW and TAF

The discount window is the means by which the Federal Reserve provides funds to banks in need of liquidity. Since 2003, the Federal Reserve has had three permanent discount window programs:[14] i) short-term *primary credit* to eligible depository institutions in generally sound financial condition at a markup

[13] 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.

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

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.[15] All three are fully collateralized[16] and have no prepayment penalties. While the first two programs provide short-term (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.[17] It reduced the spread of the primary credit rate over the FOMC's target federal funds rate to 50 basis points from 100 basis points, and made funds available 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.[18] Collateral 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, presumably to avoid the stigma of discount window usage (Ashcraft, McAndrews, and Skeie, 2011; Armantier, Ghysels, Sarkar, and Shrader, 2011).

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

[16] The following types of assets are most commonly pledged (http://www.frbdiscountwindow.org/): obligations of the U.S. Treasury; obligations of 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; residential real estate loans; commercial, industrial, or agricultural loans; commercial real estate loans; and consumer loans. Securities are typically valued using prices supplied by external vendors. Eligible securities for which a vendor price cannot readily be obtained will be assigned an internally modeled price. Margins for securities are estimated using a Value-At-Risk analysis, which develops margins from historical price volatility of assets within each collateral category. Securities margins are assigned based on asset type and duration. Any security not assigned a price by an external vendor receives the lowest margin for that asset type (see http://www.frbdiscountwindow.org/FRcollguidelines.pdf).

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

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

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 mid-September 2008. Panel B shows the 3-month and 1-month Libor-OIS (Overnight Indexed Swap) spreads, common-used measures of the health of the banking industry, as well as some turning points in the DW and TAF programs. As can be seen, the spreads often narrowed somewhat after the expansionary Federal Reserve actions, indicating an improvement in banking conditions.[19]

2.2. DW and TAF Data and Key Statistics

We employ novel data on DW and TAF usage during the crisis that were made public. Data on discount window usage were released following Freedom of Information Act requests by Bloomberg News and Fox Business Network on March 31, 2011. The Federal Reserve published data on banks that received TAF loans on December 1, 2010, because the Dodd-Frank Act mandated it to release this information. 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, and in January 2010, the Federal Reserve began rolling back expansions to the primary credit program, reflecting improvement in financial market conditions.[20]

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

[19] 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.

[20] 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).

GTA[21] up to $1 billion) and large commercial banks (GTA over $1 billion). We also show a panel for non-commercial banks (entities which do not fill out the Call Report and therefore do not have GTA available), mostly agencies and branches of foreign banks. As shown in Panel B, three highlights emerge for small banks. First, DW usage is large relative to TAF usage. Second, by May 2008, term DW loans exceeded overnight funds for small banks and continued to be larger through the rest of the crisis. Third, by January 2009, TAF became their largest single source of Federal Reserve funding and later in 2009, TAF exceeded the sum of overnight and term DW usage for these banks. Turning to large banks in Panel C, three facts stand out. First, the amounts obtained are much greater than for small banks. Second, by January 2008, TAF usage dominated DW usage. Third, TAF and DW usage essentially exploded in October 2008. While TAF usage continued to rise until March 2009 (and then fell to much lower levels), DW usage dropped relatively quickly. Finally, for non-commercial banks in Panel D, it is clear that TAF usage dominated DW usage shortly after its inception and that TAF usage by these banks was almost as high as for commercial banks that filled out Call Reports.

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 DWTAF, and separately for DW and TAF. Note that more than 10 banks appear in each list because the top 10 are not necessarily the same for DW and TAF combined, and for DW and TAF separately.

Table 2 Panel A shows that for every type of bank, the frequency of DWTAF usage is generally close to that of DW usage, reflecting that there were only a limited number of TAF auctions.[22] The top 10 users among small and large commercial banks accessed DWTAF 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

[21] 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).
[22] There were 58 TAF auctions and the average TAF user accessed the facility 9 times.

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).[23]

In Table 2 Panel B, the lists of banks with the highest average DWTAF 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 DWTAF versus the DW separately, reflecting 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 three of the top large banks have majority foreign ownership.

We also created rankings of banks that had funding outstanding on the most days and of banks with the highest outstandings relative to assets on a given day. While yielding interesting additional insights, they are shown and discussed in the Internet Appendix only for brevity.

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

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

3.1 Methodology

We use regression analyses to examine the characteristics of banks that used DW and TAF during the recent crisis, during the height of the crisis, and the intensity with which they used these funding sources. All 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 bank dummy, a foreign ownership dummy, primary federal

[23] 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.

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 differences in Federal Reserve Bank discretion in allowing banks to use the discount window and other regional economic conditions. In addition, we include time fixed effects to control for 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 during the financial crisis

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:

(1) $P(\text{bank used funds from Federal Reserve}_{i,t})$

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

where P(•) indicates probability and *j*, *k* and *l* indicate primary federal regulator, state, and Federal Reserve district, respectively. The dependent variable is a dummy variable that is one if the bank used funds from the Federal Reserve (alternatively: DWTAF; DW separately; and TAF separately) during the particular quarter of the crisis. 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 during the height of the financial crisis

To evaluate banks' use of funds from the Federal Reserve during the height of the financial crisis, we use a specification that is similar to equation (1) used above, but restrict the sample to a cross-sectional analysis of funds usage between September 15, 2008 and December 31, 2008. This is the period immediately following the collapse of Lehman Brothers, when market liquidity was most difficult for banks to access.

(2) *P(bank used funds from Federal Reserve$_{i,height}$)*

= *g(bank size$_{i,2008:Q3}$, capital$_{i,2008:Q3}$, portfolio risk$_{i,2008:Q3}$, earnings$_{i,2008:Q3}$, illiquidity$_{i,2008:Q3}$, other funding sources$_{i,2008:Q3}$, BHC dummy$_{i,2008:Q3}$, listed dummy$_{i,2008:Q3}$, foreign ownership dummy$_{i,2008:Q3}$, primary federal regulator dummies$_{j,2008:Q3}$, state income growth$_{k,2008:Q3}$, Federal Reserve district dummies$_{l,2008:Q3}$)*

The dependent variable is a dummy that is one if bank *i* obtained funds from the Federal Reserve (alternatively: DWTAF; DW separately; and TAF separately) during the height of the crisis.

3.1.3 Methodology –Usage intensity during the financial crisis

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 these four intensity measures, *y*, we use Tobit specifications because most observations for the dependent variable are 0 and the degree of intensity is increasing as a continuous variable. The Tobit has the following form:

(3) $$y_{i,t} = \begin{cases} y^*_{i,t} & if \;\; y^*_{i,t} > 0 \\ 0 & if \;\; y^*_{i,t} \leq 0 \end{cases}$$

where

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

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

bank to account for potential within-bank correlation in residuals.

3.2 Results

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

The results are presented in Tables 3, 4, and 5. In all 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.

3.2.1 Results – Usage during the financial crisis

Table 3 shows the regression results for which banks received funds during the crisis (equation 1). 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 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). These variables are all defined and summary statistics are provided in the Data Appendix at the end of the tables (before the Internet Appendix). The results shown in Table 3 are generally robust to the use of these alternative measures of capital, portfolio risk, and earnings. To make the probit results easier to interpret, we report marginal effects evaluated at the means of the explanatory variables.

The results for small banks in Table 3 Subpanel A1 suggest that those receiving DWTAF are larger, more capital constrained, have more commercial real estate loans (a risky form of lending), more mortgage-backed securities (securities which appeared to be risky during the recent crisis), are more often domestically owned, and are less often supervised by the FDIC (which maybe is 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 appear 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 does not play a role, earnings has a positive effect, and banks supervised by the OCC are less likely to use TAF.

The results for large banks in Table 3 Subpanel A2 suggest that those receiving DWTAF generally are larger, have less volatile earnings, have more commercial real estate loans and mortgage-backed securities, are more illiquid, and are in states with higher income growth. Capital does not seem to matter. 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 do 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 does play a role. While earnings volatility does not seem to matter, listed banks are more likely to use TAF. Overall, the results for large banks suggest that those in need were not as likely to receive funding as small banks in need, except that large banks with liquidity problems may have addressed these with TAF. These findings suggest that the Federal Reserve did not adhere strictly to an LOLR role in that it did not only provide funds to weak large banks.

We propose five potential explanations for the counterintuitive large-bank finding. The first reason is stigma. All else equal, stigma costs may be greater for large banks than small banks for two reasons. Large banks accessing the DW may be more likely to be discovered because aggregate DW usage by Federal Reserve District is made public weekly, and usage by large banks may stand out more. Large banks may be more susceptible to "runs" by counterparties since they rely more on interbank borrowing and engage in other activities (e.g., derivatives and other trading) where funding costs are sensitive to counterparty concerns. The fact that weakness is more correlated with TAF usage (shown by other researchers to be a low stigma option) than it is with DW usage lends some support to this interpretation. 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.[24] A fourth reason is that healthy large banks may have been encouraged to use such funds.[25]

[24] The Federal Reserve has never lost money on any discount window or TAF loan.

A final reason is that healthy large banks may prefer to use DWTAF with a 30- or 90-day maturity at a premium in order to obtain longer-maturity funds with certainty, instead of rolling over federal funds which typically are provided overnight.

The dummies for Federal Reserve districts in Table 3 are also often statistically significant for both small and large banks, consistent with systematic variation in usage propensity by district.[26]

3.2.2 Results – Usage during the height of the financial crisis

Table 4 shows the results based on equation (2), characterizing the use of funds from the Federal Reserve during the height of the crisis. The explanatory variables are the same as in Table 3, except that in the small-bank TAF regressions, the foreign ownership dummy and three Federal Reserve district dummies drop out since all small TAF recipients are domestically owned and located in other districts. As in Section 3.2.1, we again try alternative specifications of capital, portfolio risk, and earnings. Since the results are again robust across these measures, we report here only the baseline specification with EQRAT, the standard deviation of ROA, and ROE.

Comparing the small-bank results in Table 4 Subpanels A1 and B1 with those in Table 3 Subpanels A1 and B1 reveals that the characteristics that predict DWTAF or DW usage during the crisis also tend to predict usage during the height of the crisis. Small banks that were weaker across a number of dimensions (including capitalization, portfolio risk, and state income growth) were more likely to receive funding. In contrast, comparing Table 4 Subpanel C1 with Table 3 Subpanel C1 shows that small banks using TAF during the height of the crisis were less needy (as measured by Stddev ROA) than those using TAF during the entire crisis.

The results for large banks in Table 4 convey an almost opposite story. The results based on DWTAF and DW (in Subpanel A2 and B2, respectively) reveal that weaker large banks were more likely to

[25] 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.

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

obtain Federal Reserve funding during the height of the crisis than during the crisis as a whole. The coefficients on earnings and illiquidity support this interpretation. In contrast, Table 4 Subpanel C2 suggests that large banks using TAF during the height of the crisis demonstrated less weakness than those using such funds during the entire crisis.

Only a few Federal Reserve district dummies are significant in the small- and large-bank regressions, suggesting that usage was geographically widespread during height of the crisis.

3.2.3 Results – Usage intensity during the financial crisis

Table 5 presents the results on the intensity of DWTAF usage. All estimations use the Tobit specification in equation (3). In each panel, Columns (1) and (2) show the results for the number of times the bank obtained 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 5, we in addition show the 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 in Table 5.

The results for small banks in Table 5 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 5 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 5 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 large banks in more need using funds from the Federal Reserve more intensively. The results for DW and TAF in Table 5 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.

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 address whether banks used the funds from the Federal Reserve as substitutes for or complements to other sources of funds. We then present the results.

4.1 Methodology

To examine the extent to which funds from the Federal Reserve substituted for or complemented other sources of funding, we regress changes in the proportions of the portfolio funded by DWTAF, DW, and TAF on contemporaneous changes in the proportions of the portfolio funded by other sources, as well as a set of control variables. In all cases, we eliminate observations on banks involved in mergers for the quarters in which the mergers occur to rule out changes in bank funding are due to the mergers. We run the following OLS regressions:

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

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

where $\Delta(\text{funds from Federal Reserve}_{i,t})/GTA_{i,t-1}$ is the change in the average amount of DWTAF, DW, or TAF outstanding during the quarter normalized by lagged GTA. The key right-hand-side variables are the changes in other sources of bank funding normalized by lagged GTA. The control variables include bank fixed effects and all of the independent variables used above except for the Federal Reserve district dummies, as banks typically do not change Federal Reserve districts, and so these dummies would be collinear with the bank fixed effects. This is a particularly strong set of control variables, 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.

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 goal here 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 6 contains the OLS regression results. Panel A shows the effects using DWTAF for small banks (Subpanel A1) and large banks (Subpanel A2), while Panels B and C show the results for DW and TAF, respectively. For brevity, we show and discuss the key explanatory variables of interest only, and do not show or discuss the results for the control variables.

The small-bank results suggest that, to some extent funds from the Federal Reserve were substitutes for other funding sources such as Core Deposits, Fed Funds, Other Hot Money, and FHLB advances. On average, when these other funding sources declined, funding from the Federal Reserve increased. Separating DW from TAF, it appears that small banks used the facilities differently: DW appears to substitute for core deposits and other hot money, while TAF appears to substitute for Fed Funds and FHLB advances.

The large-bank results also suggest that funding from the Federal Reserve is primarily a substitute for other sources of funding, primarily other hot money and FHLB advances. One notable exception is TARP funding, which appears to complement DWTAF. Separating DW from TAF reveals that for large banks, the results are mostly driven by TAF, which is unsurprising given their limited usage of the discount window (see Figure 2 Panel B).

While these results are statistically significant, they should be viewed as economically weak, given that the coefficients are far smaller in magnitude than -1 or 1. We cannot rule out the possibility that the funds were strong substitutes for some banks and strong complements for other banks.

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. We also briefly examine whether banks used part of the funds to liquefy their balance sheets.

5.1 Methodology

We perform two types of analyses: 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:

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

$= m(\Delta(DWTAF_{i,t}) / GTA_{i,t-1}, [\Delta(Core\ Deposits_{i,t})/GTA_{i,t-1}, \Delta(Fed\ Funds_{i,t})/GTA_{i,t-1}, \Delta(Repos_{i,t})/GTA_{i,t-1}, \Delta(Other\ Hot\ Money_{i,t})/GTA_{i,t-1}, \Delta(FHLB_{i,t})/GTA_{i,t-1}, \Delta(TARP_{i,t})/GTA_{i,t-1},]$ *bank size*$_{i,t-1}$, *capital*$_{i,t-1}$, *portfolio risk*$_{i,t-1}$, *earnings*$_{i,t-1}$, *illiquidity*$_{i,t-1}$, *BHC dummy*$_{i,t-1}$, *foreign ownership dummy*$_{i,t-1}$, *listed dummy*$_{i,t-1}$, *state income growth*$_{j,t-1}$, *primary federal regulator dummies*$_{k,t-1}$, *bank fixed effects*$_i$, *time fixed effects*$_t$)

where $\Delta(DWTAF_{i,t}) / GTA_{i,t-1}$ is the change in the average amount of DWTAF outstanding during the quarter 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.

$\Delta lending_{i,t} / GTA_{i,t-1}$ 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) 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. We include both time and bank fixed effects and exclude Federal Reserve district dummies, which are collinear with the bank fixed effects.[27] Standard errors are clustered by bank.

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. 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 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[28] or it may be negatively related because previous usage could induce the bank 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.[29] These instruments should not have a direct effect on the change in lending in this quarter, and hence seems to meet the exclusion restriction.

---

[27] 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.

[28] 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.

[29] As noted above, banks access DW and TAF funds through their district Federal Reserve Bank. Weekly amounts of borrowing at each district bank are reported in the Federal Reserve's weekly H.4.1 statistical release.

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 fixed effects.

5.2 Results

Below, we first present the OLS results, followed by the IV results. By way of preview, the key takeaway from these regressions is that DWTAF usage increased lending by both small and large banks.

5.2.1 OLS results

Table 7 contains the OLS regression results. Panel A shows the effects of DWTAF usage on overall lending for small banks (Subpanel A1) and large banks (Subpanel A2). For brevity, we discuss only the explanatory variable of interest and do not discuss the results for the control variables.

Both subpanels show the results two ways – first without changes in other funding sources and then with those changes included. The results from both subpanels yield the same signs, but somewhat different magnitudes. We will focus on the magnitudes from the specification with the other funding sources included because 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 is associated with a significant increase in overall lending by the institutions receiving the funds. The statistically significant coefficient of approximately 0.92 in Column (2) suggests that an additional dollar of funds from the Federal Reserve is 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 Federal Reserve funding is 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. To some extent, the sizeable increase in lending may reflect enhanced confidence that Federal Reserve funding will be available in the future.

We next explore if this increase in lending applies to different types of lending. For example, since

both funding sources (DW and TAF) are short-term, it is possible that only short-term lending increased. However, long-term lending may also have increased if the funds provided sufficient assurance of continued access to future funding. That is, DW and TAF may have helped the maturity transformation role of banks. 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).[30] We also want to examine whether key loan categories were affected differently. For example, they may have been reticent to expand into real estate loans given the problems with such loans during the crisis. To address this, we split total loans into C&I loans, CRE loans, RRE loans, and other loans.[31]

Table 7 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.

5.2.2 IV results

Table 8 contains the IV regression results. 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).

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 (significant only for small banks). This suggests that a bank faces lower stigma costs after other banks in its

[30] 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. Call Reports do provide information on loans with a remaining maturity or next repricing date of up to three months, but these data include longer-term floating-rate loans that reprice within three months.

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

district have already obtained funds from their district Federal Reserve Bank.

Panels C and D show the results of the second stage of IV estimations for small and large banks, respectively. The columns show the full set of results for overall lending as well as the different types of lending. The results in Panel C 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 Panel D show that large banks' overall lending also increased with use of funds, with the increase coming primarily from 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 Federal Reserve borrowing on bank lending.[32]

IV estimates are biased toward the OLS estimates in finite samples if the instruments are weak (the correlation with the endogenous regressors is low). To verify that this is not an issue, 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.

5.3 Additional results

The results above suggest that using funds from the Federal Reserve has a positive effect on bank lending for both small and large banks. We now examine the height of the crisis, split the sample in different ways, and briefly address whether banks used part of the funds to liquefy their balance sheets.

5.3.1 Height of the crisis results

The height of the crisis was a period of unprecedented turmoil in which banks were in need of funding. One may wonder whether the banks that obtained DWTAF lent those funds during this time period. Since DWTAF usage increased so much during the height of the crisis, particularly for large banks (see Figure 2 Panel B), it is unclear if these banks used the funds for lending or merely to liquefy their balance sheets.

[32] Documenting a much larger coefficient estimate for IV compared to OLS is consistent with Levitt (1996) and Berger and Bouwman (2009).

To examine this, we rerun the lending regressions 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.[33]

Table 9 shows the results. Two things stand out. First, while the overall effect on lending is similar for small banks, it is stronger for large banks. Second, both small and large banks seem to have used the funds to boost their short-term lending. In contrast to the overall crisis results, the funds did not affect long-term lending during the height of the crisis. Overall, banks did seem to use the funds for lending during this period.

5.3.2 Subsample results

It is possible that the results are driven by certain types of banks. To address this, we run our regressions leaving out Too-Big-To-Fail (TBTF) banks and also split the sample by the bank's listing status.

Banks that are TBTF may have driven the increase in lending by large banks, 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 SCAP program, and would be assisted with capital injections if they could not raise capital on their own, essentially announcing that they were TBTF.

Table 10 Panel A shows the results for large banks excluding TBTF banks based on both definitions. The results are similar to the main large-bank results, suggesting that TBTF banks did not drive the increase in lending by large banks.

DWTAF 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 DWTAF as much to increase lending. To address this, we interact Δ(DWTAF) / GTA with the listed dummy and focus on the coefficient of this interaction term.

[33] We do not include fixed effects in these regressions since they only include one quarter of data.

Table 10 Panel B shows the results. The interaction term is never significant for small banks and negative and significant in one instance for large banks (C&I loans). Thus, the effect of DWTAF on lending is similar at privately-held and listed banks, suggesting that greater access to other sources of funding is not a determining factor in the use of DWTAF funds.

5.3.3 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,[34] 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 in closing, we do want to briefly address whether they may have also used part of the funds to liquefy their balance sheets. To do so, we run regressions that are similar to the lending regressions (Equation (5)) except that we replace the dependent variable $\Delta(\text{lending}) / GTA_{i,t-1}$ alternately with the change in cash normalized by lagged GTA and the change in securities normalized by lagged GTA.

Table 11 shows the results. The results suggest that small banks used DWTAF in part to increase their securities holdings, not their cash holdings. In contrast, there is no evidence that large banks used DWTAF funds to liquefy their balance sheets.

6. Conclusion

The Federal Reserve provided an unprecedented amount of liquidity to the U.S. banking sector 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 indeed 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, small banks that needed the funds were more likely to get them. Large banks receiving Federal Reserve funding were generally not weaker than other large banks. Greater stigma, greater reliance on funding from disrupted capital markets, more intense screening of large banks by Reserve Banks,

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

encouragement of healthy large banks to use funds from the Federal Reserve, and a preference of healthy large banks to obtain term funds at a premium instead of rolling over overnight federal funds are all potential drivers of this counterintuitive large-bank finding.

Second, funding from the Federal Reserve's liquidity facilities appears to substitute for other funding sources, with the notable exception that, for large banks, DWTAF complements TARP funds. These effects are economically small but may mask large substitutions or complementarities for individual banks.

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.

In terms of policy, our findings suggest that the Federal Reserve went beyond the traditional role of LOLR in two dimensions. Instead of enabling only the weakest banks to borrow, as would be predicted by the traditional LOLR role, it enabled healthier banks to obtain funds as well. The Federal Reserve also set an additional goal of increasing the flow of credit to firms and households through increased bank lending and appears to have achieved this goal.

References

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

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

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

Armantier, O., E. Ghysels, A. Sarkar, and J. Shrader, 2011, Stigma in financial markets: Evidence from liquidity auctions and discount window borrowing during the crisis, Federal Reserve Bank of New York Working Paper.

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

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

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

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

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

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

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

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

Boyson, N.M., J. Helwege, J. Jindra, 2013, Thawing frozen capital markets and backdoor bailouts: Evidence from the Fed's liquidity programs, Working paper.

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

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

Corbett, J., and J. Mitchell, 2000, Banking crises and bank rescues: The effect of reputation, Journal of Money, Credit and Banking 32: 474-512.

Drechsler, I., T. Drechsel, D. Marques-Ibanez, P. Schnabl, 2013, Who borrows from the lender of last resort?, Working paper.

Ennis, H.M., and J.A. Weinberg, 2012, Over-the-counter loans, adverse selection, and stigma in the interbank market, Federal Reserve Bank of Richmond Working Paper.

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

Freixas, X. and B.M. Parigi, 2010, Lender of last resort and bank closure policy, in The Oxford Handbook of Banking (eds: A.N. Berger, P. Molyneux, and J.O.S. Wilson), Oxford University Press.

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

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

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

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

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

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

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

Labonte, M., 2013, Monetary policy and the federal reserve: Current policy and conditions, Congressional Research Service Report for Congress.

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

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

Mitchell, K., and D. Pearce, 1992, Discount window borrowing across Federal Reserve districts: Evidence under contemporaneous reserve accounting, Journal of Banking and Finance 16: 771-790.

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

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

Roberts, M. J., and J. R. Tybout, 1997, The decision to export in Colombia: An empirical model of entry with sunk costs, American Economic Review 87: 545-564.

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

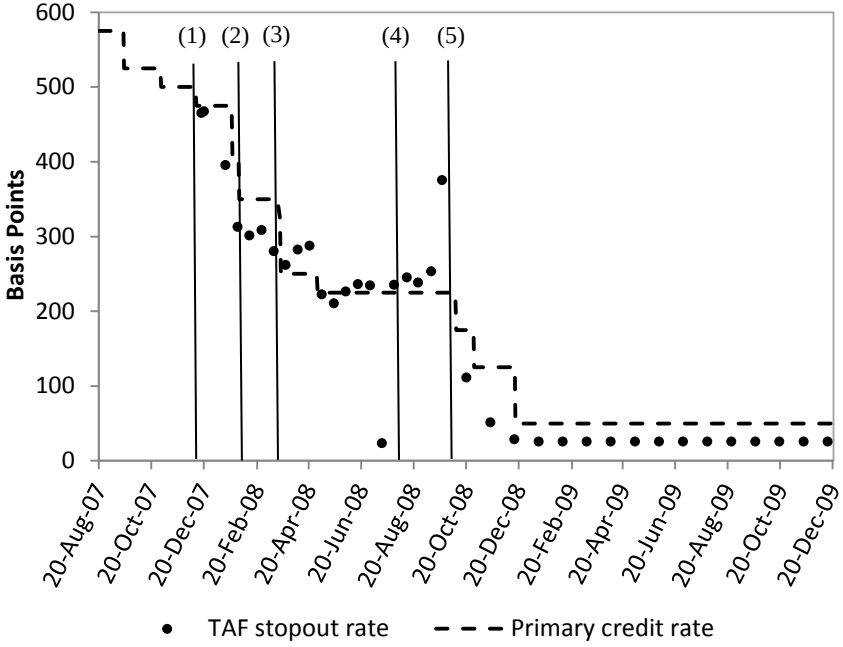
Thornton, H., 1982, An Enquiry into the Nature and Effects of the Paper Credit of Great Britain (ed: F. A. Hayek).

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

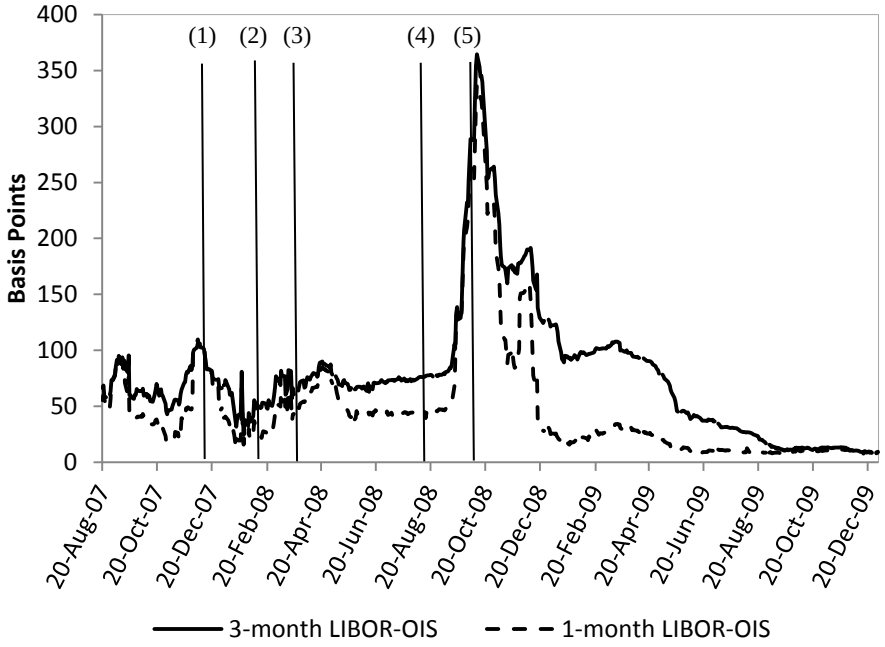
Figure 1: The cost of DW, TAF, and interbank borrowing

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

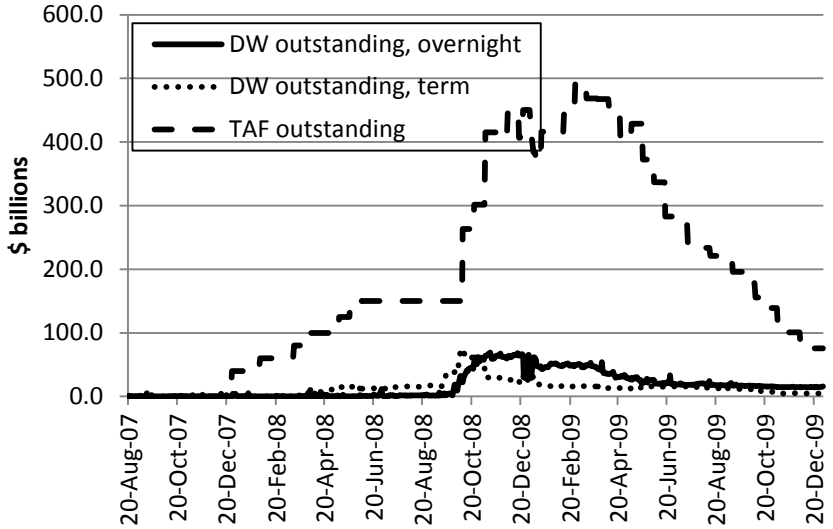


(1) TAF announced (December 12, 2007)
(2) Minimum TAF bid size reduced to $5 million (February 1, 2008)
(3) DW primary credit spread reduced to 25 bps;
maximum term extended to 90 days (March 16, 2008)
(4) 84-day TAF loans introduced (July 30, 2008)
(5) TAF auction size increased to $150 billion (October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

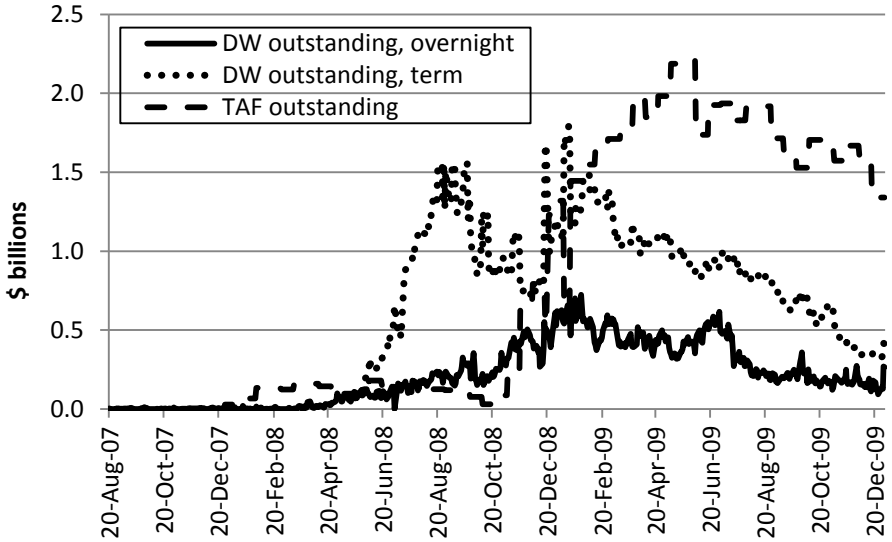
Figure 2: DW and TAF outstandings during the crisis

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. 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).

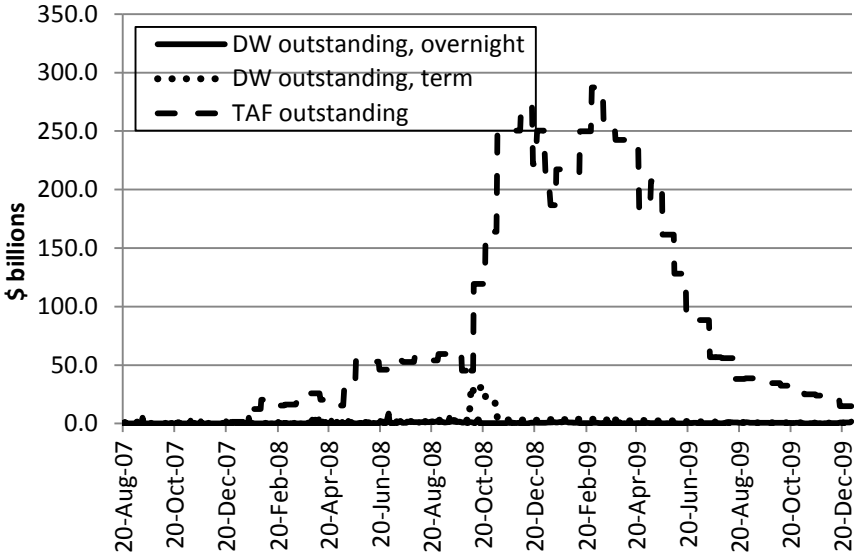
Panel A: All banks



Panel B: Small commercial banks



Panel C: Large commercial banks



Panel D: Non-commercial banks

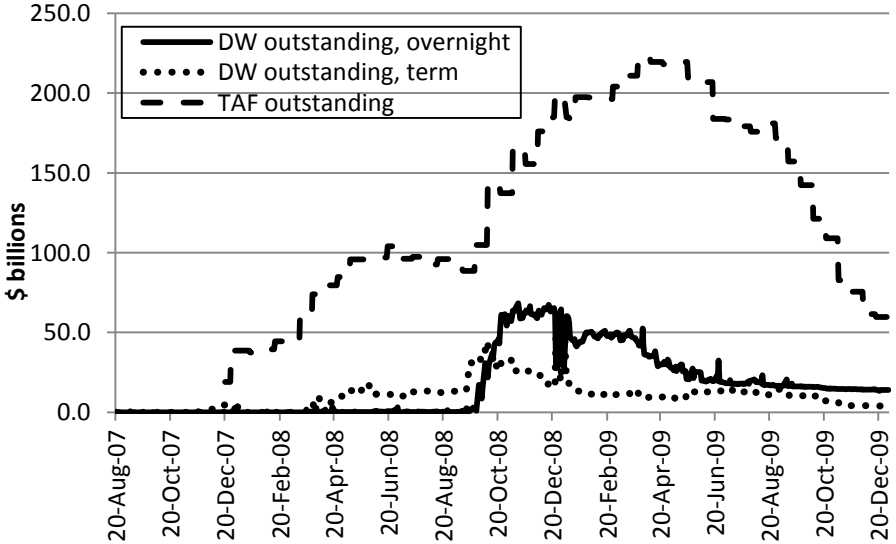


Table 1: DW and TAF issued during the crisis and the height of the crisis

This table presents DW and TAF usage during the crisis (August 20, 2007 – December 31, 2009) and the height of the crisis (September 15, 2008 – December 31, 2008). The numbers do not represent outstandings, which are shown in Figure 2.

	DWTAF	DW	TAF
Crisis:			
Number of loans	30,332	26,395	3,937
Par value of loans made ($ billions)	14,753.94	10,992.90	3,761.05
Average loan size ($ millions)	486.42	416.48	955.31
Median loan size ($ millions)	8.25	6.01	150.00
Standard deviation of loan size	2,720.72	2,808.58	1,937.22
Number of users	2,121	2,014	404
Number of users with at least one quarter of Call Report data during the crisis	1,804	1,728	283
Height of crisis:			
Number of loans	5,650	5,114	536
Par value of loans made ($ billions)	4,386.83	3,643.86	742.97
Average loan size ($ millions)	776.43	712.53	1,386.13
Median loan size ($ millions)	10.00	8.00	400.00
Standard deviation of loan size	3,830.35	3,929.76	2,629.62
Number of users	884	795	177
Number of users with Call Report data	730	677	109

Table 2: Top 10 users

This table shows the top 10 users ranked alternatively by DWTAF, DW, and TAF. 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, 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).

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

Subpanel A1: Small banks that used DWTAF, DW, and TAF most frequently during the crisis

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

Subpanel A2: Large banks that used DWTAF, DW, and TAF most frequently during the crisis

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

Subpanel A3: Non-commercial banks that used DWTAF, DW, and TAF most frequently during the crisis

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

Subpanel B1: Small banks with the highest average DWTAF, DW, and TAF outstandings (% bank size) during the crisis

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

Subpanel B2: Large banks with the highest average DWTAF, DW, and TAF outstandings (% bank size) during the crisis

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

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

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. 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). In Subpanel C1, n/a indicates that the variable (foreign owned) 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 (omitted due to reporting marginal effects). Coefficients shown are marginal effects evaluated at the means of the explanatory variables. t-statistics based on robust standard errors clustered by bank are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

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

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

Table 4: Characteristics of banks that used funds from the Federal Reserve during the *height* 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); results for DW and TAF separately are shown in Panels B and C. The height of the crisis is defined to last from September 15, 2008 – December 31, 2008. 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).

In Subpanel C1, n/a indicates that the variable dropped out of the regression because there were no small banks that met those criteria and obtained TAF funds (foreign owned, and Federal Reserve Districts 2, 3, and 12) during the height of the crisis; the number of observations is smaller as a result.

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 are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	Panel A: ***Dummy = 1 if the bank used DWTAF during the quarter***				**Panel B:** ***Dummy = 1 if the bank used the DW during the quarter***				**Panel C:** ***Dummy = 1 if the bank used the TAF during the quarter***			
	Subpanel A1: Small banks		**Subpanel A2: Large banks**		**Subpanel B1: Small banks**		**Subpanel B2: Large banks**		**Subpanel C1: Small banks**		**Subpanel C2: Large banks**	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Log(GTA)	0.034***	0.033***	0.165***	0.164***	0.034***	0.032***	0.012	0.012	0.534***	0.543***	0.113***	0.085***
	(9.41)	(8.91)	(7.38)	(7.30)	(9.34)	(8.82)	(0.73)	(0.70)	(5.38)	(5.39)	(7.92)	(5.67)
EQRAT	-0.199**		0.455		-0.191**		0.054		2.142		0.151	
	(-2.18)		(-0.63)		(-2.13)		(0.09)		(1.09)		(0.45)	
Tier1RAT		-0.191***		-0.038		-0.192***		-0.047		1.436		-1.842***
		(-3.10)		(-0.05)		(-3.14)		(-0.08)		(1.16)		(-3.55)
Stddev ROA	3.022**	3.010**	-33.720**	-30.639**	3.041**	3.052**	-20.708*	-20.135*	-109.738**	-102.907**	-10.056	-4.868
	(2.20)	(2.19)	(-2.37)	(-2.24)	(2.24)	(2.25)	(-1.78)	(-1.78)	(-2.07)	(-1.98)	(-1.35)	(-0.82)
CRE / GTA	0.061***	0.047**	0.500***	0.493***	0.056**	0.042*	0.155	0.152	1.102	1.190*	0.302***	0.194***
	(2.75)	(2.08)	(3.17)	(3.04)	(2.55)	(1.87)	(1.18)	(1.11)	(1.62)	(1.78)	(3.77)	(2.67)
MBS / GTA	0.106***	0.121***	0.914***	0.876***	0.109***	0.123***	0.706***	0.702***	1.896*	1.709*	0.079	0.054
	(3.25)	(3.66)	(2.89)	(2.78)	(3.36)	(3.77)	(2.64)	(2.65)	(1.83)	(1.69)	(0.48)	(0.36)
ROE	0.011	0.014	-0.269**	-0.239**	0.008	0.012	-0.234**	-0.228**	0.051	0.043	0.028	0.091*
	(0.73)	(0.94)	(-2.24)	(-2.03)	(0.57)	(0.80)	(-2.30)	(-2.28)	(0.10)	(0.09)	(0.47)	(1.85)
Illiquidity (LC / GTA)	0.015	0.005	0.202***	0.192**	0.016	0.006	0.066**	0.065**	-0.009	0.050	0.040**	0.040***
	(1.15)	(0.40)	(2.60)	(2.54)	(1.25)	(0.49)	(2.06)	(2.09)	(-0.03)	(0.17)	(2.35)	(2.93)
BHC dummy	0.023***	0.021***	-0.012	-0.027	0.025***	0.023***	-0.002	-0.006	-0.270	-0.255	-0.027	-0.077
	(3.40)	(3.06)	(-0.15)	(-0.32)	(3.75)	(3.38)	(-0.03)	(-0.08)	(-1.28)	(-1.16)	(-0.41)	(-0.97)
Listed dummy	0.032	0.031	0.003	0.003	0.028	0.027	0.022	0.022	0.516*	0.527**	0.045	0.039
	(1.33)	(1.31)	(0.06)	(0.05)	(1.19)	(1.17)	(0.50)	(0.50)	(1.92)	(1.96)	(1.32)	(1.35)
Foreign own dummy	-0.040**	-0.038**	-0.194**	-0.184**	-0.039**	-0.038**	-0.151**	-0.149**	n/a	n/a	0.007	0.028
	(-2.19)	(-2.05)	(-2.49)	(-2.33)	(-2.26)	(-2.09)	(-2.24)	(-2.21)			(0.13)	(0.50)

OCC dummy	0.009	0.010	0.062	0.062	0.010	0.010	0.002	0.002	-0.546**	-0.550**	0.016	0.015
	(0.91)	(0.99)	(0.87)	(0.88)	(0.95)	(1.03)	(0.03)	(0.03)	(-2.34)	(-2.35)	(0.42)	(0.46)
FDIC dummy	-0.013	-0.013	-0.001	-0.002	-0.013	-0.013	-0.036	-0.036	-0.371**	-0.380**	-0.001	0.001
	(-1.51)	(-1.48)	(-0.02)	(-0.04)	(-1.49)	(-1.47)	(-0.60)	(-0.61)	(-2.31)	(-2.37)	(-0.03)	(0.03)
Income growth	-1.265*	-1.269*	-1.668	-1.726	-1.310*	-1.316*	0.699	0.648	-9.236	-9.770	-4.267	-3.605
	(-1.77)	(-1.80)	(-0.24)	(-0.25)	(-1.84)	(-1.88)	(0.12)	(0.11)	(-0.59)	(-0.62)	(-0.91)	(-0.90)
Fed district 2	-0.025	-0.025	0.012	0.012	-0.026	-0.026	0.069	0.069	n/a	n/a	-0.002	-0.027
	(-1.18)	(-1.18)	(0.11)	(0.11)	(-1.18)	(-1.18)	(0.79)	(0.79)			(-0.03)	(-0.43)
Fed district 3	0.031	0.030	0.019	0.025	0.032	0.031	0.055	0.056	n/a	n/a	0.002	-0.039
	(1.11)	(1.08)	(0.16)	(0.21)	(1.11)	(1.08)	(0.58)	(0.58)			(0.03)	(-0.68)
Fed district 4	-0.040**	-0.040**	-0.091	-0.089	-0.040**	-0.040**	0.016	0.015	-0.127	-0.138	-0.028	-0.063
	(-2.07)	(-2.07)	(-0.76)	(-0.74)	(-2.09)	(-2.09)	(0.17)	(0.16)	(-0.32)	(-0.35)	(-0.52)	(-1.24)
Fed district 5	0.016	0.016	0.102	0.105	0.012	0.011	0.134	0.133	-0.376	-0.382	0.006	-0.028
	(0.74)	(0.72)	(0.85)	(0.88)	(0.53)	(0.52)	(1.37)	(1.37)	(-1.31)	(-1.30)	(0.10)	(-0.49)
Fed district 6	-0.022	-0.022	0.053	0.060	-0.024	-0.024	-0.010	-0.010	-0.541*	-0.547*	0.117	0.081
	(-1.15)	(-1.16)	(0.41)	(0.46)	(-1.26)	(-1.27)	(-0.10)	(-0.11)	(-1.72)	(-1.73)	(1.25)	(0.86)
Fed district 7	0.019	0.017	0.179	0.181	0.017	0.016	0.192**	0.192**	-0.589*	-0.589*	0.029	-0.009
	(0.97)	(0.90)	(1.54)	(1.55)	(0.88)	(0.81)	(2.05)	(2.04)	(-1.75)	(-1.74)	(0.46)	(-0.15)
Fed district 8	-0.011	-0.012	0.038	0.040	-0.012	-0.013	0.137	0.137	-0.126	-0.125	0.082	0.043
	(-0.57)	(-0.60)	(0.29)	(0.31)	(-0.62)	(-0.65)	(1.20)	(1.20)	(-0.49)	(-0.48)	(0.91)	(0.48)
Fed district 9	0.016	0.013	0.009	0.015	0.016	0.013	0.042	0.043	0.312	0.338	-0.039	-0.071
	(0.73)	(0.60)	(0.06)	(0.09)	(0.70)	(0.58)	(0.33)	(0.34)	(1.12)	(1.22)	(-0.79)	(-1.45)
Fed district 10	-0.015	-0.016	0.054	0.055	-0.016	-0.017	0.046	0.045	-0.387	-0.374	0.122	0.058
	(-0.80)	(-0.86)	(0.44)	(0.44)	(-0.84)	(-0.90)	(0.49)	(0.48)	(-1.27)	(-1.21)	(1.41)	(0.71)
Fed district 11	-0.036*	-0.036*	-0.036	-0.031	-0.037**	-0.037**	0.054	0.054	-0.590*	-0.603*	0.013	-0.024
	(-1.94)	(-1.94)	(-0.28)	(-0.24)	(-1.97)	(-1.97)	(0.51)	(0.51)	(-1.68)	(-1.71)	(0.18)	(-0.37)
Fed district 12	0.080***	0.081***	0.114	0.122	0.082***	0.083***	0.228***	0.229***	n/a	n/a	-0.009	-0.035
	(3.08)	(3.13)	(1.07)	(1.14)	(3.10)	(3.15)	(2.62)	(2.63)			(-0.18)	(-0.65)
Observations	6325	6325	504	504	6325	6,325	504	504	5815	5815	504	504
Pseudo R2	0.11	0.11	0.14	0.14	0.11	0.11	0.06	0.06	0.22	0.22	0.33	0.36

Table 5: The intensity with which banks used funds from the Federal Reserve during the crisis

This table examines the intensity with which banks used funds from DWTAF (Panel A), the DW (Panel B), and the TAF (Panel C), during the crisis. 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 as follows. (1) The number of times the bank used funds during the quarter. (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.

	Panel A: DWTAF usage				**Panel B: DW usage**				**Panel C: TAF usage**			
	Subpanel A1: Small banks		**Subpanel A2: Large banks**		**Subpanel B1: Small banks**		**Subpanel B2: Large banks**		**Subpanel C1: Small banks**		**Subpanel C2: Large banks**	
	# times used during the quarter	***Ave daily amount outstanding / GTA during the quarter***	***# times used during the quarter***	***Ave daily amount outstanding / GTA during the quarter***	***# times used during the quarter***	***Ave daily amount outstanding / GTA during the quarter***	***# times used during the quarter***	***Ave daily amount outstanding / GTA during the quarter***	***# times used during the quarter***	***Ave daily amount outstanding / GTA during the quarter***	***# times used during the quarter***	***Ave daily amount outstanding / GTA during the quarter***
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Log(GTA)	0.122***	0.000***	0.435***	0.002***	0.114***	0.000***	0.193***	0.000**	0.002***	0.000***	0.103***	0.001***
	(10.99)	(8.54)	(8.05)	(7.98)	(10.57)	(-8.26)	(3.83)	(2.51)	(4.25)	(4.09)	(8.30)	(6.79)
EQRAT	-0.460**	-0.001*	1.458	0.007	-0.568***	-0.001***	0.919	0.004	0.009	0.000	-0.069	-0.001
	(-2.42)	(-1.74)	(0.93)	(1.05)	(-3.00)	(-2.73)	(0.68)	(1.48)	(1.35)	(1.07)	(-0.24)	(-0.38)
Stddev ROA	2.097	0.007	-50.464*	-0.093	2.390	0.006	-42.619	-0.017	-0.086	-0.002	-2.605	-0.027
	(0.83)	(1.12)	(-1.65)	(-1.04)	(0.95)	(1.41)	(-1.47)	(-0.43)	(-1.04)	(-0.92)	(-0.57)	(-0.48)
CRE / GTA	0.187***	0.001***	2.467***	0.006***	0.164***	0.000***	1.830***	0.002**	0.007***	0.000***	0.337***	0.004***
	(3.38)	(4.10)	(4.23)	(3.39)	(2.99)	(3.46)	(3.30)	(2.02)	(3.49)	(3.42)	(3.74)	(2.89)
MBS / GTA	0.308***	0.001***	2.283***	0.008***	0.290***	0.000***	1.741**	0.003**	0.006*	0.000*	0.379***	0.004**
	(3.57)	(3.46)	(2.79)	(3.01)	(3.44)	(3.39)	(2.24)	(1.99)	(1.69)	(1.73)	(2.61)	(2.06)
ROE	0.049**	0.000**	-0.159	-0.001	0.043*	0.000**	-0.110	0.000	0.003**	0.000**	0.001	0.000
	(1.98)	(2.27)	(-0.77)	(-0.85)	(1.76)	(2.14)	(-0.56)	(0.09)	(2.42)	(2.20)	(0.02)	(0.70)
Illiquidity (LC / GTA)	0.062	0.000	0.057	0.001*	0.061	0.000	-0.101	0.000	0.000	0.000	0.046***	0.001***
	(1.45)	(1.06)	(0.74)	(1.87)	(1.47)	(1.34)	(-0.87)	(1.08)	(0.25)	(0.09)	(2.71)	(2.64)
BHC dummy	0.026	0.000	0.098	0.000	0.029	0.000	0.127	0.000	0.000	0.000	-0.031	0.000
	(1.41)	(1.29)	(0.42)	(0.30)	(1.63)	(1.57)	(0.60)	(0.49)	(0.68)	(0.56)	(-0.56)	(0.31)
Listed dummy	0.085	0.000	0.231	0.001	0.070	0.000	0.105	0.000	0.002	0.000	0.092**	0.001**
	(1.05)	(0.67)	(1.35)	(1.43)	(0.91)	(0.57)	(0.68)	(0.30)	(0.81)	(0.73)	(2.43)	(2.23)
Foreign own dummy	-0.093**	0.000	-0.034	0.001	-0.086**	0.000	-0.113	0.000	-0.002***	0.000	0.086	0.001
	(-2.50)	(1.14)	(0.13)	(0.48)	(-2.22)	(0.46)	(-0.50)	(1.17)	(-3.76)	(0.01)	(1.11)	(1.02)

OCC dummy	-0.016	-0.000*	0.178	0.000	-0.003	0.000	0.129	0.000	-0.002***	-0.000***	-0.018	0.000
	(-0.80)	(-1.70)	(0.83)	(0.32)	(-0.17)	(0.31)	(0.64)	(0.65)	(-3.14)	(-2.92)	(-0.55)	(0.45)
FDIC dummy	-0.056***	-0.000***	-0.173	0.000	-0.047**	-0.000**	-0.223	0.000	-0.001	-0.000*	-0.013	0.000
	(-2.67)	(-2.71)	(-0.92)	(0.45)	(-2.34)	(-2.27)	(-1.25)	(0.87)	(-1.54)	(-1.66)	(-0.39)	(0.00)
Income growth	0.604	0.001	9.017*	0.018	0.597	0.001	4.560	0.002	0.006	0.000	1.397	0.011
	(1.47)	(1.25)	(1.90)	(1.23)	(1.46)	(0.94)	(0.98)	(0.30)	(0.41)	(0.83)	(1.60)	(1.04)
Fed district 2	-0.073	0.000	0.162	0.001	-0.074	0.000	0.250	0.000	-0.001	0.000	0.007	0.000
	(-1.47)	(1.53)	(0.76)	(0.72)	(-1.42)	(1.46)	(1.40)	(1.42)	(-0.94)	(0.57)	(0.14)	(0.30)
Fed district 3	0.023	0.000	0.704	0.002	0.011	0.000	0.594	0.000	0.001	0.000	0.022	0.001
	(0.35)	(0.05)	(1.47)	(1.59)	(0.17)	(0.63)	(1.35)	(1.21)	(0.84)	(0.93)	(0.43)	(0.93)
Fed district 4	-0.086*	0.000	0.154	0.000	-0.115**	-0.000**	0.145	0.000	0.005	0.000	0.031	0.000
	(-1.82)	(1.13)	(0.61)	(0.47)	(-2.43)	(-2.55)	(0.69)	(0.63)	(1.54)	(1.47)	(0.57)	(0.49)
Fed district 5	-0.004	0.000	0.423	0.001	-0.035	0.000	0.455**	0.001*	0.005**	0.000*	0.029	0.000
	(-0.07)	(0.03)	(1.63)	(1.34)	(-0.70)	(1.20)	(1.97)	(1.94)	(2.02)	(1.95)	(0.51)	(0.27)
Fed district 6	-0.062	0.000	0.109	0.001	-0.071	0.000	0.058	0.000	0.001	0.000	0.056	0.001
	(-1.39)	(1.51)	(0.51)	(0.93)	(-1.52)	(1.59)	(0.32)	(0.22)	(0.68)	(0.84)	(1.05)	(1.27)
Fed district 7	0.010	0.000	0.919***	0.003***	0.003	0.000	0.876***	0.002**	0.000	0.000	0.092	0.001
	(0.21)	(0.17)	(2.80)	(2.73)	(0.06)	(0.08)	(2.96)	(2.04)	(0.74)	(0.65)	(1.37)	(1.30)
Fed district 8	-0.035	0.000	0.489	0.002*	-0.049	0.000	0.467*	0.001*	0.002	0.000	0.133	0.002
	(-0.74)	(0.62)	(1.56)	(1.74)	(-1.00)	(1.15)	(1.72)	(1.77)	(1.45)	(1.52)	(1.42)	(1.49)
Fed district 9	0.029	0.000	0.587	0.000	0.006	0.000	0.650	0.000	0.006***	0.000**	-0.044	-0.001
	(0.54)	(1.36)	(0.87)	(0.34)	(0.11)	(0.51)	(0.97)	(0.78)	(2.58)	(2.51)	(-1.29)	(-1.27)
Fed district 10	-0.082*	-0.000**	0.143	0.001	-0.094**	-0.000**	0.119	0.000	0.001	0.000	0.080	0.001
	(-1.81)	(-2.09)	(0.56)	(1.06)	(-2.00)	(-2.37)	(0.59)	(0.64)	(0.76)	(0.71)	(1.07)	(1.11)
Fed district 11	-0.137***	-0.000***	0.027	0.000	-0.145***	-0.000***	0.096	0.000	-0.001	0.000	-0.006	0.000
	(-3.10)	(-3.29)	(0.09)	(0.24)	(-3.16)	(-3.17)	(0.34)	(0.16)	(-0.93)	(0.83)	(-0.14)	(0.38)
Fed district 12	0.267***	0.001***	0.833***	0.002*	0.257***	0.000**	1.045***	0.001***	0.005*	0.000*	0.012	0.000
	(3.16)	(2.86)	(2.78)	(1.80)	(2.99)	(2.37)	(3.59)	(3.23)	(1.95)	(1.83)	(0.29)	(0.36)
Observations	63301	63257	5101	5074	63301	63257	5101	5074	56936	56892	4546	4520
Pseudo R2	0.09	0.66	0.05	-0.63	0.09	1.06	0.04	-0.23	0.17	0.35	0.15	1.32

Table 6: Do funds from the Federal Reserve substitute for or complement other funding sources?

This table reports OLS regressions which examine whether funds from DWTAF (Panel A), the DW (Panel B), and the TAF (Panel C), substitute for or complement other funding sources during the crisis. The crisis is defined to last from 2007:Q3 – 2009:Q4. Δ(DWTAF) / GTA is the change in the bank's average amount of DWTAF outstanding during the quarter normalized by lagged GTA. GTA equals total assets plus the allowance for loan and the 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 5 (with the exception of the Federal Reserve District dummies), bank and time fixed effects, and a constant (not shown for brevity). t-statistics based on robust standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent variable:	**Panel A:** ***Δ(DWTAF) / GTA***		**Panel B:** ***Δ(DW) / GTA***		**Panel C:** ***Δ(TAF) / GTA***	
	Subpanel A1: Small banks	**Subpanel A2: Large banks**	**Subpanel B1: Small banks**	**Subpanel B2: Large banks**	**Subpanel C1: Small banks**	**Subpanel C2: Large banks**
	(1)	(2)	(1)	(2)	(1)	(2)
Δ(Core Deposits)/GTA	-0.001***	0.000	-0.000***	-0.001	0.000	0.000
	(-3.88)	(0.32)	(-3.30)	(-1.22)	(1.43)	(0.27)
Δ(Fed Funds)/GTA	-0.002**	-0.008	0.000	-0.001	-0.000***	0.000
	(-2.09)	(-1.39)	(1.34)	(-0.86)	(-2.59)	(0.85)
Δ(Repos)/GTA	-0.002	-0.005	0.000	-0.002	-0.000*	0.000
	(-1.43)	(-0.80)	(0.17)	(-0.98)	(-1.84)	(0.20)
Δ(Other Hot Money/GTA	-0.002***	-0.019***	-0.001***	0.000	-0.000*	-0.001***
	(-3.20)	(-5.39)	(-3.68)	(0.18)	(-1.70)	(-5.80)
Δ(FHLB)/GTA	-0.001**	-0.011***	0.000	-0.001	-0.000***	-0.000**
	(-2.29)	(-3.09)	(0.83)	(-0.92)	(-3.51)	(-2.41)
Δ(TARP)/GTA	-0.004	0.038**	-0.002	0.004	0.000	0.003***
	(-0.92)	(2.40)	(-1.23)	(0.75)	(0.38)	(2.96)
Observations	56011	4255	56011	4255	56011	4255
R2	0.11	0.17	0.08	0.10	0.31	0.37

Table 7: Do 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. 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 A examines the effect on total bank lending, cash, and securities. 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 bank and time fixed effects and a constant (not shown for brevity). The regressions in Panel B also include a constant and the control variables included in Columns (2) in Panel A (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.

Panel A: Effect of using funds from the Federal Reserve on bank lending (*OLS results*)

Dependent variable:	***Δ(LOANS)/GTA***			
	Subpanel A1: Small banks		**Subpanel A2: Large banks**	
	(1)	(2)	(1)	(2)
Δ(DWTAF) / GTA	0.653***	0.919***	0.487***	0.941***
	(5.25)	(7.45)	(2.63)	(5.04)
Δ(Core Deposits)/GTA		0.083***		0.101***
		(14.52)		(4.14)
Δ(Fed funds)/GTA		0.462***		0.332***
		(26.42)		(5.90)
Δ(Repos)/GTA		0.142***		0.121**
		(6.13)		(2.44)
Δ(Other Hot Money)/GTA		0.250***		0.170***
		(22.08)		(4.38)
Δ(FHLB)/GTA		0.342***		0.259***
		(31.39)		(6.86)
Δ(TARP)/GTA		0.114*		-0.039
		(1.92)		(-0.38)
Log(GTA)	-0.056***	-0.041***	-0.039***	-0.030***
	(-13.72)	(-11.55)	(-4.35)	(-3.41)
EQRAT	0.252***	0.161***	0.112***	0.073*
	(7.50)	(5.21)	(3.06)	(1.74)
Stddev ROA	-0.337	-0.281	0.145	0.142
	(-1.11)	(-1.06)	(0.11)	(0.14)
CRE / GTA	-0.067***	-0.080***	-0.013	-0.057**
	(-7.29)	(-8.55)	(-0.52)	(-2.31)

MBS / GTA	0.072***	0.066***	0.063***	0.054***
	(11.54)	(11.06)	(2.73)	(3.02)
ROE	0.017***	0.016***	0.013**	0.012**
	(10.91)	(10.89)	(2.33)	(2.47)
Illiquidity (LC / GTA)	-0.006	-0.023***	0.004	0.000
	(-0.98)	(-2.99)	(0.31)	(0.02)
BHC dummy	-0.002	-0.001	0.016	0.010
	(-0.69)	(-0.33)	(1.37)	(0.99)
Listed dummy	0.013	0.010	-0.006	-0.008
	(1.56)	(1.49)	(-1.04)	(-1.26)
Foreign own dummy	0.009	0.008	0.005	0.003
	(0.69)	(0.54)	(0.67)	(0.37)
OCC dummy	-0.001	-0.001	0.000	0.011
	(-0.15)	(-0.19)	(0.04)	(0.74)
FDIC dummy	0.001	0.001	-0.005	0.006
	(0.19)	(0.24)	(-0.59)	(0.64)
Income growth	0.021	0.015	0.018	0.031
	(1.33)	(1.02)	(0.31)	(0.53)
Observations	56050	56011	4258	4255
R2	0.39	0.45	0.43	0.49

Panel B: Effect of using funds from the Federal Reserve on different types of lending (*OLS results*)

Subpanel B1: Small banks

	Effect of DWTAF usage on:					
Dependent variable:	***Δ(ST_LOANS)/GTA***	***Δ(LT_LOANS)/GTA***	***Δ(CI_LOANS)/GTA***	***Δ(CRE_LOANS)/GTA***	***Δ(RRE_LOANS)/GTA***	***Δ(OTHER_LOANS)/GTA***
	(1)	(2)	(3)	(4)	(5)	(6)
Δ(DWTAF) / GTA	0.599***	0.344***	0.153***	0.386***	0.028	0.230***
	(4.73)	(2.74)	(3.20)	(4.54)	(0.67)	(4.63)
Observations	56011	56011	56011	56011	56011	56011
R2	0.15	0.24	0.21	0.40	0.31	0.15

Subpanel B2: Large banks

	Effect of DWTAF usage on:					
Dependent variable:	***Δ(ST_LOANS)/GTA***	***Δ(LT_LOANS)/GTA***	***Δ(CI_LOANS)/GTA***	***Δ(CRE_LOANS)/GTA***	***Δ(RRE_LOANS)/GTA***	***Δ(OTHER_LOANS)/GTA***
	(1)	(2)	(3)	(4)	(5)	(6)
Δ(DWTAF) / GTA	0.349**	0.643***	0.155**	0.276***	0.092*	0.186***
	(2.31)	(2.99)	(2.17)	(3.10)	(1.66)	(2.77)
Observations	4255	4255	4255	4255	4255	4255
R2	0.21	0.28	0.26	0.51	0.35	0.21

Table 8: Do 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 lending by small banks (GTA up to $1 billion) during the crisis. 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). The crisis is defined to last from 2007:Q3 – 2009:Q4. Panel A contains the Hausman endogeneity test results for small and large banks. Panel B shows the 1st-stage regression results. Panels C and D show the 2nd-stage regression results for small and large banks, respectively. Δ(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 Δ(DWTAF) / GTA for the bank and the average of prior Δ(DWTAF) / GTA for other banks in the same Federal Reserve district.

All independent variables are defined in the Data Appendix at the end of the tables. All regressions include a constant 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.

Panel A: Hausman endogeneity test for small and large banks

	Subpanel A1: Small banks						
Dependent variable:	***Δ(LOANS) /GTA***	***Δ(ST_LOANS) /GTA***	***Δ(LT_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CRE_LOANS) /GTA***	***Δ(RRE_LOANS) /GTA***	***Δ(OTHER_LOANS) /GTA***
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Hausman endogeneity test p-value	0.00	0.18	0.00	0.25	0.01	0.30	0.01

	Subpanel A2: Large banks						
Dependent variable:	***Δ(LOANS) /GTA***	***Δ(ST_LOANS) /GTA***	***Δ(LT_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CRE_LOANS) /GTA***	***Δ(RRE_LOANS) /GTA***	***Δ(OTHER_LOANS) /GTA***
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Hausman endogeneity test p-value	0.06	0.17	0.61	0.03	0.91	0.37	0.53

Panel B: Effect of DWTAF usage on bank lending (*1st-stage IV results*)

	Small banks	**Large banks**
	Δ(DWTAF) / GTA	**Δ(DWTAF) / GTA**
Avg. of prior Δ(DWTAF)/GTA for bank	-1.485***	-1.132***
	(-17.11)	(-11.45)
Avg. of prior Δ(DWTAF)/GTA for other banks in same Fed district	0.032***	0.028
	(3.84)	(0.47)
Observations	46670	3738

Panel C: Effect of DWTAF usage on bank lending (*Small banks - 2nd-stage IV results*)

Dependent variable:	*Δ(LOANS) /GTA*	*Δ(ST_LOANS) /GTA*	*Δ(LT_LOANS) /GTA*	*Δ(CI_LOANS) /GTA*	*Δ(CRE_LOANS) /GTA*	*Δ(RRE_LOANS) /GTA*	*Δ(OTHER_LOANS) /GTA*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ(DWTAF) / GTA (instr.)	2.699***	1.093***	1.665***	0.314**	1.126***	0.164	0.800***
	(7.28)	(2.83)	(4.40)	(2.08)	(4.02)	(1.31)	(5.70)
Δ(Core Deposits)/GTA	0.083***	0.017***	0.066***	0.012***	0.057***	0.013***	-0.006***
	(14.72)	(3.45)	(12.56)	(6.30)	(17.82)	(7.23)	(-2.85)
Δ(Fed Funds)/GTA	0.443***	0.201***	0.244***	0.078***	0.173***	0.046***	0.106***
	(25.51)	(10.90)	(13.33)	(10.66)	(16.10)	(8.35)	(11.87)
Δ(Repos)/GTA	0.125***	0.041	0.078***	0.001	0.075***	0.025***	0.024**
	(5.39)	(1.47)	(2.67)	(0.10)	(4.69)	(2.80)	(2.30)
Δ(Other Hot Money)/GTA	0.240***	0.111***	0.129***	0.035***	0.106***	0.029***	0.044***
	(21.64)	(10.57)	(10.93)	(7.92)	(14.50)	(7.64)	(10.79)
Δ(FHLB)/GTA	0.331***	0.129***	0.201***	0.051***	0.138***	0.048***	0.068***
	(30.52)	(11.77)	(18.00)	(11.98)	(19.40)	(12.35)	(13.78)
Δ(TARP)/GTA	0.160***	0.146**	0.024	0.034	0.041	0.023	0.042**
	(2.83)	(2.26)	(0.33)	(1.20)	(1.12)	(1.01)	(2.23)
Log(GTA)	-0.044***	-0.020***	-0.025***	-0.007***	-0.019***	-0.006***	-0.007***
	(-11.87)	(-8.05)	(-7.49)	(-5.66)	(-7.70)	(-6.06)	(-6.45)
EQRAT	0.184***	0.055**	0.142***	0.027***	0.133***	0.029***	-0.006
	(5.58)	(2.16)	(6.16)	(2.92)	(7.43)	(4.11)	(-0.67)
Stddev ROA	-0.107	0.111	-0.229	0.169*	-0.336*	0.155*	-0.106**
	(-0.42)	(0.54)	(-0.99)	(1.85)	(-1.72)	(1.80)	(-2.21)
CRE / GTA	-0.087***	-0.019**	-0.070***	0.057***	-0.239***	0.031***	0.025***
	(-8.30)	(-2.32)	(-7.31)	(8.57)	(-20.17)	(9.07)	-4.45
MBS / GTA	0.066***	0.036***	0.030***	0.011***	0.015***	0.015***	0.019***
	(10.21)	(6.43)	(4.77)	(4.11)	(3.04)	(6.69)	(7.40)
ROE	0.013***	0.006***	0.007***	0.003***	0.009***	0.001***	0.000
	(9.22)	(4.31)	(4.23)	(4.99)	(9.09)	(2.87)	(-0.22)
Illiquidity (LC) / GTA	-0.030***	-0.025***	-0.006	-0.031***	0.044***	-0.006***	-0.019***
	(-3.34)	(-3.76)	(-0.85)	(-4.17)	(3.57)	(-3.58)	(-2.89)
BHC dummy	-0.001	0.000	0.000	0.000	-0.001	0.000	0.000
	(-0.22)	(-0.11)	(0.10)	(0.43)	(-0.26)	(-0.03)	(0.09)
Listed dummy	0.012	0.004	0.003	-0.001	0.002	0.003	0.002
	(1.63)	(0.67)	(0.46)	(-0.41)	(0.45)	(1.32)	(0.75)
Foreign own dummy	0.009	0.000	0.000	0.001	0.010	0.001	-0.004
	(0.58)	(0.00)	(0.02)	(0.26)	(0.92)	(0.38)	(-0.97)
OCC dummy	0.002	-0.002	0.006	0.002	-0.002	0.003	-0.001
	(0.38)	(-0.49)	(1.11)	(0.93)	(-0.72)	(1.62)	(-0.61)
FDIC dummy	0.001	0.000	0.003	0.000	0.001	0.001	-0.001
	(0.24)	(0.14)	(0.56)	(0.16)	(0.38)	(0.41)	(-0.77)
Income growth	0.009	0.056***	-0.046***	0.016**	-0.012	-0.023***	0.019***
	(0.63)	(3.71)	(-2.87)	(2.54)	(-1.30)	(-4.42)	(3.05)
Observations	46670	46670	46670	46670	46670	46670	46670
Angrist-Pischke weak instr. test: p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Panel D: Effect of DWTAF usage on bank lending (*Large banks - 2nd-stage IV results*)

Dependent variable:	*Δ(LOANS) /GTA*	*Δ(ST_LOANS) /GTA*	*Δ(LT_LOANS) /GTA*	*Δ(CI_LOANS) /GTA*	*Δ(CRE_LOANS) /GTA*	*Δ(RRE_LOANS) /GTA*	*Δ(OTHER_LOANS) /GTA*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ(DWTAF) / GTA (instr.)	1.968***	1.079**	0.923	0.509***	0.233	0.238	0.334
	(3.36)	(2.16)	(1.49)	(2.70)	(0.59)	(1.30)	(1.43)
Δ(Core Deposits)/GTA	0.096***	0.017	0.085***	0.015*	0.028**	0.016***	0.019**
	(4.14)	(0.99)	(3.60)	(1.82)	(2.40)	(2.72)	(2.55)
Δ(Fed Funds)/GTA	0.331***	0.207***	0.146***	0.065***	0.086***	0.067***	0.061**
	(5.75)	(4.22)	(2.60)	(2.98)	(4.99)	(3.49)	(2.26)
Δ(Repos)/GTA	0.124**	-0.067	0.196***	0.004	0.042	0.036**	0.037*
	(2.46)	(-1.19)	(3.14)	(0.18)	(1.47)	(2.56)	(1.66)
Δ(Other Hot Money)/GTA	0.173***	0.139***	0.048	0.039***	0.065***	-0.001	0.035**
	(4.14)	(4.76)	(1.24)	(3.22)	(3.90)	(-0.15)	(2.13)
Δ(FHLB)/GTA	0.259***	0.073***	0.195***	0.033***	0.093***	0.061***	0.031***
	(6.83)	(2.60)	(4.57)	(3.36)	(6.54)	(4.11)	(3.37)
Δ(TARP)/GTA	-0.072	0.128	-0.189	-0.025	-0.033	-0.001	-0.006
	(-0.69)	(1.21)	(-1.35)	(-0.57)	(-0.76)	(-0.02)	(-0.14)
Log(GTA)	-0.038***	0.003	-0.035***	-0.005	-0.012**	-0.003	-0.004*
	(-4.09)	(0.38)	(-3.86)	(-1.35)	(-2.41)	(-1.42)	(-1.71)
EQRAT	0.060*	-0.004	0.062	-0.015	-0.052*	0.048**	0.028
	(1.67)	(-0.14)	(1.37)	(-0.96)	(-1.66)	(2.07)	(1.58)
Stddev ROA	0.6	0.35	0.939	0.255	-0.671**	0.011	0.309*
	(0.64)	(0.52)	(1.00)	(0.75)	(-2.07)	(0.08)	(1.86)
CRE / GTA	-0.072***	0.008	-0.082**	0.007	-0.090***	0.004	0.007
	(-2.81)	(0.41)	(-2.21)	(0.68)	(-4.23)	(0.75)	(0.77)
MBS / GTA	0.061***	0.033**	0.028	0.020**	-0.01	0.011**	0.026***
	(3.04)	(2.10)	(1.48)	(2.40)	(-0.61)	(1.99)	(3.63)
ROE	0.011***	0.004	0.010**	0.001	0.012***	-0.001	0.000
	(2.80)	(1.37)	(2.33)	(0.34)	(6.44)	(-1.48)	(0.11)
Illiquidity (LC) / GTA	-0.001	-0.005	0.001	0.004	-0.004**	-0.003***	0.001
	(-0.12)	(-1.51)	(0.11)	(0.74)	(-2.50)	(-3.30)	(0.95)
BHC dummy	0.017*	0.000	0.013	0.006	0.003	-0.001	0.007*
	(1.66)	(0.03)	(1.19)	(0.99)	(0.92)	(-0.32)	(1.75)
Listed dummy	-0.007	0.001	-0.009	0.001	-0.004	-0.004*	-0.001
	(-0.96)	(0.17)	(-1.51)	(0.29)	(-0.88)	(-1.85)	(-0.34)
Foreign own dummy	-0.004	0.001	-0.007	0.004	0.002	-0.001	-0.007
	(-0.48)	(0.22)	(-0.71)	(1.15)	(0.50)	(-0.76)	(-1.14)
OCC dummy	0.016	0.008	0.006	0.006	0.004	-0.001	0.008
	(0.94)	(0.63)	(0.34)	(1.15)	(0.81)	(-0.65)	(0.86)
FDIC dummy	0.004	-0.012	0.015	0.003	-0.001	-0.002	0.005
	(0.39)	(-1.31)	(1.18)	(0.92)	(-0.14)	(-1.30)	(0.72)
Income growth	0.013	0.029	-0.006	0.039*	0.045*	-0.040**	-0.009
	(0.24)	(0.59)	(-0.10)	(1.93)	(1.74)	(-2.40)	(-0.33)
Observations	3738	3738	3738	3738	3738	3738	3738
Angrist-Pischke weak instr. test: p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 9: Do banks use the funds from the Federal Reserve to increase lending? Height of the crisis results

This table reports OLS regressions which examine the effect of using funds from the Federal Reserve on bank lending during the height of the crisis. The height of the crisis is defined to be 2008:Q4. ΔDWTAF 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). 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 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 are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel 1: Small banks

	Effect of DWTAF usage on:						
Dependent variable:	***Δ(LOANS) /GTA***	***Δ(ST_LOANS) /GTA***	***Δ(LT_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CRE_LOANS) /GTA***	***Δ(RRE_LOANS) /GTA***	***Δ(OTHER_LOANS) /GTA***
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ(DWTAF) / GTA	0.901***	1.082***	-0.223	0.295**	0.324*	-0.008	0.082
	(3.02)	(3.69)	(-0.84)	(2.31)	(1.76)	(-0.08)	(0.63)
Observations	6196	6196	6196	6196	6196	6196	6196
R2	0.19	0.05	0.08	0.05	0.10	0.06	0.04

Panel 2: Large banks

	Effect of DWTAF usage on:						
Dependent variable:	***Δ(LOANS) /GTA***	***Δ(ST_LOANS) /GTA***	***Δ(LT_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CRE_LOANS) /GTA***	***Δ(RRE_LOANS) /GTA***	***Δ(OTHER_LOANS) /GTA***
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ(DWTAF) / GTA	1.431***	0.883*	0.463	-0.008	0.287	0.107	0.433**
	(2.82)	(1.92)	(0.74)	(-0.08)	(1.23)	(0.81)	(2.45)
Observations	466	466	466	466	466	466	466
R2	0.31	0.13	0.16	0.18	0.21	0.16	0.12

Table 10: Do banks use the funds from the Federal Reserve to increase lending? Subsample results

This table reports OLS regressions which examine the effect of using funds from the Federal Reserve on bank lending during the crisis for different subsamples. The crisis is defined to last from 2007:Q3 – 2009:Q4. Δ(DWTAF) / GTA is the change in the bank's average amount of DWTAF outstanding during the quarter normalized by lagged GTA. GTA equals total assets plus the allowance for loan and the lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). Panel A analyzes whether similar results are obtained for large banks excluding Too-Big-To-Fail banks, alternatively defined as banks with GTA exceeding $50 billion or the 19 largest banks in each quarter. Panel B examines whether the effects are similar for banks that are listed (or part of a listed BHC) and those that are not. 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, the control variables included in Table 6 Panel A, 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.

Panel A: Large banks Excluding Too-Big-To-Fail banks

Subpanel A1: Too-Big-To-Fail defined as banks with GTA exceeding $50 billion

	Effect of DWTAF usage on:						
Dependent variable:	***Δ(LOANS) /GTA***	***Δ(ST_LOANS) /GTA***	***Δ(LT_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CRE_LOANS) /GTA***	***Δ(RRE_LOANS) /GTA***	***Δ(OTHER_LOANS) /GTA***
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ(DWTAF) / GTA	0.936***	0.258	0.742***	0.059	0.332***	0.138**	0.169***
	(4.51)	(1.60)	(3.08)	(0.86)	(3.13)	(2.29)	(2.74)
Observations	4013	4013	4013	4013	4013	4013	4013
R2	0.49	0.21	0.29	0.26	0.52	0.35	0.22

Subpanel A2: Too-Big-To-Fail defined as the 19 largest banks each quarter

	Effect of DWTAF usage on:						
Dependent variable:	***Δ(LOANS) /GTA***	***Δ(ST_LOANS) /GTA***	***Δ(LT_LOANS) /GTA***	***Δ(CI_LOANS) /GTA***	***Δ(CRE_LOANS) /GTA***	***Δ(RRE_LOANS) /GTA***	***Δ(OTHER_LOANS) /GTA***
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ(DWTAF) / GTA	0.947***	0.359**	0.645***	0.129*	0.303***	0.100*	0.207***
	(5.01)	(2.28)	(2.89)	(1.73)	(3.19)	(1.70)	(3.53)
Observations	4132	4132	4132	4132	4132	4132	4132
R2	0.49	0.21	0.28	0.26	0.52	0.35	0.22

Panel B: Listed versus unlisted banks

Subpanel B1: Small banks

Effect of DWTAF usage on:

Dependent variable:	*Δ(LOANS) /GTA*	*Δ(ST_LOANS) /GTA*	*Δ(LT_LOANS) /GTA*	*Δ(CI_LOANS) /GTA*	*Δ(CRE_LOANS) /GTA*	*Δ(RRE_LOANS) /GTA*	*Δ(OTHER_LOANS) /GTA*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ(DWTAF) / GTA	0.932***	0.574***	0.385***	0.159***	0.390***	0.016	0.239***
	(7.24)	(4.43)	(2.99)	(3.19)	(4.42)	(0.38)	(4.61)
Listed dummy	0.010	0.005	0.002	-0.001	0.004	0.000	0.002
	(1.51)	(0.91)	(0.30)	(-0.48)	(0.82)	(0.02)	(1.14)
Interaction	-0.277	0.564	-0.883	-0.118	-0.087	0.252	-0.189
	(-1.09)	(0.87)	(-1.59)	(-0.85)	(-0.34)	(1.48)	(-1.52)
Observations	56011	56011	56011	56011	56011	56011	56011
R2	0.45	0.15	0.24	0.21	0.40	0.31	0.15

Subpanel B2: Large banks

Effect of DWTAF usage on:

Dependent variable:	*Δ(LOANS) /GTA*	*Δ(ST_LOANS) /GTA*	*Δ(LT_LOANS) /GTA*	*Δ(CI_LOANS) /GTA*	*Δ(CRE_LOANS) /GTA*	*Δ(RRE_LOANS) /GTA*	*Δ(OTHER_LOANS) /GTA*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Δ(DWTAF) / GTA	1.075***	0.327	0.805***	0.235**	0.298**	0.103	0.202**
	(4.22)	(1.53)	(2.63)	(2.34)	(2.36)	(1.29)	(2.42)
Listed dummy	-0.008	0.001	-0.009*	0.001	-0.004	-0.004*	-0.001
	(-1.23)	(0.16)	(-1.69)	(0.26)	(-0.94)	(-1.77)	(-0.58)
Interaction	-0.341	0.055	-0.411	-0.202*	-0.057	-0.028	-0.042
	(-1.05)	(0.21)	(-1.13)	(-1.76)	(-0.33)	(-0.29)	(-0.33)
Observations	4255	4255	4255	4255	4255	4255	4255
R2	0.49	0.21	0.28	0.26	0.51	0.35	0.21

Table 11: Do 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 during the height of 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. 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). 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 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 are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel 1: Small banks

	Effect of DWTAF usage on:	
Dependent variable:	***Δ(CASH) / GTA***	***Δ(SECURITIES) / GTA***
	(1)	(2)
Δ(DWTAF) / GTA	0.115	0.279**
	(1.15)	(2.33)
Observations	56011	56011
R2	0.18	0.22

Panel 2: Large banks

	Effect of DWTAF usage on:	
Dependent variable:	***Δ(CASH) / GTA***	***Δ(SECURITIES) / GTA***
	(1)	(2)
Δ(DWTAF) / GTA	0.213	0.055
	(1.09)	(0.32)
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 - 11. All variables are at a quarterly frequency. The crisis lasts from 2007:Q3 – 2009:Q4. The height of the crisis lasts from September 15, 2008 – December 31, 2008 (except in Table 9 where we use quarterly Call Report data in which case we use 2008:Q4). DWTAF is DW and TAF combined, where DW is discount window, and TAF is the Term Auction Facility.

		Small		Large	
	Definition	**Mean**	**Median**	**Mean**	**Median**
Dependent variables (Tables 3-5 and Internet Appendix Table 5):					
DWTAF	= 1 if the bank used DWTAF during the quarter	0.047	0	0.223	0
DW	= 1 if the bank used the DW during the quarter	0.043	0	0.163	0
TAF	= 1 if the bank used the TAF during the quarter	0.006	0	0.089	0
Height of crisis DWTAF	= 1 if the bank used DWTAF during the height of the crisis	0.08	0	0.52	1
Height of crisis DW	= 1 if the bank used the DW during the height of the crisis	0.08	0	0.40	0
Height of crisis TAF	= 1 if the bank used the TAF during the height of the crisis	0.00	0	0.21	0
Times used DWTAF	Number of times the bank used DWTAF during the quarter	0.27	0	1.11	0
Times used DW	Number of times the bank used the DW during the quarter	0.25	0	0.88	0
Times used TAF	Number of times the bank used the TAF during the quarter	0.01	0	0.27	0
Days outstanding DWTAF	Number of days the bank had DWTAF outstanding during the quarter	0.85	0	5.74	0
Days outstanding DW	Number of days the bank had DW outstanding during the quarter	0.58	0	1.60	0
Days outstanding TAF	Number of days the bank had TAF outstanding during the quarter	0.34	0	4.87	0
Ave daily DWTAF	Average daily amount of DWTAF outstanding during the quarter normalized by the bank's GTA	0.0006	0	0.003	0
Ave daily DW	Average daily amount of DW outstanding during the quarter normalized by the bank's GTA	0.0003	0	0.0008	0
Ave daily TAF	Average daily amount of TAF outstanding during the quarter normalized by the bank's GTA	0.0003	0	0.003	0
Max daily DWTAF	Maximum daily amount of DWTAF outstanding during the quarter normalized by the bank's GTA	0.001	0	0.006	0
Max daily DW	Maximum daily amount of DW outstanding during the quarter normalized by the bank's GTA	0.001	0	0.002	0
Max daily TAF	Maximum daily amount of DW outstanding during the quarter normalized by the bank's GTA	0.0004	0	0.005	0

		Small		Large	
	Definition	**Mean**	**Median**	**Mean**	**Median**
Dependent variables (Tables 6-11):	***(All the dependent variables below are winsorized at the 1st and 99th percentiles)***				
Δ(DWTAF) / GTA	Change in the average amount of DWTAF outstanding during the quarter normalized by lagged GTA	0.0001	0.0000	0.0004	0.0000
Δ(DW) / GTA	Change in the average amount of DW outstanding during the quarter normalized by lagged GTA	0.0000	0.0000	0.0001	0.0000
Δ(TAF) / GTA	Change in the average amount of TAF outstanding during the quarter normalized by lagged GTA	0.0000	0.0000	0.0001	0.0000
Δ(LOANS) / GTA	Change in total loans normalized by lagged GTA	0.0110	0.0051	0.0032	0.0016
Δ(ST_LOANS) / GTA	Change in short-term (maturity up to 1 year) loans normalized by lagged GTA	0.0001	-0.0002	-0.0015	-0.0007
Δ(LT_LOANS) / GTA	Change in long-term (maturity exceeding 1 year) loans normalized by lagged GTA	0.0112	0.0061	0.0046	0.0029
Δ(CI_LOANS) / GTA	Change in commercial and industrial loans normalized by lagged GTA	0.0012	0.0000	-0.0002	-0.0002
Δ(CRE_LOANS) / GTA	Change in commercial real estate loans normalized by lagged GTA	0.0059	0.0017	0.0016	0.0002
Δ(RRE_LOANS) / GTA	Change in residential real estate loans normalized by lagged GTA	0.0035	0.0013	0.0010	0.0003
Δ(OTHER_LOANS) / GTA	Change in other loans normalized by lagged GTA	0.0003	-0.0001	0.0002	-0.0002
Δ(CASH) / GTA	Change in cash and due from normalized by lagged GTA	0.0043	0.0010	0.0038	0.0003
Δ(SECURITIES) / GTA	Change in securities normalized by lagged GTA	0.0021	-0.0003	0.0014	-0.0006
Independent variables:	***(All the independent variables below are lagged one quarter)***				
Log(GTA)	Natural log of GTA. 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).	11.9	11.8	15.1	14.7
EQRAT	Equity capital ratio, calculated as equity capital as a proportion of GTA	0.1118	0.0987	0.1033	0.0942
Tier1RAT	Tier 1 capital normalized by risk-weighted assets, where risk-weighted assets is the weighted sum of assets and off-balance sheet activities, with the weights based on the perceived credit risk of each activity	0.1608	0.1307	0.1161	0.1032
TotalRAT	Total capital divided by risk-weighted assets, where risk-weighted assets is the weighted sum of assets and off-balance sheet activities, with the weights based on the perceived credit risk of each activity	0.1718	0.1416	0.1306	0.1171
Stddev ROA	Standard deviation of ROA (net income normalized by GTA) over the prior 12 quarters	0.0016	0.0009	0.0018	0.0009
ALLOW LLL / GTA	Allowance for loan and lease losses divided by GTA	0.0091	0.0083	0.0111	0.0092
CRE / GTA	Commercial real estate normalized by GTA	0.2965	0.2789	0.3233	0.3246
MBS / GTA	Mortgage-backed securities normalized by GTA	0.0661	0.0331	0.0946	0.0803
ROE	Net income normalized by equity capital	0.0483	0.0751	0.0213	0.0689
ROA	Net income normalized by GTA	0.0049	0.0079	0.0031	0.0069
Illiquidity (LC / GTA)	Liquidity creation (Berger and Bouwman's (2009) "cat fat" measure) normalized by GTA	0.3087	0.3190	0.4842	0.4371

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

	Definition	Small		Large	
		Mean	Median	Mean	Median
Instruments (Table 8):					
Avg. of prior Δ(DWTAF)/GTA for bank	= Average prior change in the amount of DWTAF outstanding during the quarter normalized by lagged GTA for the bank	0.0001	0.0000	0.0004	0.0000
Avg. of prior Δ(DWTAF)/GTA for other banks in same Fed district	= Average of prior change in the amount of DWTAF outstanding during the quarter normalized by lagged GTA for other banks in the same Federal Reserve District	0.0015	0.0011	0.0013	0.0009

Internet Appendix

Discussion of Internet Appendix Table 2 Top 10 users (continued)

Internet Appendix Table 2 Panel C shows the lists of top banks that had funding outstanding on the most days. As in Panel B, there is much less 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 2 Panel D, 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 2 Top 10 users (continued)

This table shows the top 10 users ranked alternatively by DWTAF, DW, and TAF. Banks are ranked based on: days outstanding during the crisis (Panel C); and the highest daily outstandings (normalized by GTA) during the crisis (Panel D). 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 the 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.

Subpanel C1: Small banks that used DWTAF, DW, and TAF the most days during the crisis

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

Subpanel C2: Large banks that used DWTAF, DW, and TAF the most days during the crisis

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

Subpanel C3: Non-commercial banks that used DWTAF, DW, and TAF the most days during the crisis

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

Subpanel D1: Small banks with the highest DWTAF, DW, and TAF outstandings (% bank size) on a given day during the crisis

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

Subpanel D2: Large banks with the highest DWTAF, DW, and TAF outstandings (% bank size) on a given day during the crisis

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

Internet Appendix Table 5: The intensity with which banks used funds from the Federal Reserve during the crisis (continued)

This table examines the intensity with which banks used funds from DWTAF (Panel A), the DW (Panel B), and the TAF (Panel C), during the crisis. 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).

Two sets of Tobit regressions are used. The dependent variables in these regressions are as follows. (3) The number of days with funds outstanding during the quarter. (4) 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. All regressions include time fixed effects (not shown for brevity) and a constant (not shown due to reporting marginal effects). Coefficients shown are the marginal effects evaluated at the means of the explanatory variables. t-statistics based on robust standard errors clustered by bank are in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	Panel A: DWTAF usage				**Panel B: DW usage**				**Panel C: TAF usage**			
	Subpanel A1: Small banks		**Subpanel A2: Large banks**		**Subpanel B1: Small banks**		**Subpanel B2: Large banks**		**Subpanel C1: Small banks**		**Subpanel C2: Large banks**	
	# days with funds outstanding during the quarter	***Max daily amount outstanding during the quarter / GTA***	***# days with funds outstanding during the***	***Max daily amount outstanding during the quarter / GTA***	***# days with funds outstanding during the quarter***	***Max daily amount outstanding during the quarter / GTA***	***# days with funds outstanding during the quarter***	***Max daily amount outstanding during the quarter / GTA***	***# days with funds outstanding during the quarter***	***Max daily amount outstanding during the quarter / GTA***	***# days with funds outstanding during the quarter***	***Max daily amount outstanding during the quarter / GTA***
	(3)	(4)	(3)	(4)	(3)	(4)	(3)	(4)	(3)	(4)	(3)	(4)
Log(GTA)	0.324***	0.001***	2.491***	0.003***	0.228***	0.000***	0.321***	0.001***	0.050***	0.000***	1.872***	0.002***
	(12.79)	(9.68)	(11.20)	(8.65)	(12.29)	(9.67)	(3.94)	(3.29)	(4.48)	(4.19)	(8.53)	(6.99)
EQRAT	-1.052**	-0.002*	9.105	0.012	-1.101***	-0.002***	4.363	0.007	0.146	0.000	-0.801	-0.002
	(-2.00)	(-1.90)	(1.19)	(1.09)	(-2.71)	(-2.93)	(1.54)	(1.26)	(1.08)	(1.11)	(-0.17)	(-0.34)
Stddev ROA	4.188	0.015	-198.116*	-0.194	4.289	0.015	-70.527	-0.101	-1.616	-0.002	-47.511	-0.036
	(0.68)	(1.22)	(-1.81)	(-1.35)	(0.88)	(1.47)	(-1.61)	(-1.26)	(-0.95)	(-0.92)	(-0.59)	(-0.41)
CRE / GTA	0.630***	0.001***	9.118***	0.010***	0.412***	0.001***	2.918***	0.004***	0.155***	0.000***	5.729***	0.005***
	(4.32)	(4.05)	(4.83)	(3.63)	(3.62)	(3.50)	(3.35)	(2.65)	(3.76)	(3.47)	(3.60)	(2.87)
MBS / GTA	0.837***	0.002***	10.081***	0.012***	0.603***	0.001***	3.128**	0.006**	0.119*	0.000*	5.615**	0.006*
	(3.85)	(3.59)	(3.14)	(2.90)	(3.71)	(3.57)	(2.28)	(2.28)	(1.73)	(1.75)	(2.18)	(1.91)
ROE	0.170**	0.000**	-0.906	-0.001	0.111**	0.000**	-0.249	0.000	0.064**	0.000**	-0.344	-0.001
	(2.48)	(2.26)	(-1.06)	(-1.15)	(2.17)	(2.22)	(-0.74)	(0.64)	(2.55)	(2.25)	(-0.54)	(-0.78)
Illiquidity	0.149	0.000	0.512	0.001*	0.121	0.000	-0.272	0.000	0.004	0.000	0.813***	0.001***
	(1.37)	(1.17)	(1.44)	(1.85)	(1.46)	(1.26)	(-1.23)	(1.21)	(0.22)	(0.06)	(2.66)	(2.66)
BHC dummy	0.069	0.000	0.207	0.001	0.068**	0.000	0.194	0.000	-0.009	0.000	-0.497	0.000
	(1.57)	(1.35)	(0.22)	(0.48)	(2.01)	(1.56)	(0.57)	(0.77)	(-0.63)	(0.55)	(-0.51)	(0.25)
Listed dummy	0.128	0.000	1.239*	0.001	0.060	0.000	0.073	0.000	0.038	0.000	1.441**	0.001**
	(0.85)	(0.52)	(1.86)	(1.26)	(0.58)	(0.29)	(0.29)	(0.25)	(0.82)	(0.73)	(2.30)	(2.22)
Foreign own dummy	-0.226*	0.000	-0.077	0.001	-0.150	0.000	-0.391	-0.001	-0.036***	0.000	0.820	0.001
	(-1.93)	(1.31)	(-0.06)	(0.39)	(-1.34)	(0.87)	(-1.17)	(-1.05)	(-3.95)	(0.01)	(0.74)	(0.98)

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***	0.003***	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