The Evolution of Federal Reserve's Term Auction Facility and Community Bank Utilization

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Abstract

The TAF was designed to inject emergency short-term funds into all depository institutions, both large and small. We examine the evolution of the Federal Reserve's design of the Term Auction Facility (TAF), and document and describe both community and non-community FDIC insured banks usage of the facility. Our research suggests that certain aspects of the structure of the TAF were changed by the Federal Reserve, which enhanced the ability of community banks to access funds from the facility over time. However, we find that community banks were far less likely than larger, non-community banks to use the TAF as a source of funding during the financial crisis, especially in the early stages of the financial crisis.

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1. Introduction

During the worst financial crisis in decades the Federal Reserve System implemented various programs which included providing short-term liquidity to financial intermediaries, providing liquidity directly to borrowers and lenders in "key credit markets," as well as traditional open market operations.[1] One of these short-term liquidity programs, the Term Auction Facility (TAF), was intended to provide necessary liquidity to depository institutions with the aim especially of easing lending markets without the concern of a stigma that may have been attached to other programs, such as the discount window.[2] There has been a great deal of research on various aspects of the TAF program. In this paper, we seek to move this understanding forward on two fronts. First, we detail the subtle, but important ways that the Federal Reserve System worked to modify this new program to improve its efficacy over time. Prior research has characterized the new program as generally uniform from its start in December 2007 to its ending in March 2010. We show, however, that this program was modified by the Federal Reserve System in at least three important ways over time. Recognition of these changes are important as they suggest that the Federal Reserve System was itself learning over time and also reacting to changing and unfolding events and require that researchers not view the TAF period as one homogeneous episode.

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[1] Details are available at http://www.federalreserve.gov/monetarypolicy/bst_crisisresponse.htm .

[2] Details of TAF are available at http://www.federalreserve.gov/monetarypolicy/taffaq.htm . Furfine (2003) discusses the stigma associated with borrowing from the Discount Window.

Secondly, we specifically describe and document the participation of FDIC insured community and non-community banks in the TAF program. Most prior research on the TAF program has generally treated all banks as homogeneous and not singled out the smaller community banks for special consideration. However, there has recently been an increased focus on the roll that community banks play in the U.S. financial system and upon the actions of regulators toward community banks.[3] A significant amount of attention to community banks was paid by the Federal Deposit Insurance Corporation (FDIC) in its *Community Banking Study* in December, 2012. Its study sought to identify and capture the differences between community banks and non-community banks (defined as all banks that are not classified as community banks). In addition to substantial insight into the differences between community and non-community banks, the FDIC highlights the importance of community banks in which they fill a crucial gap in lending to both small businesses and agricultural borrowers. For example, during the third quarter of 2014, the FDIC reported that community banks held 45% of small loans to businesses. As of the third quarter of 2014, the FDIC identified 6,107 community banks which represent 93% of all FDIC insured institutions which hold assets of $2.0 trillion, representing 13% of industry assets.[4] Adding additional exposure to community banks, beginning in 2013, the Federal Reserve joined

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[3] Examples include a speech made by the Chair of the Board of Governors of the Federal Reserve System, Janet Yellen at the Independent Community Bankers of America 2014 Washington Policy Summit on May 1, 2014. As part of the speech, she stated "in carefully considering how our actions affect community banks, the Federal Reserve is committed to understanding your institutions and the challenges you face." See www.federalreserve.gov/newevents/speech/yellen20140501a.htm . Other examples similarly arguing for a tiered regulatory system distinguishing community banks from especially systemically important financial institutions can be found in Federal Reserve Board of Governors Daniel Tarullo speech, "A Tiered Approach to Regulation and Supervision of Community Banks," November 7, 2014. See
http://www.federalreserve.gov/newsevents/speech/tarullo20141107a.htm
[4] The report is available at https://www2.fdic.gov/qbp/2014sep/qbpcb.html.

with the Conference of State Bank Supervisors to host a conference to focus on policy and research as it relates specifically to community banks.[5]

Researchers have also shown considerable interest in examining the differences between community banks and non-community banks. For example, Hein, Koch, and MacDonald (2005) discuss the uniqueness of community banks such as their focus on relationship and human-driven transactions, interest income, and ownership structure.[6] Wilmarth (2014) also draws a sharp distinction between the business models of community banks and megabanks, and the impact of uniform banking regulation of these entities. In light of the recent focus of both regulators and academics, as well as their important role they serve in the economy, community banks continue to be an important area of research.

Several efforts have been made to quantify the impact of the TAF on different classes of banks, attempting to address the difference between how this new emergency lending system was used by community banks and other banks.[7] In our view these efforts have only crudely identified community banks and probably have made both type 1 and type 2 errors in this identification. Underlying the effort to study community banks is how to properly identify community and distinguish them from other banks. In most instances, researchers place a maximum limit on total assets (generally less than $1 billion, or sometimes less than $10 billion) as the single determining factor in deciding whether or not to classify a bank as a community bank. However, this measure

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[5] Information on the conference can be found at http://www.stlouisfed.org/banking/community-banking-conference/ .

[6] More recently, Kupiec and Lee (2012) and Wheelock and Wilson (2012) analyze the differences in returns of community banks and non-community banks. Koch (2014) discusses the operations of community banks and develops a model for community banks to follow in order to thrive in a difficult regulatory environment.

[7] Berger, Black, Bouwman, and Dlugosz (2014) examine the differences in small banks (with total assets of less than $ 1 billion and large banks. Cyree, Griffiths and Winters (2014) examine whether the TAF benefited public or private banks to a greater extent.   Blau, Hein, and Whitby (2014) examine the impact of accepting loans on stock returns around the date banks received loans.

does not capture the unique functions that a community bank undertakes. Therefore, it is important to use a measure which encapsulates the business model of a community bank. Fortunately, the FDIC created such a measure, which identifies community banks not only based on size, but also geographical and business model restrictions in order to better reflect the differences among banks.[8] We use this measure which allows us to identify the involvement of community banks within the TAF absolutely and relative to all other FDIC insured banks. While previous studies have attempted to capture the heterogeneous mix of financial institutions in the U.S., they have used cruder means to identify community banks and thus have not fully captured the differences in business models between community and other banks which are important to understanding the impact of the Federal Reserve's TAF and the role it played for community banks in particular.

Our prior belief is that the epicenter of the financial crisis occurred with large, non-community banks and TAF was designed to aid them more than community banks. Moreover, the issue of there being a stigma associated with borrowing from the Federal Reserve's discount window, the alternative to the TAF, was not likely to be a serious problem for community banks in need of short-term funding. As such, we do not anticipate that community banks would utilize the new facility nearly as much as larger, non-community banks would. This is especially likely as interbank funds were not likely to be as important for community banks.

2. The Term Auction Facility and Changes in the Auction Process

On December 12, 2007 the Federal Reserve released a statement announcing the establishment of the Term Auction Facility (TAF). At this time, banks were felt to be under liquidity pressure and the need for additional liquidity funding combined with the stigma of

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[8] The FDIC (2012) study of community banks describes in detail the process used to determine whether a bank is a community bank.

borrowing from the discount window seemed to be a binding constraint to accessible funding.[9] While the Federal Reserve had the discount window ready to lend to banks which were in need of liquidity, many sensed a reluctance of financial institutions to borrow from it due to the negative signals borrowing may send to the market.[10] A sign of this fear was the fact that banks were borrowing significantly higher amounts of short-term funds from the Federal Home Loan Banks than from the discount window (see Ashcraft, Bech and Frame (2010)). The Federal Reserve announced the facility was designed to "promote the efficient dissemination of liquidity when the unsecured interbank markets are under stress."[11]

With the announcement of the TAF, the Federal Reserve established a regular mechanism for banks in need of short term funds to borrow from the Fed for a fixed, short period of time. Since borrowing banks were engaged in a competitive auction for short-term funds, and the borrowing institution remained anonymous, it was believed that this facility would lessen the stigma felt to be associated with discount window borrow. Depository institutions that were eligible to borrow TAF funds had to be in sound financial condition and eligible to access primary credit from the discount window. Borrowing from the TAF, like discount window borrowing was fully collateralized, and each borrowing institution placed individual bids, but all winning bids paid the same close-out rate, similar to treasury auctions. The rate was determined in a Dutch auction format with a minimum rate requirement. The Federal Reserve ordered the bids it received from the highest rate to the lowest rate. The bids were submitted with the loan amount and rate willing to be paid, with total bids per bank not exceeding 10% of the total offering amount. The

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[9] From the Federal Reserve press release on December 12, 2007. The press release can be found at
http://www.federalreserve.gov/newsevents/press/monetary/20071212a.htm.
[10] Furfine (2003) suggests there exists a stigma from borrowing at the Federal Reserve discount window. Armantier, Ghysels, Sarkar, and Shrader (2011) show similar findings.
[11] Community banks generally participate in interbank markets through correspondent banks and bankers' banks.

Federal Reserve continued to fill loans up to the total offering amount, based on the amount of the loans that banks were awarded.

At the outset the Federal Reserve announced that they would be auctioning amounts of less than $75 billion in bi-weekly auctions of short-term money, and the Fed set a minimum bid rate at each auction. Originally, the term to maturity of TAF borrowing was established to generally be about 28 days and the minimum bid size by any individual borrowing bank was originally set at $10 million. When the facility began the minimum rate was equal to the expected overnight fed funds rate over the term of the loan being auctioned. This changed with the January 9th, 2009 auction, when the new minimum rate was set to equal the interest paid on excess reserves at the Federal Reserve. At each auction, a stop-out rate was established that was the minimum bid offered, which then allowed the Fed to auction off all funds it had announced to offer. In the event that loans had to be prorated at the stop-out rate, the Federal Reserve would sum all remaining loans that were bid at the stop-out rate. The Federal Reserve would then subtract the amount of all bids above the stop-out rate from the offering amount. The "Remaining Offering Amount" would then be divided by the total amount of bids made at the stop-out rate to determine the "Proration Percentage." This percentage would then be multiplied by each bid to determine the amount of the loan that each winning bid bank would receive.[12]

The TAF was set up to benefit *all* U.S. depository institutions and U.S. branches and agencies of foreign institutions that maintain deposits subject to reserve requirements.[13] This facility remained open and active until the final auction on March 8, 2010. While the Federal

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[12] This process is described in detail at the Federal Reserve's TAF FAQ.
[13] Emphasis added. This comes from the TAF background on the Board of Governors website at http://www.federalreserve.gov/newsevents/reform_taf.htm .

Reserve intended to benefit all depository institutions equally, one important question is whether the design of the facility was utilized equally by community and non-community banks.

We collect data on the features and results of each auction from the periodic Federal Reserve announcements, and use this data to further examine and summarize the evolution of the TAF. The data provided by the Fed included several aspects including the total amount of each auction, the term of the loan for that auction, the minimum bid interest rate, the minimum bid amount and the maximum award. We summarize basic features of the 60 TAF auctions conducted by the Federal Reserve over the period in Table 1. Several features of the auctions were reasonably consistent across time. For every auction, the minimum bid increment was $100,000 and the incremental change in interest rate bid submissions was 10 basis points. In general, auction amounts and other details of the upcoming auction were announced on Monday at 10:00 am, bid submission occurred an hour later from 11:00 am until 12:30 pm. Aggregate results were announced Tuesday morning, winners were notified Tuesday after the results were announced, and settlement was on Thursday.[14] TAF auctions had an average (median) total amount of funds auctioned, and thus available for bidding, or offer amount, of $92.25 ($75) billion. The average (median) rate paid on the auctions for the full period was 1.31% (0.4%), but with a sizeable variation over the time period. On average, the bid to cover ratio (or dollar amount of aggregate bids to the aggregate amount awarded) was 1.01, indicating on average over the entire program, almost every bank that bid on funds received them.

The information in Table 1 views the TAF experience as one homogeneous time period. And while other researchers have broken the TAF period into various sub periods, we have

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[14] The first six auctions—those prior to March 10, 2008—deviated slightly in that the announcement of the auction was the prior Friday, not Monday. Further, bid submissions could be made from 10:00 am until 1:00 pm.

identified three major ways that the Federal Reserve altered the nature of the facility, over its existence, other than the change in the minimum bid rate mentioned above. In particular, we recognize and document how the Federal Reserve System changed the structure of the TAF, as they considered refinements in the facility, and as the crisis grew and evolved, with three significant changes made by the Fed. Figure 1 provides our timeline of these events. The first substantial change in the TAF implemented by the Federal Reserve was when it reduced the minimum bid size from $10 million to $5 million after only four auctions. The lower minimum bid size was put in place with the February 14, 2008 auction and remained in place through the rest of the TAF existence.[15] On February 14, 2008 the Federal Reserve acknowledged the adverse impact of this bid size on smaller institutions and acknowledged that the change in minimum bid size was meant to "facilitate participation by smaller institutions."[16] As smaller institutions are generally thought of a community banks, this represents in our view admission by the Fed that the TAF process as originally designed penalized community banks, and the Fed quickly sought to lessen such adverse effects. Still, we point out that even with the lower minimum bid size there existed many banks for which a $5 million bid would be deemed large. For example, for the full existence of the facility there were always more than 2400 banks that had $100 million or less in total assets, so the institution would potentially grow more than 5% with the new funds. Still, this change was likely to aid many community banks.

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[15] This date is the settlement date of the loan, when the banks actually obtained the funds. It is the date that corresponds to the public TAF data provided by the Federal Reserve. The announcement date of the loan for this particular auction was February 11, 2008. This was the date that the Federal Reserve first announced information about the upcoming auction and solicited bids from borrowing institutions. Throughout the paper we refer to the settlement date of the loan.

[16] Federal Reserve Press release on February 1, 2008. The press release is available at http://www.federalreserve.gov/newsevents/press/monetary/20080201a.htm .

The importance of this change in TAF can be seen in Table 2, which provides information

on the number of TAF loans made below $10 million in size for various time periods, suggesting

that this change was not that big in terms of market impact. There we see that there was indeed

one loan listed in the Federal Reserve TAF data below the $ 5 million minimum prior to the Fed's

stated change in the minimum. This was simply a portion of a larger bid that was pro-rated, and

this loan was made on December 20, 2007. Still, we see that only 21 loans were awarded of less

than $10 million directly following when the minimum was lowered. Indeed the number of loans

less than $10 million remained relatively small at least until September 25, 2008. Such evidence

is consistent with the view shared by many that the epicenter of the financial crisis was large banks,

as smaller ones did not seem to be borrowing much early on. We read this evidence that the Federal

Reserve showed some sensitivity for community banks early in the evolution of the TAF by

lowering the minimum bid size, but this did not matter greatly to community banks until our last

sample period. We explore this matter more fully below.

As mentioned, the TAF was initially established with auctions having an approximate

maturity of 28 days. [17] This changed, beginning on August 14, 2008, when the Federal Reserve

made the second major change in the facility, and began auctioning off loans with maturities

generally of 84 days as a "complement to 28 day auctions."[18] The features of the longer term

auctions terms were similar except that 84 day loans required that a bank not receive more than

75% of the collateral amount posted through the TAF. The introduction of longer-term loans was

meant to allow both community and non-community banks to borrow longer-term, and there was

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[17] In general loans were designed to have a term of 28 or 84 days. However, there were deviations from this which included auctions of loans with maturities of 13, 17, 35, 42, 70, 83, and 85 days. Generally, deviations were from conflicts for holidays. For example, the loans with maturities of 13 and 17 days occurred in December of 2008.
[18] Federal Reserve press release on July 30, 2008. The press release is available at http://www.federalreserve.gov/newsevents/press/monetary/20080730a.htm.

no mention of any particular types of institutions being positively impacted by this change. Regardless, this extension in maturity of funds by the Federal Reserve is consistent with the view that the System was fearing that financial conditions continued to deteriorate, and banks of all kinds were in need of longer term funding sources.

Table 3 provides information on the maturity of various TAF auctions again for various time buckets. There we see indeed there was one auction with monies auctioned off with maturity exceeding 28 days very early on, even before the formal announced introduction of 84 days funds. This occurred on December 27, 2007, in which the Federal Reserve made the one time exception of offering 35 day term loans, as opposed to the usual 28 day term loans. Other than this one exception, there were no loans auctioned with longer than 28 day terms until the formal introduction of 84 day loans in early 2008. The table also shows that after the introduction of longer term loans about one-third of the loans made by the Federal Reserve via TAF were of the longer term nature.

In our view, the most significant Federal Reserve modification dealing with the TAF occurred on October 9, 2008, soon after the bankruptcy filing of Lehman Brothers. The week following the bankruptcy of Lehman Brothers, Reserve Primary breaking the buck, and the SEC instituting a short-sale ban on financial stocks, the Federal Reserve auctioned $75 billion.[19] The stop-out rate (the rate on the minimum winning bid) for this auction was the highest it had been since December of the prior year; it reached 3.75% with a minimum submitted bid rate of 1.94%.[20] In contrast, the previous auction stop-out rate, just two weeks prior, was 2.63% with a minimum

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[19] With the first TAF auction took place on December 17, 2007, the offering amount for this auction by the Fed was $20 billion. The offering amount steadily increased until October 9, 2008. It abruptly went from $75 billion on September 23, 2008 to $150 billion on October 9, 2008.
[20] The stop-out rate in December 2007 was 4.67% when the minimum bid rate was 4.15%.

submitted of 2.01%. In other words, during the end of September 2008, some bidders were willing to pay almost twice the minimum rate to secure a loan, indicating a significant demand for TAF loans. In apparent response to this demand and likely other signs of financial stress, the Federal Reserve increased the auction amount to $150 billion beginning with the auction on October 9, 2008, and thereafter, the amount of loans available for auction was significantly increased.[21]

With this change, every bank which submitted a bid for TAF funds received the full allotment of funds for which they bid. As such, beginning with this increased offering, we view the facility to have changes from an auction facility to a borrowing facility. In other words, after this time the availability of funds was essentially bound only by the desire of banks to receive a certain amount. The Federal Reserve continued with this amount for the next nine months and subsequently decreasing the amount offered until the final auction.[22] Given the abrupt change in features of the TAF, we use October 9, 2008 as a key breakpoint for subsequent investigation in our study. In our view, this change in the facility was quite significant and has not received the attention it deserves by researchers. This increase in auction amount, most importantly, made it possible to continue with auctions that allowed every bidder to receive a loan, regardless of their bid.

Table 4 provides evidence on the impact of this change in TAF in October 2008. Panel A provides the early period in which the maximum offered by the Federal Reserve at an auction was $75 billion, while panel B provides the latter period after which the maximum amount offered by

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[21] October 9, 2008 is the settlement date of the loan which also corresponds to the date given in the Federal Reserve data release. The bid submission date for this auction was October 6 and notification occurred the following day.
[22] The first reduction in auction offering after October 9, 2008 occurred on July 13, 2009 when the total offering amount was $125 billion. The auctions in August 2008 were for $100 billion. The auctions for 28 days and those auctions for longer periods, generally 70 days, for the remainder of the year had offering amounts of $75 billion and $25 billion respectively. The final two auctions, February 8, 2008 and March 8, 2008 decreased to $50 billion and $25 billion respectively.

the Fed at the auction was increased to $150 billion. Panel A of the table shows that the minimum bid to cover ratio was above unity in the early period, indicating that some bidders were denied funds at these auctions. However, after the increase in the maximum offering (Panel B), even the maximum bid to cover ratio was below unity, indicating that in all of these auctions every bidder was provided funds after this modification in offering amount. Each of the loans made after the increase had a rate equal to the minimum bid rate at the time of the auction. The rate was 25 basis points, the minimum bid the Federal Reserve allowed, for 27 of the 37 auctions after the increase in offering amount. In our view, the increase in offering amount at each auction after October 9, 2008 represented a paradigm shift in the Federal short-term lending policy via the TAF. Prior to this date the Fed only offered limited funds to banks, and banks frequently bid rates above the discount rate. On the other hand, after this date the Fed consistently offered more funds than the market demanded in the aggregate at the auction and the stop-out bid rate never exceeded the discount rate. As such, we are careful in our subsequent empirical analysis below to recognize this marked difference in the two time intervals.

3. Related Literature

Here we briefly highlight the institutional characteristics important to defining a community bank and discuss our preferred means of identifying community banks. We also include a brief summary of research efforts investigating various aspects of the Federal Reserve's TAF.

3.1 Researching and Identifying Community Banks

Community banks are unique (Hein, Koch, MacDonald, 2005). While most banks operate under the model of taking in deposits and making loans, the process can be much more distinct for

community banks. Relative to non-community banks, community banks tend to be smaller in terms of assets and geographic footprint, operate in more rural areas, and have higher proportions of small business loans, amongst other features.

One important characteristic of community bank operations is the focus on small business and agricultural lending. Scott (2004) finds that community financial institutions can fill an important role and give small firms access to capital markets. Kahn (2003) shows that community banks make nearly 33% of commercial loans less than $1 million while only having 19% of the share of aggregate deposits. Overall, the small business sector has relied on community banks for credit in order to thrive as an important portion of the economy (DeYoung, Hunter and Udell, 2004a).

One explanation for community banks' ability to successfully interact with small businesses is rooted in their comparative advantage in their ability to collect and evaluate soft information (Yeager, 2004). Soft information is information that is neither easily transmitted nor verified and develops through relationships over time with the business or owner (Berger and Udell, 2002). The comparative advantage community banks have over non-community banks can result from organizational diseconomies that can make it problematic for larger banks to process this type of information (DeYoung, Hunter, and Udell, 2004a). Berger and Black (2011), interestingly, find that this advantage is strongest for only the largest banks within the group of small banks. While larger banks typically engage in transactional lending, community banks generally focus on relationship loans (Berger and Udell, 2002; Hein, Koch, and MacDonald, 2005). The main reason that community banks have an advantage over non-community banks in evaluating soft information is through their development of relationships. DeYoung, Hunter, and

Udell (2004b) refer to the relationships developed by community banks as the "central principle" of community banking.

The ability of community banks to focus on relationship loans is normally associated with the effort of their loan officers. These loan officers are often engaged in two important functions, those being both the underwriting of the loan and its monitoring (Uchida, Udell, and Yamori, 2012). In non-community banks these functions are likely to be undertaken by someone outside of the community with no personal relationship with the borrower. For example, large commercial borrowers are likely to borrow from large banks which operate in many markets (Avery and Samolyk, 2004). These community ties stem from the smaller geographical footprints of community banks which allows them to collect soft information that comes from interaction (Yeager, 2004). Therefore, by being a part of the local communities, a feat that is thought to be easier if the community bank locates in a smaller geographical region, lenders are able to gather additional information which may not be conducive to the type of quantitative evaluation that may be more necessarily through product specialization in larger banks (Avery and Samolyk, 2004).

While community banks and non-community banks have many disparate qualities, researchers and policy makers typically rely on the size of the bank to determine its classification as a community bank. In essence, these size restrictions assume that all banks below a certain threshold follow the same business model (i.e. same borrowers and portfolio structure). Interestingly, researchers have not identified one universally agreed upon asset size limit to use in identifying community banks. For example, Rice and Rose (2014), who examine the impact of investment losses on community bank's lending caused by the conservatorship of Fannie and Freddie, use less than $10 billion total assets as their threshold in distinguishing community banks from other banks. On the other hand, Estes (2014) in examining the benefits of diversification on

community bank performance in the financial crisis, used less than $1 billion in total assets as the threshold for community bank identification. Previous research has acknowledged, and in some cases addressed, other differences in community banks and other commercial banks other than asset size. One of the more rich methods of community bank identification has been employed by DeYoung, Hunter, and Udell (2004a). They define community banks as those with less than $1 billion in assets (2001 dollars), which "derive half of its deposits from branches located in a single county, is domestically owned," and has a "traditional asset mix." The Federal Deposit Insurance Corporation (hereafter FDIC), has developed an even more ambitious method of identifying community banks using many different characteristics in defining community banks in an effort to distinguish the unique role they play in the economy (FDIC, 2012).

In the FDIC (2012) identification process community banks must have a ratio of loan to assets greater than 33% and core deposits to total assets greater than 50% and the identification mechanism excludes; banks that do not have loans or core deposits, have more than 10% of total assets as foreign, or have more than 50% of their assets in specialty banks. Specialty banks would include credit card specialists, consumer nonbank banks (limited charters which allow them to make loans or accept deposits, but not both), industrial loan companies, trust companies, or banker's banks. The procedure limits community banks to those FDIC insured banks that engage in activities that community banks typically engage in. The remaining banks are then limited to an indexed asset limit subject to certain restrictions. Indexed assets represent assets adjusted for time and inflation and are based on a limit of $1 billion in 2010 dollars. For banks with assets above indexed assets of $1 billion there are further restrictions that refer to basic banking activities and geographic scope. The limited geographic scope the FDIC considers allows banks to operate in no more than two of the largest MSAs (population greater than 500,000), no more than three

states, at least one but no more than 75 branches, and have no more than $5 billion of deposits at one branch. This allows for a more flexible definition as bank deposits are not limited to simply one county, which may have been the case in previous studies.

3.2. Existing Empirical Evidence on the Use of the Term Auction Facility (TAF)

Several studies examine the TAF emphasizing its differences from the discount window. Armantier, Ghysels, Sarkar, and Shrader (2011) find that banks were willing to pay an average premium of 37 basis points to avoid the stigma associated with the discount window and borrow from the TAF instead. Armantier et al. (2011) find that a 1% increase in assets reduces the discount window stigma by 5.25 basis points. They suggest that this may indicate the incidence of stigma is higher with small banks, or simply that they had limited access to other markets relative to larger banks. Gauthier, Lehar, Perez-Saiz, and Souissi (2014) hypothesize that investors might perceive borrowing from the discount window as a negative signal. They find that following the TAF program, banks that borrowed from the TAF have a 33 basis point discount in average funding costs relative to those that borrowed from the discount window. Originally, this stigma might have been propagated by the Federal Reserve's earlier requirement that banks access all other sources of available liquidity before borrowing form the discount window. Although, while this requirement ended on January 9, 2003, presumably, the stigma still remains (Furfine, 2003; Armantier, et al., 2011; Blau, Hein, and Whitby, 2014).

Other studies have analyzed the TAF with an eye to the involvement of, and impact on, different classes of banks. Cyree, Griffiths, and Winters (2014) examine public, private, "too big to fail," and investment banks. They find that private banks borrow more than public banks and suggest that there may be fewer aspects of market discipline for private banks so the cost of stigma is lower. Blau, Hein, and Whitby (2014) investigate an aspect of this market discipline by

accessing the market's ability to glean necessary information in order to impact prices. They find that, although the names of the institutions were not released until after the completion of the program, public bank stocks which accepted TAF loans had negative cumulative abnormal returns around the TAF loans. Benmelech (2012) examines the role foreign banks played in the TAF and concludes that a currency mismatch of European banks led to their large participation. In support of the extensive participation by foreign banks, Fleming (2011) found that the ten most frequent borrowers were New York branches of foreign branches. Berger, Black, Bouwman, and Dlugosz (2014) examine the differences of TAF participation within the groups of small banks and large banks. They find that small banks with total gross assets less than $1B, which did borrow from the facility were relatively weaker (as measured by earnings, returns, and portfolios) than those small banks that did not. However, large banks that borrowed were no less weak than those large banks that did not borrow.

4. New Empirical Evidence on U.S. Insured Bank Utilization of the Term Auction Facility

We turn our attention now to the use of the term auction facility by U.S. banks, but using the FDIC identification system to further distinguish community banks from other non-community banks. The Federal Reserve initially described the TAF as a way to inject much needed liquidity into the economic system through depository institutions. The question we investigate is whether there was a difference in TAF usage by community and non-community banks?

To undertake this investigation, data is acquired from several sources. First, data was obtained from the FDIC identifying all FDIC insured banks as either community or non-community banks using the aforementioned procedure which is described in detail in the FDIC's (2012) report on community banks. The FDIC determined community bank status for each year depending on particular characteristics. In our analysis, community banks are those we can

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identify using the FDIC measure as community banks for each of the four respective years in our sample. Non-community banks are those which are not community banks but have FDIC cert numbers. This FDIC identification mechanism provides us the benefit of capturing the fundamental differences in the operations of U.S. community banks versus non-community banks beyond simple size as frequently used. We also compare our results with a simple asset size identifier of community banks and find the FDIC measure superior in empirically identifying community banks.

TAF loan data for individual institutions was made available to the public by the Federal Reserve on December 1, 2010. The TAF loan data includes information on the name of the borrower, the date that credit was extended and when it was due, the loan amount and its interest rate, and information about the type and amount of collateral.[23] TAF loan data was then merged with auction results and community bank/non-community bank identifiers.[24] Of the total 4,214 TAF loans made by the Federal Reserve System, we were able to match 2,834 loans as U.S. community or non-community U.S. banks. Thus, we ignore 1,380 loans with most of those being loans to foreign banks branches (1,364) and the other16 loans made to credit unions. For those interested, Benmelech (2012) provides additional detail on foreign bank participation as foreign banks represent a different borrowing clientele.

Figure 2 provides a graphical representation of the participation of community and non-community banks by tracking the number of respective TAF borrowers in each category over time. In the figure we identify three separate time series breaks based on the prior discussion of changes

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[23] Further information about the Federal Reserve's liquidity programs is available at
http://www.federalreserve.gov/newsevents/reform_transaction.htm.
[24] We thank Ken Cyree for providing clarity in this procedure.

made in the structure of the TAF by the Federal Reserve represented by the vertical lines in the figure that portray the evolution of the structure of the TAF based on the changes in the auction process. Prior to October 9, 2008, it appears that community banks (represented by the light grey bars) were awarded few loans in auctions relative to the number of all insured banks which participated in TAF. We find that while 1,231 loans were made to community banks overall; only 91 of these occurred prior to October 9, 2008. As Figure 2 highlights, after the Federal Reserve increased the offering amount of the auctions to $150 billion in October 2008, there appears to be a significant increase in the number of community banks that participated. However, this is just part of the story as it only details the number of uses of TAF by the various classified banks, but ignores both the relative numbers of banks in each category and the dollar amounts of that usage.

While community banks received 1,231 loans altogether, there are significant differences in the total amount of loans taken by each group over the period. Table 5 provides a summary of the number of loans to community and non-community banks during the four sub-periods, as well as our full sample. [25] The table also provide the respective dollar amounts borrowed for all non-community banks and all community banks, over the same periods. Finally, the table also provides the median loan amount, the median value for loan to total assets, and the median value for loan to core deposits for both categories of banks. As detailed there, the difference in the aggregate amount of loans taken by non-community and community banks is substantial: non-community banks borrowed a total $1,753 billion over the sample whereas community banks only borrowed $68.32 billion, indicating that less than 4% of the TAF aggregate funds lent out by the Federal Reserve went to community banks. Moreover, over 85% of the community bank funds borrowed

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[25] The four periods in our sample are: (1) prior to the reduction in the minimum bid size, (2) between this reduction and the introduction of 84 day loans, (3) between the introduction of 84 day loans and the increase in auction offering amount to $150 billion, and (4) after the increase in the offering amount to $150 billion. The table also provides information for (5) the full sample from the first TAF auction to the last.

from TAF occurred after the October 1, 2008 increase in TAF offerings by the Fed. Non-community banks borrowed almost a quarter of the funds acquired from TAF before this date, evidence generally consistent with the notion that the onset of the financial crisis was large bank centered. The table also details the fact that in the post October 1, 2008 period that the median loan amount borrowed by community banks was $10 million, indicating that approximately one-half of community bank TAF loans during this period were for amounts less than the originally established minimum bid of $10 million. The table also documents the fact that median TAF loan amount relative to total assets (or core deposits) are similar for both community banks and non-community banks.

While Figure 2 highlights a significant increase in the number of community banks which participated in the TAF after October 1, 2008, it is important to remember that there are significantly more community banks than non-community banks. For example, in 2009 we find there are less than 800 non-community banks and more than 7,000 community banks. Subsequently, any increase in the number of community bank borrowings should be taken into context of the substantially larger amount of banks in this category. Therefore, in order to address the proportionate increase in community bank borrowing, we supplement the analysis with the estimation of a probit model.

5. Estimating the Probability of Utilizing the Term Auction Facility

To analyze the probability of a bank borrowing from the TAF we estimate a probit model. Given our discussion of the evolution of the facility over time, we further break the full sample into two sub-periods. [26]The first sub-period is the early interval prior to the marked increase in

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[26] Several studies examine different periods of time for which accessing the TAF could result in different expectations. For example, Berger et al. (2014) examine different periods including the "height of the crisis" from

offerings from the Fed, and the second sub-period includes the period in which the offering amount exceeded the total dollar amount of bids. We find that before October 2008, all banks had an unconditional probability of borrowing of 1.87%. This increases to 4.29% after the offering amount increase, indicating that the post September 2008 represented an increased utilization of the TAF. When we distinguish between community and non-community banks, we find a sharp difference, indicating that non-community banks found the facility relatively more useful, as a source of additional liquidity. For non-community banks the unconditional probability of using TAF was always higher, over 15% in the first period and rising to over 21% in the second period, indicating that there was almost a one in four probability that a non-community bank used TAF in any one quarter after October 2008. On the other hand, the probability of community bank borrowing in a quarter was never exceeded 3%. Indeed in looking at the sub-periods, we find that the unconditional probability of a community bank borrowing from TAF in a quarter rose from 0.34% in the early sub-period to 2.44%. This evidence is consistent with the belief that the TAF was primarily an aid to large banks, not community banks. Of course, these estimates are ignoring features that could have made the TAF more attractive to a particular bank.

To examine this matter, we develop a conditional probit model, which includes several explanatory variables in the spirit of Berger et al. (2014).[27] The explanatory variables they examine include variables to control for bank size, capital, portfolio risk, earnings and illiquidity measures.

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the period of September 15, 2008 through December 31, 2008. Cyree, Griffiths, and Winters (2014) also examine four periods with the third period corresponding to a similar point as Berger et al. (2014); they examine from September 12, 2008 through the end of 2008. In analyzing the cost of the discount window stigma, Armantier et al. (2014) focus on the period from the initiation of the TAF through September 22, 2008.

[27] Berger et al. (2014) also estimate the usage of TAF, and discount window borrowing, by both large and small banks. However, they do not directly compare the utilization of these facilities by large versus small banks, but are directly interested in the financial health of borrowers. They find evidence that smaller banks that borrowed from the Federal Reserve were in weaker financial health than non-borrowers. On the other hand, they found no such evidence for large bank borrowers.

We build on this framework, and further include an interest rate spread variable, the difference between the earlier observed primary credit discount rate and the TAF stop-out rate, to capture the financial incentive to use TAF versus the discount rate. Early on, prior to the October 2008 increase in offerings by the Federal Reserve, the stop-out TAF interest rate exceeded the discount rate, which would discourage the usage of TAF. However, after the increase the stop-out TAF rate was generally less than the discount rate which should have increased the financial incentive to use the TAF rather than the discount window.

Consistent with Berger et al. (2014), we include the Tier 1 Capital Ratio relative to risk weighted asset size to control for capital, the standard deviation of the bank's ROA, the amount of commercial real estate the bank has to total assets, and the amount of mortgage backed securities to total assets to control for portfolio risk, and ROE to control for earnings. We also include an asset size measure, but use the log of total net assets rather than the log of gross total assets. Berger et al. (2014) also use the "fatcat" measure of Berger and Bouwman (2009) to account for liquidity. This measure captures how much liquidity banks create. We instead use net non-core funding dependence (NCFD) as our measure of liquidity, since the FDIC has suggested this to be an accurate summary gauge of bank liquidity as it relates to bank failures and the use of wholesale funding.[28] This measure examines the exposure to a liquidity problem if wholesale funding were to disappear (Koch, 2014). [29]

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[28] NCFD is measured as the quotient of noncore liabilities less short-term investments and long-term assets. Noncore liabilities are the sum of uninsured deposits, other borrowed money, foreign office deposits, securities sold under agreements to repurchase, fed funds purchased, and insured brokered deposits. Short-term investments are defined as the sum of interest-bearing bank balances, federal funds sold, securities purchased under agreements to resell, and debt securities with a remaining maturity of one year or less. Long-term assets are the sum of net loans and leases, loans and leases held for sale, held-to-maturity securities, available-for-sale securities, and other real estate owned less debt securities with a remaining maturity of one year or less.

[29] Johnson (2014) provides evidence that net noncore funding dependence was particularly high for banks in Georgia and Florida, where more bank failures occurred, suggesting this is a good measure of liquidity distress for banks.

Our probit model is specified as

P(bank borrowed during quarter) = f(Log Total Assets$_{i,t}$, NCFD$_{i,t}$, Tier 1 Ratio$_{i,t}$, Standard Deviation of ROA$_{i,t}$, ROE$_{i,t}$, Spread$_t$, CRE$_{i,t}$, MBS$_{i,t}$)

The dependent variable = 1 if the bank borrowed from the Term Auction Facility (TAF) during the quarter. The independent variables used: *Log Total Assets* is the natural log of total assets. *NCFD* is the net non-core funding dependency as defined above. *NCFD* is scaled by one million to show the magnitude of the significant coefficient estimates. *Tier 1 Ratio* is the Tier 1 ratio relative to risk weighted asset size for the bank. *STD ROA* is the standard deviation of return on assets over the previous twelve quarters. *ROE* is the return on equity of the bank. *Spread* is the difference between the rate paid on a loan at the Discount Window and the stop-out rate for accepted TAF loans from the last observation from the previous quarter. *CRE* is the amount of Commercial Real Estate the bank has in its portfolio divided by total assets. *MBS* is the amount of Mortgage-Backed Securities the bank has divided by total assets. Given the significance of the change in October 2008 previously discussed, we estimate separate probit regressions for borrowing that occurred before or after the offering amount was raised to $150 B., high enough to ensure all bids were fulfilled after that.

For each sub-period we run three regressions. First, we run the regression with all FDIC insured banks. To account for different effects, we also separate the regressions allowing differ responses for non-community and community banks. This separation allows us to avoid forcing all coefficient estimates for community banks and non-community banks to be the same for our control variables. Essentially, our estimates indicate that there are significant differences between the group of community banks and the group of non-community banks. This conclusion is justified by comparing our all bank combined estimation, with a model that incorporates a dummy variable

for community banks, as well as the interaction between this dummy variable and the remaining variables in our model. A Chi^2 Test shows that the inclusion of these variables are jointly significantly different from zero. In other words, the estimation of the coefficients for community banks separate from non-community banks is justified statistically. When we test the hypothesis that there is no additional explanation by incorporating the community bank shift variables, we find a Chi^2 statistic of 24.29 before October 2008 and 67.47 after that, both with a p-value of less than one percent.

Table 6 reports the marginal effects for the explanatory variables, along with conditional probabilities, for our respective models in both sample periods, along with Z-statistics. The table reports estimates for all banks combined, but we emphasize these as such estimates constrain the marginal effects to be the same across community banks and non-community banks, a hypothesis we reject above. However, there is one conclusion that appears to holds somewhat universally: Regardless of bank classification, or sample period, larger banks borrowed more from the facility, as the coefficient on the total assets variable is always positive and statistically significant. However, even with the sign of this effect being similar for community and non-community banks, the coefficient estimates are very different absolutely, with non-community banks TAF borrowing being more sensitive to asset size.

We see many other differences between community banks and non-community banks as to the factors that influence their respective decisions to borrow from TAF. For example, while we find that NCFD is positive and marginally statistically different from zero for both community and non-community banks, after the increased offering amounts, the absolute value of the coefficients are markedly different. For non-community banks, we find that the level of liquidity, measured by the net noncore funding dependency, is less important in shaping the decision to borrow from TAF,

in comparison to community bank sensitivity. But, we can conclude that banks that faced greater liquidity problems were more likely to turn to TAF borrowing in a quarter. The coefficient on the capital ratio variable for the group of all banks is found to be negatively related to TAF borrowing. This implies that those with higher capital levels were less likely to borrow before the break; this is primarily driven by non-community banks. We generally don't find much evidence to reject the hypothesis that the return on equity or the standard deviation of the return on assets matters greatly in explaining a particular bank's usage of TAF.

The sign on the interest rate spread variable is different before October 2008 and after that, as expected, and the marginal effect is generally found to be statistically significant. When the stop-out TAF rate exceeded the discount rate, resulting in a negative spread, the marginal effect was negative, indicating that banks had a disincentive to use TAF. On the other hand, after the expansion in TAF offerings, the stop-out TAF rate was less than the discount rate, so widening of this spread lead to more borrowing, statistically significant for community banks. We also find that certain asset holdings made it more likely for banks to borrow from TAF. There is a universally positive, and generally statistically significant, relation between CRE holdings relative to total assets and TAF borrowing, suggesting that such lending exposure was associated with heightened liquidity needs that were fulfilled with TAF borrowing. Again, while the signs of this effect are similar across community and non-community banks, the estimates of the marginal effects differ greatly. Interestingly, the effect of more holdings of mortgage backed securities relative to total assets does not have the expected positive influence on TAF borrowing, for either types of bank, statistically.

5. a. Using Assets Size to Identify Community Banks

There is a great precedence in empirical research on community banks in using total asset size as a gauge of community banks, with various asset size maximums as the threshold. For direct comparison to such research, we also perform the above probit analysis using only the amount of assets of a bank as the driving variable in the determination of whether or not it is a community bank. Specifically we define those banks with less than $1 billion in total assets as "small" banks, and all other banks as "large" banks. The results of this estimation are presented in Table 7.

We find generally similar results to our primary model with a few exceptions. The most significant differences is the importance of MBS on participation. Before the break, small banks had a negative relation between MBS and participation indicating that those with lower levels of MBS were more likely to borrow. After the break, MBS is not significant for small banks, however, it is for large banks. After October, 2008 large banks with higher levels of MBS were more likely to borrow from the TAF. As for the capital ratio variable, for large banks, there is a negative relation between the Tier 1 Ratio of the bank and the probability of borrowing; this indicates that large banks with a higher Tier 1 Ratio were less likely to borrow. Additionally, the ROE for small banks is positively related to borrowing, although the absolute effect is small.

Examining the conditional probability estimates, we find that both the likelihood of participation of both large banks and small banks significantly increases after October, 2008. Large banks are estimated to have a conditional probability of borrowing before October 2008 of 11.04% which increases to 23.03%. Small banks, on the other hand, have a conditional probability of less than 0.01% and which increases to 1.27% after the increase in offering amount. Therefore, in general, we find that the increase in offering amounts by the Fed benefitted both large and small banks. However, large banks had much larger conditional probabilities of using TAF in both periods. Finally, in comparing the pseudo R-squares in table 6 and 7, we see that the FDIC

identification method seems superior to the large bank/small bank separation, in that the pseudo R-squares are generally much larger in table 6. In general, we are convinced that there is additional value to be had by using the FDIC identification of community banks, rather than simply using asset size as the identification mechanism.

6. Conclusion

The evolution of the Federal Reserve's Term Auction Facility (TAF) over its existence shows three obvious and notable changes to the program, as implemented by the Federal Reserve. The first change in the TAF involved the minimum bid for each auction. The minimum bid was initially set at $10 million for the first four auctions. This minimum bid amount was reduced to $5 million in order to facilitate community bank participation in the TAF. Of the loans that were below the initial $10 million minimum bid amount, nearly 90% of them were made to community banks. A subsequent change in the structure of the TAF of note was the introduction of 84 day loans, extending the original, shorter term of approximately 28 day loans. The final, and most significant structural change made by the Federal Reserve to the TAF, was the amount of loans the Federal Reserve was willing to auction off. Prior to October 9, 2008, every auction had many more bidders than those that received loans. This turned out to be a potential limitation on community banks' ability to access funds from the TAF. After the increased offerings with the October 9, 2008 auction, no bank that submitted a qualified bid was denied funds.

In light of these changes in the structure of the auction process, we examine the use of TAF by FDIC-insured community banks and non-community bank. We identify community banks by using the FDIC's identification system which focuses on many characteristics beyond asset size,

which are broadly indicative of a community bank. Using this definition, we find that in general community banks were far less likely to participate by borrowing via TAF than their non-community bank counterparts. Although, community bank participation evolved with the changes in the TAF and indeed increased after the Federal Reserve sharply increased its offering level, community banks never used the facility to the extent non-community banks did. Of the 4,214 TAF loans we consider, 1,231 loans were made to community banks. Apparent limitations in the structure of the TAF and the fact that the financial crisis appeared to start with large banks resulted in community banks was disproportionately using the TAF primarily after October 9, 2008. Specifically, of the 1,231 loans made to community banks only 91 were made prior to October 9, 2008. The very limited amount of liquidity provided by the Federal Reserve, and the fact that community banks did not face severe liquidity problems during the first half of the TAF appeared to have limited community banks' use of the facility early on. We find that community banks increased their utilization of the facility after the Federal Reserve sharply increased the amount it provided at each auction and as community banks faced growing liquidity problems, but still community banks never utilized the program proportionally to the extent used by non-community banks.

These results have implications for regulatory reform. First, they outline the importance of subtle features in designing liquidity programs to impact all banks and the importance of modifying such programs as economic conditions change. For example, with respect to the TAF, it appears that throughout the course of the program the Federal Reserve made several changes that facilitated ever increased accessibility to community banks, but community banks never used the facility to the extent that it served non-community banks. The results illustrate the importance of how the design of a liquidity program can influence the perception of those that participate.

While certain categories of banks may appear to choose to participate, it could be that there are impediments created from the design of the program itself. Finally, we should note that the TAF did seem to provide one benefit that is noticeable: In particular, there was very little evidence to indicate that banking panics and runs were a significant problem in the U.S. experience during the financial crisis. As such, the banking public seemed confident that even when many community banks were facing liquidity problems and even failing, this did not spawn concern about other healthy community banks.

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Table 1:

Summary Stats TAF Auctions -This table provides summary statistics for all TAF auctions. There were 60 auctions performed at the Term Auction Facility.

| **Total TAF Auctions** | | | | | | |
Variable	N	Mean	S.D.	Min	Median	Max
Offer Amount ($B)	60	92.25	49.69	20	75	150
Term	60	43.32	25.07	13	28	85
Max Bid Amount ($B)	60	9.22	4.97	2	7.5	15
Min Bid Rate (%)	60	1.14	1.13	0.2	0.4	4.17
Max Award ($B)	60	9.22	4.97	2	7.5	15
Stop Out Rate (%)	60	1.31	1.33	0.2	0.4	4.67
Total Submitted ($B)	60	71.76	35.92	3.41	74.43	142.45
Total Accepted ($B)	60	63.64	37.1	3.41	55.67	142.45
Bid to Cover Ratio	60	1.01	0.66	0.08	0.75	3.08
Number of Bidders	60	80.42	22.15	16	81	124
Pro-Rated Stop Out Rate (%)	60	82.92	29.12	1.96	100	100

Figure 1:

This timeline gives a representation of the events that shaped the rules and construction of the Term Auction Facility. The events represented: The TAF was created, minimum bid size was lowered from $10 million to $5 million, extended loan maturities were added with maturities greater than 28 days, total offering limits were raised to $150 billion to meet latent demand, and when the TAF extended its last loan.

February 14, 2008
The Federal Reserve lowers
minimum bid size from $10
million to $5 million

October 9, 2008
The Federal Reserve
raises offering limit
from $75 Billion to $150
Billion

December 12, 2007
The Federal Reserve
establishes Term Auction
Facility

Aug 14, 2008
The Federal Reserve offers
84 day loans for first time

March 11, 2010
The Federal Reserve extends
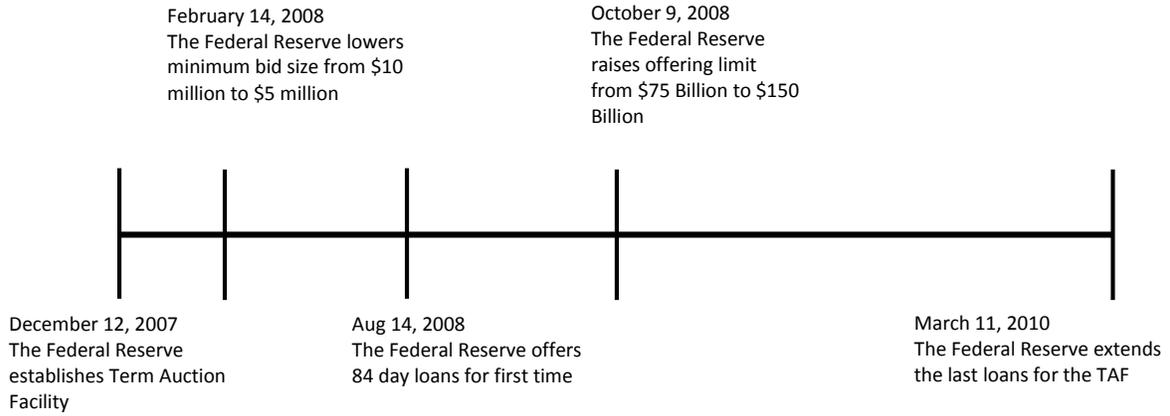the last loans for the TAF

Table 2:

This table presents the number of loans taken within each of the four periods of the TAF by its loan amount. We report the number of loans with amounts less than $10 million and greater than or equal to $10 million for simplicity. The minimum bid amount was reduced on February 14, 2008. The loans from time period (1) were received before the adjustment from the minimum bid being $10 million but prior to time period (2). The loans from time period (2) were received after the minimum bid is lowered to $5 million but prior to time period (3). The loans from time period (3) were received after 84 day loans are made available but prior to time period (4). The loans from time period (4) were received after the total offering amount is raised initially to $150 billion.

Time Period	Less than $10 Million	Greater than or equal to $10 Million
(1) Before Feb 14, 2008	1	135
(2) Feb 14 to July 31, 2008	21	639
(3) Aug 14 to Sep. 25, 2008	10	204
(4) After October 1, 2008	488	2,716
Total Loans	520	3,694

* There was one pro-rated loan below $10 million given December 20, 2007.

Table 3:

This table presents the number of loans taken within each of the four periods of the TAF by its maturity. We report the number of loans with maturities of 28 days or less and more than 28 days for simplicity. Loans with longer maturities were offered beginning August 14, 2008. The loans from time period (1) were received before the adjustment from the minimum bid being $10 million but prior to time period (2). The loans from time period (2) were received after the minimum bid is lowered to $5 million but prior to time period (3). The loans from time period (3) were received after 84 day loans are made available but prior to time period (4). The loans from time period (4) were received after the total offering amount is raised initially to $150 billion.

Time Period	Maturity of 28 days or less	Maturity greater than 28 days
(1) Before Feb 14, 2008	112	24
(2) Feb 14 to July 31, 2008	660	0
(3) Aug 14 to Sep. 25, 2008	163	51
(4) After October 1, 2008	1,856	1,348
Total Loans	2,791	1,423

* December 27, 2007 there was an auction of 35 day term loans with 24 loans extended.

Table 4:

This table provides summary statistics for TAF auctions. Panel A shows auctions before the October 1st, 2008 auction. Panel B shows the October 1st, 2008 and all subsequent auctions from the TAF.

Panel A: Before Limit Increase						
Variable	N	Mean	S.D.	Min	Median	Max
Offer Amount ($B)	23	50.43	22.25	20	50	75
Max Bid Amount ($B)	23	5.04	2.23	2	5	7.5
Min Bid Rate (%)	23	2.43	0.72	1.94	2.04	4.17
Stop Out Rate (%)	23	2.87	0.73	2.1	2.67	4.67
Total Submitted ($B)	23	71.6	23.63	13.56	84.17	96.62
Total Accepted ($B)	23	50.43	22.25	20	50	75
Bid to Cover Ratio	23	1.69	0.54	1.12	1.77	3.08
Number of Bidders	23	71.26	12.86	38	73	93
Pro-Rated Stop Out Rate (%)	23	55.44	31.54	1.96	64.1	98.87

Panel B: After Limit Increase						
Variable	N	Mean	S.D.	Min	Median	Max
Offer Amount ($B)	37	118.24	43.96	25	150	150
Max Bid Amount ($B)	37	11.82	4.4	2.5	15	15
Min Bid Rate (%)	37	0.34	0.24	0.2	0.25	1.39
Stop Out Rate (%)	37	0.34	0.24	0.2	0.25	1.39
Total Submitted ($B)	37	71.85	42.11	3.41	66.47	142.45
Total Accepted ($B)	37	71.85	42.11	3.41	66.47	142.45
Bid to Cover Ratio	37	0.58	0.22	0.08	0.61	0.95
Number of Bidders	37	86.11	24.82	16	91	124
Pro-Rated Stop Out Rate (%)	37	100	0	100	100	100

Figure 2:

This bar graph gives a graphical representation of the raw number of banks that took loans from the Term Auction Facility broken down by community and non-community banks. The dark fill represents non-community banks with the light fill (top of the bars) represents community banks. The three vertical lines represent breakpoints of changes in how the TAF was constructed. The first line was when the minimum bid was lowered from $10 million to $5 million. The second line represents when 84 day loans became available. The final vertical line is when the total offering limit was raised high enough to meet latent demand and the bid-to-cover ratio fell to below 1.0.
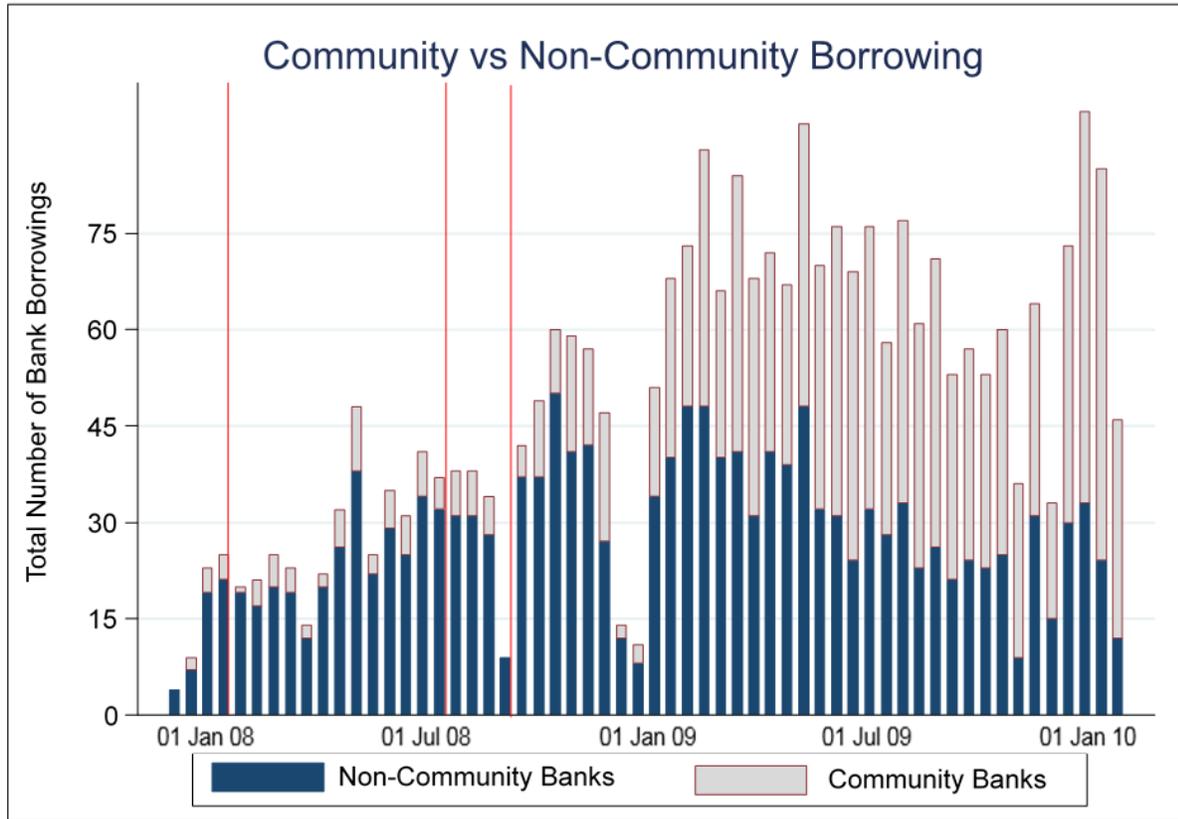
Table 5:

This table shows the amount, number, median loan amount, median loan amount to total assets, and the median loan amount to core deposits of loans taken between community and non-community banks separated by four distinct periods. The Federal Reserve made three main adjustments to the parameters of borrowing from the TAF. The loans from time period in column 2 come before the adjustment from the minimum bid being $10 million but prior to time period in column 3. The loans from column 3 come after the minimum bid is lowered to $5 million but prior to time period in column 4. The loans from column 4 come after 84 day loans are made available but prior to time period in column 5. The loans from column 5 come after the total offering amount is raised initially to $150 billion. This limit fluctuates through the end of the program but is always higher than the total amount of bids for each offering. The gross (total) borrowing amount for each sub period is listed in $billions with a sum in the final column. The average borrowing amount for each loan within in each sub period is in $millions.

	Sub periods				Full Sample
	Dec. 1, 2007 to Feb. 13, 2008	Feb. 14, 2008 to July 31, 2008	Aug. 14, 2008 to Sep. 25 2008	Oct 1, 2008 to Mar. 31, 2010	Dec. 1, 2007 to Mar. 31, 2010
Non-Community Banks					
Total Amount ($ billion)	$27.99	$268.62	$109.72	$1,346.79	$1,753.12
Number of Borrowings	51	313	99	1,140	1,603
TAF Loan Amount ($ mil)	$200	$240	$430	$150	$150
TAF Loan to Total Assets	.0116	.0146	.0146	.0225	.0202
TAF Loan to Core Deposits	.0199	.0245	.0265	.0384	.0344
Community Banks					
Amount ($ billion)	$0.161	$7.21	$2.77	$58.18	$68.32
Number of Borrowings	10	61	20	1,140	1,231
TAF Loan Amount ($ mil)	$14	$17	$12.5	$10	$11
TAF Loan to Total Assets	.0168	.0165	.0108	.0287	.0278
TAF Loan to Core Deposits	.0241	.0256	.0166	.0454	.0440

Table 6:

This table shows the results of a probit regression with the dependent variable = 1 if the bank borrowed from the Term Auction Facility (TAF) during the quarter. There are two panels separated by whether the TAF borrowing occurred before or after the offering amount was raised (to $150 B.) high enough to ensure all bids were fulfilled. Columns 2, 3, and 4 come before the limit increase. While columns 5, 6, and 7 occur after the increase. For each subsection we run three regressions. Columns 2 & 5 contain total bank quarters. Columns 3 & 6 represent only banks with assets above $1 billion. Columns 4 & 7 represent only banks with assets below $1 billion. The conditional and unconditional probabilities for each regression are shown in rows 2 & 3. All regressions are clustered by bank. For ease of interpretation the marginal effects are shown. Z-stats are shown in parentheses. *Log Total Assets* is the natural log of total assets. *NCFD* is the Non-Core Funding Dependency as calculated by the FDIC. *Tier 1 Ratio* is the Tier 1 ratio for the bank. *STD ROA* is the standard deviation of return on assets. *ROE* is the return on equity of the bank. *Spread* is the difference between interest rate made on loans at the Discount Window at the end of the previous quarter and the interest rate on the TAF loan at the same point. *CRE* is the level of the bank's commercial real estate divided by its total assets. *MBS* is the level of the bank's mortgage backed securities divided by total assets.

	Before October 1, 2008			After October 1, 2008		
Unconditional	.0187	.1504	.0034	.0429	.2163	.0244
Conditional	.0003	.0073	.0001	.0193	.1689	.0121
	All Banks	Non-Comm.	Comm.	All Banks	Non-Comm.	Comm.
Log Total Assets	0.001	0.008	0.000	0.019	0.073	0.014
	(12.05)	(6.24)	(8.57)	(18.90)	(9.34)	(9.61)
NCFD	-0.000	-0.000	-0.012	0.002	0.024	1.893
	(-1.19)	(-1.21)	(-1.48)	(1.36)	(1.79)	(1.82)
Tier 1 Ratio	-0.009	-0.149	-0.002	-0.012	-0.001	-0.013
	(-2.58)	(-2.76)	(-1.01)	(-0.51)	(-0.05)	(-0.74)
STD ROA	0.009	-0.334	0.006	-0.107	-4.719	0.197
	(0.54)	(-0.57)	(1.28)	(-0.56)	(-2.58)	(1.29)
ROE	0.000	-0.005	0.000	0.000	-0.007	0.000
	(1.34)	(-0.34)	(1.87)	(0.72)	(-0.73)	(0.79)
Spread	-0.001	-0.024	-0.001	0.009	0.012	0.009
	(-2.70)	(-1.95)	(-3.58)	(5.57)	(0.82)	(6.10)
CRE	0.005	0.082	0.001	0.213	1.835	0.090
	(3.84)	(2.37)	(1.38)	(4.39)	(2.93)	(2.18)
MBS	-0.062	-0.585	-0.058	0.574	-0.720	0.448
	(-1.47)	(-0.79)	(-1.79)	(1.38)	(-0.20)	(1.26)
Pseudo R²	.5159	.3498	.2976	.2541	.1856	.1525
Wald Chi²	248.25	101.38	114.52	473.90	122.27	192.43
N	22,633	2,361	20,272	44,459	4,300	40,159

Table 7:

Probit model using $1 billion in assets as the demarcation of a small or large bank. This table shows the results of a probit regression with the dependent variable = 1 if the bank borrowed from the Term Auction Facility (TAF) during the quarter. There are two panels separated by whether the TAF borrowing occurred before or after the offering amount was raised (to $150 B.) high enough to ensure all bids were fulfilled. Columns 2, 3, and 4 come before the limit increase. While columns 5, 6, and 7 occur after the increase. For each subsection we run three regressions. Columns 2 & 5 contain total bank quarters. Columns 3 & 6 represent only banks with assets above $1 billion. Columns 4 & 7 represent only banks with assets below $1 billion. The conditional and unconditional probabilities for each regression are shown in rows 2 & 3. All regressions are clustered by bank. For ease of interpretation the marginal effects are shown. Z-stats are shown in parentheses. *Log Total Assets* is the natural log of total assets. *NCFD* is the Non-Core Funding Dependency as calculated by the FDIC. *Tier 1 Ratio* is the Tier 1 ratio for the bank. *STD ROA* is the standard deviation of return on assets. *ROE* is the return on equity of the bank. *Spread* is the difference between interest rate made on loans at the Discount Window at the end of the previous quarter and the interest rate on the TAF loan at the same point. *CRE* is the level of the bank's commercial real estate divided by its total assets. *MBS* is the level of the bank's mortgage backed securities divided by total assets.

	Before October 1, 2008			After October 1, 2008		
Unconditional	.0187	.1895	.0036	.0429	.2568	.0220
Conditional	.0003	.1104	.0000	.0193	.2303	.0127
	All Banks	> 1B	< 1B	All Banks	> 1B	< 1B
Log Total Assets	0.001	0.088	0.000	0.019	0.102	0.014
	(12.05)	(7.83)	(3.25)	(18.90)	(7.51)	(8.28)
NCFD	-0.000	-0.004	-0.001	0.002	0.017	0.608
	(-1.19)	(-1.11)	(-1.04)	(1.36)	(1.67)	(1.22)
Tier 1 Ratio	-0.009	-2.399	-0.000	-0.012	-1.207	0.001
	(-2.58)	(-3.30)	(-1.22)	(-0.51)	(-2.18)	(1.07)
STD ROA	0.009	3.961	-0.000	-0.107	-0.649	-0.018
	(0.54)	(0.87)	(-0.18)	(-0.56)	(-0.31)	(-0.10)
ROE	0.000	0.086	0.000	0.000	0.004	0.000
	(1.34)	(0.55)	(2.63)	(0.72)	(0.52)	(0.80)
Spread	-0.001	-0.315	-0.000	0.009	0.002	0.011
	(-2.70)	(-2.47)	(-0.84)	(5.57)	(0.13)	(6.75)
CRE	0.005	0.869	0.000	0.213	1.054	0.140
	(3.84)	(2.66)	(2.45)	(4.39)	(1.54)	(3.64)
MBS	-0.062	2.012	-0.037	0.574	11.047	0.052
	(-1.47)	(0.37)	(-2.41)	(1.38)	(2.09)	(0.12)
Pseudo R²	.5159	.3151	.2774	.2541	.1335	.1018
Wald Chi²	248.25	104.37	79.79	473.90	77.49	154.07
N	22,633	1,836	20,797	44,459	3,964	40,495