Did TARP banks get competitive advantages?*

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Abstract:

We investigate whether the Troubled Assets Relief Program (TARP) gave TARP banks competitive advantages. We find that: 1) TARP recipients received competitive advantages and increased both their market shares and market power; 2) results may be driven primarily by the ***safety channel*** (TARP banks may be perceived as safer), which is partially offset by the ***cost disadvantage channel*** (TARP funds may be relatively expensive); and 3) these competitive advantages are primarily or entirely due to TARP banks that repaid early. The results of this paper may help explain other findings in the literature and yield important policy implications.

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1. Introduction

This paper conducts an empirical assessment of the Troubled Assets Relief Program (TARP) – one of the largest government interventions in US during the recent financial crisis – on bank competition and investigates whether TARP may have given its recipients competitive advantages. The main component of TARP, the Capital Purchase Program (CPP), is a preferred stock and equity warrant purchase program led by the US Treasury's Office of Financial Stability. We use the name TARP henceforth to refer to CPP, since this is the ultimate name widely used in the media (although CPP is only one of the interventions).

The main objectives of TARP were to improve the stability of the financial system and increase availability of credit. However, it may also have had unintended effects on bank competition and resource allocation, given that the literature on regulatory interventions in the banking sector often opines that public guarantees distort competition (e.g., French et al. (2010), Gropp, Hakenes, and Schnabel (2011), Calderon and Schaeck (2012)).

Using the full sample of commercial banks in US (2005-2012), we show that TARP provided competitive advantages to TARP recipients, and increased both their market shares and market power relative to non-TARP recipients. Results suggest that the positive market share and market power findings may be driven primarily by the ***safety channel*** (TARP banks may be perceived as safer), which is partially offset by the ***cost disadvantage channel*** (TARP funds may be relatively expensive).[1] The competitive advantages appear to be primarily or entirely due to TARP banks that repaid early, suggesting that these banks had significantly reduced importance of the ***cost disadvantage channel*** and had increased importance of the ***safety channel***. Our results suggest a possible distortion in competition due to the government intervention, which may have misallocated resources. The results may also help explain other findings in the literature on the effects of TARP on bank risk and lending, and yield important policy implications.

Our hypotheses suggest diverging predictions regarding the effect of TARP on bank competitive indicators, market share and market power. TARP can either increase or decrease these measures of

[1] These effects are described in detail in Section 4.

competitive advantage. We consider separately the cases of market share and market power because our different effects may influence market share and market power in the same or opposite directions.

We first consider the case of market share as measured by local market share of assets. TARP can lead to competitive advantages if it helps recipient banks increase their market shares relative to non-TARP banks. Three potential channels may lead to a higher market share: the ***predation channel*** (TARP banks may compete more aggressively), the ***safety channel*** (TARP banks may be considered safer due to the bailout), and the ***cost advantage channel*** (TARP funds may be cheaper than non-TARP funds). A contrasting view would suggest that TARP may decrease the market share of TARP banks relative to non-TARP banks. Three different channels may lead to a lower market share: the ***charter value / quiet life channel*** (bailout may increase charter value and/or allow for a "quiet life"), the ***stigma channel*** (TARP banks may be perceived as riskier), and the ***cost disadvantage channel*** (TARP funds may be more expensive than non-TARP funds). Importantly, the ***safety channel*** is the opposite of the ***stigma channel***, the ***cost disadvantage channel*** is the opposite of the ***cost advantage channel***, and only one of each pair can hold for a given bank at a given time.

We then consider the case of market power as measured by Lerner Index. TARP banks may increase their market power relative to non-TARP banks due to four different channels, three of which also affect market share as described above: the ***safety channel***, the ***moral hazard increase channel*** (reduction in discipline results in shifts into riskier portfolios), the ***charter value / quiet life channel***, and the ***cost advantage channel***. Alternatively, TARP banks may decrease their market power relative to non-TARP banks due to four different channels, three of whichalso affect market share as described above: the ***predation channel***, the ***moral hazard decrease channel*** (increase in capital results in shifts into safer portfolios), the ***stigma channel***, and the ***cost disadvantage channel***.

Some of the market share and market power channels go in the same direction and some go in the opposite direction and we formulate hypotheses that take these channels into consideration. We test the hypotheses and try to distinguish which of the channels empirically dominate using a difference-in-difference (DID) regression model. The model uses indicators of competitive advantage – local market

share of assets as a proxy for market share and Lerner index as a proxy for market power – as the key dependent variables. The exogenous variables include a *TARP Recipient* dummy and a DID term, *Post TARP x TARP Recipient* (where *Post TARP* is a dummy equal to one in 2009-2012, the period after the TARP program initiation), to capture the effect of the TARP treatment. We also control for proxies for CAMELS, the declared set of financial criteria used by regulators to assess the health of banking organizations, as well as a rich set of other bank characteristics and time fixed effects.

Our results suggest that TARP banks did get competitive advantages and increased both their market share and market power relative to non-TARP banks. When splitting the TARP participants by whether or not they repaid early, we find that the competitive advantages are primarily or entirely due to recipients that repaid early, suggesting that these banks had significantly reduced the importance of the ***cost disadvantage channel*** and had increased the importance of the ***safety channel***. When assessing which of the channels above are the strongest and weakest based on our results, we have several important findings: 1) The ***moral hazard channels*** seems to be unimportant, 2) the ***cost disadvantage channel*** seems to dominate the ***cost advantage channel***, at least for the banks that repaid early, and 3) the ***safety channel*** dominates the ***stigma*** and ***cost disadvantage channels***.

We perform a number of robustness checks. First, we address the possible endogeneity problems between our independent variable (*TARP recipient*) and the dependent variables for competitive advantage following Bayazitova and Shivdasani (2012), Duchin and Sosyura (forthcoming), and Li (forthcoming). We use both propensity score matching and instrumental variable analysis. Second, we check the sensitivity of our results to alternative proxies of TARP – TARP infusion amount over gross total assets (GTA)[2] and TARP infusion amount over risk-weighted assets – instead of a TARP recipient dummy. Third, we use alternative proxies of market share – local market shares of loans and deposits – instead of the local market share of assets. Fourth, we use alternative econometric models, bank fixed effects and random effects models, as well as a model with standard errors clustered at the bank level. We also perform tests to capture

[2] Gross total assets (GTA) equals total assets plus the allowance for loan and lease losses and the allocated transfer risk reserve (a reserve for certain foreign loans). Total assets on Call Reports deduct these two reserves, which are held to cover potential credit losses. We add these reserves back to measure the full value of the assets financed.

the effects of different bank sizes. We finally also conduct several subsample analyses such as: excluding involuntary participants, excluding stress-tested banks, and subsample analyses based on bank capitalization, and local market concentration.

The remainder of the paper is organized as follows. In Section 2, we describe TARP. In Section 3, we review the related literature. In Section 4, we develop the empirical hypotheses. In Section 5, we describe the econometric framework. In Section 6, we discuss the data. In Section 7, we present the main empirical results. In Section 8, we focus on robustness tests. In Section 9, we draw conclusions, explain how our findings may explain other results in the TARP literature, and give policy implications.

2. Description of the Troubled Asset Relief Program (TARP)

The Troubled Asset Relief Program (TARP) was established in October 2008 pursuant to the Emergency Economic Stabilization Act of 2008 (EESA). It was one of the largest government interventions to address the subprime mortgage crisis. Its primary purposes were to improve financial stability by purchasing up to $700 billion of the banking organizations' "troubled assets" (thus allowing them to stabilize their balance sheets and avoid further losses) and encourage banks to resume lending.

Rather than purchasing "troubled assets," the Capital Purchase Program (CPP) of TARP authorized the U.S. Treasury to invest up to $250 billion (out of the $700 billion bailout package) in the preferred equity of selected financial institutions to enhance their capital ratios. This included $125 billion in $10 billion and $25 billion increments to nine large involuntary participants (Citigroup, Bank of America, JPMorgan Chase, Wells Fargo, Goldman Sachs Group, Morgan Stanley, Wachovia Corporation, State Street Corporation, and Merrill Lynch). These initial recipients did not follow the formal CPP evaluation process, while the rest of the banks followed the formal process and applied for CPP funds from the U.S. Treasury. During 2008-2009, TARP infused capital of $204.9 billion into 709 banking organizations. Approval to receive TARP funds took into account the health of the banking organizations, with the viable, healthier ones being more likely to receive capital. In addition, Duchin and Sosyura (2012, forthcoming), Bayazitova and Shivdasani (2012), and Li (forthcoming) find that the banks with more political influence

were more likely to receive TARP funds. The TARP investment in preferred shares was determined by the Treasury, ranging from 1-3% of a firm's risk-weighted assets or $25 billion (whichever was smaller).

In return for the TARP capital infusion, banks provided the Treasury with non-voting preferred stock (which pays quarterly dividends at an annual yield of 5% for the first three years and 9% afterwards) and ten-year life warrants for the common stock (which allowed the purchase of common stock for an amount equal to 15% of the preferred equity infusion), giving taxpayers the opportunity to benefit from the banks' future growth. In addition, TARP participants were subject to compensation restrictions. Some of these were outlined at program inception in October 2008: limited tax deductibility of compensation for senior executives to $500,000, required bonus claw-backs, and limited golden parachute payments. In February 2009, the Treasury revised the compensation rules and limited total annual compensation for senior executives at TARP banks to $500,000 excluding certain incentive awards, and the American Recovery and Reinvestment Act (ARRA) further prohibited bonuses, retention awards, and incentive compensation other than long-term restricted stock awards that did not exceed one-third of annual compensation. As of December 31, 2012, the Treasury had received over $220 billion in total cash back on $204.9 billion TARP investments in banking organizations (more than 100% of the total disbursed).[3]

3. Related literature

A number of papers look at TARP determinants and effects. First, several papers that look at factors that affect the initial decisions to apply for and receive TARP funds by banks. Duchin and Sosyura (2012, forthcoming) investigate the allocation of TARP capital to publicly listed banks and find that banks with a high political connections index are more likely to receive TARP funds. Bayazitova and Shivdasani (2012) find that banks that posed systemic risk and faced high financial distress costs, but had strong asset quality, obtained TARP equity infusions. Cornett, Li, and Tehranian (2013) find that financial characteristics related to the probability of receiving TARP differ for the healthiest (''over-achiever'') versus the least healthy (''under-achiever'') banks. Thus, TARP under-achievers had weaknesses in income production and

[3] http://www.treasury.gov/initiatives/financial-stability/reports/Pages/Monthly-Report-to-Congress.aspx

experienced liquidity issues while TARP over-achievers' loans performed well, but liquidity issues hurt the abilities of these banks to continue their lending. Some other papers look at "exit from TARP" decisions and characteristics of banks that exit early (Bayazitova and Shivdasani (2012) and Wilson and Wu (2012)), and find that banks with high levels of CEO pay were more likely to exit early, presumably due to the restrictions on executive pay imposed on TARP recipients.

Second, some papers look at valuation effects of TARP. Ng, Vasvari, and Wittenberg-Moerman (2013) find that TARP banks had lower equity returns in the program initiation and increased their valuations later. Harrisa, Huertab, and Ngob (2013) find deteriorating operating efficiency for TARP banks. Veronesi and Zingales (2010) determine the costs and benefits of TARP capital infusions in the ten largest banks up to 2009. They find that this intervention increased the value of banks' financial claims by $130 billion at a taxpayers' cost of $21 billion - $44 billion with a net benefit between $86 billion and $109 billion. Norden, Roosenboom, and Wang (2012) find that TARP led to spillover effects from the banking sector to the corporate sector, leading to a significantly positive impact on borrowing firms' stock returns.

Third, other papers investigate the impact of TARP on bank risk-taking and/or lending. Duchin and Sosyura (forthcoming), using a sample of 529 publicly traded financial firms (2006-2010) which tend to be the largest firms, find that TARP banks seemed to approve riskier loans, and find no evidence of an increase in credit supply. Black and Hazelwood (forthcoming) analyze risk-taking by bank size using a dataset of 81 banks from the Survey of Terms of Bank Lending (STBL) survey (2007-2010). They find that risk of loans originated increased for large TARP banks, but decreased at small TARP banks. They also look at the impact on lending and find that outstanding commercial and industrial loans (C&I) increased at small TARP banks, but decreased at large TARP banks relative to non-TARP banks. Li (forthcoming) looks at TARP's effect on bank loan supply using a sample of 7,062 banks (both public and private), out of which 647 are TARP recipients. He focuses on banks with below-median Tier 1 ratios (less well capitalized) because these are more likely to receive TARP, and finds that these TARP banks expanded their credit supply, and this increase was registered in all major types of loans. Presumably, the results in this last study were dominated by the effects on small banks, which generally constitute the vast majority of banks.

Another relevant paper is Koetter and Noth (2012), a contemporaneous working paper to ours, which looks at the impact of the probability of TARP on competition. They find that a higher probability of bailout is associated with higher market power after the crisis. However, our work is substantially different from theirs in several important respects: 1) we consider the actual TARP bailout, rather than the probability of bailout, 2) we consider market share effects in addition to market power effects, 3) we use a DID approach, 4) we distinguish among eight different channels through which bailouts may impact competitive advantages, and 5) we draw a distinction between TARP banks that repaid early and TARP banks that did not repay early.

A related strand of literature looks at impact of government capital interventions other than TARP on bank risk-taking, lending, and liquidity creation. Hryckiewicz (2012) uses an international bank dataset and finds that government capital injections negatively impact credit growth. In a study of Germany, Berger, Bouwman, Kick, and Schaeck (2013) find that both regulatory interventions and capital support are associated with significant reductions in risk-taking, and regulatory interventions are associated with significant reductions in liquidity creation. Dam and Koetter (2012) use a bailout probability measure in a study of Germany and show that a higher probability of being bailed out increases German banks' risk-taking significantly. Using an international sample for 53 countries, Brandao-Marques, Correa, and Sapriza (2012) find that more government support is associated with more risk-taking and this effect is especially strong during the recent financial crisis (2009-2010). A few papers look at the impact of government interventions other than TARP on competition. In a theoretical framework, Cordella and Yeyati (2003) emphasize a reduction in bank risk-taking, which suggests less aggressive competitive conduct, in instances when banks are subject to bailouts. Gropp, Hakenes, and Schnabel (2011) use a dataset for banks from OECD countries and find that bailouts give rise to market distortions by encouraging competitors of bailed out institutions to take on more risk (become more aggressive), while they find no evidence that public guarantees increase the protected banks' risk-taking, except for banks with outright public ownership. Calderon and Schaeck (2012) use a country-level dataset in an international setting (124 countries) and find that government interventions (blanket guarantees, liquidity support, recapitalizations, and nationalizations) increase competition (lower Lerner Indices and net interest margins) in the banking systems. The channel

through which interventions reduce net interest margins operates via competition in loan rather than deposit markets. King (2013) investigates the contagion and competition effects of bank bailouts announced in October 2008 by eight countries and finds that government bailouts are associated with contagion effects for bank creditors, but competition effects for bank shareholders, and the effects are present both domestically among banks located in the same country and cross-border for foreign rivals.

Also relevant are papers studying the impact of capital on competition, given that TARP increased bank capital. Theoretical findings of Allen, Carletti, and Marquez (2011) and Mehran and Thakor (2012) suggest a positive relationship between capital and market share. Empirical findings of Calomiris and Mason (2003) and Calomiris and Wilson (2004) suggest that capital enhances the ability of banks to compete for deposits and loans. Berger and Bouwman (2013) look at the impact of capital on banks' market share during financial crises and normal times. They find that higher capital helps small banks increase their market shares at all times and helps medium and large banks during banking crises.

Finally, there is also research that examines the effect of competition on financial stability, which is relevant because TARP may distort competition and so it may have further implications for financial stability. There exist two opposing strands of literature that relate competition to stability. The "competition-fragility" view (e.g., Marcus (1984), Keeley (1990), Demsetz, Saidenberg, and Strahan (1996), Carletti and Hartmann (2003)) contends that more banking competition erodes market power and increases bank instability, while the "competition-stability" view (e.g., Boyd and De Nicolo (2005), Boyd, De Nicolo, and Jalal (2006), Schaeck and Cihak (2010)) asserts the opposite, that lower competition is associated with financial instability. Berger, Klapper, and Turk-Ariss (2009) find that the two main strands of literature on competition and stability do not necessarily yield opposing predictions and find evidence supporting both. Other authors predict a potential nonmonotonic U-shape relationship between market power and risk-taking (e.g., Martinez-Miera and Repullo (2010)). In a recent study about bank failures during the recent financial crisis, Berger, Imbierowicz, and Rauch (2013) account for competition as a factor impacting failure, and find results consistent with the arguments of Martinez-Miera and Repullo

(2010) that the effect of concentration increased the probability of failure at high levels and decreased it at low levels.

4. Hypothesis Development

Our hypotheses examine the impact of TARP on competition. We consider two indicators of competitive advantage, market share and market power, which may go same way or opposite ways. We first consider the case of market share. On the one hand, higher capital induced by government capital infusons can lead to competitive advantages if it helps them increase their market share relative to non-TARP banks (Holmstrom and Tirole (1997), Boot and Marinc (2008), Allen, Carletti, and Marquez (2011), Mehran and Thakor (2012), Berger and Bouwman (2013)). Three potential channels could lead to this. First, the ***predation channel*** (Telser (1966), Fudenberg and Tirole (1986)) suggests that better capitalized banks may have used TARP capital to act aggressively to take market share away from financially constrained peers. Anecdotal evidence suggests that some of the TARP recipients used the funds to acquire peers with poorer capital ratios.[4] Second, under the ***safety channel***, TARP banks may be perceived as safer due to the bailout and/or due to the selection criteria which targeted "healthy, viable institutions." In this case, customers may take more loans and loan commitments from them because TARP banks are less likely to fail or become financially distressed, and creditors are more likely to lend them money because TARP banks are more likely to pay back, both suggesting higher market shares for the TARP banks. Finally, under the ***cost advantage channel,*** TARP funds may be cheaper than non-TARP funds, in which case TARP banks have an incentive to expand their portfolios because they are more cheaply funded, yielding higher market shares.

A contrasting view would suggest that higher capital as a result of capital infusions will decrease the market share of TARP banks relative to non-TARP banks, and there are three different channels that can lead to this. First, under the ***charter value / quiet life channel*** (Hicks (1935), Keeley (1990), Cordella and Yeyati (2003)), the bailout may increase charter value and/or allow for a "quiet life," decreasing

[4] For example, MB Financial acquired in 2009 several failing institutions: Benchmark Bank, Corus Bank NA, InBank, and Heritage Community Bank; M&T Bank Corp, New York, acquired all the outstanding common stock of Provident Bankshares Corp in May 2009, and Wilmington Trust Corporation.

incentives for aggressive behavior and risk taking, leading to a lower market share. In addition, the bailout may induce more aggressive behavior on the part of the competitors, leading to lower market shares for the TARP banks (Gropp, Hakenes, and Schnabel (2011)). Second, a lower market share may also result from a ***stigma channel***, if market may perceive them as more risky.[5] This may lead customers to take less loans and loan commitments from them because TARP banks may be more likely to fail or become financially distressed, and creditors less likely to lend them money because TARP banks are less likely to pay back. Finally, a lower market share may also result from the ***cost disadvantage channel***, under which TARP funds may be more expensive than non-TARP funds. In this case, TARP banks decrease the size of their portfolios because costs of funds are higher, leading to lower market shares. Note that the ***safety channel*** is the opposite of the ***stigma channel***, the ***cost disadvantage channel*** is the opposite of the ***cost advantage channel***, and only one of each pair can hold for a given bank at a given time.

We test empirically the impact of the TARP on market share to try to understand which view finds empirical support as well as which channels dominate. Our first series of hypotheses (H1a-H1b) are:

H1a: TARP banks increased their market shares relative to non-TARP banks.

H1b: TARP banks decreased their market shares relative to non-TARP banks.

We next consider the case of market power. Market power is proxied by *Lerner GTA* and is *Price* minus *MC* (marginal cost) divided by *Price* (discussed in Section 6.2). TARP banks may increase their market power relative to non-TARP banks due to four different channels, three of which also affect market share above. First, under the ***safety channel***, customers may pay more for loans and loan commitments from them because TARP banks are less likely to fail or become financially distressed, and creditors may charge them lower interest rates because TARP banks are more likely to pay back, both leading to higher market power for the TARP banks. Second, under the ***moral hazard increase channel***, there may be reductions in market and regulatory discipline due to the increased probability of future bailouts, which

[5] Hoshi and Kashyap (2010), in their study about lessons from the recent Japanese crisis to consider for US, mention that a bank may refuse government assistance if the capital injection generates stigma or an adverse signal that the bank is expected to have high future losses.

result in shifts into riskier portfolios. This leads to a higher market power because the riskier pool of customers pay more for loans and loan commitments. Creditors may also charge higher interest rates if they perceive the TARP banks as riskier, but this increase will be less than enough to compensate for the riskier asset portfolio. Third, under the ***charter value / quiet life channel***, a TARP bailout may decrease incentives for aggressive behavior and risk taking. This may lead to a higher market power as TARP banks maintain higher rates and fees for loans and loan commitments and maintain lower deposit and non-deposit funding rates rather than going after business. Finally, under the ***cost advantage channel***, TARP banks have a decline in marginal cost and may reduce price (by a lesser amount) to attract more business, so they end up with higher market power.

Alternatively, TARP banks may decrease their market power relative to non-TARP banks due to four different channels, three of which are from the market share hypotheses above. First, under the ***predation channel,*** TARP banks may use the capital infusions to increase their market shares by offering customers lower rates and fees on loans and loan commitments and higher rates on deposits and other funds, and this can result in a lower market power. Second, under the ***moral hazard decrease channel***, the increase in capital may result in shifts into safer portfolios. This leads to a lower market power because the safer pool of customers pay less for loans and loan commitments. Creditors may also charge lower interest rates if they perceive the TARP banks as safer, but this decrease will be less than enough to compensate for the safer asset portfolio. Third, under the ***stigma channel,*** customers may demand lower rates on loans and loan commitments from TARP banks because they may be more likely to fail or become financially distressed, and creditors charge TARP banks more for funds as TARP banks may be less likely to pay back, leading to lower market power. Finally, under the ***cost disadvantage channel,*** TARP banks have an increase in marginal cost and may increase price (by a lesser amount), leading to lower market power. Note that the ***moral hazard decrease channel*** is the opposite of the ***moral hazard increase channel*** and only one can hold for a given bank at a given time.

We test empirically the impact of the TARP on market power to try to understand which view finds more empirical support. Our second series of hypotheses (H2a-H2b) are as follows:

H2a: TARP banks increased their market power relative to non-TARP banks.

H2b: TARP banks decreased their market power relative to non-TARP banks.

The eight channels described above may influence market share and market power in the same or opposite directions as shown in Figure 1. The only exceptions are the ***moral hazard channels***, for which we only have a prediction for market power. We also distinguish between TARP banks that repaid early and those that did not repay early.

We expect that those that repaid early would have shed some of the cost disadvantages or the cost advantages of the program by leaving it. In addition, any stigma attached to the program would likely largely be lifted, and there may be an increase in the importance of the ***safety channel*** from demonstrating the ability to repay. The changes in the importance of the channels are shown with the smaller and larger arrows in Figure 2. We expect that for those that repaid early, the ***cost disadvantage channel*** and/or the ***stigma channel*** was likely in force encouraging the repayment. Since the ***cost disadvantage channel*** and ***stigma channel*** have negative influences on both market share and market power, the reduction of importance of these channels as well as any increase in the importance of the ***safety channel*** should make the overall impact of TARP more positive or less negative for those that repaid early. These arguments lead us to our third hypothesis, which is as follows:

H3: TARP banks that repaid early incurred more positive or less negative market share and market power outcomes.

5. Econometric Framework

We test the effects of TARP on competition using firm-level data for all banking organizations in US. The changes in banks' behavior after TARP are analyzed using a difference-in-difference (DID) analysis. A DID estimator is commonly used in the program evaluation literature (e.g., Meyer (1995)) to compare a treatment group to a control group both before and after treatment, and has been recently utilized in the banking literature (e.g., Beck, Levine, and Levkov (2010)), Gilje (2012), Schaeck, Cihak, Maehler, and Stolz (2012), Berger, Kick, and Schaeck (2013). In this case, the treated group consists of banks that received TARP funds, and the control group consists of non-TARP recipients. An advantage of this

empirical approach is that by analyzing the time difference of the group differences, the DID estimator can account for omitted variables that affect treated and untreated banks alike.The first DID regression model considers all TARP banks (banks that repaid early and those that did not) equally. It has the following form, which accounts for Hypotheses H1a, H1b, H2a, and H2b:

$$\begin{aligned} Y_{it} &= \beta_0 + \beta_1 \cdot TARP\ Recipient_{it} + \\ &+ \beta_2 \cdot Post\ TARP_{it}\ x\ TARP\ Recipient_{it} + \\ &+ \beta_3 \cdot X_{it-1} + \beta_4 \cdot Time_t + \varepsilon_{it} \end{aligned} \quad (1)$$

Y_{it} is the dependent variable which is a competitive advantage indicator (market share or market power), $TARP\ Recipient_{it}$ is a dummy variable equal to one if the bank was provided TARP capital support, $Post\ TARP_{it}\ x\ TARP\ Recipient_{it}$ is the DID term and captures the effect of the treatment (TARP) on the treated (TARP recipients) compared to the untreated (non-TARP banks) after the treatment ($Post\ TARP_{it}$ is a dummy equal to one in 2009-2012, the period after the TARP program initiation following Duchin and Sosyura (forthcoming), but considering a longer period for estimation), X_{it-1} are control variables, $Time_t$ is a series of quarterly time fixed effects and ε_{it} represents a white noise error term.[6] A positive coefficient on the DID term would show the presence of a competitive advantage conveyed by TARP.

The second DID regression model analyzes the different behavior of TARP banks that repaid early and those that did not repay early, and takes the following form and accounts for Hypothesis H3:

$$\begin{aligned} Y_{it} &= \delta_0 + \delta_1 \cdot TARP\ Recipient\_Not\ Repaid_{it} + \\ &+ \delta_2 \cdot TARP\ Recipient\_Repaid_{it} + \\ &+ \delta_3 \cdot Post\ TARP_{it}\ x\ TARP\ Recipient\_Not\ Repaid_{it} + \\ &+ \delta_4 \cdot Post\ TARP_{it}\ x\ TARP\ Recipient\_Repaid_{it} + \\ &+ \delta_5 \cdot X_{it-1} + \delta_6 \cdot Time_t + \eta_{it} \end{aligned} \quad (2)$$

All the variables are the same as in equation (1), except that $TARP\ Recipient\_Repaid_{it}$ (a dummy equal to one if the bank repaid early in 2009-2010) and $TARP\ Recipient\_Not\ Repaid_{it}$ (a dummy equal to one if the bank did not repay in 2009-2010) replace the $TARP\ Recipient_{it}$. $Post\ TARP_{it}\ x\ TARP\ Recipient\_Repaid_{it}$ and

[6] The term *Post TARP* is not included in the model by itself because it is subsumed by the time fixed effects.

Post TARP$_{it}$ x TARP Recipient_Not Repaid$_{it}$ are the DID terms and capture the effects of the treatment (TARP capital infusion) on the treated (TARP recipients that repaid early and TARP recipients that did not repay early) compared to the rest of the banks. Positive coefficients on these terms would show the conveyance of competitive advantages. Under Hypothesis H3, the effect of TARP is more positive or less negative for those that repaid early, predicting that δ_4 is greater than δ_3.

6. Data and sample

6.1 Data sources

The data are collected from multiple sources. We obtain TARP transactions data for the period October 2008 to December 2010 and TARP recipients list from the Treasury's website.[7] We match by name and location the institutions in the list with their corresponding RSSD9001 (Call Reports ID) where available. The TARP report has 756 transactions included for 709 unique institutions (572 bank holding companies (BHCs), 87 commercial banks, 48 thrifts, and 2 S&Ls), since some institutions have multiple transactions – some received more than one TARP capital purchase and some made one or more repayment transactions.[8] We exclude thrifts and S&Ls because datasets are not comparable with banks and these institutions compete in different ways than commercial banks.

We obtain bank data from quarterly Call Reports for the period 2005:Q1 to 2012:Q4. Given that the majority of our TARP recipients are BHCs, we aggregate Call Report data of all the banks in the BHC at the holding company level. This aggregation is done for all bank-level variables, including competitive indicators. If the commercial bank is independent, we keep the data for the commercial bank. For convenience, we will use the term bank to mean either type of entity.

[7] http://www.treasury.gov/initiatives/financial-stability/Pages/default.aspx

[8] A few special cases are resolved as follows: For Union First Market Bancshares Corporation (First Market Bank, FSB) located in Bowling Green, VA, we include the RSSD9001 of the branch of the commercial bank First Market Bank because this is the institution located in Bowling Green, VA. In two other cases where M&As occurred (the bank was acquired by another BHC according to the National Information Center (NIC)), and TARP money were received by the unconsolidated institution, we included the RSSD9001 of this unconsolidated institution.

We exclude firm-quarter observations that do not refer to commercial banks (RSSD9331 different from 1), have missing or incomplete financial data for total assets and common equity, have missing or negative data for the income statement items such as interest expenses, personnel expenses, and non-interest expenses, or if the bank failed before Q1 of 2009 (before observation of TARP effects). In order to avoid distortions for the Equity to GTA ratio, for all observations with equity less than 0.01 * GTA, we replace equity with 1% of GTA. In addition, we normalize all financial variables using seasonally adjusted GDP deflator to be in real 2012:Q4 dollars. We merge the TARP data with the Call Report data.

We also use data from several other sources for additional control variables and instruments: FDIC Summary of Deposits, List of Corrective Actions, House of Representatives website, Missouri Census Data Center, Execucomp, DEF 14A Filings from SEC Edgar website, Center for Responsible Politics, and Federal Reserve Bank of Philadelphia website. The regressions also lose one quarter of observations because of the use of lagged values for some of the exogenous variables. We end up with a final regression sample of 178,604 firm-quarter observations for 7,323 unique banks.

6.2 Main dependent variables

For dependent variables, we first consider market share proxied by local market asset share of each bank (Metropolitan Statistical Area (MSA), New England County Metropolitan Areas (NECMAs), or rural county). In the cases of multimarket banks, we use the weighted average local market asset share, where the weights are the proportions of deposits in the different local markets (deposits are the only banking variable for which location is available).

Our second way of measuring competitive advantage is market power. We proxy market power by the Lerner Index for GTA, and calculate it as observed price-cost margin divided by price (e.g., Lerner (1933), Brucker (1970, 1972), Benston (1972), Fernandez de Guevara, Maudos, and Perez (2005), Berger, Klapper, and Turk-Ariss (2009), Jimenez, Lopez, and Saurina (2010)). The *Lerner GTA* is calculated as

$$Lerner\ GTA_{it} = \frac{Price_{it} - MC_{it}}{Price_{it}} \tag{3}$$

The main advantage it presents is that it can be calculated for each bank at each point in time and it does not require the assumption of long-run equilibrium, like other competition indicators such as the Panzar and Rosse H-Statistic (Dick and Hannan (2010)). A firm in perfect price competition would have an index value of 0 and thus no market power (as *Price* = *MC*) and a firm that has market power would have a positive index.

We follow the methodological approach of Fernandez De Guevara, Maudos, and Perez (2005) and Berger, Klapper, and Turk-Ariss (2009). We consider $Price_{it}$ as the price of GTA proxied by the ratio of total revenues (interest and non-interest income) to GTA for a bank *i* at a time t and MC_{it} represents marginal cost of total assets for a bank *i* at time t. In order to get MC_{it} for each bank for each point in time, we take the derivative from the following estimated translog cost function:

$$\ln(Cost_{it}) = \theta_0 + \theta_1 \ln GTA_{it} + \frac{\theta_2}{2} \ln GTA_{it}^{\,2} + \sum_{k=1}^{3} \gamma_k \ln W_{k,it} + \sum_{k=1}^{3} \phi_k \ln GTA_{it} \ln W_{k,it} + \sum_{k=1}^{3} \sum_{j=1}^{3} \gamma_{kj} \ln W_{k,it} \ln W_{j,it} + \theta_3 Time_t + \mu_{it} \tag{4}$$

where *i* represents banks and *t* represents time in quarters, $Cost_{it}$ is total operating plus financial costs, GTA_{it} is gross total assets (proxy for bank output), $W_{k,it}$ represents input prices: $W_{1,it}$ is the ratio of personnel expenses to GTA (proxy for input price of labor), $W_{2,it}$ is the ratio of interest expenses to total deposits and money market funding (proxy for input price of all funds) and $W_{3,it}$ is the ratio of other operating and administrative expenses to GTA (proxy for input price of fixed capital) and $Time_t$ is a vector of time fixed effects. The $W_{k,it}$ are average prices in the market because we want to allow individual banks to have different prices to reflect their individual market power. To construct the input prices $W_{k,it}$, we calculate the weighted average of the input prices for all local markets in which the bank operates, where the weights are the ratios of the deposits of bank *i* in the local markets over the bank total deposits.. Marginal cost for GTA is finally determined as:

$$MC_{it} = \frac{Cost_{it}}{GTA_{it}} \left[\hat{\theta}_1 + \hat{\theta}_2 \ln GTA_{it} + \sum_{k=1}^{3} \hat{\phi}_k \ln W_{k,it} \right] \tag{5}$$

where the ^'s indicate estimated coefficients.

6.3 Main independent variables

As discussed above, we use several TARP variables for our regression analysis: *TARP Recipient*, *TARP Recipient_Repaid*, and *TARP Recipient_Not Repaid* and the interaction terms $Post\ TARP_{it}$ *x TARP* $Recipient_{it}$, $Post\ TARP_{it}$ *x TARP* $Recipient\_Repaid_{it}$ and $Post\ TARP_{it}$ *x TARP* $Recipient\_Not\ Repaid_{it}$. These are defined above in Section 5.

6.4 Control variables

We include a broad set of control variables to mitigate potential omitted variable problems. We explicitly control for proxies for CAMELS (the declared set of financial criteria used by regulators for evaluating banks*)* as in Duchin and Sosyura (forthcoming) because these are widely perceived as good indicators of a bank's financial health. We control for *Capital Adequacy* to account for the extent to which a bank can absorb potential losses and compete more vigorously. *Capital Adequacy* is constructed as the ratio of equity capital divided by GTA. We control for *Asset Quality* to account for the overall condition of a bank's portfolio. *Asset Quality* is defined by the fraction of nonperforming loans to total loans. We also control for *Management Quality* using the negative of the number of corrective actions that were taken against bank executives by the corresponding banking regulator (FED, FDIC, and OCC) during the sample period 2005-2012. We control for *Earnings* because banks that are more profitable may be in better positions to get competitive advantages. *Earnings* is proxied by return on assets (ROA), and it is measured as the ratio of the annualized net income to GTA. We also account for bank *Liquidity*, proxied by the ratio of cash over bank total deposits. Finally, *Sensitivity to Market Risk* is defined as the ratio of the absolute difference (gap) between short-term assets and short-term liabilities to bank assets.

We also control for several other bank characteristics following the literature. We first include *Bank Size*, measured as the natural log of GTA because prior research shows there may be a connection between size and capacity to gain a competitive advantage (Berger and Bouwman (2009, 2013)). Second, we control for *Bank Age*, calculated as the age (in years) of the commercial bank or the oldest bank owned by the BHC

(when there are multiple banks owned by a BHC). This is another important factor for competition, because market shares usually rise as a bank accumulates years in a market and is more established (Berger and Dick (2007)). Third, we control for *Merger*, a dummy variable that takes a value of 1 from the time that the bank acquired another institution, and 0 otherwise. Institutions that acquire others may gain market share and market power.[9] Fourth, we control for *BHC*, a dummy variable that takes the value of 1 if the entity is a BHC or owned by a BHC), as this membership may help a bank strengthen its competitive position because the holding company may support its affiliates by injecting capital through the internal capital markets (Houston, James, and Marcus (1997)). Fifth, we control for the public status of the bank (*Listed*) as listed banks have better access to capital markets and more public information available, which may affect their competitive advantages. *Listed* is constructed as a dummy variable equal to 1 if a bank is listed on a stock exchange or is part of a bank holding company that is listed on a stock exchange.[10] Sixth, we control for the predominant deposit location of the bank in metropolitan areas, as banks in metropolitan locations may have more opportunities for expansion and growth. We construct *Metropolitan* as a dummy variable that takes a value of 1 if the majority of bank deposits (50% or more) are in metropolitan areas. Seventh, we control for *HHI Deposits* to measure local market concentration, as this may affect the pricing strategy of the bank. *HHI Deposits* is the Herfindahl-Hirschman Index determined using the bank deposit data from the FDIC Summary of Deposits. HHI is weighted by the share of bank deposits in each local market over bank's total deposits weighted over all the markets in which the bank operates. Eighth, we control for organizational structure/strategy, as prior research indicates that this may affect banks' ability to compete (e.g., Degryse and Ongena, 2005, 2007; Bharath, Dahiya, Saunders, and Srinivasan, 2007; Degryse, Laeven, and Ongena, 2009; Berger and Bouwman (2013)). We proxy this via *Branches/GTA*, the ratio of the number of branches that the bank has over GTA multiplied by 1000, following Berger and

[9]As an alternative way to control for mergers in unreported results, we exclude the quarter of the acquisition. Results are robust to this alternative method.

[10] In order to split banks by listed versus non-listed status, we match banks in the Call Reports with the CRSP dataset using the CRSP-FRB link from the University of Chicago.

Bouwman (2013), because banks that have more branches per dollar of assets may have more complex organizational structures.

7. Empirical results

7.1 Summary statistics

Table 1 provides the definitions and summary statistics for our variables. We present the means, medians, standard deviations, and numbers of observations across all banks in the sample for the variables used in our analyses. In terms of competitive advantage indicators, the average bank has a *Local Market Share of Assets* of 0.049 and a *Lerner GTA* of 0.051. As for the TARP indicators, *TARP Recipient* dummy shows that 9.7% of the banks received TARP money – 1.8% repaid early (*TARP Recipient_Repaid*) and the remaining 7.9% did not repay early (*TARP Recipient_Not Repaid*).

Looking at the proxies for CAMELS ratings for the sample banks, we find that the average bank has *Capital Adequacy* of 0.109, *Asset Quality* of 0.003, *Management Quality* of -0.004, *Earnings* of 0.017, *Liquidity* of 0.137, and *Sensitivity to Market Risk* of 0.130. These statistics suggest that, on average over the sample period, banks were well capitalized and did not have many performance problems, although the means mask problems for individual banks at different points in time. Looking next at other bank variables, we find that the average bank has a *Bank Size* (logarithm of the GTA) of 12.053 (mean GTA is $1.89 billion) and a *Bank Age* of 76.26. In addition, 21.90% of the banks in the sample acquired another institution (*Merger*), 86.30% of the banks are BHCs or part of a BHC (*BHC*), 6.80% banks are listed (*Listed*), 67.30% are in metropolitan locations (*Metropolitan*). The average bank also has a local market concentration (*HHI Deposits)* of 1,162 and a ratio of *Branches/GTA* of 0.029.

7.2 Regression analysis

Table 2 tabulates the main estimation results for equation (2) that tests Hypotheses H1a, H1b, H2a, and H2b (time fixed effects are not shown for brevity). First, Panel A columns (1) and (3) indicate that the DID term, $Post\ TARP_{it}$ * $TARP\ Recipient_{it}$, is positive and statistically significant at 1% level, indicating that TARP banks gained a competitive advantage and increased both market share and market power compared

to non-TARP banks after TARP capital injections. These results are also economically significant. The coefficient on *Post TARP$_{it}$ * TARP Recipient$_{it}$* of 0.0045 in the market share equation increases the local market share by 9.14%, evaluated at the average market share of 0.0492. In addition, the coefficient on *Post TARP$_{it}$ * TARP Recipient$_{it}$* of 0.0387 in the market power equation increases the Lerner Index by 75.43%, evaluated at the average Lerner Index of 0.0513 Results are consistent with the empirical dominance of Hypothesis H1a over Hypothesis H1b and Hypothesis H2a over Hypothesis H2b. Second, Panel A columns (2) and (4) and Panel B showing *t*-tests for the equality of the effects for the two types of TARP banks.[11] These indicate that the competitive advantage is predominantly for the TARP banks that repaid early, suggesting that these banks significantly reduced their cost disadvantages and increased their revenues, consistent with Hypothesis H3.

Turning to the bank control variables, we find across both market share and market power regressions, most of the proxies for *CAMELS* indicating better asset quality, better management quality, higher earnings, higher liquidity, and lower sensitivity to market risk may be more able to help them gain competitive advantages in both market share and market power. The only CAMELS variable that differs across the two competitive advantage indicators is capital adequacy. However, this is consistent with the possibility that higher capitalized banks may try to reduce their risk by charging higher rates on loans and reducing their lending and thus reducing the market share and increasing the Lerner Index. Looking at the other control variables, across both market share and market power regressions we find that banks with more experience (as proxied by the *Bank Age*), higher local market concentration, lower metropolitan coverage, not with a BHC membership, not engaging in M&As, and with a less complex organizational structure are more likely to gain competitive advantages. In terms of impact of size and public status on market share, estimates indicate that smaller and private banks may be more able to increase their market share, consistent with Berger and Bouwman (2013), while it may be harder for larger and public banks to do so due to different growth and expansion strategies. However, in terms of market power, estimates indicate that larger and

[11] We test for equality of the coefficients on the terms *TARP Recipient_Repaid$_{it}$ * Post TARP$_{it,}$* and *TARP Recipient_Not Repaid$_{it}$ * Post TARP$_{it}$*.

public banks are more likely to increase market power as they may have a better ability to set higher prices for their products or obtain cheaper funding from the capital markets.

7.3 Lerner Index decomposition

In Table 3, we decompose *Lerner GTA* into its components, *Price* and *MC*, to shed light on the source of the market power competitive advantage that TARP banks obtain. An increase in *Price* would come from charging higher interest rates and fees for loans and loan commitments, while a lower *MC* would come from paying lower interest rates on deposits and non-deposit funds. Results in Panel A columns (1) and (3) suggest that our competitive advantage findings are primarily due to marginal cost going down, suggesting that the market power gain is mainly on the input side (lower prices for deposits and/or other sources of funding). When splitting the banks between banks that repaid early and banks that did not repay early, we find that both groups had an increase in their market power on the input side as a result of the TARP infusion and banks that repaid also had an increase in market power on the output side.

7.4 Channels analysis

In Figure 3, we examine which of the possible channels of TARP on competition appear to be relatively important and unimportant for explaining our empirical results. The shaded areas surrounded by dotted lines illustrate the channels most consistent with our findings, while the crossed-out areas illustrate the channels least consistent with our findings.[12] We have several important findings. First, the ***moral hazard channels*** seem to be unimportant because *Price* does not change nearly as much as *MC* and goes in two different directions for those that did not repay and those that repaid. Second, the ***cost disadvantage channel*** seems to dominate the ***cost advantage channel***, at least for the banks that repaid early, because when the cost effects are reduced by early repayment, the competitive advantages are amplified. Finally, the ***safety channel***, the only one with positive influences on both market share and market power appears to dominate the ***stigma*** and ***cost disadvantage channels***, which have negative influences on both. For banks that did not repay, the ***safety channel*** seems to primarily come in the form of lower interest rates for deposits and/or

[12] Any remaining channels are not relevant for our findings because the market share and market power effects go in opposite directions.

other types of financing, which more than offset the higher cost of TARP funds. Banks that repaid also got a boost in their revenues from an enhanced ***safety channel***. In sum, the ***safety channel*** and the ***cost disadvantage channel*** are the most important to explain the results.

8. Robustness tests

In this section, we provide a number of robustness tests. We include all control variables from the main regressions in these tests, but they are not shown for brevity.

8.1 Endogeneity Treatment

The potential endogeneity of our *TARP Recipient* variable could bias our findings. For example, TARP capital might be more often provided to the strongest banks, which may be more likely to gain a competitive advantage, yielding a spurious relationship. To address this, we employ two main methods, propensity score matching (PSM) and instrumental variable (IV) analysis.

8.1.1 Propensity score matching (PSM) analysis

We follow Black and Hazelwood (forthcoming) and Duchin and Sosyura (forthcoming) and match each TARP recipient based on the propensity score probabilities to one or more non-TARP banks with similar characteristics to help dispel the competing explanation that our results spuriously reflect differences in the characteristics of recipients and non-recipients rather than the effect of TARP per se on competitive advantage indicators. Using a probit regression, we estimate the propensity scores of all banks by size, capitalization level, and profitability. The propensity score is the probability of a bank receiving TARP funds, based on the bank's pre-treatment characteristics. TARP banks are assigned their corresponding non-TARP bank matches based on the absolute difference in propensity scores. Banks with the smallest differences are considered matches and are selected to be part of our matched analysis.

We use several matching techniques: 1) 1-1 matching without replacement, which matches to the nearest control unit. This technique ensures that we do not have multiple TARP banks assigned to the same control, which can lead to a smaller control group than the treatment group; 2) 1-1 matching with replacement, which performs a similar matching to first method, the only difference being that each

treatment unit can be matched to the nearest control unit even if it is used more than once, 3) Nearest-neighbor matching with n=2 with replacement, which match each TARP bank with 2 non-TARP banks with the closest propensity scores, and 4) Nearest-neighbor matching with n=3 with replacement. We rerun all main regressions using these matched samples to see if we see any difference in the results for market share and market power compared to using the full sample of banks (Table 4). Table 4 Panel A shows the results for market share using the four different PSM samples (columns (1)-(8)) and we find that market share results continue to hold, except that in some instances only TARP recipients that repaid early continue to show a competitive advantage. Table 4 Panel B shows the results for market power using the four different PSM samples (columns 1-8) and we find that market power results continue to hold. The *t*-tests of equality for the different groups of TARP banks reported in Panel C again indicate that the competitive advantage is greater for the TARP banks that repaid early.

8.1.2 Instrumental variable (IV) analysis

We conduct an instrumental variable (IV) analysis to isolate the causal impact of TARP on competitive indicators. Prior research on TARP finds that bank's political and regulatory connections can affect the bank's probability of receiving TARP funds. We use the following instruments for the *TARP Recipient* variables: *Subcommitee on Financial Institutions or Capital Markets*, a dummy variable which takes a value of 1 if a firm is headquartered in a district of a House member who served on the Capital Markets Subcommittee or the Financial Institutions Subcommittee of the House Financial Services Committee in 2008 or 2009, following Sosyura and Duchin (forthcoming); *Democrat*, a dummy variable which takes a value of 1 if a bank's local Representative was a Democrat in the 2007-2008 campaign election cycle, following Li (forthcoming); *Fed Director*, a dummy which takes a value of 1 if the bank's director was on the board of directors of one of the 12 Federal Reserve Banks (FRB) or a branch in 2008 or 2009, following Bayazitova and Shivdasani (2012), Duchin and Sosyura (forthcoming), and Li (forthcoming).[13]

[13] We use the MABLE/Geocorr2k software on the Missouri Census Data Center website to associate banks with congressional districts by using the zip codes of their headquarters. The final regression sample for this test is 167,112 bank-quarter observations which is less than the main regression sample. This is due to two reasons: First, some of the banks could not be mapped into a congressional district (either due to an invalid headquarters zipcode or because there is not an exact match to a congressional district), a problem reported also by Li (forthcoming). Second, we use

In addition, because we consider separately the TARP recipients that did and did not repay early, we include two additional instrumental variables that account for the exit from the TARP program. Bayazitova and Shivdasani (2012) show that costs of participation in the TARP program are a major determinant for whether banks chose to remain in the program or exit. Thus, revised compensation rules announced in February 2009 may pose restrictions for management compensation and freedom of decisions in TARP banks with highly compensated executives. We include *CEO Compensation*, a dummy which takes a value of one if bank's CEO had a total compensation greater than $500,000 in 2008[14] because banks with high CEO compensation are more likely to exit the program due to government interference in compensation, following Wilson and Wu (2010) and Bayazitova and Shivdasani (2012). We also use the change in state *Coincident Index (weighted)*, which combines four state-level indicators to summarize economic conditions in a single statistic.[15] The *Coincident Index (weighted)* is calculated as the weighted average of the changes in the Philadelphia Federal Reserve's state coincident indexes from December 2007 to December 2010 with the share of the deposits of a given bank taken as weights, following Bayazitova and Shivdasani (2012), because banks in states that experience more growth in their local markets may exit the program earlier since they can raise cheaper financing in the local market, and/or have more internal growth in funding.

Because the potential endogenous explanatory variable in equation (1) is binary and we need the instrument to predict treatment, we employ a dummy endogenous variable model as suggested in in section 18.4.1 of Wooldridge (2002). For the first stage, we use a probit model in which we regress the *TARP Recipient* dummy on the political and regulatory instruments discussed and all control variables from the main regression model. We then use the predicted probability obtained from the first stage as an instrument

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an indicator of local market conditions for the 2007-2010 period, and some entities may not be in our sample during this entire period.

[14] For the construction of this variable, we consider banks with GTA greater than $1 billion and use Execucomp complemented with DEF14A Filings in SEC Edgar to determine the compensation package for the CEO in 2008 for all banks that have information available. We assume for the rest that CEO Compensation is less than $500,000 in 2008 due to both data unavailability and the reasoning that these are less likely to receive such a high level of compensation.

[15] The four indicators are: nonfarm payroll employment, average hours worked in manufacturing, the unemployment rate, and wage and salary disbursements deflated by the consumer price index.

for the second stage. Similarly, for equation (2), we conduct a probit regression for each of the two types of TARP banks, *TARP Recipient_Not Repaid* and *TARP Recipient_Repaid* on all political instruments and regulatory instruments discussed and the two extra instruments for early program exit decisions. We also include all control variables from the main regression model. We then use the predicted probabilities obtained from the first stage as instruments for the second stage. The results of the IV regressions are reported in Table 5. We report the first-stage regression results in Table 5 Panel A columns (1)-(3), and the second-stage results for the IV specification in Table 5 Panel B, with columns (1) and (3) for market share and columns (2) and (4) for market power, respectively. The first-stage regressions in column (1) indicate that the instrumental variables are positively related to TARP injections, and the *F*-test indicates that each of the instruments is valid. Similarly, the first-stage regression in columns (2) and (3) indicate that the additional instrumental variables for repayment of TARP, *CEO Compensation* and *Coincident Index (weighted)* related to TARP repayment decisions, so that TARP recipients that repaid are more likely to have had higher CEO compensation and higher growth in local markets, while the opposite is true for the TARP banks that did not repay. *F*-test again indicates that each of the instruments is valid. The second stage results in panel B and the tests of equality for different types of TARP banks in Panel C show that the main results continue to hold, except that only TARP recipients that repaid early show a competitive advantage.

8.2 Alternative measures of TARP

We next test the robustness of our results to the use of alternative measures of TARP. In Table 6, we replace the *TARP Recipient* dummies with our alternative measures of TARP infusion: *Bailout Amount / GTA* and *Bailout Amount / Risk-Weighted Assets*. Our main results continue to hold, except that in some instances only TARP recipients that repaid early continue to show a competitive advantage.

8.3 Alternative measures of market share

We test the robustness of our results to the use of alternative measures of market share. In Table 7, we replace the *Local Market Share Assets* with *Local Market Share Loans and Local Market Share Deposits*. Our main results continue to hold, except that in some instances only TARP recipients that repaid early continue to show a competitive advantage.

8.4 Alternative econometric models

In order to help alleviate the concern that omitted unobserved bank-specific determinants might be spuriously responsible for our results, we also test robustness using specifications with bank fixed effects and random effects (using a generalized least squares approach). These results are presented in Table 8 Panel A columns (1)-(8). We also present a model with time fixed effects and White standard errors which are robust to within-cluster correlation at the bank level (Rogers standard errors) in Table 8 Panel A columns (9)-(12). In all specifications, we continue to find support for our earlier results.

8.5 Effects by size classes

As discussed above, size may be a source of economic strength for a bank and could offer a better competitive position on the market, and thus effects of TARP may differ by bank size. We split the banks according to their size in GTA into three different classes: small banks (GTA ≤ $1 billion), medium banks ($1 billion ≤ GTA < $3 billion) and large banks (GTA > $3 billion) and create the following three size dummies: *SMALL, MEDIUM*, and *LARGE*. We interact these size dummies with the *TARP Recipient* dummy and obtain the following interaction terms: *SMALL*TARP Recipient, MEDIUM*TARP Recipient, LARGE*TARP Recipient*. We then create interaction terms between the previously obtained variables and our *Post TARP* dummy: *SMALL * TARP Recipient * Post TARP, MEDIUM * TARP Recipient * Post TARP, LARGE * TARP Recipient * Post TARP*. We similarly create variables for the two types of TARP banks. We rerun our regressions using these new variables to understand the impact of various class sizes on our results. Table 9 Panel A, columns (1)-(2) presents the results considering size classes for the market share regressions and Table 9 Panel A, columns (3)-(4) show the results for market power. Table 9 Panel B reports results from a test for the equality of coefficients for the two types of TARP recipients. The regressions show that the greater the bank size the higher the competitive advantage the TARP banks can obtain in terms of both market share and market power. When splitting between TARP banks that repaid and those that did not, we find that for those banks that did not repay, again the greater the bank size the higher the competitive advantage of TARP banks. For banks that repaid, the results are again stronger for the large banks than for the small banks, but the results for the medium banks are mixed.

8.6 Subsample analyses

In the sub-sample analyses, we group banks according to several characteristics that could provide more specificity to our results on competitive indicators.

8.6.1 Excluding involuntary participants

Most of the banks voluntarily participated in the TARP program, however there are a few that were involuntary – they were required to participate in the program at its inception. We classify the following eight banks as involuntary participants: Citigroup, JP Morgan, Wells Fargo, Morgan Stanley, Goldman Sachs, Bank of New York, Bank of America, and State Street Bank.[16] Since we would like to ensure that our results are not driven by the involuntary participants, we rerun our analysis using a sample that excludes them in Table 10 Panel A columns (1) - (4) and report the tests of equality between the two types of TARP groups in Panel E. The results are qualitatively similar to our main findings.

8.6.2 Excluding banks subject to stress tests (SCAP)

The US Banks Stress Tests aka Supervisory Capital Assessment Program (SCAP) was a mandatory program applied to 19 banking organizations with assets exceeding $100 billion that cover about 2/3 of U.S banking assets and about half of loans.[17] It was conducted by Federal Bank Regulatory Agencies (FED, FDIC, OCC) from February 25, 2009 to late April 2009 and it was designed to ensure that large banking organizations had enough capital to withstand the recession and a more adverse scenario that might occur over the rest of 2009 and 2010. These organizations had to have or raise enough capital to meet capital requirements under more adverse scenario, or the Treasury would provide the capital. One possible unintended consequence of the SCAP program was to essentially publicize that the 19 biggest banking organizations were too-big-to-fail (TBTF) to assure the public of the safety of the financial system. Given this special treatment of banks under SCAP, we worry that our competitive advantage for TARP banks

[16] We exclude Merrill Lynch from the original 9 involuntary recipients because it is not a bank.

[17] These were 19 banks, including Bank of America, Citigroup, Goldman Sachs, JP Morgan Chase, Morgan Stanley, Wells Fargo, Bank of NY Mellon, BB&T, Fifth Third Bancorp, Keycorp, PNC Financial, Regions Financial, SunTrust Banks, US Bancorp, Ally Financial, American Express Company, Capital One Financial, Metlife, and State Street.

might be driven by this subsample of banks.[18] Therefore, we reestimate our regressions by using a sample which excludes banks that were subject to the SCAP stress tests. Table 10 Panel B, columns (1) - (4) report the estimation results and Panel E reports the tests of equality between the two types of TARP groups. We find that main results continue to hold.

8.6.3 Capitalization Ratio

The level of capital a bank has prior to infusion can impact the competitive advantage that the TARP recipients can get. We group banks according to whether they had low equity to assets ratio (*EQCAP_08Q3* ≤ 7%) or high capital (*EQCAP_08Q3* > 7%) before the TARP program started (2008:Q3) and regression estimates are shown in Table 10 Panel C, columns (1)-(8). Banks with a higher level of capital prior to infusion may have a better ability to use the extra capital to expand and acquire less well capitalized peers (Berger and Bouwman (2013)). Looking at the regression results, we find that only banks with a higher capitalization ratio gained competitive advantages in terms of market share and market power as indicated by the positive coefficients for the DID terms.

8.6.4. HHI

We also group banks according to their local market concentration. This is measured via HHI Deposits for the local markets where the bank is present. We consider three groups for the bank concentration following Department of Justice guidelines: unconcentrated (HHI ≤ 1,000), moderately concentrated (1000 < HHI ≤ 1,800), and highly concentrated (HHI >1,800).

Our results for the three subsamples (Table 10 Panel D, columns (1)-(12)) suggest that the most competitive advantages given by TARP were gained by the banks in the highly concentrated category, followed by the moderately concentrated category. Therefore, the more concentrated the local banking market, the higher increase in competitive advantage a bank gets.

9. Conclusions

[18] These same banking organizations were also subject to the Comprehensive Capital Analysis and Review (CCAR) stress tests in 2011 and 2012, which may also impact their competitive advantages.

The Troubled Asset Relief Program (TARP) was one of the largest government rescue programs in US aimed at restoring stability in the banking sector and increasing availability of credit. This paper conducts an empirical assessment of the TARP injections on bank competition and investigates whether TARP may have given its recipients competitive advantages. Our difference-in-difference (DID) regression analysis yields several important results:

1. TARP recipients did get competitive advantages and increased both their market share and market power relative to non-TARP recipients, consistent with the empirical dominance of Hypothesis H1a over Hypothesis H1b and Hypothesis H2a over Hypothesis H2b.

2. Results point to the likelihood that the positive market share and market power findings may be driven primarily by the ***safety channel*** (TARP banks may be perceived as safer), which is partially offset by the ***cost disadvantage channel*** (TARP funds may be relatively expensive). Thus, the ***safety channel*** and the ***cost disadvantage channel*** are the most important to explain the results.

3. The competitive advantages are primarily or entirely due to TARP recipients that repaid early, suggesting that these banks significantly reduced the importance of the ***cost disadvantage channel*** and increased the importance of the ***safety channel***, consistent with Hypothesis H3.

Overall, our results suggest that TARP may have resulted in a possible distortion in competition, which may have misallocated resources, and may help explain other findings in the literature on the effects of TARP on bank risk and bank lending. First, our findings may help explain the results in the literature that TARP increased risk for the large banks (Black and Hazelwood, forthcoming; Duchin and Sosyura, forthcoming) and decreased risk for the small banks (Black and Hazelwood, forthcoming). As discussed above, results in the literature suggest that a nonmonotonic effect of market power on risk may have been in effect during the crisis period – higher market power may be associated with higher risk for banks at high levels of market power, while higher market power may be associated with lower risk at low levels of market power (Martinez-Miera and Repullo, 2010; Berger, Imbierowicz and Rauch, 2013). Given that large

(small) banks typically have higher (lower) levels of market power, TARP may have led to an increase (decrease) in risk for large (small) banks.

Our results also may help explain the findings in the literature that TARP resulted in reduced or no change in lending by large banks (Black and Hazelwood, forthcoming; Duchin and Sosyura, forthcoming) and increased lending by small banks (Black and Hazelwood, forthcoming; Li, forthcoming). According to the standard structure-conduct-performance hypothesis, an increase in market power should lead to a reduced supply of credit. However, for relationship borrowers, the supply of credit may be increased by larger market share and larger market power because limits on competition help banks force implicit contracts with relationship borrowers that result in greater credit availability (e.g., Sharpe, 1990; Petersen and Rajan, 1995). This may help explain the increase in lending by small banks which tend to specialize in relationship lending, and the decrease or no change in lending by the large banks, which more often engage in transactional lending (Berger, Miller, Petersen, Rajan and Stein, 2005).

In terms of policy implications, determination about which banks to be bailed out should rely on a comprehensive analysis of both benefits and costs. Some but not all of these costs and benefits, competition, risk taking, and lending, may be evaluated based on our results and those in the literature. Based on the findings for these three effects, any bailouts may be focused primarily on the small banks, where the effects seem to be less distortionary and more toward the public interest, since the increase in market share and market power is the least, risk may be decreased, and lending may be increased. However, in regards to the other major benefit of bailouts, increasing the stability of the financial system, presumably the benefits would be greater for the large banks. However, also the distortions in competition may be greater, and risk taking and lending implications may be less favorable. Therefore, policymakers should balance all these different effects.

References

Allen, F., Carletti, E., Marquez R., 2011. Credit market competition and capital regulation. *Review of Financial Studies* 24, 983-1018.

Bayazitova, D., Shivdasani, A., 2012. Assessing TARP. *Review of Financial Studies* 25, 377-407.

Beck, T., Levine, R., Levkov, A., 2010. Big bad banks? The winners and losers from bank deregulation in the United States. *Journal of Finance* 65, 1637–1667.

Benston, G. J., 1972. A Microeconomic approach to banking competition: Comment. *Journal of Finance*, 27, 722-723.

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

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

Berger, A. N., Bouwman C. H. S., Kick T. K., Schaeck K. 2013. Bank risk taking and liquidity creation following regulatory interventions and capital support. Working Paper, University of South Carolina.

Berger, A. N., Dick, A., 2007. Entry into banking markets and the early-mover advantage. *Journal of Money, Credit and Banking* 39, 775-807.

Berger, A. N., Kick T. K., Schaeck K. 2013. Executive board composition and bank risk taking. Working Paper, University of South Carolina.

Berger, A. N., Klapper, L. F., Turk-Ariss, R. 2009. Bank competition and financial stability. *Journal of Financial Services Research* 35, 99-118.

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

Bharath, S., Dahiya, S., Saunders, A., Srinivasan, A., 2007. So what do I get? The bank's view of lending relationships. *Journal of Financial Economics* 85, 368-419.

Black, L. K., Hazelwood, L. N. Forthcoming. The effect of TARP on bank risk-taking. *Journal of Financial Stability*.

Boot, A. W. A., Marinc, M., 2008. Competition and entry in banking: Implications for capital regulation. Working Paper. University of Amsterdam.

Boyd J. H., De Nicolo G. 2005. The theory of bank risk taking revisited. *Journal of Finance* 60, 1329–1343.

Boyd J. H., De Nicolo, G., Jalal A. M., 2006. Bank risk taking and competition revisited: New theory and evidence. IMF Working Paper.

Brandao-Marques, L., Correa, R., Sapriza, H., 2012. International evidence on government support and risk-taking in the banking sector. IMF Working Paper.

Brucker, E., 1970. A microeconomic approach to banking competition. *Journal of Finance* 25, 1133-1141.

Brucker, E., 1972. A microeconomic approach to banking competition: Reply. *Journal of Finance* 27, 724-726.

Carletti, E., Hartmann, P., 2003. Competition and financial stability: What's special about banking? In: Mizen P. (eds.), Monetary history, exchange rates and financial markets: Essays in honor of Charles Goodhart. Vol.2. Edward Elgar, Cheltenham, UK.

Calderon C., Schaeck, K., 2012. Bank bailouts, competitive distortions, and consumer welfare. Working Paper. World Bank.

Cordella, T., Yeyati, E. L., 2003. Bank bailouts: moral hazard versus value effect. *Journal of Financial Intermediation* 12, 300-330.

Cornett, M. M., Li, L., Tehranian, H., 2013. The Performance of Banks around the Receipt and Repayment of TARP Funds: Over-achievers versus Under-achievers," *Journal of Banking & Finance* 37, 730–746.

Dam, L., Koetter, M., 2012. Bank bailouts and moral hazard: Empirical evidence from Germany. *Review of Financial Studies* 25, 2343-2380.

Degryse, H., Laeven, L., Ongena, S., 2009. The impact of organizational structure and lending technology on banking competition. *Review of Finance* 13, 225-259.

Degryse, H., Ongena, S., 2005. Distance, lending relationships, and competition. *Journal of Finance* 60, 231-266.

Degryse, H., Ongena, S., 2007. The impact of competition on bank orientation. *Journal of Financial Intermediation* 16, 399-424.

Demsetz, R.S., Saidenberg M. R., Strahan, P. E., 1996. Banks with something to lose: the disciplinary role of franchise value. Federal Reserve Bank of New York, *Economic Policy Review* 2, 1–14.

Dick, A., Hannan, T., 2010. Competition and anti-trust policy in banking. Chapter 16 in Oxford Handbook of Banking of Berger, A., Molyneux, P., and Wilson, J. , Oxford University Press, Oxford, UK.

Duchin D., Sosyura D. 2012. The politics of government investment. *Journal of Financial Economics* 106, 24-48.

Duchin R., Sosyura, D., Forthcoming. Safer ratios, riskier portfolios: Banks' response to government aid. *Journal of Financial Economics*.

Fernandez de Guevara, J. F., Maudos, J, Perez, F., 2005. Market power in European banking sectors. *Journal of Financial Services Research* 27, 109-137.

French, K. R., Baily, M. N., Campbell, J. Y., Cochrane, J. H., Diamond, D. W., Duffie, D., Kashyap, A. K., Mishkin, F. S., Rajan, R. G., Scharfstein, D. S., Shiller, R. J., Shin, H. S., Slaughter, M. J., Stein, J. C., Stulz, R. M., 2010. *The Squam Lake Report, Fixing the Financial System*. Princeton University Press.

Fudenberg, D., Tirole, J., 1986. A 'signal-jamming' theory of predation. *Rand Journal of Economics* 17, 366-376.

Gilje, E., 2012. Does local access to finance matter?: Evidence from U.S. oil and natural gas shale booms. Working Paper, Boston College.

Gropp, R., Hakenes, H., Schnabel, I., 2011. Competition, risk-shifting, and public bail-out policies. *Review of Financial Studies* 24, 2084-120.

Hakenes, H., Schnabel, I., 2010. Banks without parachutes: Competitive effects of government bail-out policies. *Journal of Financial Stability* 6, 156-168.

Harrisa, O., Huertab, D., Ngob, T., 2013. The impact of TARP on bank efficiency, *Journal of International Financial Markets, Institutions and Money* 24, 85–104

Hicks, J., 1935. Annual Survey of Economic Theory: The Theory of Monopoly. *Econometrica* 3, 1-20.

Holmstrom, B., Tirole, J., 1997. Financial intermediation, loanable funds, and the real sector. *Quarterly Journal of Economics* 112, 663-691.

Hoshi, T., and A. K. Kashyap. 2010. Will the U.S. bank recapitalization succeed? Eight lessons from Japan. *Journal of Financial Economics* 97, 398–417.

Houston, J., James, C., Marcus, D., 1997. Capital market frictions and the role of internal capital markets in banking. *Journal of Financial Economics* 46, 135-164.

Hryckiewicz, A. 2012. Government interventions - restoring or destroying financial stability in the long run?, Working Paper. Goethe University of Frankfurt.

Jimenez, G., Lopez, J., Saurina, J., 2010. How does competition impact bank risk taking?. Working Paper. Banco de Espana.

Keeley, M. C., 1990. Deposit insurance, risk, and market power in banking. *American Economic Review* 80, 1183-1200.

King, M. R., 2013. The Contagion and Competition Effects of Bank Bailouts Announced in October 2008, Working Paper, University of Western Ontario

Koetter, M. and Noth, F., 2012. Competitive Distortions of Bank Bailouts. Working Paper, Frankfurt School of Finance and Management.

Lerner, A. P, 1933. The concept of monopoly and the measurement of monopoly power. *Review of Economic Studies* 1, 157-175.

Li, L., Forthcoming. TARP Funds Distribution and Bank Loan Supply. *Journal of Banking and Finance*.

Marcus, A. J., 1984. Deregulation and bank financial policy. *Journal of Banking and Finance* 8, 557-565.

Martinez-Miera, D, Repullo R., 2010. Does competition reduce the risk of bank failure?, *Review of Financial Studies* 23, 3638-3664.

Mehran, H., Thakor, A. V., 2012. Bank capital and value in the cross-section. *Review of Financial Studies* 24, 1019-1067.

Merton, R. C., 1977. An analytic derivation of the cost of the deposit insurance and loan guarantees: An application of modern option pricing theory. *Journal of Banking and Finance* 1, 3-11.

Meyer, B. D., 1995. Natural and quasi-experiments in economics. *Journal of Business and Economic Statistics* 13, 151-161.

Ng, J., Vasvari, F. P., Wittenberg-Moerman, R., 2013. The Impact of TARP's Capital Purchase Program on the stock market valuation of participating banks. Working Paper. University of Chicago.

Norden, L., Roosenboom, P., Wang, T., Forthcoming. The Impact of Government Intervention in Banks on Corporate Borrowers' Stock Returns. *Journal of Financial and Quantitative Analysis*.

Petersen, M. A., Rajan, R. G., 1995. The effect of credit market competition on lending relationships. *Quarterly Journal of Economics*, 110, 407-443.

Schaeck, K., Cihak, M., 2010. Competition, efficiency, and soundness in banking: An industrial organization perspective. Working Paper. Bangor Business School.

Schaeck, K., Cihak, M., Maehler, A. M., Stolz, S. M., 2012. Who disciplines bank managers. *Review of Finance*, 16:197-243.

Sharpe, S. A., 1990. Asymmetric Information, Bank Lending, and Implicit Contracts: A Stylized Model of Customer Relationships, *Journal of Finance*, 45: 1069–87.

Telser, L. G., 1966. Cutthroat competition and the long purse. *Journal of Law and Economics* 9, 259-77.

Veronesi, P., and Zingales L., Paulson's gift, 2010. *Journal of Financial Economics* 97, 339-36.

Wilson, L., Wu, Y.W., 2012. Escaping TARP. *Journal of Financial Stability* 8, 32–42.

Wooldridge, J. M. 2002. Econometric analysis of cross section and panel data. Cambridge, MA: MIT Press, 623-25.

Figure 1: Channels and indicators of competitive advantage
(All TARP banks considered equally)

Channel	Indicators of Competitive Advantage	
	Market Share	Market Power
Predation	↑	↓
Safety	↑	↑
Cost Advantage	↑	↑
Charter Value/Quiet Life	↓	↑
Stigma	↓	↓
Cost Disadvantage	↓	↓
Moral Hazard Increase	?	↑
Moral Hazard Decrease	?	↓

Figure 2: Channels and indicators of competitive advantage
(TARP banks that repaid early)

Channel	Indicators of Competitive Advantage	
	Market Share	Market Power
Predation	↑	↓
Safety	↑	↑
Cost Advantage	↑	↑
Charter Value/Quiet Life	↓	↑
Stigma	↓	↓
Cost Disadvantage	↓	↓
Moral Hazard Increase	?	↑
Moral Hazard Decrease	?	↓

Figure 3: Channels and indicators of competitive advantage
(Considering Empirical Results)

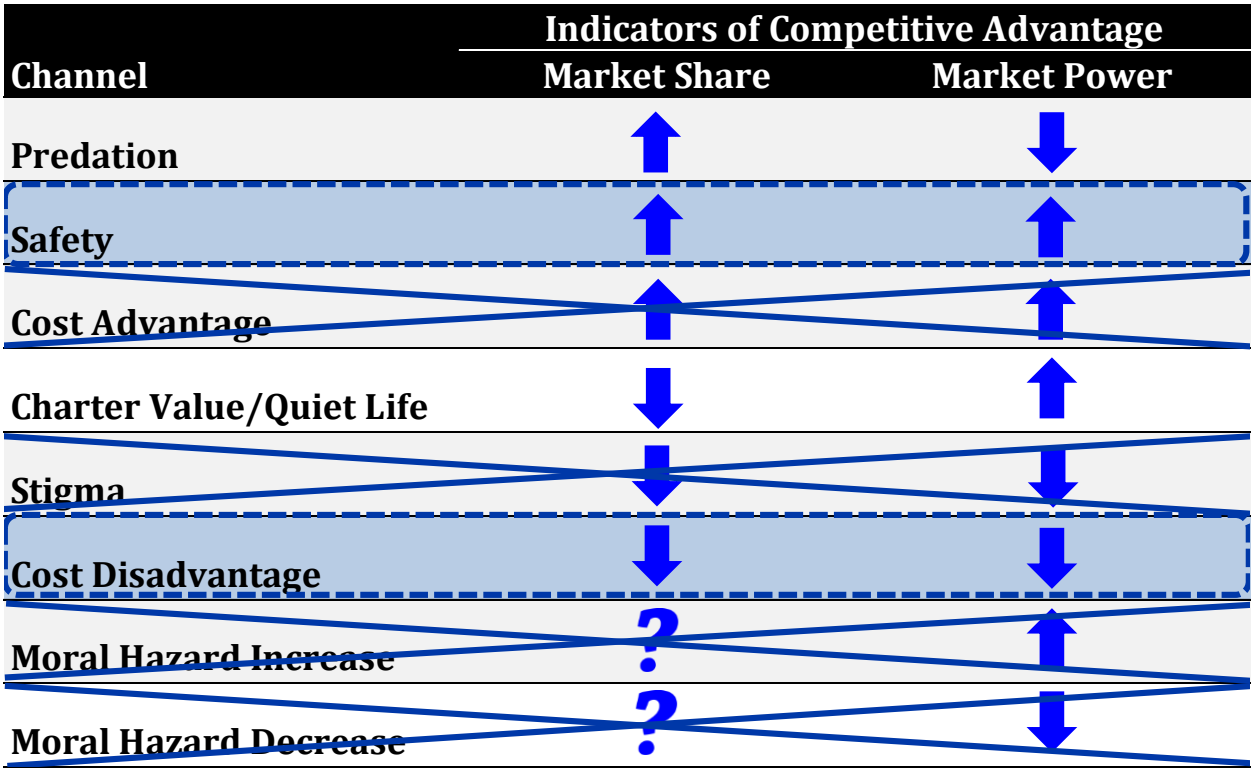

Table 1: Definitions and Summary Statistics

This table reports summary statistics for the full US bank sample. This table reports summary statistics of the variables for the full US bank sample. All variables are constructed via aggregation of all the banks in the BHC at the holding company level if the BHC has more than one commercial bank owned. Otherwise, the data for the commercial bank is retained. All variables using dollar amounts are expressed in real 2012:Q4 dollars using the implicit GDP price deflator.

Variable Definitions and Summary Statistics for the Full Sample (2005-2012)

Type	*Variable*	*Definition*	*Mean*	*Median*	*Std*	*N*
Competition Variables *(Source: Call Reports and Summary of Deposits)*	*Local Market Share Assets*	Bank's GTA local market share, measured as the bank's average market share given the weight of the bank deposits in each local market. GTA equals total assets plus the allowance for loan and the lease losses and the allocated transfer risk reserve.	0.049	0.014	0.099	178,604
	Local Market Share Loans	Bank's total loans local market share, measured as the bank's average market share given the weight of the bank deposits in each local market.	0.048	0.014	0.094	178,604
	Local Market Share Deposits	Bank's total deposits local market share, measured as the bank's average market share given the weight of the bank deposits in each local market.	0.027	0.009	0.060	178,604
	Lerner GTA	A proxy for the bank level measure of competition measured as the observed price-cost margin for total assets. A bank in perfect price competition would have an index value of 0 and thus no market power (as *Price = MC*) and a bank that has market power will show a positive index value.	0.051	0.098	0.358	178,604
	Price	A subcomponent of *Lerner GTA,* represents average price of bank activities and is a proxy for market power in the loan market.	0.015	0.015	0.003	178,604
	MC	A subcomponent of *Lerner GTA* , a proxy for the cost of funding (among other costs).	0.014	0.013	0.005	178,604
TARP Variables *(Source: US Department of the Treasury)*	*TARP Recipient*	A dummy variable which takes a value of 1 if the bank was provided TARP capital support.	0.097	0.000	0.297	178,604
	TARP Recipient_Not Repaid	A dummy taking a value of 1 if the bank did not repay in 2009-2010.	0.079	0.000	0.270	178,604
	TARP Recipient_Repaid	A dummy taking a value of 1 if the bank repaid in 2009-2010.	0.018	0.000	0.133	178,604
	Bailout Amount/GTA	A ratio of the bank dollar bailout support over bank GTA; a larger value indicates a higher degree of TARP support.	0.003	0.000	0.009	178,604
	Bailout Amount/Risk-Weighted Assets	A ratio of the bank dollar bailout support over bank risk-weighted assets; a larger value indicates a higher degree of TARP support.	0.003	0.000	0.014	178,604
	Post TARP	An indicator equal to 1 in 2009 -2012 and 0 in 2005-2008. Similar to Sosyura and Durchin(2012) but using an extended time period.	0.501	1.000	0.500	178,604

Variable Definitions and Summary Statistics for the Full Sample (2005-2012)

Type	*Variable*	*Definition*	*Mean*	*Median*	*Std*	*N*
Control Variables *(Source: Call Reports, Summary of Deposits, Bank List with Corrective Actions, Federal Housing Finance Agency website, US Census Bureau)*	*CAMELS Proxy: Capital Adequacy*	Capitalization ratio, defined as equity capital divided by GTA. Capital adequacy refers to the amount of a bank's capital relative to its assets. Broadly, this criterion evaluates the extent to which a bank can absorb potential losses.	0.109	0.099	0.048	178,604
	CAMELS Proxy: Asset Quality	Asset quality evaluates the overall condition of a bank's portfolio and is typically evaluated by a fraction of nonperforming assets and assets in default. Noncurrent loans and leases are loans that are past due for at least ninety days or are no longer accruing interest. Higher proportion of nonperforming assets indicates lower asset quality.	0.003	0.000	0.008	178,604
	CAMELS Proxy: Management Quality	The negative of the number of corrective actions that were taken against bank executives by the corresponding banking regulator during the sample period 2005-2012 (FED, OTS, FDIC, and OCC).	-0.004	0.000	0.062	178,604
	CAMELS Proxy: Earnings (ROA)	Return on assets (ROA), measured as the ratio of the annualized net income to GTA.	0.017	0.018	0.045	178,604
	CAMELS Proxy: Liquidity	Cash divided by bank total deposits.	0.137	0.051	14.400	178,604
	CAMELS Proxy: Sensitivity to Market Risk	The sensitivity to interest rate risk, defined as the ratio of the absolute difference (gap) between short-term assets and short-term liabilities to earning assets.	0.130	0.105	0.107	178,604
	Bank Size	The log value of GTA.	12.053	11.917	1.339	178,604
	Bank Age	Age (in years) of the bank or the oldest bank owned by the bank holding company.	76.263	81.000	66.913	178,604
	Merger	A dummy variable that takes a value of 1 from the time that the bank acquired another institution and 0 otherwise.	0.219	0.000	0.414	178,604
	BHC	A dummy variable that takes a value of 1 if bank is owned by a bank holding company (BHC).	0.863	1.000	0.940	178,604
	Listed	A dummy variable that takes a value of 1 if bank is listed on a stock exchange or is part of a bank holding company that is listed on a stock exchange.	0.068	0.000	0.252	178,604
	Metropolitan	A dummy variable that takes a value of 1 when the majority of bank deposits (50% or more) are in metropolitan areas and 0 otherwise.	0.672	1.000	0.469	178,604
	HHI Deposits	A measure of bank concentration, measured by the Herfindahl-Hirschman Deposits Index determined using the bank deposit data from the FDIC Summary of Deposits. Higher values show greater market concentration.	1162.678	1041.415	883.522	178,604

Variable Definitions and Summary Statistics for the Full Sample (2005-2012)

Type	*Variable*	*Definition*	*Mean*	*Median*	*Std*	*N*
Control Variables (cont.)	*Branches/GTA*	A measure of organizational complexity defined as the ratio of the number of branches over GTA multiplied by 1000.	0.029	0.024	0.022	178,604
Instrumental Variables: Political & Regulatory *(Sources: Center for Responsive Politics, House of Representatives website, Missouri Census Data Center, Fed website, Execucomp, Mergent Online)*	*Subcommittee on Financial Institutions or Capital Markets*	A dummy variable which takes a value of 1 if a firm is headquartered in a district of a House member, who served on the Capital Markets Subcommittee or the Financial Institutions Subcommittee of the House Financial Services Committee in 2008 or 2009.	0.088	0.000	0.227	167,112
	Democrat	A dummy variable which takes a value of 1 if a bank's local Representative was a Democrat in the 2007-2008 campaign election cycle.	0.429	0.000	0.495	167,112
	Fed Director	A dummy that equals 1 if a bank's director sat on the board of directors of a Federal Reserve Bank (FRB) or of a branch of a FRB in 2008 or 2009.	0.013	0.000	0.112	167,112
	CEO Compensation	A dummy variable that takes a value of 1 if bank's CEO had a total compensation greater than $500,000 in 2008.	0.030	0.000	0.172	167,112
	Coincident_Index (weighted)	A state macro growth index calculated as a weighted average of the changes in the Philadelphia Fed's state coincident indexes from December 2007 to December 2010 with the share of the deposits of a given bank taken as weights.	-0.771	-0.759	0.358	167,112

Table 2: Effect of TARP on Bank Competition: Main Results

This table reports estimates from difference-in-difference (DID) regression estimates for analyzing the impact of TARP on competition in Panel A. The measures of competitive advantage are *Market Share* (proxied by *Local Market Share Assets*) and *Market Power* (proxied by *Lerner GTA*). *TARP Recipient* is a dummy variable equal to one if the bank was provided TARP capital support, *Post TARP* is a dummy equal to one in 2009-2012, the period after TARP program initiation. *TARP Recipient_Repaid* is a dummy equal to one if the bank repaid in 2009-2010. *TARP Recipient_Not Repaid* is a dummy equal to one if the bank did not repay in 2009-2010. All models include time fixed effects. The estimation results are for 2005-2012. Panel B shows the tests of equality for the effects of TARP for two types of TARP banks: TARP banks that repaid early and TARP banks that did not. All variables are defined in Table 1. *, **, and *** denote significance at 10%, 5%, and 1% level.

Panel A: Regression parameters

Dependent Variable:	***Market Share***		***Market Power***	
Independent Variables:	**(1)**	**(2)**	**(3)**	**(4)**
TARP Recipient	-0.013***		-0.026***	
	(-15.345)		(-7.632)	
Post TARP x TARP Recipient	0.005***		0.039***	
	(4.098)		(9.200)	
TARP Recipient_Not Repaid		-0.014***		-0.026***
		(-16.533)		(-7.076)
TARP Recipient_Repaid		-0.007***		-0.017***
		(-3.150)		(-2.783)
Post TARP x TARP Recipient_Not Repaid		0.003***		0.029***
		(2.968)		(6.053)
Post TARP x TARP Recipient_Repaid		0.011***		0.084***
		(3.245)		(10.789)
Capital Adequacy	-0.051***	-0.052***	2.012***	2.009***
	(-13.950)	(-14.167)	(36.832)	(36.765)
Asset Quality	-0.044**	-0.050**	-0.797***	-0.825***
	(-2.022)	(-2.286)	(-6.617)	(-6.835)
Management Quality	0.005*	0.005	0.188***	0.187***
	(1.710)	(1.607)	(11.533)	(11.440)
Earnings(ROA)	0.147***	0.146***	3.118***	3.114***
	(26.064)	(25.913)	(40.170)	(40.134)
Liquidity	0.000***	0.000***	-0.000	-0.000
	(5.897)	(6.019)	(-0.622)	(-0.620)
Sensitivity to Market Risk	-0.019***	-0.019***	-0.155***	-0.155***
	(-9.619)	(-9.638)	(-16.041)	(-16.064)
Bank Size	-0.006***	-0.006***	0.012***	0.012***
	(-26.107)	(-27.347)	(13.903)	(13.090)
Bank Age	0.000***	0.000***	0.000***	0.000***
	(21.825)	(21.772)	(29.856)	(29.776)
Merger	-0.011***	-0.011***	-0.002	-0.001
	(-22.828)	(-22.581)	(-1.274)	(-0.927)
BHC	-0.004***	-0.004***	-0.019***	-0.019***
	(-17.922)	(-17.948)	(-18.865)	(-18.790)
Listed	-0.015***	-0.015***	0.022***	0.020***
	(-21.693)	(-22.495)	(6.898)	(6.051)
Metropolitan	-0.035***	-0.035***	-0.049***	-0.049***
	(-42.556)	(-42.496)	(-29.362)	(-29.187)
HHI Deposits	0.000***	0.000***	0.000***	0.000***
	(65.287)	(65.294)	(3.951)	(3.918)
Branches/GTA	-0.737***	-0.741***	-0.927***	-0.941***
	(-64.498)	(-64.678)	(-16.828)	(-17.033)
Constant	0.099***	0.101***	-0.822***	-0.814***
	(32.668)	(33.940)	(-55.344)	(-54.348)
Time Fixed Effects	**Yes**	**Yes**	**Yes**	**Yes**
Observations	178,604	178,604	178,604	178,604
Adjusted R-squared	0.219	0.219	0.451	0.451

Panel B: Tests of the equality of the effects of TARP for the two types of TARP banks

	Market Share	***Market Power***
***t*-stat:**		
Effect for TARP banks that repaid early = effect for TARP banks that did not repay early	2.241**	6.188***

Table 3: Effect of TARP on Bank Competition: Lerner Index Decomposition

This table reports estimates from difference-in-difference (DID) regression estimates for the impact of TARP on *Lerner GTA* components: *Price* (price of bank GTA) and *MC* (marginal cost). The regression estimates are reported in Panel A. *TARP Recipient* is a dummy variable equal to one if the bank was provided TARP capital support, *Post TARP* is a dummy equal to one in 2009-2012, the period after TARP program initiation. *TARP Recipient_Repaid* is a dummy equal to one if the bank repaid in 2009-2010. *TARP Recipient_Not Repaid,* which is a dummy equal to one if the bank did not repay in 2009-2010. The estimation results are for 2005-2012. All models include time fixed effects. Panel B shows the tests of equality for the effects of TARP for two types of TARP banks: TARP banks that repaid early and TARP banks that did not. All variables are defined in Table 1. Robust *t*-statistics are reported in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level.

Panel A: Regression parameters

Dependent Variable: Lerner Components				
	Price		***MC***	
Independent Variables:	**(1)**	**(2)**	**(3)**	**(4)**
TARP Recipient	0.00026***		0.00066***	
	(12.860)		(16.551)	
Post TARP x TARP Recipient	-0.00023***		-0.00069***	
	(-8.057)		(-13.836)	
TARP Recipient_Not Repaid		0.00031***		0.00074***
		(14.371)		(17.116)
TARP Recipient_Repaid		0.00005		0.00023***
		(1.057)		(2.771)
Post TARP x TARP Recipient_Not Repaid		-0.00031***		-0.00069***
		(-10.013)		(-12.519)
Post TARP x TARP Recipient_Repaid		0.00011*		-0.00074***
		(1.679)		(-6.727)
Controls	**Yes**	**Yes**	**Yes**	**Yes**
Time Fixed Effects	**Yes**	**Yes**	**Yes**	**Yes**
Observations	178,604	178,604	178,604	178,604
Adjusted R-squared	0.540	0.540	0.507	0.507

Panel B: Tests of the equality of the effects of TARP for the two types of TARP banks

	Price	***MC***
***t*-stat:**		
Effect for TARP banks that repaid early = effect for TARP banks that did not repay early	5.795***	0.458

Table 4: Effect of TARP on Bank Competition: Matched Sample Analysis

This table reports difference-in-difference (DID) regression estimates for analyzing the impact of TARP on competition in Panel A and Panel B. We use four different propensity score matched samples: 1-1 matching without replacement, 1:1 matching with replacement, 2 neighbors with replacement and 3 neighbors with replacement. The measures of competitive advantage are *Market Share* (proxied by *Local Market Share Assets*) and *Market Power* (proxied by *Lerner GTA*). *TARP Recipient* is a dummy variable equal to one if the bank was provided TARP capital support, *Post TARP* is a dummy equal to one in 2009-2012, the period after TARP program initiation. *TARP Recipient_Repaid* is a dummy equal to one if the bank repaid in 2009-2010. *TARP Recipient_Not Repaid,* which is a dummy equal to one if the bank did not repay in 2009-2010. All models include time fixed effects. The estimation results are for 2005-2012. Panel C reports the tests of equality for the effects of TARP for two types of TARP banks: TARP banks that repaid early and TARP banks that did not. All variables are defined in Table 1. Robust *t*-statistics are reported in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level.

Panel A: Market Share

	Dependent Variable: *Market Share*							
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Independent Variables:	**PSM: 1:1 Matching w/o replacement**		**PSM: 1:1 Matching w/ replacement**		**PSM: 2 Neighbors w/ replacement**		**PSM: 3 Neighbors w/ replacement**	
TARP Recipient	-0.012***		-0.014***		-0.013***		-0.013***	
	(-10.054)		(-10.652)		(-12.261)		(-13.225)	
Post TARP x TARP Recipient	0.003**		0.004***		0.005***		0.004***	
	(2.163)		(2.604)		(3.106)		(3.191)	
TARP Recipient_Not Repaid		-0.013***		-0.015***		-0.014***		-0.014***
		(-11.233)		(-11.539)		(-13.515)		(-14.675)
TARP Recipient_Repaid		-0.007***		-0.010***		-0.008***		-0.007***
		(-2.801)		(-3.688)		(-3.186)		(-3.025)
Post TARP x TARP Recipient_Not Repaid		0.002		0.003*		0.003**		0.003**
		(1.331)		(1.823)		(2.242)		(2.268)
Post TARP x TARP Recipient_Repaid		0.011***		0.012***		0.012***		0.011***
		(2.918)		(3.173)		(3.202)		(3.166)
Controls	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Time Fixed Effects	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Observations	34,745	34,745	31,418	31,418	42,418	42,418	51,582	51,582
Adjusted R-squared	0.103	0.105	0.105	0.107	0.111	0.112	0.114	0.115

Panel B: Market Power

Dependent Variable: *Market Power*								
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Independent Variables:	**PSM: 1:1 Matching w/o replacement**		**PSM: 1:1 Matching w/ replacement**		**PSM: 2 Neighbors w/ replacement**		**PSM: 3 Neighbors w/ replacement**	
TARP Recipient	-0.009**		-0.016***		-0.015***		-0.014***	
	(-2.064)		(-3.431)		(-3.702)		(-3.686)	
Post TARP x TARP Recipient	0.022***		0.025***		0.025***		0.024***	
	(3.632)		(4.046)		(4.763)		(4.871)	
TARP Recipient_Not Repaid		-0.011**		-0.017***		-0.016***		-0.014***
		(-2.265)		(-3.430)		(-3.679)		(-3.576)
TARP Recipient_Repaid		-0.002		-0.010		-0.008		-0.008
		(-0.349)		(-1.569)		(-1.285)		(-1.304)
Post TARP x TARP Recipient_Not Repaid		0.015**		0.018***		0.018***		0.017***
		(2.387)		(2.781)		(3.231)		(3.167)
Post TARP x TARP Recipient_Repaid		0.055***		0.059***		0.058***		0.057***
		(6.211)		(6.568)		(6.921)		(7.068)
Controls	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Time Fixed Effects	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Observations	34,745	34,745	31,418	31,418	42,418	42,418	51,582	51,582
Adjusted R-squared	0.471	0.472	0.470	0.471	0.478	0.478	0.483	0.484

Panel C: Tests of the equality of the effects of TARP for the two types of TARP banks

Tests of the equality of the effects of TARP for different types of TARP recipients			
		Market Share	***Market Power***
PSM: 1:1 Matching w/o replacement	***t*-stat:** Effect for TARP banks that repaid early = effect for TARP banks that did not repay early	2.425**	4.625***
PSM: 1:1 Matching w/ replacement	***t*-stat:** Effect for TARP banks that repaid early = effect for TARP banks that did not repay early	2.458**	4.713***
PSM: 2 Neighbors w/o replacement	***t*-stat:** Effect for TARP banks that repaid early = effect for TARP banks that did not repay early	2.360**	4.545***
PSM: 3 Neighbors w/o replacement	***t*-stat:** Effect for TARP banks that repaid early = effect for TARP banks that did not repay early	2.347**	4.629***

Table 5: Effect of TARP on Bank Competition – Instrumental Variable Analysis

This table shows difference-in-difference (DID) regression estimates for analyzing the impact of TARP on competition using an instrumental variable approach as in Wooldridge Section 18.4.1. We use as instruments several political and regulatory connections variables: *Subcommittee on Financial Institutions or Capital Markets, Democrat, Fed Director, CEO Compensation,* and the *Coincident Index (weighted)*. *Subcommittee on Financial Institutions or Capital Markets* is a dummy variable, which takes a value of 1 if a firm is headquartered in a district of a House member, who served on the Capital Markets Subcommittee or the Financial Institutions Subcommittee of the House Financial Services Committee in 2008 or 2009. *Democrat* is a dummy variable, which takes a value of 1 if a bank's local Representative was a Democrat in the 2007-2008 campaign election cycle. *Fed Director* is a dummy that equals 1 if a bank's director sat on the board of directors of a Federal Reserve Bank (FRB) or of a branch of a FRB in 2008 or 2009. *CEO Compensation* is a dummy variable that takes a value of 1 if bank's CEO had a total compensation greater than 500,000 in 2008. *Coincident Index (weighted)* is a state macro growth index calculated as a weighted average of the changes in the Philadelphia Fed's state coincident indexes from December 2007 to December 2010 with the share of the deposits of a given bank taken as weights. The measures of competitive advantage are *Market Share* (proxied by *Local Market Share Assets*) and *Market Power* (proxied by *Lerner GTA*). *TARP Recipient* is a dummy variable equal to one if the bank was provided TARP capital support, *Post TARP* is a dummy equal to one in 2009-2012, the period after TARP program initiation. *TARP Recipient_Repaid* is a dummy equal to one if the bank repaid in 2009-2010. *TARP Recipient_Not Repaid,* which is a dummy equal to one if the bank did not repay in 2009-2010. All models include time fixed effects. Panel A reports first stage results. Panel B reports second stage regression estimates. The estimation results are for 2005-2012. Panel C reports the tests of equality for the effects of TARP on two types of TARP banks: TARP banks that repaid early and TARP banks that did not. All variables are defined in Table 1. Robust *t*-statistics are reported in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level.

Panel A: IV First Stage as in Wooldridge (Section 18.4.1)

	First Stage (Probit Model)		
Dependent Variable:	***TARP Recipient***	***TARP Recipient_Not Repaid***	***TARP Recipient_Repaid***
Independent Variables:	**(1)**	**(2)**	**(3)**
Subcommitee on			
Financial Institutions or Capital Markets	0.102***	0.092***	0.131***
	(5.297)	(4.716)	(3.469)
Democrat	0.050***	0.046***	0.066***
	(5.194)	(4.611)	(3.629)
FED Director	0.349***	-0.067*	0.469***
	(10.732)	(-1.734)	(11.378)
CEO Compensation		-0.497***	0.743***
		(-17.060)	(21.492)
Coincident_Index(weighted)			
(state-level economic conditions)		-0.069***	0.101***
		(-5.080)	(4.174)
Controls	**Yes**	**Yes**	**Yes**
Time Fixed Effects	**Yes**	**Yes**	**Yes**
Observations	167,112	167,112	167,112
Pseudo R-squared	0.242	0.173	0.344

Robust t-statistics in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Panel B: IV Second Stage as in Wooldridge (Section 18.4.1)

	Second Stage (IV 2SLS)			
Dependent Variable:	***Market Share***		***Market Power***	
Independent Variables:	**(1)**	**(2)**	**(3)**	**(4)**
TARP Recipient	0.073***		0.133***	
	(7.328)		(2.584)	
Post TARP x TARP Recipient	0.011***		0.054***	
	(3.374)		(4.470)	
TARP Recipient_Not Repaid		0.529***		-0.166
		(6.818)		(-0.828)
TARP Recipient_Repaid		0.155***		-0.035
		(5.530)		(-0.560)
Post TARP x TARP Recipient_Not Repaid		-0.126***		0.020
		(-4.659)		(0.358)
Post TARP x TARP Recipient_Repaid		0.115***		0.180***
		(4.752)		(4.303)
Controls	**Yes**	**Yes**	**Yes**	**Yes**
Time Fixed Effects	**Yes**	**Yes**	**Yes**	**Yes**
Observations	167,112	167,112	167,112	167,112
Adjusted R-squared	0.171	0.022	0.443	0.448
F-test	337.309***	15.379***	337.309***	15.379***

Panel C: Tests of the equality of the effects of TARP for the two types of TARP banks

	Market Share	***Market Power***
***t*-stat:**		
Effect for TARP banks that repaid early = effect for TARP banks that did not repay early	5.042***	1.676*

Table 6: Alternative Measures of TARP Support

This table reports estimates from difference-in-difference (DID) regression estimates for the impact of TARP on competition using an alternative measures for TARP Support: *Bailout Amount/GTA* and *Bailout Amount/ Risk-Weighted Assets* in Panel A. The measures of competitive advantage are *Market Share* (proxied by *Local Market Share Assets*) and *Market Power* (proxied by *Lerner GTA*). *TARP Recipient* is a dummy variable equal to one if the bank was provided TARP capital support, *Post TARP* is a dummy equal to one in 2009-2012, the period after TARP program initiation. *TARP Recipient_Repaid* is a dummy equal to one if the bank repaid in 2009-2010. *TARP Recipient_Not Repaid,* which is a dummy equal to one if the bank did not repay in 2009-2010. All models include time fixed effects. Estimation results are for 2005-2012. Panel B reports the tests of equality for the effects of TARP on the two types of TARP banks: TARP banks that repaid early and TARP banks that did not. All variables are defined in Table 1. Robust *t*-statistics are reported in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level.

Panel A: Regression parameters

	Bailout Amount / GTA				***Bailout Amount / Risk-Weighted Assets***			
Dependent Variable:	***Market Share***		***Market Power***		***Market Share***		***Market Power***	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Independent Variables:								
TARP Recipient	-0.292***		-0.567***		-0.164***		-0.734***	
	(-13.179)		(-3.113)		(-8.077)		(-4.120)	
Post TARP x TARP Recipient	0.154***		0.954***		0.108***		0.805***	
	(3.942)		(4.535)		(3.826)		(4.248)	
TARP Recipient_Not Repaid		-0.281***		-0.556***		-0.165***		-0.737***
		(-12.272)		(-2.774)		(-7.883)		(-3.791)
TARP Recipient_Repaid		-0.331***		-0.504**		-0.108*		-0.553***
		(-5.429)		(-2.370)		(-1.698)		(-3.355)
Post TARP x TARP Recipient_Not Repaid		0.031		0.539**		0.046		0.603***
		(0.784)		(2.225)		(1.474)		(2.796)
Post TARP x TARP Recipient_Repaid		0.711***		2.779***		0.536***		2.202***
		(6.861)		(9.138)		(5.400)		(9.470)
Controls	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Time Fixed Effects	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Observations	178,381	178,381	178,381	178,381	178,381	178,381	178,381	178,381
Adjusted R-squared	0.219	0.219	0.452	0.452	0.219	0.219	0.452	0.452

Panel B: Tests of the equality of the effects of TARP for the two types of TARP banks

		Market Share	***Market Power***
Bailout Amount / GTA	***t*-stat:** Effect for TARP banks that repaid early = effect for TARP banks that did not repay early	6.263***	5.910***
Bailout Amount / Risk-Weighted Assets	***t*-stat:** Effect for TARP bank that repaid early = effect for TARP bank that did not repay early	4.797***	5.242***

Table 7: Alternative Measures of Market Share

This table reports difference-in-difference (DID) regression estimates for the impact of TARP on competition using an alternative measures for market share: *Local Market Share Loans* and *Local Market Share Deposits*. The regression estimates are reported in Panel A. The measures of competitive advantage are *Market Share* (proxied by *Local Market Share Assets*) and *Market Power* (proxied by *Lerner GTA*). *TARP Recipient* is a dummy variable equal to one if the bank was provided TARP capital support, *Post TARP* is a dummy equal to one in 2009-2012, the period after TARP program initiation. *TARP Recipient_Repaid* is a dummy equal to one if the bank repaid in 2009-2010. *TARP Recipient_Not Repaid,* which is a dummy equal to one if the bank did not repay in 2009-2010. All models include time fixed effects. The estimation results are for 2005-2012. Panel B reports the tests of equality for the effects of TARP on two types of TARP banks: TARP banks that repaid early and TARP banks that did not. All variables are defined in Table 1. Robust *t*-statistics are reported in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level.

Panel A: Regression parameters

Dependent Variable:	***Local Market Share Loans***		***Local Market Share Deposits***	
	(1)	**(2)**	**(3)**	**(4)**
Independent Variables:				
TARP Recipient	-0.011***		-0.007***	
	(-14.176)		(-17.655)	
Post TARP x TARP Recipient	0.003***		0.002***	
	(2.988)		(3.842)	
TARP Recipient_Not Repaid		-0.011***		-0.007***
		(-12.713)		(-15.875)
TARP Recipient_Repaid		-0.013***		-0.009***
		(-8.042)		(-10.359)
Post TARP x TARP Recipient_Not Repaid		0.002*		0.001
		(1.675)		(1.590)
Post TARP x TARP Recipient_Repaid		0.008***		0.007***
		(4.039)		(5.545)
Controls	**Yes**	**Yes**	**Yes**	**Yes**
Time Fixed Effects	**Yes**	**Yes**	**Yes**	**Yes**
Observations	178,603	178,603	178,604	178,604
Adjusted R-squared	0.215	0.215	0.298	0.298

Panel B: Tests of the equality of the effects of TARP for the two types of TARP banks

	Local Market Share Loans	***Local Market Share Deposits***
***t*-stat:**		
Effect for TARP banks that repaid early = effect for TARP banks that did not repay early	2.825***	4.610***

Table 8: Alternative Econometric Models

This table reports difference-in-difference (DID) regression estimates for the impact of TARP on competition using alternative econometric models: bank fixed effects and bank random effects in Panel A. The measures of competitive advantage are *Market Share* (proxied by *Local Market Share Assets*) and *Market Power* (proxied by *Lerner GTA*). *TARP Recipient* is a dummy variable equal to one if the bank was provided TARP capital support, *Post TARP* is a dummy equal to one in 2009-2012, the period after TARP program initiation. *TARP Recipient_Repaid* is a dummy equal to one if the bank repaid in 2009-2010. *TARP Recipient_Not Repaid,* which is a dummy equal to one if the bank did not repay in 2009-2010. All models include time fixed effects. The estimation results are for 2005-2012. Panel B reports the tests of equality for the effects of TARP on two types of TARP banks: TARP banks that repaid early and TARP banks that did not. All variables are defined in Table 1. For the bank fixed effects models, (1)-(4), we report adjusted R-squared and for the bank random effects models, (5)-(8), we report R-squared. Robust *t*-statistics are reported in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level.

Panel A: Regression parameters

	Bank Fixed Effects				Bank Random Effects				Clusters by Bank			
Dependent Variable:	***Market Share***		***Market Power***		***Market Share***		***Market Power***		***Market Share***		***Market Power***	
Independent Variables:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
TARP Recipient					-0.029***		-0.053***		-0.013***		-0.026***	
					(-8.576)		(-7.009)		(-4.224)		(-4.057)	
Post TARP x TARP Recipient	0.004***		0.024***		0.005***		0.039***		0.005***		0.039***	
	(9.936)		(5.620)		(3.895)		(4.779)		(2.650)		(5.462)	
TARP Recipient_Not Repaid						-0.031***		-0.054***		-0.014***		-0.026***
						(-9.837)		(-6.816)		(-4.534)		(-3.898)
TARP Recipient_Repaid						-0.019**		-0.042***		-0.007		-0.017
						(-1.995)		(-2.870)		(-0.842)		(-1.314)
Post TARP x TARP Recipient_Not Repaid		0.004***		0.012**		0.004***		0.026***		0.003*		0.029***
		(7.449)		(2.430)		(2.901)		(2.816)		(1.674)		(3.566)
Post TARP x TARP Recipient_Repaid		0.008***		0.078***		0.008***		0.095***		0.011***		0.084***
		(9.684)		(10.214)		(4.193)		(7.432)		(3.403)		(6.947)
Controls	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Time Fixed Effects	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Bank Fixed Effects	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**
Bank Random Effects	**No**	**No**	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**No**	**No**	**No**
Observations	178,604	178,604	178,604	178,604	178,604	178,604	178,604	178,604	178,604	178,604	178,604	178,604
R-squared (or Adjusted R-squared)	0.882	0.882	0.610	0.610	0.047	0.047	0.409	0.410	0.219	0.219	0.451	0.451
No. Clusters									7333	7333	7333	7333

Panel B: Tests of the equality of the effects of TARP for the two types of TARP banks

		Market Share	*Market Power*
Bank Fixed Effects	***t*-stat:** Effect for TARP banks that repaid early = effect for TARP banks that did not repay early	4.478***	7.708***
Bank Random Effects	***t*-stat:** Effect for TARP banks that repaid early = effect for TARP banks that did not repay early	1.800*	4.555***
Clusters by Bank	***t*-stat:** Effect for TARP banks that repaid early = effect for TARP banks that did not repay early	2.182**	3.863***

Table 9: Effect of TARP on Bank Competition by Size Class

This table shows tests for the impact of TARP on competition by bank size classes. We report difference-indifference (DID) regression estimates for banks with interactions of the key terms with different bank sizes: small *(GTA ≤ 1 Billion*), medium (*1 Billion < GTA ≤ 3 Billion)* and large (*GTA > 3 Billion*). The measures of competitive advantage are *Market Share* (proxied by *Local Market Share Assets*) and *Market Power* (proxied by *Lerner GTA*). *TARP Recipient* is a dummy variable equal to one if the bank was provided TARP capital support, *Post TARP* is a dummy equal to one in 2009-2012, the period after TARP program initiation. *TARP Recipient_Repaid* is a dummy equal to one if the bank repaid in 2009-2010. *TARP Recipient_Not Repaid,* which is a dummy equal to one if the bank did not repay in 2009-2010. All models include time fixed effects. Panel C reports the tests of equality for the effects of TARP on two types of TARP banks: TARP banks that repaid early and TARP banks that did not. The estimation results are for 2005-2012. All variables are defined in Table 1. Robust *t*-statistics are reported in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level.

Panel A: Regression parameters

Dependent Variable:	***Market Share***		***Market Power***	
Independent Variables:	**(1)**	**(2)**	**(3)**	**(4)**
SMALL x TARP Recipient	-0.013***		-0.028***	
	(-13.350)		(-7.262)	
MEDIUM x TARP Recipient	-0.012***		-0.003	
	(-10.175)		(-0.424)	
LARGE x TARP Recipient	-0.005*		0.008	
	(-1.805)		(0.921)	
SMALL x Post TARP x TARP Recipient	0.001		0.022***	
	(0.541)		(4.262)	
MEDIUM x Post TARP x TARP Recipient	0.007***		0.032***	
	(5.368)		(3.537)	
LARGE x Post TARP x TARP Recipient	0.017***		0.112***	
	(4.676)		(11.567)	
SMALL x TARP Recipient_Not Repaid		-0.013***		-0.028***
		(-13.130)		(-6.567)
MEDIUM x TARP Recipient_Not Repaid		-0.011***		-0.002
		(-8.547)		(-0.342)
LARGE x TARP Recipient_Not Repaid		-0.017***		-0.007
		(-11.284)		(-0.587)
SMALL x Post TARP x TARP Recipient_Not Repaid		-0.000		0.016***
		(-0.124)		(2.839)
MEDIUM x Post TARP x TARP Recipient_Not Repaid		0.008***		0.027***
		(5.314)		(2.666)
LARGE x Post TARP x TARP Recipient_Not Repaid		0.020***		0.131***
		(9.035)		(8.976)
SMALL x TARP Recipient_Repaid		-0.013***		-0.030***
		(-4.174)		(-3.905)
MEDIUM x TARP Recipient_Repaid		-0.015***		-0.003
		(-8.590)		(-0.225)
LARGE x TARP Recipient_Repaid		0.007		0.021**
		(1.618)		(1.983)
SMALL x Post TARP x TARP Recipient_Repaid		0.009*		0.075***
		(1.707)		(6.484)
MEDIUM x Post TARP x TARP Recipient_Repaid		0.003		0.056***
		(1.320)		(3.090)
LARGE x Post TARP x TARP Recipient_Repaid		0.013**		0.094***
		(2.083)		(7.466)
Controls	**Yes**	**Yes**	**Yes**	**Yes**
Time Fixed Effects	**Yes**	**Yes**	**Yes**	**Yes**
Observations	178,604	178,604	178,604	178,604
Adjusted R-squared	0.219	0.219	0.451	0.451

Panel B: Tests of the equality of the effects of TARP for the two types of TARP banks

	Market Share	***Market Power***
***t*-stat:** Effect for small TARP banks (GTA ≤ 1 Billion) that repaid early = effect for small TARP banks (GTA ≤ 1 Billion) that did not repay early	0.654	3.023***
***t*-stat:** Effect for medium TARP banks (1 Billion < GTA ≤ 3 Billion) that repaid early = effect for medium TARP banks (1 Billion < GTA ≤ 3 Billion) that did not repay	0.200	0.245
***t*-stat:** Effect for large TARP banks (GTA > 3 Billion) that repaid early = effect for large TARP banks (GTA > 3 Billion) that did not repay early	0.964	1.897*

Table 10: Effect of TARP on Bank Competition: Subsamples Analysis

This table shows additional subsample tests for analyzing the impact of TARP on competition. Panel A columns (1)-(4) report difference-in-difference (DID) regression estimates from a sample that excludes involuntary participants. Panel B columns (1)-(4) report difference-in-difference (DID) regression estimates from a sample that excludes banks subject to stress-tests (SCAP).Panel C columns (1)-(8) report difference-in-difference (DID) regression estimates for banks with low capitalization (*EQCAP_08Q3 ≤ 7%)* and high capitalization (*EQCAP_08Q3 > 7%*). Panel D columns (1)-(12) report difference-in-difference (DID) regression estimates for banks with different local concentration: *Unconcentrated*, which represents banks for which HHI is below 1,000 points, *Moderately Concentrated*, which covers banks for which HHI is between 1,000 and 1,800 points, and *Highly Concentrated*, those for which the HHI is in excess of 1,800 points. The measures of competitive advantage are *Market Share* (proxied by *Local Market Share Assets*) and *Market Power* (proxied by *Lerner GTA*). *TARP Recipient* is a dummy variable equal to one if the bank was provided TARP capital support, *Post TARP* is a dummy equal to one in 2009-2012, the period after TARP program initiation. *TARP Recipient_Repaid* is a dummy equal to one if the bank repaid in 2009-2010. *TARP Recipient_Not Repaid,* which is a dummy equal to one if the bank did not repay in 2009-2010. All models include time fixed effects. Panel E reports the tests of equality for the effects of TARP on two types of TARP banks: TARP banks that repaid early and TARP banks that did not. The estimation results are for 2005-2012. All variables are defined in Table 1. Robust *t*-statistics are reported in parentheses. *, **, and *** denote significance at 10%, 5%, and 1% level.

Panel A: Excluding TARP Involuntary Participants

	Excluding Involuntary Participants			
Dependent Variable:	***Market Share***		***Market Power***	
Independent Variables:	**(1)**	**(2)**	**(3)**	**(4)**
TARP Recipient	-0.013***		-0.025***	
	(-16.727)		(-7.428)	
Post TARP x TARP Recipient	0.004***		0.038***	
	(4.299)		(8.864)	
TARP Recipient_Not Repaid		-0.013***		-0.026***
		(-16.065)		(-7.085)
TARP Recipient_Repaid		-0.013***		-0.014**
		(-7.282)		(-2.276)
Post TARP x TARP Recipient_Not Repaid		0.003***		0.029***
		(2.989)		(6.053)
Post TARP x TARP Recipient_Repaid		0.010***		0.081***
		(4.169)		(10.126)
Controls	**Yes**	**Yes**	**Yes**	**Yes**
Time Fixed Effects	**Yes**	**Yes**	**Yes**	**Yes**
Observations	178,408	178,408	178,408	178,408
Adjusted R-squared	0.223	0.223	0.451	0.451

Panel B: Excluding Banks Subject to the Stress Tests (SCAP)

Excluding Banks Subject to the Stress Tests				
Dependent Variable:	***Market Share***		***Market Power***	
Independent Variables:	**(1)**	**(2)**	**(3)**	**(4)**
TARP Recipient	-0.013***		-0.025***	
	(-16.575)		(-7.368)	
Post TARP x TARP Recipient	0.004***		0.036***	
	(4.049)		(8.468)	
TARP Recipient_Not Repaid		-0.013***		-0.026***
		(-15.950)		(-7.022)
TARP Recipient_Repaid		-0.013***		-0.014**
		(-7.090)		(-2.386)
Post TARP x TARP Recipient_Not Repaid		0.003***		0.028***
		(2.887)		(5.813)
Post TARP x TARP Recipient_Repaid		0.009***		0.079***
		(3.782)		(9.825)
Controls	**Yes**	**Yes**	**Yes**	**Yes**
Time Fixed Effects	**Yes**	**Yes**	**Yes**	**Yes**
Observations	178,101	178,101	178,101	178,101
Adjusted R-squared	0.223	0.223	0.451	0.451

Panel C: Subsamples by Capitalization Level (EQCAP_08Q3)

Dependent Variable:	***Market Share***				***Market Power***			
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
	Poorly Capitalized		***Highly Capitalized***		***Poorly Capitalized***		***Highly Capitalized***	
Independent Variables:	***EQCAP_08Q3 ≤ 7%***		***EQCAP_08Q3 > 7%***		***EQCAP_08Q3 ≤ 7%***		***EQCAP_08Q3 > 7%***	
TARP Recipient	0.029***		-0.016***		0.040***		-0.029***	
	(4.476)		(-20.218)		(3.473)		(-8.563)	
Post TARP x TARP Recipient	0.009		0.005***		-0.019		0.040***	
	(0.827)		(5.043)		(-1.219)		(9.352)	
TARP Recipient_Not Repaid		-0.005		-0.015***		0.043***		-0.031***
		(-1.395)		(-16.966)		(3.283)		(-8.159)
TARP Recipient_Repaid		0.122***		-0.021***		0.031		-0.015**
		(6.127)		(-18.748)		(1.603)		(-2.424)
Post TARP x TARP Recipient_Not Repaid		0.003		0.003***		-0.014		0.031***
		(0.645)		(3.082)		(-0.802)		(6.249)
Post TARP x TARP Recipient_Repaid		0.040		0.012***		-0.035		0.088***
		(1.162)		(7.739)		(-1.175)		(10.944)
Controls	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Time Fixed Effects	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Observations	7,176	7,176	171,428	171,428	7,176	7,176	171,428	171,428
Adjusted R-squared	0.145	0.187	0.225	0.225	0.575	0.575	0.445	0.446

Panel D: Subsamples by Local Concentration (HHI)

Dependent Variable:	***Market Share***						***Market Power***					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
	Unconcentrated		***Moderately Concentrated***		***Highly Concentrated***		***Unconcentrated***		***Moderately Concentrated***		***Highly Concentrated***	
Independent Variables:	***HHI ≤ 1000***		***1000 < HHI ≤ 1,800***		***HHI > 1800***		***HHI ≤ 1000***		***1000 < HHI ≤ 1,800***		***HHI > 1800***	
TARP Recipient	-0.007***		-0.016***		-0.033***		-0.021***		-0.024***		-0.056***	
	(-7.489)		(-15.421)		(-8.646)		(-3.717)		(-5.074)		(-5.915)	
Post TARP x TARP Recipient	0.001		0.006***		0.027***		0.022***		0.049***		0.075***	
	(0.847)		(4.279)		(5.870)		(3.097)		(8.324)		(6.310)	
TARP Recipient_Not Repaid		-0.008***		-0.015***		-0.040***		-0.023***		-0.027***		-0.033***
		(-10.668)		(-13.752)		(-10.455)		(-3.682)		(-5.350)		(-2.949)
TARP Recipient_Repaid		0.002		-0.017***		-0.005		-0.009		0.001		-0.125***
		(0.386)		(-7.739)		(-0.595)		(-0.869)		(0.143)		(-9.626)
Post TARP x TARP Recipient_Not Repaid		0.004***		0.003*		0.024***		0.018**		0.042***		0.039***
		(3.642)		(1.929)		(4.936)		(2.281)		(6.278)		(2.704)
Post TARP x TARP Recipient_Repaid		-0.015***		0.020***		0.046***		0.049***		0.082***		0.196***
		(-2.834)		(4.951)		(4.485)		(3.524)		(7.519)		(12.085)
Controls	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Time Fixed Effects	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Observations	84,627	84,627	68,181	68,181	25,796	25,796	84,627	84,627	68,181	68,181	25,796	25,796
Adjusted R-squared	0.095	0.096	0.073	0.074	0.252	0.253	0.526	0.527	0.398	0.398	0.436	0.436

Panel E: Tests of the equality of the effects of TARP for different types of TARP recipients

		Market Share	***Market Power***
Excluding Involuntary Participants	***t*-stat:** Effect for TARP bank that repaid early = effect for TARP bank that did not repay early	2.627***	5.711***
Excluding Banks Subject to the Stress Tests	***t*-stat:** Effect for TARP bank that repaid early = effect for TARP bank that did not repay early	2.349**	5.595***
Poorly Capitalized EQCAP_08Q3 ≤ 7%	***p* value:** Effect for TARP bank that repaid early = effect for TARP bank that did not repay early	1.072	0.608
Highly Capitalized EQCAP_08Q3 > 7%	***p* value:** Effect for TARP bank that repaid early = effect for TARP bank that did not repay early	4.723***	6.206***
Unconcentrated HHI ≤ 1000	***p* value:** Effect for TARP bank that repaid early = effect for TARP bank that did not repay early	3.464***	1.944*
Moderately Concentrated 1000 < HHI ≤ 1,800	***p* value:** Effect for TARP bank that repaid early = effect for TARP bank that did not repay early	4.138***	3.282***
Highly Concentrated HHI > 1800	***p* value:** Effect for TARP bank that repaid early = effect for TARP bank that did not repay early	2.052**	7.375***