Decision-Making during the Crisis:

Why did the Treasury let Commercial Banks fail?

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This Draft: June 21, 2014

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Abstract

Although commercial banks represent a substantial number of the banks bailed-out by the US Treasury under the TARP Capital Purchase Program (CPP) or subject to FDIC receivership in the wake of the credit crisis, their fate has only attracted scarce attention. We investigate two related research questions. One is whether CPP funds were allocated to commercial banks that proved to be non-viable. The other is whether the non-allocation of CPP funds forced viable commercial banks into FDIC receivership.

Our data show almost no overlap between CPP-funded and FDIC-resolved commercial banks, which is attributable to failing banks being easily identifiable as early as 2006. Moreover, it appears that CPP funding was driven by bank age, size, cash holdings, asset performance and deposit type. We provide evidence that lack of CPP funding resulted in a significant number of viable commercial banks being forced into FDIC receivership. This is attributable to excessive reliance upon financial ratios and deficient comparison of funding and resolution costs. While we do not claim to make any policy implications on the optimality of bail-outs per se, our results suggest that if a bail-out program is already on the table, its aim should be to rescue as many banks as possible.

JEL classification: G21, G28, G33, K23, K29

Keywords: Resolution, Bail-out, Commercial Bank, CPP, Financial crisis, Bankruptcy.

*We thank Jean-Charles Rochet, David Skeel and participants in the 2103 ETH Zurich Law & Finance Seminar, 2014 Virginia Law School Law & Finance Seminar, 2014 ESCP Law & Finance Seminar, 2014 Lund University Seminar and 2014 NYU-ETH Zurich Law & Banking Conference for their comments.

1. Introduction

Since September 15, 2008, the day Lehman Brothers filed a petition seeking relief under chapter 11 of the US Bankruptcy Code, the Federal Deposit Insurance Corporation (FDIC) has been appointed as receiver for almost 500 banks.[1] This is more than ten times the number of banks subject to FDIC receivership during the expansion period that preceded the credit crisis (40 banks failed between October 2000 and September 15, 2008).

[Please insert Figure 1 about here]

It is an open question whether this large increase in FDIC interventions is related to the decisions taken during the 2007-08 financial crisis by the US Treasury, and in particular by its management of the Capital Purchase Program (CPP). In handling the CPP, the Treasury had to avoid two types of mistakes: (i) subsidizing banks that were not viable; (ii) not assisting banks that were viable. Philippon and Schnabl (2013) argue that the Treasury's approach is consistent with the solution proposed in a theoretical model, which calls for cash injections in exchange for preferred stock and warrants and for limiting the participation in the program to a small number of large banks. They also claim that this solution minimizes macroeconomic as well as informational rents.[2]

Theoretically, the proper way to deal with a still *viable* bank facing financial or other difficulties is to have the state intervene in special circumstances and provide some form of state aid (as in the case of the CPP).[3] By contrast, when the bank is *not viable*, it should be restructured or wound-down. However, insuring for the continuation of essential services often requires the state to provide financial support to banks that may not be viable, especially if their failures may lead to a bank-run and result in the so-called too-many-to-fail effect (Brown and Dinc, 2011). In addition, pressures by politicians worried about the impact of bank failure upon their constituency can lead to

[1] See FDIC, List of failed banks, available at fdic.gov (as of January 16, 2014).

[2] In Philippon and Schnabl (2013), macroeconomic rents accrue to banks that do not participate in the program but benefit from the reduction in aggregate credit risk because of other banks' participation. Informational rents are enjoyed by banks that participate opportunistically in the program.

[3] For a literature review, see Bolzico et al. (2007); Mishkin (2000).

the bailout of non-viable banks (Blau et al. 2013), even though this kind of state aid is likely to merely delay resolution or liquidation. This is not only increasing the costs of subsequent FDIC intervention (Liu and Ngo, 2014), but is also likely to generate fire sales of bank assets that, in turn, affects the viability of additional banks (Caballero and Simsek, 2013).

These considerations highlight the practical importance of the viability decisions made by the Treasury during the credit crisis: (i) were CPP funds allocated to non-viable banks? (ii) was the non-allocation of CPP funds a determinant factor of FDIC receivership for viable banks? Related to this, there is also the issue of whether the Treasury took optimal decisions once we properly account for the cost of FDIC interventions—in particular in view of the FDIC often carrying 80% of the losses resulting from the sale of resolved bank assets.[4]

This paper empirically investigates the decisions government officials took to accepting some banks into the CPP program and not supporting others that were thereafter subject to resolution. Our focus is on commercial banks, especially smaller ones, rather than on bank holding companies (BHCs). In fact, it is important to note that although CPP has often been characterized as a large bank program, over half of the 707 applications approved and funded by the Treasury were submitted by institutions with less than $500 million in assets (Cornett et al., 2013). Limiting the analysis to commercial banks allows for a cleaner comparison of CPP bail-outs, which targeted bank holding companies as well as commercial banks, and FDIC resolutions, which were limited to commercial banks.[5]

[4] During the crisis there was a serious risk that the Treasury had to finance FDIC, even though FDIC is financed by the banks themselves, due to implicit government guarantees. This was pointed out by chairman Sheila Bair saying that FDIC had the ability to borrow up to $500 billion from the Treasury and suggesting that "a decline in the fund balance does not diminish our ability to protect insured depositors". FDIC-Insured Institutions Lost $3.7 Billion in the Second Quarter of 2009, Press Release PR-153-2009, FDIC. http://www.fdic.gov/news/news/press/2009/pr09153.html (last accessed on April 23, 2014).

[5] During the pre-Dodd-Frank Act period, which represent a significant part of our sample, group holding companies were only subject to bankruptcy (Chapter 11) procedures. The FDIC powers were limited to the seizure and resolution of commercial bank affiliates within bank or financial holding companies. Post Dodd-Frank, the Treasury has (yet untested) powers to petition the DC court to appoint the FDIC as a receiver for systemically important institutions: see Jackson and Skeel (2012) and Scott (2012).

We investigate whether banks that received CPP funds were systematically different from those that were not bailed-out and eventually faced FDIC resolution. More specifically, we are trying to understand whether CPP funds were allocated to banks in temporary distress but viable in the long run, or whether the allocation was essentially random, or possibly driven by other considerations—for example political connections.[6] While there are studies that identify the characteristics of banks that applied for and received CPP funds, we are not aware of any research that investigates systematic differences and relations between CPP banks and banks that were later subject to FDIC resolution.

Our evidence shows that only 19 of the banks resolved by the FDIC got financial support from the Treasury. In other words, there is almost no overlap between FDIC resolved banks and banks that received (or whose bank holding companies received) CPP funding. The low number of failed banks within the CPP sample is consistent with one of the stated goals of the TARP, i.e. to financially support *temporarily* unhealthy banks.

Furthermore, our probit and hazard rate models shed light on the criteria the Treasury is likely to have used to distinguish viable (and thus deserving CPP funding) from non-viable banks. Compared to failed banks, CPP banks were generally larger and older, marginally more capitalized, had less cash and non-performing assets, and relied less on brokered deposits. This result could be interpreted as evidence that the Treasury did a good job in identifying banks that were viable enough to deserve bailout money, as a mere 3.6% of CPP banks proved to be non-viable ex post.

However, there are many instances where the financial situation of failed and CPP banks did not differ significantly at the onset of the crisis. By matching CPP banks to banks with *similar characteristics* that did *not* receive funding, we provide evidence suggesting that CPP funding turned out to be important for a bank's survival. In fact, the failure rate within five years from the

[6] As suggested by the findings of Duchin and Sosurya (2012).

beginning of the crisis is almost five times higher for the matching banks sample than for the CPP banks sample (11.86% vs. 2.3%).

This is a somewhat puzzling result. It cannot be attributed to limited availability of funds, as the Treasury only allocated about 80% of the available CPP money (US$205bn out of US$250bn). It is also unlikely to be due to the Treasury trying to minimize macroeconomic and informational rents associated with CPP funding.[7] Our findings are related to smaller commercial banks, meaning that the advantages in terms of rent limitation pale in comparison to the corresponding increase in resolution costs.

Alternatively, the Treasury's approach to CPP funding could be interpreted as an attempt to minimize the competitive distortions that are generally associated with the provision of state subsidies. In fact, Berger and Roman (2013) provide evidence of TARP-banks increasing their market share and market power relative to non-TARP banks.[8] However, our evidence at the smaller, commercial bank level does not support the view that government funding altered competition. After we match CPP banks to comparable non-CPP banks, we find that the two groups have similar performance in terms of ROA and ROE after the crisis. We interpret this absence of abnormal performance as evidence of CPP funding having a limited impact on competition, the latter being mostly confined to CPP funding increasing the likelihood of survival of their recipient.

One could also argue that the Treasury limited the provision of CPP funding to avoid giving the impression of wasting taxpayers' money. Politics may indeed have played a funding allocation role. In particular, it is also possible that politically motivated claims that the Treasury tended to overvalue bank assets (Bebchuk 2009) resulted in some banks being denied CPP funding. However, the available evidence points towards politics generally increasing rather than decreasing bailouts (Duchin and Sosyura, 2011; Liu and Ngo, 2014).

[7] See above note 2.
[8] Note that this is essentially due to CPP-banks being perceived as safer than non- CPP banks.

In fact, the Treasury's restrictive funding approach is more likely to reflect conservatism in assessing bank viability. The credit crisis banks generally prompted banks to overstate the value of distressed assets (Huizenga and Laeven 2012) and to understate their portfolio risk (Vallascas and Hagendorff 2013). If one also takes into account the prototypical increase in bank opaqueness in times of crisis (Flannery, Kwan, and Nimalendran 2013), it becomes natural to question the reliability of the capital ratios banks were reporting. This is not a problem if one considers capital levels as a rather futile benchmark of bank risk (Delis and Staikouras 2011). As a matter of fact, the Treasury considered many (nominally) well-capitalized banks as non-viable. This is supported by our data given that 95% of FDIC resolved banks had capital ratios that classified them as "well-capitalized" under FDIC regulation.

To be sure, this does not mean that all resolved banks deserved CPP funding or would have proved viable if they had gotten CPP funding. On the other hand, the fact that non-CPP banks were five times more likely to fail than their matching CPP peers is evidence pointing toward the US Treasury having been very conservative when it came to bailing out smaller commercial banks. More importantly, we show, that it would have cost less to provide matching banks with CPP funding than have deposit insurance covering the losses induced by their failures. Using the estimated loss projections provided by FDIC, we find that the costs of failure are higher than bailout costs for about 85% of the failed banks. Again this does not justify saving all banks, but it definitely questions the validity of a strategy that denies bailout funding to banks that *match* banks that have benefited from these funds.

We offers several contributions to the literature. On a general level, we provide evidence about the viability of smaller banks in financial crises situations, an important component of the US banking system.

More specifically, we firstly add to the growing literature on the effect of CPP bail-outs (Bayazitova and Shivdasani, 2011; Ng et al., 2011; Duchin and Sosurya, 2012; Duchin and Sosurya,

2014; Black and Hazelwood, 2013; Li 2012; Berger and Roman 2013; Berger, Imbierowicz, and Rauch 2013). None of the above studies investigates whether it would have been preferable to have some CPP banks subject to FDIC resolution or vice versa.

Second, we extend the literature on commercial bank failures. James (1991) examined bank failures in the 1980s, finding that the loss on assets is on average 30% of the failed bank's assets. Recent studies have investigated the factors that cause commercial bank failures during the financial crisis of 2007-2008, like real estate investments (Cole and White, 2012); the contribution of income from non-traditional banking activities to US commercial bank failures during the financial crisis (De Young and Torna, 2013); and the role of capital in helping commercial banks to survive during financial crises (Berger and Bouwman, 2013).[9] None of the above studies attempts to establish a link between bank failure and CPP funding management.

Third, we provide additional evidence that minimum regulatory capital ratios may not serve their purposes in situations of general bank distress.

The organization of the paper is as follows. Section 2 discusses the institutional background of CPP funding and FDIC resolutions. Section 3 introduces the sample and the data. Section 4 presents the empirical analysis. Section 5 discusses whether it would have been optimal to rescue failed banks. Finally, Section 6 provides our conclusions.

[9] Post-2007 intervention by the FDIC has also been the target of empirical analysis, but the literature remains scarce even though the FDIC resolution/liquidation portfolio increased massively in the wake of the credit crisis. The results of existing empirical studies can be summarized as follows: (i) FDIC-backed debt issues under the Temporary Liquidity Guarantee Program (TLGP) were accompanied by positive bond and negative stock returns (Ambrose, Cheng and King 2013); (ii) acquirers of resolved banks experienced large and long lasting abnormal returns around the announcement when the FDIC is experiencing large outflows (Christoffersen, Hynes and Walt 2012); and (iii) winning bidders in failed bank auctions experienced substantial positive abnormal stock returns, which supports the hypothesis that resolution through acquisition requires subsidization (Cowan and Salotti 2013).

2. CPP Funding & FDIC Resolution: Institutional Background

On October 14, 2008, less than a month after Lehman Brothers' Chapter 11 filing, the US Treasury announced the Capital Purchase Program (CPP). The aim was to increase the flow of financing to the U.S. economy by reinforcing the equity position of viable financial institutions. As documented by Ivashina and Scharfstein (2010), there was a significant decrease in bank lending during the financial crisis of 2008.

Participation was voluntary, but eligible institutions were encouraged to apply, especially those considered of *systemic* importance. As shown by Wells Fargo's reluctance to participate, not all banks were enthusiastic about getting Treasury funding.[10] This was at least partly because CPP participation required compliance with executive compensation restrictions. But reluctance to participate was also fueled by dilution effects. However, Duchin and Sosyura (2012) find that the overwhelming majority (80.2%) of public firms eligible to participate in CPP submitted applications for investment. They interpret this finding as a confirmation of the attractiveness of the financial conditions of the program and its simplicity. To get funding, banks had to issue preferred shares (the dividend being set at 5% for the first five years, 9% thereafter) and warrants, so as to enable taxpayers to share the profits bailed-out financial institutions were expected to make once markets had recovered.

Banks organized under US law and not controlled by a foreign entity were generally eligible to participate in the CPP. Applicants were required to provide basic information about themselves and the amount of preferred shares they wanted the US Treasury to acquire. Submissions had to be made to the primary supervisory authority, i.e. the Office of the Comptroller of the Currency (OCC) for federally chartered banks; the Federal Reserve Board for state chartered banks members of the

[10] See Damian Paletta, Jon Hilsenrath and Deborah Solomon, *At Moment of Truth, U.S. Forced Big Bankers to Blink*, Wall Street Journal, October 15, 2008, available at http://online.wsj.com/news/articles/SB122402486344034247

Federal Reserve System (FRS); and the FDIC for state chartered banks not members of the FRS. Bank holding companies were additionally required to submit an application to the supervisor of the largest insured deposit institution they controlled. These applications were processed by the Treasury, working in consultation with the supervisory authorities. Once it had made a preliminary decision, the Treasury notified the applicant. To the extent there was preliminary acceptance into the program, the financial institution had to submit its final documentation within 30 days.

The criteria used to approve CPP funding have not been made public (Ng et al 2011). The Treasury did not release details of the applicant list to the public either (Duchin and Sosyura, 2012; Cornett et al., 2013). Therefore, it is not possible to know the number of banks that withdrew their TARP applications voluntarily despite being qualified the number of banks that were encouraged by the banking regulators to withdraw their application because they did not meet the requirements. The literature does not provide clear indications about the number of withdrawn applications, but according to Cornett et al. (2013), a large number of banks withdrew their applications. Some banks were asked by the federal regulators not to apply. All we know is that the Treasury (i) provided some guidance to assist federal banking regulators in their reviewing of CPP applications; and (ii) determined the allocation of CPP funds based upon an overall viability assessment by the responsible banking supervisor.[11]

CPP investments amounted to $205 billion and represented approximately on third of the funding available under the Troubled Asset Relief Program (TARP). The largest investment was $25 billion, the smallest $301'000, with the last CPP funding taking place in December 2009. While impressive on paper, these numbers were relatively small compared to the size of the banking industry.[12] This is in line with the Treasury's claim that its investments targeted viable banks—a

[11] See e.g. http://www.federalreserve.gov/oig/the%20Capital%20Purchase%20Program.htm

[12] The sum of the total assets of the 6,900 commercial banks included in the analysis is around US$2,833bn, almost fourteen times the total CPP investments. This is a very conservative estimate of the size of the banking industry because our sample does not include the largest banks.

point also made clear by capping CPP equity injections at 3% of total risk weighted assets (5% if the bank had less than US$500 million in total assets).

There is some evidence that many of the smaller CPP beneficiaries (372 out of 656 banks benefiting from preferred stocks investments) have been both reluctant to exit the program and prone to miss their dividend payments to taxpayers (Wilson 2013), raising doubts about their long-term viability. There is also evidence that these banks are weaker than the healthier banks that have exited the CPP program (SIGTARP 2012, Special SBLF, p. 15).

In the United States, insolvent banks do not have access to protection from creditors under the bankruptcy code (De Young and Torna, 2013). When a bank becomes insolvent or nears insolvency, it is closed by its primary (state or federal) regulator and its assets are seized by the FDIC. Since September 15, 2008, the day Lehman Brothers filed a petition seeking relief under Chapter 11 of the US Bankruptcy Code, the FDIC has been appointed as a receiver for almost 500 failed banks.[13] This is more than ten times the number of banks subject to FDIC receivership during the expansion period that preceded the credit crisis (40 banks failed between October 2000 and September 15, 2008) and clearly above the 4.5 yearly average prototypical of the 1995-2007 period (Cowan and Salotti 2013). On the other hand, having 140 banks subject to FDIC resolution in 2009, followed by an additional 157 banks in 2010 is comparable to the 162 yearly FDIC receivership average experienced in the wake of the savings and loans crisis (Bennett and Ural 2010).

These failure numbers should not obfuscate the fact that the vast majority of US banks endured the credit crisis without governmental assistance. Moreover, the (relatively few) non-CPP banks with equity problems did not necessarily fail. Given our focus on commercial and thus FDIC-insured banks, we can assume that their supervisory authority required the taking of prompt

[13] See FDIC, List of failed banks, available at fdic.gov (as of January 16, 2014).

corrective actions as soon as they became undercapitalized[14], including the submission of a capital restoration plan within 45 days (12 U.S.C. §1831o). It is only when these actions proved insufficient that failure, i.e. the appointment of a receiver, did follow.[15]

In practice, the FDIC acts as a receiver as well as a deposit insurer for all FDIC-insured banks (Miller 2008). The resolution of a non-viable bank can be done using four different methods: (i) liquidate all assets; (ii) pay a third party to reimburse depositors; (iii) get an acquirer to purchase some/all assets and to assume some/all liabilities (Purchase and Assumption); (iv) set-up a bridge bank that include some/all assets and liabilities and continues to conduct business until an acquirer is found (12 U.S.C. §1821).

Nowadays, the FDIC favors the Purchase and Assumption (P&A) method and used it for 453 of the 502 financial institutions it resolved or assisted from 2008 to September 2013.[16] P&A transactions often include a loss sharing agreement, under which the FDIC absorbs a portion of the loss on a given set of assets, in principle on an 80% FDIC/20% acquirer basis. The approach is deemed to make resolution operationally simpler while permitting to postpone the sale of individual assets until market conditions are favorable.[17]

[14] Under the Federal Deposit Insurance Act, Section 38, banks are deemed undercapitalized when their leverage ratio falls below 4% and/or their total risk-based capital ratio falls below 6%.

[15] In theory, the supervisory authority could place the bank in conservatorship (to correct problems at a viable bank) rather than in receivership (to resolve a failed bank by liquidating assets). However, conservatorship is the exception: from 1934 to 2005, 2094 FDIC-insured institutions were placed in receivership and only 2 in conservatorship (Miller 2008, at 700, 706).

[16] http://www2.fdic.gov/hsob/HSOBSummaryRpt.asp?BegYear=2008&EndYear=2013&State=1&Header=0. An additional 11 P&A transactions involved insured deposits only.

[17] 302 shared-loss agreements have been entered into by June 30, 2013, allowing for estimated savings of $41 billion compared to outright cash sales of assets: http://www.fdic.gov/bank/individual/failed/lossshare/.

3. Data & Descriptive analysis

3.1 Data

For the reasons mentioned in the introduction and following De Young and Torna (2013), we focus on commercial banks, rather than their parent bank or financial holding companies. We start from the list of failed banks whose primary federal regulator was the FDIC. This list covers the period from Oct. 2000 to Jun. 2013.[18] Accounting data used throughout the study are obtained from *Consolidated Reports of Condition and Income (Call Reports)*.[19]

Data for CPP recipients and CPP transactions are from the US Treasury's website.[20] When CPP funding is made at the bank holding company level (which is the rule), we consider the commercial bank affiliated to the BHC as a CPP recipient. Using this approach, we identify 519 commercial bank CPP recipients, of which 53 were commercial banks that directly received funds from the US Treasury.

Table 1 reports the number of failed banks in the FDIC list from September 30, 2008 to September 30, 2013, as well as the number of banks the FDIC included in its *problem list*.[21] We report in the column *Commercial Banks* the number of failed banks that actually have Call Reports data available.[22] As already noticed by De Young and Torna (2013) and Cole and White (2012), commercial bank failures significantly increased in the immediate aftermath of the financial crisis (2009-2010). However, a substantial number of failures also took place in 2011 and 2012, a period during which the US economy was already recovering. The column *Surviving Filters* reports the number of failed commercial bank included in our final sample. Like in De Young and Torna

[18] Available on the FDIC website http://www2.fdic.gov/hsob/SelectRpt.asp?EntryTyp=30

[19] Call reports data for commercial banks are available from the Federal Reserve Bank of Chicago's website (http://www.chicagofed.org/webpages/banking/financial_institution_reports/commercial_bank_data.cfm) and starting from March 2011 from https://cdr.ffiec.gov/public/ .

[20] www.treasury.gov

[21] The names of the banks included in the problem bank list is not publicly available. The number of banks in the list is published every quarter.

[22] The majority of the failed banks without Call Reports data are savings banks.

(2013) banks have to survive the following screens to be included: (i) the commercial bank or its bank holding company has less than $100bn of total assets (because the probability of failure for a too-big-to-fail bank does not depend on its financial performance, and their participation in the CPP was almost compulsory); (ii) the ratio between deposits and total assets is larger than zero; (iii) the ratio between total gross loans and total assets is above (or equal) to 0.25; (iv) the bank is not controlled by a majority foreign owner (which would have prevented it from getting CPP funding); (v) the age of the bank is at least 3 years. This requirement is to mitigate the problem of the so-called de novo banks, i.e. banks that have been recently established. DeYoung (2003) finds that these banks are financially fragile and they face an increasing likelihood of failure during the initial period. Finally, we also require that the commercial bank be classified as domestic and located in one of the 50 states (plus District of Columbia).[23]

Overall, as of September 30, 2008, 6900 US banks survive the five filters, of which 382 failed over the next five years. Bank failures are relatively more frequent in some states, like Georgia, Florida, and Arizona.[24] Appendix A provides the breakdown of failures and CPP investments by state level.

[Insert Table 1 about here]

Table 2 presents descriptive statistics for the universe of 6900 commercial banks available in the Call reports data for the quarter ending on September 30, 2008. All non-binary variables are winsorized at 1% on both tails. Variables are described in Appendix A.

Commercial banks affiliated to a listed bank represent less than 10% of the sample, which stresses the importance of extending the analysis to non-listed banks (see Bayazitova and Shivdasani 2011; and Duchin and Sosyura 2012). The median bank has total assets of less than $150 million, again signaling that small banks represents an important component of the US

[23] This requirement leads to the removal of four commercial banks which were incorporated in US territories.

[24] In Georgia and Arizona, more than 25% of the commercial banks were seized by FDIC during the 2008-2012 period.

banking system. Studying the 1984-2004 period, Ashcraft (2008) documents evidence that multi-bank holding company subsidiary banks are less likely to fail and more likely to receive capital injections from parent companies when faced with financial distress. In our sample, one out of five banks is affiliated with a BHC with more than one depository institution (*Multibank* dummy).

Operating performance (ROA) is negligible, and return on equity (ROE) is less than 5%. On average, the equity ratio is above 10%, which suggests that, at least on paper, US banks were relatively well capitalized at the beginning of the crisis. This conjecture is also supported by a Tier 1 ratio larger than 14%. Descriptive statistics for the other variables used in the empirical analysis show values that are in line with existing bank failure literature (Cole and White, 2012; De Young and Torna, 2013).[25] The high value for real estate loans (48.29% of the total assets) is remarkably similar to the average bank holding company in 2008 examined by Huizenga and Laeven (53%).

[Insert Table 2 about here]

3.2 Descriptive Analysis

Table 3 shows descriptive statistics for CPP banks and FDIC resolved banks. Panel A of Table 3 compares the number of failed banks and the number of commercial banks affiliated with a BHC that received CPP funding.

Overall, 382 out of 6900 commercial banks failed (5.5 percent). However, 363 of these banks (95 percent) did not receive CPP funding, while the percentage of CPP recipient commercial banks that failed within five years is only 2.3 percent. Panel A clearly shows that there is almost no overlapping between CPP and failures: only 13 (19) banks that received CPP funds had failed by the end of 2011 (2013). This allows us to treat CPP funding and FDIC resolution as mutually exclusive events (or treatments for that matter).

[25] Equity ratios and regulatory capital ratios are examined in more detail in Section 5.5.5.

[Insert Table 3 about here]

Panel B of Table 3 reports information concerning bank failures and CPP funding by bank size (measured by the bank's total assets). The largest banks received more than half of the CPP funds, whereas small banks (less than 500 million USD in total assets) received less than 23% of the total CPP allocation. By contrast, more than 70% of the failures involve small banks.

Panel C of Table 3 provides descriptive statistics for four subgroups (No CPP/No Failure; CPP; Failed; CPP/Failed; No CPP/Failed): (i) banks that did not receive CPP money and did not fail until 30 September 2013 (*No CPP*, 5760); (ii) banks that received CPP money (*CPP*, 813); (iii) banks that failed by the end of 2013 (*Failed*, 363); and (iv) 19 banks that received CPP money and failed (*CPP& Failed*). The results of the tests comparing CPP and failed banks (we ignore the CPP/Failed group given the limited size) show that CPP banks were on average more viable than failed banks at the end of the last quarter before TARP (data are taken at 30 September 2008). CPP banks were larger and older; more capitalized, even if only marginally so; had less cash; and relied less on brokered deposits.[26] CPP banks also had less troubled loans.

However, our evidence does not suggest that commercial banks that received CPP funds directly or via their BHC are in better financial shape than no-CPP/No Failure banks, as suggested for example by Ng et al. 2011. They find that CPP banks had stronger fundamentals compared to non-CPP banks both prior to and during the program's initiation period. At the commercial bank level, the data points to CPP banks being in worse shape than No CPP/No Failure banks, even if not in as bad conditions as the No-CPP/Failed banks. This is an interesting result *per se*, because our picture at the commercial bank level seems to be different from the BHC level picture provided by other papers.[27]

[26] Brokered deposits are deposits that are raised through national brokers rather than from local customers. According to Cole and White (2012), brokered deposits have been associated with rapid and risky growth.

[27] See for example also Berger and Roman (2013).

4. Econometric Analysis

4.1 Predicting bank failure

Were bank failures (and bailouts) *foreseeable* when the crisis started and, if yes, did the Treasury bail-out *all* commercial banks that were both viable and in temporary distress? In order to answer these questions we first estimate a Probit model with FDIC resolution and CPP as the dependent variable. Table 4 serves the purpose of verifying whether it was possible to forecast which banks were likely to fail and which ones likely to receive cash injections from the Treasury.

[Insert Table 4 about here]

Panel A presents results of probit model regressions where the dependent variables are: *failure* dummies (columns I, and III); *CPP participation* (Column II); and *No full repayment* of CPP funds by 2013 (Column III). These results are based on data for the quarter ending on September 30, 2008 data. Consistent with the univariate analysis, we find that *brokered deposits, credit risk*, low *equity* ratios, *goodwill*, non-performing loans (*NPL*), weak profitability (measured as *ROA*[28]), and real estate (*RE*) *loans* increase the likelihood to fail. In particular, the positive coefficient for *goodwill* is consistent with the interpretation that it represents overpayment in acquisitions (Cole and White, 2012). Column I also shows that commercial banks affiliated to *listed* and/or *multibank* holding companies are less likely to fail. Looking at Column II, significant differences in the determinants of failure and bailout emerges. *Size* positively affects the likelihood to receive a bailout, as well as commercial and industrial (*C & I*) *loans*. Being affiliated to a *listed* and/or *multibank* holding has a positive impact on the probability to receive a bailout. Profitability is no longer significant. Finally, *non-performing loans* and *age* affect the likelihood of a bailout negatively. The results in Column III, in which only banks that either failed or received a bailout are included, confirm significant differences between bailed-out and failed banks, confirming once again the univariate evidence. It

[28] We obtain similar results if we include ROE instead of ROA in the regression models. ROA and ROE cannot be included in the same model for collinearity reasons.

follows from Panel A that it is reasonable to assume that it would have been possible to predict the viability of a bank at the outset of the credit crisis.

In Panel B, we rerun the same models using end of 2006 data, which were available before the beginning of the crisis. In particular return on assets (*ROA*), *loans*, *credit risk* and *equity* indicators suggest that the characteristics leading to eventual bank failures were both systematic and possible to identify *ex ante*, well before the crisis. In other words, the problems of a bank were not hidden; they were in the spotlight and thus could have been detected by the regulators and the Treasury. This conclusion is supported by the fact that only 19 banks that received CPP funds had failed by September 2013.

4.2 Did CPP banks outperform non-CPP banks?

In this section, we try to validate whether the CPP funding that did occur was *necessary* to stave off further bankruptcies of commercial banks.

Table 5 reports the estimates of means and medians abnormal variables for CPP banks for quarters ending between December 31, 2008 (one quarter ahead) and September 30, 2011 (twelve quarters ahead). Quarter 0 is the quarter ending on September 30, 2008. Abnormal variables are measured as the difference between the value of the variable of a CPP bank minus the corresponding performance of a matching non-CPP bank. Matching banks are selected using a propensity score matching approach, which relies on the probit model (II) of Table 4, Panel A. Once we obtain the predicted values from the probit model (scores), the non-CPP bank with the score closest to the CPP bank is selected as matching bank. If the matching bank drops out of the sample, the second closest is used as matching bank. We repeat this algorithm up to the fifth closest bank. Abnormal variables are winsorized at 2.5% on both tails.

[Insert Table 5 about here]

Panel A compares CPP banks and their matching non-CPP banks as of September 30, 2008. Looking at median tests, the two groups of banks are not statistically different, with the only exception of ROE (significant at 10%-level). While these results confirm the quality of the matching procedure, they also highlight the existence of several non-CPP banks with characteristics similar to those that received CPP funds.

Panel B shows that commercial banks that received CPP funds (or were affiliated to a BHC that received CPP funds) have similar performance in terms of ROA than those of matched non-CPP banks. This suggests that CPP funding did not create a competitive edge to these banks. These results differ, again, with those reported for BHCs. For example, Berger and Roman (2013) find that CPP recipients had competitive advantages and increased both their market shares and market power. Looking at ROE, there is some evidence that CPP banks outperform non-CPP banks until the end of 2009 (Quarter 5), but only if we look at the mean. In fact, median abnormal ROE is never significant. Overall, our results suggest that the profitability of CPP bank assets and equity has been no different than those of non-CPP banks.

At the same time, CPP banks have more solid Equity/Total Assets ratios than matched firms starting from the second quarters. This state of affairs is associated with the actual reception of CPP funds, which increased the capital ratios of the receiving banks. These higher capital ratios for CPP banks remained stable up to the tenth quarter after September 2008 (March 2011). In the last two quarters, the difference in the equity ratio is no longer statically significant, even if it remains positive. While initially there are not statistically significant differences in terms of total loans, starting from quarter 6, CPP banks started to lend more with respect to the matching banks, suggesting that CPP banks were under pressure to increase loans. This finding is consistent with a report by the Office of the Special Inspector General for the Troubled Asset Relief Program (SIGTARP) that argued that, immediately after receiving the cash injections, several banks did not

increase lending as a result of TARP (SIGTARP 2009). In terms of risk, CPP banks also tend to be riskier in terms of credit risk, but this excess risk becomes significant only in the last quarters.

While Panel B does not highlight significant differences between CPP banks and similar banks that did not receive government money, the importance of government funding for CPP banks is made clear by Panel C. Panel C shows that while only 19 CPP banks out of 826 (2.3%) went bankrupt, 98 matching banks had to face FDIC resolution over the next five years (11.86%). Since we are comparing banks that at the beginning of the crisis were remarkably similar, it appears that the Treasury funding allocation was instrumental to increase the likelihood of survival for these banks. This finding suggests that the Treasury may have been too restrictive in selecting CPP banks, and that more banks could have been saved, assuming that saving many banks was the objective.

Table 5 results are corroborated by Table 6, which presents the results of a Cox proportional hazards model. The key variables of interest are the binary variable for CPP funding and CPP repayment. The sample period includes quarters ending between December 31, 2008, and December 31, 2009 (five quarters) in Columns I and II; between December 31, 2008, and December 31, 2010 (nine quarters) in Columns III and IV; and between December 31, 2008, and September 30, 2013 (twenty quarters) in Columns III and IV. CPP funding substantially decreases the likelihood of a failure event. CPP repayment also signals to the market that the bank is in good financial health, lowering the probability of failure going forward, but only in Column II and IV. This indicates that repayment of CPP are considered a positive signal for the survival of the bank only if the banks were able to repay the Treasury quickly.

[Insert Table 6 about here]

4.3 Comparing CPP and failed banks' performance

Section 4.1 shows that commercial bank failures were predictable and that very few non-viable banks received CPP funding. But did the Treasury bail-out *all* commercial banks that were both viable and only in temporary distress?

To answer this question, we match each bank subject to FDIC resolution with a CPP bank of similar characteristics at the time of CPP funding. This test has the following goals. First, we verify if at the beginning of the crisis the soon-to-be failed banks were comparable to some of the CPP banks that were rescued. Second, we use the performance of the CPP bank as a proxy for the performance of the failed bank would it have received CPP funds. If the CPP bank performs better, it signals that the cash injection could have increased the probability to survive of the failed bank. If the performance is similar (as we do not expect that a CPP bank performs worse than a failed bank), then the cash injection would probably have been a waste of money.

Table 7 reports the estimates of means and medians abnormal performance for failed banks for quarters ending between December 31, 2008 and September 30, 2011 (twelve quarters). As in Table 5, quarter 0 is the quarter ending on September 30, 2008. Our abnormal variables are measured as the difference between the variable value for the failed bank and the corresponding variable of the matching CPP bank. Matching banks are selected using a propensity score matching approach, which relies on the probit model (I) of Table 4. Once we obtain the predicted values from the probit model (scores), the CPP bank with the propensity score closest to the failed bank is selected as matching bank. If - for any reason not related to resolution - the matching bank drops out of the sample, the second closest is used as matching bank. As we did for the matching approach in Table 5, we repeat this algorithm up to the fifth closest bank. Abnormal variables are winsorized at 2.5% on both tails.

Using the approach adopted in Section 5.2, Panel A compares failed banks and their matching CPP banks as of September 30, 2008. Here, the propensity score matching highlights the differences between the two groups of banks, which do not disappear along the dimensions

considered (profitability of assets and equity, loans, equity ratio, and credit risk) even when we select the closest match. This suggests that matched failed banks (unlike matched non-CPP banks) were remarkably different from CPP banks.

[Insert Table 7 about here]

Panel B deals with five variables: *ROA, ROE, loans, equity,* and *credit risk*. *Abnormal* performance (both ROA and ROE) is *negative* and significant in almost all quarters. It has to be noted that several small banks received CPP funding in the spring of 2009 (3 quarters ahead), which can explain why the performance differential is more negative after this quarter. Abnormal ROE results are stronger than ROA ones. Assuming that matched banks are also similar in terms of managerial quality, this points towards CPP banks having been able to take more business risks than their failed counterpart. *Loans* issued by failed banks and matched CPP banks are not significantly different, which is surprising given that a goal of TARP was to increase lending. *Equity* ratios are also worse for failed banks than for CPP banks, consistent with the fact that the cash injection helped stabilize these banks.

Overall, Table 7 shows that banks that were relatively *similar* at the onset of the crisis performed very *differently* afterwards. Using the performance of the closest CPP bank as a proxy for the performance of the failed bank, we find a significant improvement in operating performance, capital ratios, and asset quality following the injection of CPP funding. These results do not allow us to say with certainty that failed banks could have been saved if they had received CPP funding. While additional tests would be required to estimate how many resolved banks should have been rescued, our findings raise serious doubts concerning the Treasury's approach. Overall, there are indications that it adopted a very restrictive approach in allocating CPP funding, which resulted in the exclusion of small banks that could have survived with Treasury support but failed in its absence. Of course, we do not claim that either would have been the better policy.

4.4 CPP, bank failures and TAF

Starting December 12, 2007, the Federal Reserve established the Term Auction Facility (TAF) to meet financial institutions' demand for term funding.[29] Under the program, the Federal Reserve auctioned 28-day loans, and, beginning in August 2008, 84-day loans, to depository institutions in generally sound financial condition. The loans were fully collateralized. All depository institutions eligible to borrow under the Federal Reserve's primary credit program were eligible to participate in TAF.[30] The final TAF auction was held on March 8, 2010, with loan reimbursements expected on April 8, 2010. All loans made under the facility were repaid in full, with interest and in accordance with the terms of the facility.

Since banks facing liquidity problems could have used TAF either as a complement or as an alternative to CPP funding, we investigate whether our results are affected by this contemporaneous program. Data on term action facilities is available on the Federal Reserve's website.[31] Table 8 shows that TAF was actually used by banks in sound financial conditions. In fact, only 17 out of 244 participants (about 7%) in the TAF program went bankrupt between Sept. 2008 and Sept. 2013 and less than 0.50% of the auctioned loans went to banks that failed.

It is noteworthy that 45% of TAF users were CPP banks and almost 90% of the loan volume made via TAF went to CPP banks. Panel C also shows that CPP banks were more likely (12.6% vs. 8.5%) to receive TAF funding than the matched non-CPP counterparts identified in Section 4.2. Only three banks that received both CPP and TAF failed.

Overall, these results indicate that TAF was used as a complement rather than a substitute to CPP funding. Moreover, this additional source of liquidity was not available to banks that later

[29] Initially, the FED tried to increase the amount of liquidity available to financial institutions through the discount window. However, many banks were reluctant to borrow at the discount window out of fear that their borrowing would become known and would be erroneously taken as a sign of financial weakness.

[30] U.S. branches and agencies of foreign banks were elegible to borrow under TAF.

[31] http://www.federalreserve.gov/newsevents/reform_taf.htm

faced FDIC resolution, confirming our previous conclusion that the Treasury effectively screened out the worst banks.

[Insert Table 8 about here]

4.5 CPP, bank failures and Capital Ratios

Previous literature has already warned that accounting discretion may lead banks to overstate regulatory capital (Huizenga and Laeven 2012). Delis and Staikouras (2011) document that capital requirements are not particularly useful to control bank risk. Indeed, Vallascas and Hagendorff (2013) document that capital requirements are only loosely related to the bank's portfolio risk. Because of this low risk-sensitivity, even pronounced increases in portfolio risk generate only negligible increases in capital requirements. Since the descriptive statistics provided in Tables 2 and 3 show that banks had very high equity ratios at the beginning of the crisis, we take a closer look at whether capital ratios do offer valuable information about the financial health of the banks.

Table 9 presents descriptive statistics also for the leverage ratios and the Tier 1 ratios in addition to the equity ratio already used in the analysis. The definition of these two ratios follows the FDIC rules: *Leverage ratio* is Tier1 capital over total assets (*Tier 1 Risk Based*), while the *Tier 1 ratio* is defined as Tier 1 capital over risk-weighted assets. According to the FDIC manual of Examination Policies, Section 2.1 Capital,[32] generally, a bank is well-capitalized when the leverage ratio (Tier 1 ratio) is above 5% (6%).

Table 9 clearly shows that on Sept. 30, 2008, according to FDIC rules, only an extremely low number of banks were *not well-capitalized* and required prompt corrective actions. The table confirms that failed banks have worse capital ratios than CPP banks (see Table 3 and also the regression analysis). However, it also documents that at the onset of the crisis even 95% of banks that later failed had capital ratios well above the 5% (6%) ratio that the FDIC requires to be

[32] Part 325, Subpart B

considered *well-capitalized*. Similar results are obtained if we use capital ratios of the quarter ending on Dec. 31, 2006. Therefore, the evidence provides confirmation to previous literature about the lack of effectiveness of regulatory capital ratios to prevent crises and failures.

[Insert Table 9 about here]

6. Would it have been optimal to rescue failed banks?

In this section we investigate the cost of letting the 382 banks fail during the period Sept. 2008 – Sept 2013. While the FDIC is mostly funded by premiums that banks and thrift institutions pay for deposit insurance coverage, government intervention may become necessary to save deposit insurance corporations during severe crises, e.g., during the savings & loans crisis.[33] During the recent crisis there was a severe drainage of the deposit insurance fund that shrunk from $52.8 billion at the end of March 2008 to only $10.4 billion in August 2009. Moreover, the Federal Deposit Insurance Corporation Improvement Act (FDICIA) of 1991 gave FDIC the ability to borrow from the Treasury.[34] To calm the public when large losses were announced in the second quarter of 2009, Chairman Sheila Bair remarked that FDIC had the ability to borrow up to $500 billion from the Treasury. She also added that a "*decline in the fund balance does not diminish our ability to protect insured depositors*," implicitly suggesting government guarantees.[35] For these reasons, we believe that the cost associated with the bank failure borne by the FDIC should be included in the cost and benefit analysis of the Treasury decision.

Our goal is to determine whether the Treasury took a prudent decision to not provide CPP funds to these banks, either by denying their applications or simply by discouraging them from

[33] The Financial Institutions Reform, Recovery, and Enforcement Act of 1989 (FIRREA) abolished the Federal Savings and Loan Insurance Corporation (FSLIC), which had provided deposit insurance to S&Ls since 1934. FIRREA authorized the use of taxpayer money to resolve S&L failures.

[34] During the

[35] FDIC-Insured Institutions Lost $3.7 Billion in the Second Quarter of 2009, Press Release PR-153-2009, FDIC. http://www.fdic.gov/news/news/press/2009/pr09153.html (last accessed on April 23, 2014)

applying. To do so, we need to estimate the *expected cost of the failure* and the *expected cost of bailing-out* a bank. By comparing these two expected costs, we classify the Treasury decision as incorrect if the expected cost of the failure is larger than the expected cost of bailing out the bank. Formally:

$$Expected\ Cost\ of\ Failure \geq Expected\ of\ Cost\ of\ Bailout \quad (1)$$

which can be written as:

$$p_F * Cost\ of\ Failure_{NR} \geq Cost\ of\ Bailout + p_{FR} * Cost\ of\ Failure_R \quad (2)$$

where p_F is the probability to fail without government intervention, *Cost of Failure*$_{NR(R)}$ is the estimated cost of bankruptcy at the time of the decision to rescue the bank without government assistance (given government assistance), p_{FR} is the probability of failure given government intervention and *Cost of Bailout* is the estimated cost of the intervention to save the bank. Adopting a worst-case scenario approach that plays in favor of the Treasury decision, we assume this cost is sunk and not recoverable by the Treasury. While the cost of failure without government intervention is likely to be larger than the cost of failure once the government has intervened, we make the conservative assumption that the two values are equal.

We use as a proxy for the *Cost of Failure* the *Estimated Loss* provided by FDIC. FDIC defines the estimated loss as "the difference between the amount disbursed from the Deposit Insurance Fund (DIF) to cover obligations to insured depositors and the amount estimated to be ultimately recovered from the liquidation of the receivership estate. Estimated losses reflect unpaid principal amounts deemed unrecoverable and do not reflect interest that may be due on the DIF's administrative or subrogated claims should its principal be repaid in full." The cost of failure is different from the loss realized in a bank failure (see for example, James, 1991). While the loss realized in a bank failure captures the difference between the difference between the book value of a bank's assets at the time of its closure and the value of the assets in an FDIC receivership or the

value of the assets to an acquirer, the estimated loss measures the expected cost for the FDIC. Values for estimated losses are available for 367 of the 382 failures.[36] Our proxy for p_F is the *estimated probability of failure* obtained from model I in Table 4, panel A. The *Cost of Bailout* is estimated as a percentage of the bank's risk-weighted assets: 3% if the bank's total assets are above US$500m, 5% if the total assets are below US$500m. The rationale for this proxy stems from the fact that the government intervention was capped to 3% of the risk-weighted assets of the applying banks, cap that was raised to 5% in the third CPP window in May 2009 for small banks (i.e. banks with less than US$500m in assets). Finally, the *probability of failure given government intervention* is equal to p_F minus the reduction induced by the government's cash injection. To estimate this unobserved reduction, we rely on the realized frequency of resolutions for CPP banks and their matching banks reported in Panel D of Table 5. The frequency of resolutions for non-CPP banks is 11.86%, while the frequency in the CPP sample is just 2.30%. So, receiving CPP funds implies, on average, a decrease in the frequency of resolutions of 80.26% (= (11.86% - 2.30%) / 11.86%)). Denoting this decrease by π, our proxy for p_{FR} is the following:

$$p_{FR} = (1 - \pi) * p_F \qquad (3)$$

Panel A of Table 10 reports descriptive statistics for key inputs of our analysis. The average estimated loss is around US$130m per failed bank, which is slightly less than 20% of the bank's total assets at the end of the third quarter of 2008. The grand total of the estimated losses is around US$ 47.8bn, almost one-fifth of the money injected in the system with the CPP. The average risk-weighted assets is about US$460m. To further confirm the good fit of the model used in the analysis, the average probability of failure is larger than 41.92%. Finally, the probability of failure given government assistance is only 8.13%.

[36] Since the estimated loss does not materialize on the day of the decision but in a future date, we should discount it. However, we ignore discounting in this situation to use a more conservative estimate of this value. Ignoring discounting does not affect our results.

[Insert Table 10 about here]

Panel B Table 10 reports means and medians for the expected cost of failure, the expected cost of bailout, and their difference. The table offers a clear picture: the expected cost of saving these banks is small compared to the expected cost incurred by FDIC because of their bankruptcies. Indeed, even using very conservative assumptions that play in favor of the Treasury, when we look at the comparison between the two values at bank level, we find that 308 out of the 367 banks *should* have been saved (84%). The aggregated expected cost of saving these banks is a relatively small US$6.4bn, while the expected cost of their failures is US$22.1bn. Thus, injecting capital via CPP in these banks would have saved FDIC, and thus the US government, more than US$15.6bn.

There is substantial evidence that FDIC interventions were delayed (see for example, Liu and Ngo, 2014). The FDIC may have waited as long as possible before starting resolution procedures, which may have increased their costs. So, the estimated *Cost of failure* could be overstated because of these late interventions. We need, therefore, to determine a potential date for the resolution without delay. To do that, we exploit data on supervisory actions hand-collected from the FDIC ED&O database, the Office of the Comptroller of the Currency (OCC) Formal Enforcement Actions search engine, and the Federal Reserve's Enforcement Actions search engine. Similarly to De Young and Torna (2013), we consider the following *enforcement actions:* a *consent order*; an *order to cease & desist*; a *prompt corrective action* directive; a *written or formal agreement*; an *order for restitution*. In particular, we use the first enforcement action against the failed bank after September 2008 (or the non-terminated action started before Sep. 2008) as the reference point for the date in which the bank should have been seized by FDIC. The delay is computed as the number of quarters between the quarter before the enforcement action and the last quarter before the failure. Overall, we find that 295 out of the 382 failed banks received at least one enforcement action before their failure (77.22%), and the average (median) delay is 3.78 (3)

quarters. These delays were indeed costly for the involved banks, whose total assets decreased on average by about 13% ($76 million).[37]

To account for these delays in our estimation of the cost of failure, we subtract the decrease in total assets between the quarter before the enforcement action and the last quarter before the failure from the estimated loss.[38] Then, we multiply the new cost of failure by the probability of failure to obtain the new expected cost of failure, which is reported in Panel B of Table 10 under the column *No Delay*. The average *expected cost of failure* decreases by about one third when we take into account the delays in FDIC actions. However, even this new estimate (slightly less than $40 million on average) is well below the *average cost of saving the bank*.[39] The *total expected cost of failure* is $14.5bn, which results in a saving for the US treasury of about $8bn. Assuming resolutions without delays from the FDIC and the consequent reduction in the expected costs of failure reduces the number of banks worth bailing out to 182, or 49.5% of the 367 failed banks included in the analysis.

An issue with the analysis above is that we limited it to the banks that were going to fail within five years.[40] Indeed, the goal of the analysis was to understand whether it was optimal to bailout a single bank. However, this assumption could lead to underestimate the true cost of a policy aimed at rescuing all banks. To put it another way, the US$15.6bn saving is inflated because of these restrictions.

To address this issue, we run an additional analysis in which we assume that *x* non-CPP banks with the highest estimated probabilities of failure receive cash injections from the Treasury in

[37] It is worth remembering that a decrease of 13% in total assets is more than enough to wipe out completely the bank's equity.
[38] If there is an increase in total assets, we set the decrease equal to zero.
[39] To apply the more conservative estimate, we leave the cost of failure unchanged in the computation of the expected cost of the bailout (i.e. the cost of failure is still equal to the estimated loss).
[40] We are not assuming that the Treasury has perfect foresight. If these were the case, the probability of failure in the next five year would have been equal to 1, not to p_F. Moreover, with perfect foresight, the Treasury would have immediately understood the implication of its actions, and whether the bailout would have been successful (i.e. p_{FB} would have been equal to either 1 or 0).

the measure of 3% - 5% of their risk-weighted assets depending on their size.[41] The number *x* is either (i) the number of banks on the FDIC's Problem List at the time of the third CPP window (May 2009, 416); or (ii) the average number of banks that appear on the FDIC's Problem List between Sept. 2008 and Sept. 2011 (639).[42] Under this scenario we are extending government assistance to a pre-specified number of trouble banks to minimize the number of failures. The cost of the strategy is given by:

$$Cost\ of\ Strategy = Cost\ of\ Bailout + p_{FR} * Cost\ of\ Failure + Cost\ of\ Failure * I_F \quad (4)$$

where I_F is an indicator variable that captures failed banks that were not included in the "bailed-out" group. The first strategy (*x*=416) provides funds to 237 failed banks, i.e. 56.6% of the banks that received cash injection under this strategy failed within 5 years. To put it differently, this strategy could have rescued 62.6% of the failed banks. The aggregate cost of this strategy, which adds the cost of the failure of the 145 "missed" failures to the expected cost of bailout of an additional *x* banks, is US$20.6bn. The second strategy (*x*=639), by extending the bailout to a larger number of banks, would give money to more failed banks (293, 76.7% of the total 382 failure), but at the cost of including more banks that did not fail. However, the aggregate cost of this strategy is lower, US$17.7bn, than the cost of the first strategy, because it limits the "missed" failures (only 89).

Under these assumptions, both strategies would have led to an aggregate cost that is potentially lower than the expected cost of the 382 bank failures that took place during the five years within 5 years of the beginning of the crisis (US$22.1bn). According to our calculation, savings could vary between US$1.4bn (6.4% of the expected cost) and US$4.3bn (20%). Of course, this type of strategy may generate incentives to increase risk in good times, exacerbating a moral

[41] Since this analysis is interested whether the decision to leave some banks fail was correct and not whether the decision to accept banks in the CPP was optimal, we assume that all the CPP banks receive CPP funds. Therefore, we neglect them in the analysis.

[42] The FDIC problem bank list is a confidential list created and maintained by the FDIC, which lists banks that are in jeopardy of failing. All listed banks have a composite CAMELS rating of 4 or 5.

hazard problem that already exists. However, conditional on bailing-out (some) banks in the first place, the question is whether increasing the number of bailed-out banks substantially increases the already existing risk of moral hazard further. One could argue that the optimal policy to prevent moral hazard is to not bail-out a single bank at all, but if bail-out is considered to be the optimal policy response (as it was in the recent crisis) then restricting the set of rescued banks based on arbitrary benchmarks or an ill-defined notion of their systemic importance is difficult.

To conclude, while the Treasury made good choices in term of the viability of the banks chosen to be included in the CPP program, its policy was too selective when it comes to potentially bail out more banks. Including other banks in the program, and thus lowering their probability to go bust, could have saved taxpayer money. So if taken at face value, our results imply that if a bailout program is on the table, its aim should be to rescue as many banks as possible.

6. Conclusions

We investigate the stark increase in the number of FDIC resolutions of commercial banks following the credit crisis and whether it could have been reduced with a more generous approach of the Treasury's TARP Capital Purchase Program (CPP).

Our data show almost no overlap between CPP-funded and FDIC-resolved commercial banks, which is attributable to failing banks being easily identifiable as early as 2006. Moreover, it appears that CPP funding was driven by bank age, size, cash holdings, asset performance and deposit type. Thus, our results suggest that the Treasury made a good job when it came to granting CPP or TAF funding. It managed to stave off further bankruptcies while avoiding to fund non-viable banks. Moreover, we could not find evidence that the CPP program provided a competitive advantage for those commercial banks that were bailed out.

However, there is evidence that Treasury could have prevented some commercial bank from failing by making them benefit from CPP funding as this would have enhanced their performance. Our results suggest that lack of CPP funding resulted in a significant number of viable commercial banks being forced into FDIC receivership. This outcome is attributable to excessive reliance upon financial ratios and deficient comparison of funding and resolution costs, and points towards the Treasury having adopted a too restrictive approach in the allocation of CPP funding. Including more banks in the program could potentially have saved taxpayer money. So while we do not claim to make any policy implications on the optimality of bail-outs per se, our results suggest that if a bail-out program is already on the table, its aim should be to rescue as many banks as possible.

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Appendix A: Variable Definitions

Variable Name	Definition (Call reports codes in parentheses)
Age	Difference between sample year and the year of opening (RSSD9950)
Brokered Deposits	Brokered deposits scaled by total assets (RCON2365/ RCFD2170)
C&I Loans	Commercial and industrial loans scaled by total assets (RCON1766/RCFD2170)
Cash	Cash scaled by total assets (RCFD0010/RCFD2170)
Cost Inefficiency	Noninterest expenses divided by total assets (riad4093/RCFD2170)
Credit risk	Risk weighted assets scaled by total assets (RCONA223/RCFD2170)
Crisis Dummy	Binary variable that takes value one in years 2008 and 2009
Equity	Total equity capital scaled by total assets (RCFD3210/ RCFD2170)
Failure 08-11	Binary variable that takes value 1 if the bank fails between Sept. 30, 2008 and Dec. 31, 2011.
Failure 08-12	Binary variable that takes value 1 if the bank fails between Sept. 30, 2008 and Dec. 31, 2012.
Failure 08-13	Binary variable that takes value 1 if the bank fails between Sept. 30, 2008 and Sep. 31, 2013.
Goodwill	Godwill scaled by total assets (RCFD163/RCFD2170)
Leverage ratio	Tier1 capital over total assets (RCFD8274/RCFD2170)
Listed	Binary variable that takes value 1 if the bank or its bank holding company is listed on a major stock exchange.
Loan Loss Reserves	Loan loss allowance scaled by total assets (RCFD3123/RCFD2170)
Loans	Total Loans & Leases, scaled by total assets (RCFD1400/ RCFD2170)
Multibank	Binary variable that takes value 1 if the bank is affiliated to a bank holding company with more than one commercial banks in the sample.
Non Interest Income	Total noninterest income scaled by total assets (riad4079/RCFD2170)
NPL	loans 90 days past due plus nonaccrual loans scaled total assets ((RCFD1407+RCFD1403)/ RCFD2170)
RE Loans	Real estate loans scaled by total assets (RCFD1410/RCFD2170)
Repaid TARP	Binary variable that takes value one in quarters after the bank repaid TARP funds.
ROA	Net Income scaled by total assets (RIAD4340/RCFD2170)
ROE	Net Income scaled by total equity capital (RIAD4340/RCFD3120)
Size	Total assets (RCFD2170)
Tarp	Binary variable that takes value one in quarters after the bank received TARP funds.
Tier 1 Ratio	Tier 1 capital over risk-weighted assets (RCFD8274/RCFD223)

Figure 1 – Failing Banks 2004-2013

The figure presents the time series of US commercial bank failures between 2004 and 2013. Data are from the FDIC website.

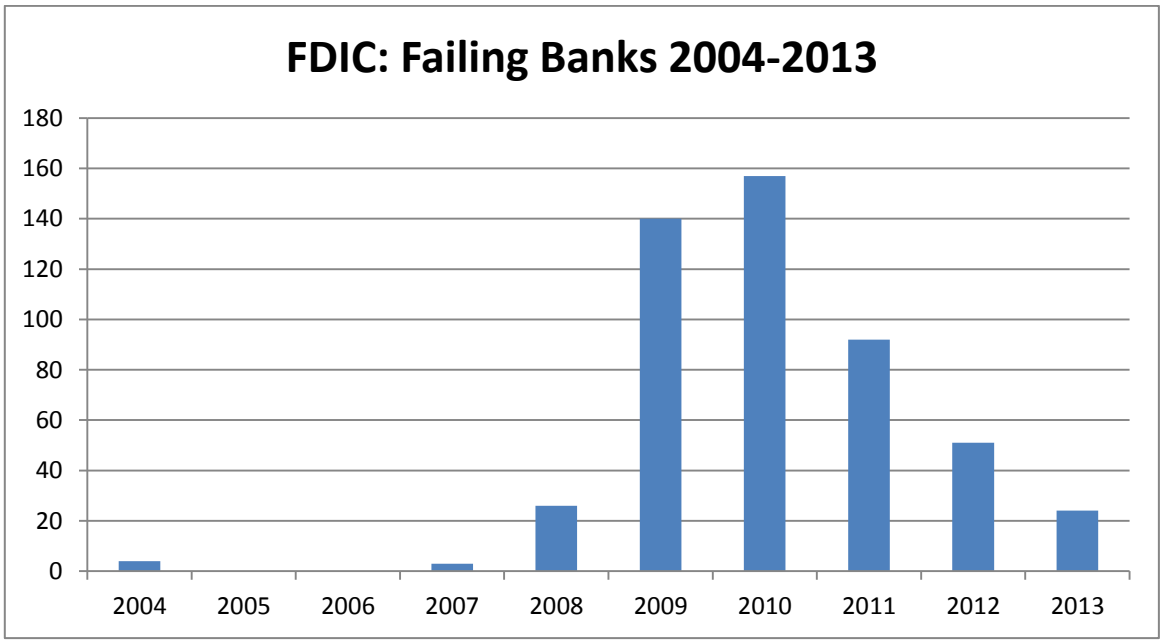

Table 1 – Sample of Failures after September 30, 2008

The table reports commercial bank failures by year (Panel A) and by quarter (Panel B) that took place in the US after September 30, 2008. Column "FDIC Failure List" presents the number of failed bank in every year (quarter) according to the list of failed banks available on the FDIC website. The Column "Commercial Banks" identifies how many of these failed banks have Call reports data available. Finally, the column "Surviving filters" presents the number of commercial banks that survived the following screens: 1) the commercial bank or its bank holding company has less than $100bn of total assets; 2) the ratio between deposits and total assets is larger than zero; 3) the ratio between total gross loans and total assets is above (or equal) to 0.25; 4) the bank is not controlled by a majority foreign owner; 5) the age of the bank is at least 3 years. In Panel B, the column "Problem List" reports the number of banks in the Problem list, a list created and maintained by the Federal Deposit Insurance Corporation which lists banks that are in jeopardy of failing.

Panel A: Failures by year

Year	FDIC Failure List	Commercial Banks	Surviving Filters	Problem List
2008	17	13	8	252
2009	148	126	117	702
2010	154	136	125	844
2011	92	86	77	813
2012	51	42	41	651
2013 (Jan-Sep)	20	19	14	515
Total	482	422	382	

Panel B: Failures by Quarter

Year	FDIC failure list	Commercial Banks	Surviving Filters	Problem List
20081231	17	13	8	252
20090331	29	26	21	305
20090630	24	21	21	416
20090930	50	42	41	552
20091231	45	37	34	702
20100331	41	37	33	775
20100630	42	40	38	839
20100930	41	32	30	860
20101231	30	27	24	844
20110331	26	24	24	888
20110630	22	19	18	865
20110930	26	25	19	844
20111231	18	18	16	813
20120331	16	13	12	772
20120630	15	11	11	732
20120930	12	11	11	694
20121231	8	7	7	651
20130331	4	4	4	612
20130630	12	11	7	553
20130930	4	4	3	515
Total	482	422	382	

Table 2 – Descriptive statistics

The table presents descriptive statistics for the universe of commercial banks available in the Call reports data for the quarter ending on September 30, 2008. To be included in the sample, banks have to survive the following screens: 1) the commercial bank or its bank holding company has less than $100bn of total assets; 2) the ratio between deposits and total assets is larger than zero; 3) the ratio between total gross loans and total assets is above (or equal) to 0.25; 4) the bank is not controlled by a majority foreign owner; 5) the age of the bank is at least 3 years. All non-binary variables are winsorized at 1% on both tails. Variables are described in the Appendix.

	Mean	Median	25th Perc.	75th Perc.	Stand. Dev.	N
Age	70.54	81	27	104	42.42	6900
Brokered Deposits	3.95%	0.00%	0.00%	4.13%	7.90%	6900
C&I Loans	9.72%	8.28%	4.86%	13.02%	6.81%	6900
Cash	4.34%	3.02%	2.02%	4.90%	4.12%	6900
Cost Inefficiency	2.25%	2.14%	1.78%	2.57%	0.76%	6900
Credit Risk	72.72%	73.99%	64.10%	82.13%	12.82%	6900
Equity	10.60%	9.78%	8.40%	11.90%	3.30%	6900
Goodwill	0.46%	0.00%	0.00%	0.07%	1.28%	6900
Listed Banks	9.84%	0.00%	0.00%	0.00%	29.79%	6900
Loan Loss Reserves	0.93%	0.84%	0.64%	1.09%	0.49%	6900
Loans	68.59%	70.84%	59.67%	79.31%	14.31%	6900
Multibank	19.25%	0.00%	0.00%	0.00%	39.43%	6900
Non Interest income	0.55%	0.45%	0.28%	0.68%	0.46%	6900
NPL	1.28%	0.74%	0.25%	1.64%	1.62%	6900
RE Loans	48.29%	49.63%	35.55%	61.92%	17.82%	6900
ROA	0.48%	0.61%	0.22%	0.93%	0.85%	6900
ROE	4.46%	5.81%	2.17%	9.10%	9.43%	6900
Size	410566	143719	68210	323422	1017073	6900

Table 3 – Failures & CPP

In Panel A, the table compares the numbers of failed banks and the number of commercial banks whose bank holding company received CPP money. Panel B reports CPP investments and failures by bank size, measured as the bank's total assets. In Panel C, the table provides descriptive statistics for the four subgroups (No CPP/No Failure; CPP; Failed; CPP & Failed). All non-binary variables are winsorized at 1% on both tails. Variables are described in the Appendix. Variables are defined in the appendix and measured at the end of the quarter ending on September 30, 2008.

Panel A: CPP & Failures

	Failure within 31.12.2011		Failure within 31.12.2012		Failure within 30.09.2013	
	#	%	#	%	#	%
No CPP/No Failure	5760	83.48%	5725	82.97%	5711	82.77%
CPP	813	11.78%	807	11.70%	807	11.70%
Failed	314	4.55%	349	5.06%	363	5.26%
CPP & Failed	13	0.19%	19	0.28%	19	0.28%
Total	6900		6900		6900	

Panel B: CPP and Failures by Bank Size

Size Range	CPP Investment		CPP Dummy		Failure 08-13		
	Total	%	Total	%	Total	%	# Obs.
Less than $500	115037.4	22.66%	461	55.81%	275	71.99%	5810
$500<= X <$1000	21018.7	4.14%	148	17.92%	53	13.87%	598
$1000<= X <$2000	58647.8	11.55%	78	9.44%	29	7.59%	243
$2000<= X <$3000	31780.7	6.26%	38	4.60%	9	2.36%	85
Larger than $3000	281286.6	55.40%	101	12.23%	16	4.19%	164
Total	507771.0		826		382		6900

Panel C: Descriptive Statistics at 30 Sept. 2008

	No CPP/No Failure		CPP		Failed (2008-2013)		CPP/Failed		P-value Tests CPP vs. Failed	
Variable	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Age	75.02	87.00	54.59	36.00	37.38	21.00	36.32	11.00	0.0000	0.0000
Brokered Deposits	2.88%	0.00%	6.54%	3.38%	14.55%	10.98%	12.88%	12.34%	0.0000	0.0000
C&I Loans	9.32%	7.98%	12.38%	10.88%	9.74%	7.62%	15.37%	14.73%	0.0000	0.0000
Cash	4.59%	3.19%	3.11%	2.37%	3.28%	2.20%	3.19%	2.51%	0.4342	0.1640
Cost Inefficiency	2.25%	2.15%	2.21%	2.10%	2.39%	2.24%	2.22%	1.82%	0.0015	0.0430
Credit Risk	71.05%	71.88%	79.80%	81.07%	82.70%	83.88%	83.63%	83.15%	0.0000	0.0000
Equity	10.78%	9.93%	10.10%	9.16%	8.95%	8.42%	9.09%	9.35%	0.0000	0.0000
Goodwill	0.35%	0.00%	1.27%	0.06%	0.43%	0.00%	0.73%	0.00%	0.0000	0.0000
Listed Banks	4.52%	0.00%	45.35%	0.00%	13.50%	0.00%	31.58%	0.00%	0.0000	0.0000
Loan Loss Reserves	0.88%	0.80%	1.03%	0.94%	1.56%	1.30%	0.98%	1.10%	0.0000	0.0000
Loans	67.09%	69.15%	74.97%	76.98%	77.67%	79.41%	77.05%	80.34%	0.0000	0.0000
Multibank	17.14%	0.00%	37.17%	0.00%	13.50%	0.00%	0.00%	0.00%	0.0000	0.0000
Non Interest income	0.55%	0.46%	0.61%	0.50%	0.40%	0.29%	0.57%	0.37%	0.0000	0.0000
NPL	1.09%	0.65%	1.30%	0.95%	4.23%	3.60%	1.42%	1.29%	0.0000	0.0000
RE Loans	46.15%	46.53%	56.05%	57.51%	64.32%	67.05%	54.94%	55.01%	0.0000	0.0000
ROA	0.59%	0.67%	0.28%	0.40%	-0.78%	-0.40%	0.01%	0.39%	0.0000	0.0000
ROE	5.59%	6.29%	3.07%	4.31%	-10.08%	-4.54%	-0.70%	4.02%	0.0000	0.0000
Size	273604.5	121158	1282909	428779	570740.5	246861	1466517	270753	0.0000	0.0000
# Obs.	5711		807		363		19			

Table 4. Probability to predict Failure, CPP, and CPP repayment at the onset of the crisis

The table reports the estimates of probit models to predict failure, CPP participation, and no repayment of CPP money. In Panel A, we use independent variables measured right before the start of the CPP program (September, 30, 2008), while in Panel B independent variables are measured at the end of 2006. Only banks with data available on September 30, 2008 are included in the analysis (both Panel A and B). Robust standard errors are reported in brackets. All independent variables are winsorized at 1% on both tails. All regressions models include State fixed effects. Variable definitions are provided in the appendix. The symbols ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A: Predictions based on Call reports 30 Sept. 2008

	Failure 2008-2013	CPP	Failure 2008-2013	No Repayment CPP
	(I)	(II)	(III)	(IV)
Sample	*All Banks*	*All Banks*	*CPP and Failed*	*CPP*
Constant	-2.2572***	-4.5953***	4.3396***	2.5063**
	[0.6784]	[0.4553]	[1.2045]	[0.9858]
Age (log)	0.0109	-0.1421***	0.1775***	0.0323
	[0.0389]	[0.0273]	[0.0608]	[0.0536]
Brokered Deposits	2.5417***	-0.3095	3.6585***	1.4322**
	[0.3570]	[0.3197]	[0.6101]	[0.6576]
C&I Loans	0.8322	2.5924***	-1.6998	2.3934**
	[1.1134]	[0.5041]	[1.7421]	[1.0490]
Cash	-1.849	-0.8488	-2.8493	0.4597
	[1.3117]	[0.9058]	[2.1817]	[2.2664]
Cost Ineff.	-11.1191	9.2042*	-32.8481***	-11.9137
	[7.0427]	[5.2695]	[11.1546]	[11.2649]
Credit Risk	2.1423***	1.0455***	0.9911	-2.0314**
	[0.6014]	[0.4015]	[1.2736]	[1.0005]
Equity	-11.5445***	-6.3139***	-12.7517***	-8.5474***
	[2.3318]	[1.2293]	[3.4955]	[3.0994]
Goodwill	15.6428***	17.6574***	8.3739	2.3744
	[3.9895]	[2.2386]	[6.0289]	[4.5943]
Listed	-0.2799**	0.8663***	-0.7030***	0.2385*
	[0.1277]	[0.0734]	[0.1816]	[0.1340]
Loan Loss Reserves	10.9681	-2.0267	23.9945	8.3611
	[9.0549]	[7.2082]	[16.2305]	[17.0324]
Loans	-1.5687	-0.0799	-0.7222	0.2916
	[1.0535]	[0.5101]	[1.7415]	[1.0886]
Multibank	-0.5195***	0.3573***	-0.9712***	-0.2206*
	[0.1129]	[0.0629]	[0.1553]	[0.1193]
Noninterest Income	7.9214	-4.5587	23.9613	-1.1053
	[11.6794]	[7.7624]	[18.2196]	[16.1452]
NPL	16.7403***	-10.0266***	26.2785***	12.8950**
	[2.1347]	[2.1402]	[4.1693]	[5.3427]
RE loans	2.1502**	0.8698**	2.0084	2.1608***
	[0.8676]	[0.3467]	[1.3925]	[0.6901]
ROA	-30.8611***	-1.9391	-51.1773***	-6.879
	[5.6778]	[4.3423]	[10.2054]	[9.2661]
Size (log)	-0.0322	0.2395***	-0.4343***	-0.0907
	[0.0406]	[0.0279]	[0.0810]	[0.0602]
State Fixed Effects	yes	yes	yes	yes
Pseudo R2	0.4559	0.3294	0.5417	0.1538
Observations	6363	6888	1105	805

Panel B: Predictions based on Call reports 30 Dec. 2006

	Failure 2008-2013	CPP	Failure 2008-2013	No Repayment CPP
	(I)	(II)	(III)	(IV)
Sample	*All Banks*	*All Banks*	*CPP and Failed*	*CPP*
Constant	-3.7301***	-4.6684***	0.5513	3.6433***
	[0.7132]	[0.4719]	[1.0192]	[1.0286]
Age (log)	-0.0817**	-0.0974***	0.0413	0.1058*
	[0.0371]	[0.0276]	[0.0542]	[0.0574]
Brokered Deposits	2.8895***	-0.1264	3.7100***	1.8186*
	[0.4380]	[0.3889]	[0.6816]	[0.9435]
C&I Loans	1.7105*	2.7343***	-0.9496	3.4829***
	[0.9959]	[0.4827]	[1.3914]	[1.1277]
Cash	-3.6083**	1.7216*	-6.0733**	-5.4855***
	[1.8287]	[0.9810]	[2.6487]	[2.0261]
Cost Ineff.	3.0389	1.7503	8.5565	-27.0755**
	[6.8176]	[4.7868]	[10.3928]	[10.8976]
Credit Risk	2.9452***	1.2563***	2.6492***	0.4608
	[0.5008]	[0.3923]	[0.9340]	[0.9107]
Equity	-3.6090**	-4.5368***	-1.8308	-5.5366*
	[1.7300]	[1.2470]	[2.6953]	[2.8366]
Goodwill	13.6482***	13.6557***	5.6272	2.0411
	[3.6064]	[2.4921]	[4.9999]	[4.9141]
Listed	-0.1321	0.8863***	-0.5488***	0.1013
	[0.1202]	[0.0762]	[0.1516]	[0.1395]
Loan Loss Reserves	1.3048	26.6134***	-3.4608	46.3070**
	[12.1629]	[8.7496]	[23.5601]	[23.4488]
Loans	-3.1801***	-0.5008	-3.6573***	-2.6867**
	[0.9646]	[0.4558]	[1.3284]	[1.0728]
Multibank	-0.5268***	0.3509***	-0.8898***	-0.2044
	[0.1153]	[0.0638]	[0.1468]	[0.1255]
Noninterest Income	-9.0064	6.0559	-25.3974	37.5037**
	[11.4361]	[6.9627]	[17.9175]	[14.9559]
NPL	26.3090***	-13.5106***	53.9807***	-4.1102
	[4.3320]	[4.4658]	[9.3733]	[12.0945]
RE loans	3.4671***	0.8550***	3.4357***	2.8924***
	[0.7884]	[0.3084]	[1.0401]	[0.7274]
ROA	-16.1288**	-27.7114***	10.1715	-47.0856***
	[6.3372]	[5.3395]	[10.3845]	[12.9065]
Size (log)	0.0721	0.2367***	-0.1766**	-0.1862***
	[0.0470]	[0.0305]	[0.0693]	[0.0626]
State Fixed Effects	yes	yes	yes	yes
Pseudo R2	0.3385	0.3201	0.3676	0.1677
Observations	5916	6552	994	740

Table 5. Did CPP banks outperform non-CPP banks?

Panel A presents the differences between CPP Banks and matched NON-CPP banks at matching date (30.09.2008). Panel B reports the estimates of means and medians for abnormal variables of CPP banks for quarters ending between December 31, 2008 and September 30, 2011. Quarter 0 is the quarter ending on September 30, 2008. *Abnormal* variables are measured as the difference between the variables of the CPP bank minus the corresponding variable of the matching firms. Matching firms are selected from the universe of commercial banks with available data on Sept. 30, 2008. Matching banks are selected using a propensity score approach, which relies on the probit model (II) of Table 4, Panel A. Abnormal variables are winsorized at the 2.5% level on both tails. In Panel B, the table reports the number of CPP banks and the number of matched banks that faced FDIC resolution before Sept. 30, 2013. Panel D presents the number of banks that failed in between Sep. 2008 and Sep. 2013 in both samples. Variable definitions are provided in the appendix.

Panel A: Differences between CPP Banks and Matched NON-CPP banks at matching date (30.09.2008).

				P-value Tests	
Abnormal Variable	Mean	Median	N. Obs.	Mean	Median
ROA	0.28%	-0.01%	826	0.0000	0.3935
ROE	3.51%	0.42%	826	0.0000	0.0870
Loans	0.58%	0.86%	826	0.2388	0.1608
Equity	-0.05%	-0.19%	826	0.6791	0.2716
Credit Risk	0.13%	0.75%	826	0.7940	0.5710

Panel B: ROA, ROE, Loans, Equity, and Credit Risk.

	Abnormal ROA		Abnormal ROE		Abnormal Loans		Abnormal Equity		Abnormal Credit Risk		
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	N
1 Quarter ahead	0.30%	-0.09%	5.83%	-0.54%	0.26%	0.32%	0.10%	0.07%	-0.05%	0.51%	800
p-value tests	0.0019	0.2987	0.0000	0.6535	0.5975	0.6556	0.4098	0.5196	0.9186	0.9664	
2 Quarters ahead	0.05%	-0.01%	0.62%	-0.17%	0.36%	-0.06%	0.58%	0.56%	0.13%	0.64%	791
p-value tests	0.0096	0.6510	0.0078	0.5502	0.4755	0.5272	0.0000	0.0000	0.7896	0.6689	
3 Quarters ahead	0.13%	-0.03%	2.18%	-0.44%	0.23%	0.07%	0.68%	0.50%	0.17%	0.25%	782
p-value tests	0.0078	0.8256	0.0011	0.8997	0.6475	0.6323	0.0000	0.0000	0.7177	0.5720	
4 Quarters ahead	0.06%	-0.12%	2.98%	-1.25%	0.55%	0.42%	0.64%	0.57%	0.30%	0.12%	770
p-value tests	0.4070	0.3254	0.0030	0.4625	0.2883	0.3021	0.0000	0.0000	0.5484	0.5064	
5 Quarters ahead	0.02%	-0.15%	7.76%	-1.47%	0.63%	0.74%	0.56%	0.45%	0.10%	0.40%	765
p-value tests	0.8798	0.1049	0.0001	0.2886	0.2239	0.1994	0.0000	0.0000	0.8323	0.5628	
6 Quarters ahead	0.02%	-0.01%	0.06%	-0.08%	1.09%	0.86%	0.53%	0.42%	0.23%	0.07%	759
p-value tests	0.2437	0.7308	0.8317	0.9276	0.0345	0.0380	0.0001	0.0000	0.6306	0.5495	
7 Quarters ahead	-0.01%	-0.05%	0.77%	-0.51%	1.50%	0.68%	0.30%	0.32%	0.46%	0.12%	725
p-value tests	0.8375	0.1405	0.1440	0.2158	0.0039	0.0112	0.0167	0.0032	0.3376	0.2552	
8 Quarters ahead	-0.04%	-0.10%	1.27%	-0.90%	1.75%	1.46%	0.23%	0.34%	0.69%	0.96%	719
p-value tests	0.5030	0.0669	0.1123	0.1692	0.0010	0.0031	0.0675	0.0085	0.1429	0.0926	
9 Quarters ahead	-0.02%	-0.08%	5.51%	-0.77%	1.81%	1.48%	0.32%	0.40%	0.74%	0.97%	706
p-value tests	0.8431	0.1555	0.0035	0.1991	0.0011	0.0056	0.0205	0.0079	0.1286	0.1145	
10 Quarters ahead	-0.02%	-0.03%	0.37%	-0.20%	0.99%	1.18%	0.24%	0.38%	0.36%	-0.03%	698
p-value tests	0.2720	0.0707	0.1638	0.1070	0.0700	0.1196	0.0816	0.0331	0.4617	0.4450	
11 Quarters ahead	-0.05%	-0.04%	0.12%	-0.40%	1.55%	1.46%	0.18%	0.31%	1.00%	0.88%	683
p-value tests	0.1228	0.0814	0.8082	0.1102	0.0054	0.0099	0.1984	0.1002	0.0443	0.0351	
12 Quarters ahead	-0.03%	-0.06%	1.05%	-0.37%	1.44%	0.98%	0.15%	0.35%	0.86%	1.52%	671
p-value tests	0.5342	0.1332	0.1409	0.2141	0.0132	0.0305	0.2921	0.1085	0.0817	0.0591	

Panel C: Failures over the period 30.09.2008-30.09.2013

	# Resolution	% Resolution	# Observations
CPP Sample	19	2.30%	826
Matching Sample	98	11.86%	826
	T-test for difference		
t-stat	7.7073		
p-value	0.000		

Table 6. CPP and the likelihood of Failures

The table reports the estimates of hazard ratios for a hazard rate model to predict failure. A Cox Cox proportional hazards model is employed. The sample period includes quarters ending between December 31, 2008, and December 31, 2009 (five quarters) in Columns I and II; and between December 31, 2008, and December 31, 2010 (nine quarters) in Columns III and IV; and between December 31, 2008 and September 30, 2013 (20 quarters). Robust standard errors are reported in brackets. All independent variables are winsorized at 1% on both tails. All regressions models include State fixed effects. Variable definitions are provided in the appendix. The symbols ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

	(I)	(II)	(III)	(IV)	(V)	(VI)
Failure between:	*Q4 2008 – Q42009*	*Q4 2008 – Q42009*	*Q4 2008 – Q42010*	*Q4 2008 – Q42010*	*Q4 2008 – Q32013*	*Q4 2008 – Q32013*
CPP	-0.8830**	-0.8811**	-1.0846***	-1.0782***	-0.5671***	-0.5970***
	[0.4341]	[0.4338]	[0.3771]	[0.3772]	[0.2043]	[0.2117]
CPP Repaid		-38.3398		-37.3862***		0.8183
		[0.0000]		[0.8533]		[0.6754]
Age (log)	-0.0448	-0.0449	0.0956*	0.0956*	0.0541	0.0553
	[0.0962]	[0.0962]	[0.0563]	[0.0563]	[0.0458]	[0.0458]
Brokered Deposits	1.1245	1.1239	0.9158	0.9144	0.8358	0.8364
	[1.2041]	[1.2041]	[0.6844]	[0.6844]	[0.6037]	[0.6038]
C&I Loans	-4.0862	-4.0865	-0.241	-0.2367	-0.2169	-0.2303
	[2.9974]	[2.9972]	[1.6146]	[1.6141]	[1.2801]	[1.2802]
Cash	1.5562	1.5557	0.6504	0.6493	0.2182	0.2222
	[1.5895]	[1.5894]	[1.1053]	[1.1051]	[0.8256]	[0.8249]
Cost Ineff.	38.6094***	38.6075***	31.8939***	31.8708***	25.1341***	25.3948***
	[9.0204]	[9.0196]	[6.8777]	[6.8772]	[5.1366]	[5.1584]
Credit Risk	2.2688*	2.2686*	2.9760***	2.9755***	3.6628***	3.6693***
	[1.3221]	[1.3222]	[0.8738]	[0.8736]	[0.6837]	[0.6840]
Equity	-120.967***	-120.938***	-133.197***	-133.169***	-148.708***	-148.735***
	[25.2343]	[25.2419]	[19.9734]	[19.9805]	[18.8457]	[18.8152]
Goodwill	25.1133	25.1122	18.1249	18.137	18.8283	18.773
	[17.1399]	[17.1404]	[13.5148]	[13.5151]	[12.5710]	[12.5745]
Listed	-0.3271	-0.3271	-0.2081	-0.2077	0.0005	0
	[0.2807]	[0.2807]	[0.1863]	[0.1863]	[0.1455]	[0.1457]
Loan Loss Reserves	12.5291	12.5298	23.4040**	23.3996**	24.1414***	24.1637***
	[15.4960]	[15.4962]	[10.4592]	[10.4598]	[8.3623]	[8.3708]
Loans	-2.4598	-2.4594	-2.9132**	-2.9135**	-3.1372***	-3.1486***
	[2.0957]	[2.0955]	[1.4260]	[1.4252]	[1.1739]	[1.1750]
Multibank	0.306	0.3062	-0.005	-0.0052	-0.4208**	-0.4188**
	[0.2307]	[0.2308]	[0.1929]	[0.1929]	[0.1922]	[0.1924]
Noninterest Income	-76.2022*	-76.1924*	-67.3154***	-67.2882***	-45.2488***	-45.5240***
	[39.9322]	[39.9324]	[22.7493]	[22.7491]	[14.8899]	[14.9005]
NPL	24.2938***	24.2949***	21.5684***	21.5630***	24.8881***	24.8958***
	[6.0679]	[6.0680]	[3.9757]	[3.9760]	[3.1945]	[3.1954]
RE loans	0.7437	0.7431	1.0943	1.0964	0.5459	0.5444
	[2.0741]	[2.0739]	[1.2154]	[1.2148]	[1.0248]	[1.0257]
ROA	-43.7059**	-43.7096**	-58.9501***	-58.9467***	-69.2859***	-69.1492***
	[19.7702]	[19.7713]	[13.0762]	[13.0746]	[9.5037]	[9.5062]
Size (log)	0.1474	0.1474	0.0934	0.0932	0.0452	0.0465
	[0.0942]	[0.0942]	[0.0654]	[0.0654]	[0.0514]	[0.0515]
State Fixed Effects	yes	yes	yes	yes	yes	yes
Pseudo R2	0.4238	0.4238	0.3997	0.3998	0.4153	0.4154
Observations	20619	20619	47543	47543	114291	114291

Table 7. Do failed banks perform worse than CPP banks?

Panel A presents the differences between failed banks and matched CPP banks at matching date (30.09.2008). Panel C reports the estimates of means and medians for abnormal variables of failed banks for quarters ending between December 31, 2008 and September 30, 2011. Quarter 0 is the quarter ending on September 30, 2008. Abnormal variables are measured as the difference between the variable of the failed bank minus the corresponding variable of the matching firms. Matching firms are banks that participated to the CPP program. Matching banks are selected using a propensity score approach, which relies on the probit model (I) of Table 4, Panel A. Abnormal variables are winsorized at the 2.5% level on both tails. Variable definitions are provided in the appendix.

Panel A: Differences between Failed Banks and Matched CPP banks at matching data (30.09.2008).

				P- values Tests	
Abnormal Variable	Mean	Median	N. Obs.	Mean	Median
ROA	0.82%	0.31%	382	0.0000	0.0000
ROE	2.14%	2.60%	382	0.2620	0.0021
Loans	-1.38%	-1.05%	382	0.0122	0.0151
Equity	-1.25%	-0.99%	382	0.0000	0.0000
Credit Risk	-3.04%	-3.45%	382	0.0000	0.0000

Panel C: ROA, ROE, Loans, Equity, Credit Risk.

	Abnormal ROA		Abnormal ROE		Abnormal Loans		Abnormal Equity		Abnormal Credit Risk		
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	N
1 Quarter ahead	0.09%	-0.21%	-19.06%	-5.03%	-0.46%	0.03%	-1.71%	-1.62%	-2.19%	-1.85%	373
p-value tests	0.6442	0.8199	0.0000	0.0005	0.4124	0.6691	0.0000	0.0000	0.0000	0.0001	
2 Quarters ahead	-0.55%	-0.13%	-17.46%	-1.98%	-1.31%	-1.13%	-2.49%	-2.26%	-1.74%	-1.81%	353
p-value tests	0.0000	0.0000	0.0000	0.0000	0.0224	0.0394	0.0000	0.0000	0.0036	0.0031	
3 Quarters ahead	-1.30%	-0.57%	-16.44%	-7.19%	-1.63%	-1.47%	-3.53%	-2.98%	-1.98%	-2.64%	332
p-value tests	0.0000	0.0000	0.0471	0.0000	0.0043	0.0141	0.0000	0.0000	0.0015	0.0003	
4 Quarters ahead	-1.53%	-1.11%	-59.01%	-19.32%	-0.75%	-1.16%	-3.54%	-3.24%	-2.10%	-2.44%	290
p-value tests	0.0000	0.0000	0.0000	0.0000	0.1989	0.1800	0.0000	0.0000	0.0012	0.0008	
5 Quarters ahead	-2.65%	-2.48%	-126.44%	-66.84%	-1.43%	-1.29%	-4.52%	-4.57%	-2.04%	-2.60%	257
p-value tests	0.0000	0.0000	0.0000	0.0000	0.0207	0.0198	0.0000	0.0000	0.0024	0.0021	
6 Quarters ahead	-0.45%	-0.29%	-10.45%	-5.52%	-2.46%	-2.38%	-4.92%	-5.07%	-2.67%	-3.65%	224
p-value tests	0.0000	0.0000	0.1260	0.0000	0.0009	0.0010	0.0000	0.0000	0.0006	0.0007	
7 Quarters ahead	-1.10%	-0.88%	-65.11%	-24.48%	-2.13%	-1.86%	-5.51%	-5.53%	-1.63%	-1.92%	186
p-value tests	0.0000	0.0000	0.0000	0.0000	0.0112	0.0191	0.0000	0.0000	0.0635	0.0537	
8 Quarters ahead	-1.90%	-1.62%	-80.88%	-45.64%	-1.67%	-1.04%	-5.50%	-6.06%	-0.46%	0.12%	156
p-value tests	0.0000	0.0000	0.0000	0.0000	0.0727	0.0832	0.0000	0.0000	0.5824	0.4991	
9 Quarters ahead	-2.96%	-2.71%	-197.40%	-90.57%	-2.45%	-2.95%	-6.29%	-6.57%	-0.39%	-1.13%	132
p-value tests	0.0000	0.0000	0.0000	0.0000	0.0148	0.0147	0.0000	0.0000	0.6591	0.4604	
10 Quarters ahead	-0.78%	-0.63%	-43.10%	-16.04%	-1.23%	-2.26%	-6.34%	-6.69%	0.78%	-1.34%	108
p-value tests	0.0000	0.0000	0.0004	0.0000	0.2921	0.2089	0.0000	0.0000	0.4885	0.9487	
11 Quarters ahead	-1.63%	-1.48%	-55.32%	-40.94%	-0.48%	-1.13%	-6.41%	-6.82%	1.38%	1.00%	90
p-value tests	0.0000	0.0000	0.0038	0.0000	0.6991	0.6859	0.0000	0.0000	0.2388	0.3495	
12 Quarters ahead	-2.75%	-2.36%	-148.17%	-74.08%	-0.88%	-1.19%	-6.88%	-7.44%	1.88%	0.46%	71
p-value tests	0.0000	0.0000	0.0000	0.0000	0.5469	0.4159	0.0000	0.0000	0.1868	0.2763	

Table 8. Failures, CPP, and TAF

Panel A reports the number and percentage of banks that received TAF loans during the period 2007-2010. Panel B reports the amount of loans received. All loans are included (i.e. loans that are renewed are counted). Panel C reports the number and percentage of CPP banks and their matching non-CPP banks that received TAF loans. Matching non-CPP banks are described in Section 5.2.

Panel A: TAF Recipient

	TAF		TAF pre Sept 2008		TAF post Sept 2008	
	#	%	#	%	#	%
No CPP/No	119	48.77%	26	10.66%	114	46.72%
CPP	108	44.26%	34	13.93%	103	42.21%
Failed	14	5.74%	4	1.64%	12	4.92%
CPP/Failed	3	1.23%	2	0.82%	1	0.41%
Total	244	100.00%	66	27.05%	230	94.26%

Panel B: Loan Amount Received

	TAF		TAF pre Sept 2008		TAF post Sept 2008	
	Amount	% Total TAF	Amount	% Total	Amount	% Total
No CPP/No Failure	77482.4	10.39%	11012.8	1.48%	66469.6	8.91%
CPP	664833.9	89.13%	263495.6	35.32%	401338.3	53.80%
Failed	2988	0.40%	827.5	0.11%	2160.5	0.29%
CPP/Failed	630	0.08%	55	0.01%	575	0.08%
Total	745934.3		275390.9	36.92%	470543.4	63.08%

Panel C: TAF Loans received by non-CPP matching banks

	CPP Banks	Non-CPP matching banks
Banks that received TAF loans	104	70
%	12.59%	8.47%
Total Banks	826	826
T-test for difference		
t-stat	-2.7295	
p-value	0.0064	

Table 9 – Capital & Regulatory Capital Ratios

The table presents descriptive statistics of capital (Equity Ratio, Panel A) and regulatory capital (leverage ratio (Panel B) and Tier 1 Ratio (Panel C)) for the universe of commercial banks available in the Call reports data for the quarter ending on September 30, 2008. Failure is a binary variable that takes value 1 if the bank appears on the FDIC failed bank list between Sept. 2008 and Sept. 2013. CPP is a binary variable that takes value 1 if the bank has received or is affiliated to a BHC that received CPP funds. All non-binary variables are winsorized at 1% on both tails. Variables are described in the Appendix.

Panel A: Equity Ratio (Total Common Equity/Total Assets)

Equity Ratio		Failure			CPP	
	#	%	% Cum.	#	%	% Cum.
>=15%	14	3.66%	3.66%	63	7.63%	7.63%
>=10%	79	20.68%	24.35%	255	30.87%	38.50%
>8%	144	37.70%	62.04%	323	39.10%	77.60%
>5%	121	31.68%	93.72%	176	21.31%	98.91%
>4%	12	3.14%	96.86%	4	0.48%	99.39%
>3%	7	1.83%	98.69%	4	0.48%	99.88%
<3%	5	1.31%	100.00%	1	0.12%	100.00%
	382			826		

Panel B: Leverage Ratio (Tier 1 Capital /Total Assets)

Leverage Ratio		Failure			CPP	
	#	%	% Cum.	#	%	% Cum.
>=15%	7	1.83%	1.83%	13	1.57%	1.57%
>=10%	62	16.23%	18.06%	115	13.92%	15.50%
>8%	148	38.74%	56.81%	370	44.79%	60.29%
>5%	146	38.22%	95.03%	326	39.47%	99.76%
>4%	8	2.09%	97.12%	1	0.12%	99.88%
>3%	5	1.31%	98.43%	0	0.00%	99.88%
<3%	6	1.57%	100.00%	1	0.12%	100.00%
	382			826		

Panel C: Tier 1 Ratio (Tier 1 Capital /Risk-Weighted Assets)

Tier 1 Ratio		Failure			CPP	
	#	%	% Cum.	#	%	% Cum.
>=15%	24	6.28%	6.28%	54	6.54%	6.54%
>=10%	140	36.65%	42.93%	398	48.18%	54.72%
>8%	163	42.67%	85.60%	346	41.89%	96.61%
>5%	34	8.90%	94.50%	27	3.27%	99.88%
>4%	14	3.66%	98.17%	0	0.00%	99.88%
>3%	4	1.05%	99.21%	0	0.00%	99.88%
<3%	3	0.79%	100.00%	1	0.12%	100.00%
	382			826		

Table 10. Cost of Saving the Failed Banks

Panel A of Table 10 reports descriptive statistics for estimated losses, total assets, risk-weighted assets, the probability of failure (p_F) and the probability of failure given government assistance (p_{FR}). Panel B reports means and medians for the expected cost of failure, the expected cost of rescue, and their difference. Panel C reports the number and percentage of salvageable failed banks. P-values for the tests for differences between the means and medians of the two groups are provided. Values are in US$ thousands.

Panel A: Estimated Loss, Total Assets, Risk-Weighted Assets, and probabilities

	Estimated Loss (in $1,000)	Total Assets(in $1,000)	Risk-Weighted Assets (in $1,000)	P_F	P_{FR}
Mean	130’256	673’776	560’453	41.92%	8.13%
Median	60’442	254’522	204’856	37.29%	7.23%
N. Obs.	367	367	367	367	367
Total	47’804’098.8				

Panel B: Expected cost of failure and expected cost of rescue

	Delay			No Delay	
	(1) Expected Cost of Bailouts (in $1,000)	(2) Expected cost of Failure (in $1,000)	(3) Difference (2)-(1) (in $1,000)	(4) Expected cost of Failure (in $1,000)	(5) Difference (4)-(1) (in $1,000)
Mean	17’524	60’103	42’579***	39’451	21’926
Median	9’647	22’401	13’621***	7’035	-144.55
N. Obs.	367	367	367	367	367
Total	6’431’466	22’057’926	15’626’460	14’478’348	8’046’882

Panel C: Salvageable Failed Banks.

	Delay		No Delay	
	#	%	#	%
Salvageable Failed Banks	308	83.92%	182	49.59%
Failed Banks	367		367	

Appendix A: CPP & Bank failures by State

	Failure 08-11	% Failure 08-11	Failure 08-12	% Failure 08-12	Failure 08-13	% Failure 08-12	CPP Dummy	% CPP dummy	Obs.
AK	0	0.00%	0	0.00%	0	0.00%	1	16.67%	6
AL	4	3.01%	5	3.76%	5	3.76%	19	14.29%	133
AR	1	0.73%	1	0.73%	1	0.73%	15	10.95%	137
AZ	10	27.78%	10	27.78%	12	33.33%	5	13.89%	36
CA	29	13.24%	30	13.70%	30	13.70%	68	31.05%	219
CO	8	6.35%	8	6.35%	8	6.35%	13	10.32%	126
CT	0	0.00%	0	0.00%	0	0.00%	5	11.63%	43
DC	0	0.00%	0	0.00%	0	0.00%	2	40.00%	5
DE	0	0.00%	0	0.00%	0	0.00%	10	71.43%	14
FL	41	19.52%	48	22.86%	51	24.29%	38	18.10%	210
GA	63	22.66%	72	25.90%	74	26.62%	43	15.47%	278
HI	0	0.00%	0	0.00%	0	0.00%	1	25.00%	4
IA	1	0.28%	1	0.28%	1	0.28%	11	3.06%	359
ID	0	0.00%	0	0.00%	0	0.00%	4	28.57%	14
IL	45	7.67%	52	8.86%	53	9.03%	72	12.27%	587
IN	2	1.72%	2	1.72%	2	1.72%	16	13.79%	116
KS	6	1.85%	7	2.16%	7	2.16%	18	5.56%	324
KY	0	0.00%	0	0.00%	0	0.00%	21	11.86%	177
LA	2	1.52%	2	1.52%	2	1.52%	13	9.85%	132
MA	1	0.68%	1	0.68%	1	0.68%	9	6.12%	147
MD	2	3.85%	4	7.69%	4	7.69%	22	42.31%	52
ME	0	0.00%	0	0.00%	0	0.00%	4	19.05%	21
MI	9	6.47%	10	7.19%	10	7.19%	17	12.23%	139
MN	16	3.97%	18	4.47%	19	4.71%	17	4.22%	403
MO	7	2.22%	11	3.49%	11	3.49%	35	11.11%	315
MS	2	2.25%	2	2.25%	2	2.25%	16	17.98%	89
MT	0	0.00%	0	0.00%	0	0.00%	1	1.43%	70
NC	4	5.26%	5	6.58%	6	7.89%	32	42.11%	76
ND	0	0.00%	0	0.00%	0	0.00%	3	3.33%	90
NE	2	0.87%	2	0.87%	2	0.87%	10	4.37%	229
NH	0	0.00%	0	0.00%	0	0.00%	4	28.57%	14
NJ	3	4.00%	3	4.00%	3	4.00%	21	28.00%	75
NM	2	4.44%	2	4.44%	2	4.44%	4	8.89%	45
NV	7	28.00%	7	28.00%	7	28.00%	4	16.00%	25
NY	3	2.94%	3	2.94%	3	2.94%	14	13.73%	102
OH	2	1.16%	2	1.16%	2	1.16%	18	10.47%	172
OK	4	1.65%	5	2.07%	5	2.07%	6	2.48%	242
OR	6	18.18%	6	18.18%	6	18.18%	5	15.15%	33
PA	3	1.65%	4	2.20%	4	2.20%	34	18.68%	182
RI	0	0.00%	0	0.00%	0	0.00%	2	33.33%	6
SC	4	6.67%	4	6.67%	4	6.67%	19	31.67%	60
SD	1	1.27%	1	1.27%	1	1.27%	2	2.53%	79
TN	0	0.00%	3	1.73%	5	2.89%	27	15.61%	173
TX	7	1.27%	7	1.27%	7	1.27%	32	5.81%	551
UT	6	11.32%	6	11.32%	6	11.32%	8	15.09%	53
VA	1	1.08%	1	1.08%	1	1.08%	30	32.26%	93
VT	0	0.00%	0	0.00%	0	0.00%	0	0.00%	12
WA	17	22.08%	17	22.08%	18	23.38%	20	25.97%	77
WI	5	1.95%	5	1.95%	6	2.33%	23	8.95%	257
WV	0	0.00%	0	0.00%	0	0.00%	7	11.48%	61
WY	1	2.70%	1	2.70%	1	2.70%	5	13.51%	37
Total	327		368		382		519		6900