

To Merge or Not to Merge: Determinants of Bank Consolidation During the 2008 Financial Crisis

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Abstract

This paper analyzes the determinants that make a bank more likely to engage in merger activity either as an acquirer or a target using a sample between the years 1995 and 2019. We first examine the bank merger characteristics during the 2008 financial crisis and then extend our analysis by focusing on banks that received TARP funds. In our consecutive analysis, we compare pre- and post-crisis merger determinants. Using a logit model with interaction variables, we find that acquirers during the crisis tended to be more profitable and had lower non-performing loans and leverage than the acquirers during the stable periods. Moreover, we find that TARP recipient acquirers tended to be more profitable, had lower sensitivity to market risk, and had higher non-performing loans than the non-TARP acquirers. Lastly, a post-crisis analysis reveals that acquirers after the crisis tended to be smaller than acquirers during the pre-crisis period. These findings show that different characteristics make a bank more likely to be involved in a merger before, during, and after the 2008 financial crisis. Moreover, government support plays an important role in merger determinants during the crisis.

Keywords: Banks; M&A; Financial Crises

JEL Codes: G01, G21, G28, G34

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All errors are our own. We have no relevant or financial interests related to this project to disclose. An online appendix is available at http://www.goncasenel.com/uploads/2/4/8/1/24818900/maslak_senel_merger_determinants_online_appendix.pdf

1. Introduction

There has been an ongoing consolidation trend in the U.S. banking industry since the 1990s. As shown in [Figure 1](#), the number of banks has declined by 45 percent in the last two decades.¹ The first significant wave of bank mergers took place in the second half of the 1990s after the passage of the Reigle-Neal Act of 1994, which allowed interstate acquisitions and mergers. After this period, bank mergers continued, albeit at a slower pace. During the 2008 financial crisis, the rate of bank mergers reaccelerated when bank mergers and acquisitions (M&A) were used as a means of bank resolution both by private banks and the federal government. Specifically, between 2007 and 2010, the number of banks declined by 12 percent.²

Given this overall trend, this paper aims to explore the nature and underlying determinants of these bank mergers. In particular, we first focus on mergers that occurred during the 2008 financial crisis to examine whether merger determinants differ with respect to the economic environment or government support. Next, we compare whether bank merger determinants were significantly different after the 2008 financial crisis compared to those prior to the crisis.

Our paper contributes to the literature on bank mergers in four distinct ways. First, we consider mergers from 1995 to 2019, extending the analysis of earlier literature. Second, we focus on the mergers during the 2008 financial crisis to determine whether there were any firm-specific characteristics that influenced the likelihood of being involved in a merger (either as an acquirer or as a target) during the 2008 financial crisis. Third, we isolate the banks concerning whether they received TARP funds and analyze whether government support impacted their merger determinants.³ Last, we compare the determinants pre- and post-crisis to evaluate any changes in the ex-ante characteristics of these merging banks. To our knowledge, our paper is the first one that explores the relationship between TARP funds and the determinants of mergers during the 2008 financial crisis.

Using a logit model, we test the differences in the merger determinants proxied by CAMELS variables and some additional variables commonly used in the literature. First, using the stable period acquirers as the base case scenario, we find that these acquirers tended to have higher tier-1 capital, larger size, more tangible assets, and more loans as compared to non-merging banks. Moreover, these acquirers had lower liquidity, non-performing loans, operating expenses,

¹Some of this decline is due to bank failures; however, the share of failed banks is small and approximately less than 3 percent of the total number of banks, which implies that the decline is mainly driven by the merger activity.

²This finding is in line with Wheelock (2011).

³We explore the effects of FDIC assistance in the online appendix.

and book leverage ratios. Comparing these with the acquirers during the crisis period, we find that acquirers of the crisis tended to be more profitable and had lower non-performing loans and book leverage than the acquirers of the stable periods. Considering the targets of the stable periods, we find that these targets tended to have lower tier-1 capital levels as compared to the non-merging sample. Comparing these targets with the targets of the crisis period, we find that targets during the crisis period tended to have lower non-performing loans than their stable period counterparts.

In our subsequent analysis, we focus on the mergers of the crisis period and examine whether the acquirers and targets differ with respect to whether they received TARP funds or not. Using the non-TARP bank mergers as the base case scenario, we find that non-TARP bank mergers tend to have acquirers larger bank sizes and lower non-performing loans and book leverage as compared to the non-merging sample. Comparing these with the acquirers that received TARP funds, we find that TARP recipient acquirers tended to be more profitable, had lower sensitivity to market risk proxied by the non-interest income ratio, but had higher non-performing loans as compared to the non-TARP acquirers. Considering the non-TARP targets, we find that these targets tend to have lower tier-1 capital and non-performing loans. Comparing these targets with the TARP recipient targets, we find that TARP recipient targets tended to have more tier-1 capital as compared to the non-TARP targets.

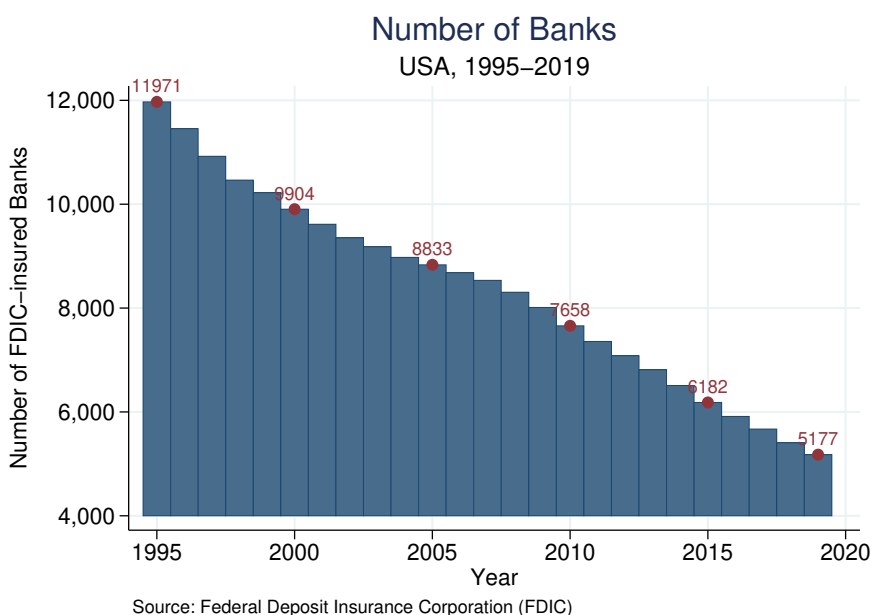
Last, we exclude the crisis periods and compare the mergers of the pre-crisis periods with the post-crisis periods. Using the pre-crisis bank mergers as the base case scenario, the analysis for the CAMELS shows that pre-crisis acquirers tended to have higher tier-1 capital and lower non-performing loans, operating expenses, and liquidity ratios. Moreover, considering the variables other than the CAMELS, we find that acquirers of the pre-crisis period tended to have larger bank size, more tangible assets, a higher loans ratio, and a lower book leverage ratio. Comparing pre-crisis acquirers with post-crisis acquirers, we find that acquirers of the post-crisis periods tend to be smaller in size. Moreover, the interaction terms for liquidity and book leverage are negative and significant, implying that acquirers of the post-crisis period tend to have lower liquidity and lower book leverage. Finally, the positive interaction term for the non-performing loans indicates that post-crisis acquirers tended to have more non-performing loans than their pre-crisis counterparts. However, compared to the non-acquirers of the post-crisis, this ratio is not significantly different. Considering the targets, the targets of the pre-crisis period tended to have lower tangibility. Comparing pre-crisis targets with the post-crisis targets, we find that

targets of the post-crisis periods tended to be smaller in size.

These findings have important financial implications and provide insight for future policy-making. Our analysis shows that during the crisis, acquirers tended to be more profitable banks that were able to transact despite the financial distress and often purchased higher quality targets as measured by better loan performance. This result indicates that during the crisis, banks with higher quality balance sheets are able to take advantage of high-quality merger opportunities involving better quality targets. Within the crisis, acquirers that received TARP funds were often more profitable, centered on more traditional banking activities (i.e., lower non-interest income), and had higher operating expenses due to TARP-related regulatory costs. Meanwhile, TARP banks that were acquired often had higher shares of tier-1 capital as compared to the non-TARP counterparts. Therefore, the liquidity provided by TARP funds was beneficial for the banks to either help them make acquisitions or become more attractive acquisition targets. After the crisis, the effect of bank size on the probability of being an acquirer is smaller. This result is possibly a reflection of greater regulation and a reduced too-big-to-fail incentive. In line with the acquirers, bank size had a negative impact on the likelihood of being a target after the crisis.

The outline of this paper is as follows: Section 2 summarizes the literature on bank mergers. Section 3 outlines our hypotheses. Section 4 presents methodology and data and discusses the explanatory variables employed in the analysis. Section 5 presents our empirical analysis. Section 6 concludes.

Figure 1: NUMBER OF FDIC-INSURED BANKS



2. Literature Review

There is a growing literature on the ex-ante differences in the firm-specific characteristics of potential acquirers and targets. One of the earlier examples of this literature is Hannan and Rhoades (1987), where the authors report that banks with larger market shares and lower capital-to-asset ratios were more likely to be acquired. Another example is Moore (1997), where the author finds that the market share, profitability, and capital-asset ratio were all negatively related to the likelihood of being a target. Hadlock et al. (1999) find that banks with higher degrees of management ownership were less likely to become targets. Moreover, Wheelock and Wilson (2000) analyze the characteristics that make a bank more likely to be acquired using competing-risks hazard models and find that productive inefficiency and low capitalization increase the probability of being a target. Similarly, Akhigbe et al. (2004) document that the probability of a bank being acquired was higher for larger banks with higher capital levels, lower profitability, lower nonperforming loans, and lower market-to-book value. Another paper that explores the determinants of being acquired is Hannan and Pilloff (2009). In this paper, the authors find that less profitable firms are more likely to be acquired and that banks with higher capital-asset ratios are less likely to be acquired. Similar to Wheelock and Wilson (2000), Hernando et al. (2009) find that poorly managed banks are likely to be acquired. Gorton et al. (2009) propose a theory of merger and explores the size effects on the merger probability. In addition to these, Pasiouras et al. (2011) find that acquirers were significantly larger, more profitable, less capitalized, and more efficient, while targets were less profitable and had lower growth. Becalli and Frantz (2013) investigate the characteristics that make a bank more likely to become an acquirer as well as a target. In their paper, Becalli and Frantz (2013) find that larger banks with high growth, greater cost X-efficiency, and lower capitalization are more likely to become acquirers, while less efficient, undercapitalized, and illiquid banks with lower free cash flows are more likely to be targets. Moreover, Ly et al. (2017) present the difference in the likelihood of being targets or acquirers among stand-alone banks, single-bank holding company affiliates, and multibank holding company affiliates and find that multibank holding company parents get their distressed, poorly performing and smaller affiliates involved in mergers in order to discipline them. Lastly, Dunn et al. (2015) compare the acquirer and target characteristics during the crisis and find that undervalued targets relative to their acquirers experience larger offer premiums during the crisis.

3. Hypotheses

3.1. Hypotheses

We test the following hypotheses in our paper (corresponding sections in parentheses):

- *H1: The determinants of mergers that took place during the 2008 financial crisis differ from those of the stable periods. (Section 5.1)*

Banks have different motivations to be involved in mergers. As discussed in DeYoung et al. (2009), banks merge to create safety nets through too-big-to-fail government guarantees, increase efficiency, expand and diversify their product and consumer base. During the 2008 financial crisis, due to financial distress and government intervention, banks may use consolidation for purposes different than the stable periods. Therefore the characteristics of the acquirers and the targets may differ during the 2008 financial crisis. Moreover, for the acquirers, stronger balance sheet characteristics played a more important role during this period of stress.

- *H2: Banks that received TARP payments may have different characteristics and motivations to be involved in a merger during the 2008 financial crisis. (Section 5.2)*

There is a significant amount of research on the effects of TARP provisions. Farruggio et al. (2013) explain that these provisions can help banks absorb the losses of their toxic or illiquid assets and help them diversify their asset portfolio. Moreover, as Berger and Bouwman (2013) discuss, the increase in capital holdings are positively connected with the survival of the banks. Berger, Imbierowicz, and Rauch (2016) and Aubuchon and Wheelock (2010) also show that banks that received TARP injections were less likely to fail than those that did not. On the other hand, in the same paper, Farruggio et al. (2013) also show that even though the announcement of the TARP funds has a positive impact, the increase in the uncertainty of whether the banks will be able to repay their loans creates additional value losses for the banks. Furthermore, TARP banks experience a more significant decline in operating efficiency. Therefore, liquidity provisions to the TARP banks may encourage or discourage them from being involved in mergers, and the characteristics of these banks will be different from non-TARP acquirer counterparts.

- *H3: The determinants of mergers that took place after the 2008 financial crisis may differ from those that occurred before. (Section 5.3)*

Following the crisis, banks may still be recovering from the aftermath of the financial shock they have experienced. Moreover, the (de)regulations following the crisis may impact the balance sheet characteristics of these banks. Berger and Turk-Ariss (2014) show that the government's expansion of the deposit insurance coverage and rescue of the troubled banks have created unintended consequences and reduced the market discipline that would have penalized the banks for risk-taking behavior after the crisis except for the small banks. Therefore, the mergers after the crisis include banks with different risk-taking behavior and related balance sheet characteristics.

We test these hypotheses using the following balance sheet characteristics commonly used in the literature.

CAMELS

- *Capital Adequacy: Tier-1 Capital Ratio*

Berger et al. (2008) discuss that banks keep excess capital for acquisition purposes to be ready if any investment opportunities arise. Also, capital is needed for sustained financial safety and soundness. Moreover, Berger and Bouwman (2013) show that higher capitalized banks are more likely to survive. Therefore, we expect acquirers to be better capitalized while the targets are expected to have lower levels of tier-1 capital.

- *Asset Quality: Non-performing Loans Ratio*

As discussed in Berger and Deyoung (1997), the literature on bank failures finds that failing institutions have a large share of non-performing loans, and loan quality is an important factor in insolvency (see Demirguc-Kunt 1989, Whalen 1991, and Barr and Siems 1994). Moreover, an increase in non-performing loans may also increase the operating costs due to a rise in the cost of monitoring and selling out these loans. We expect that banks with a higher share of loan losses are less likely to have the capacity to become acquirers. Moreover, banks with higher non-performing loans are expected to be less attractive acquisition targets.

- *Management: Operating Expense Ratio*

We expect that poorly managed banks have a higher operating expense ratio, and therefore these banks are less likely to become acquirers. Moreover, we expect that less efficient banks are more likely to be acquired for the targets.

- *Earnings: ROA*

Banks that are expanding their operations through consolidation must be profitable and have sound balance sheet characteristics to attract additional financing. Therefore, we expect that banks with higher profitability are more likely to become acquirers. Moreover, Wheelock and Wilson (2000) show that less profitable banks are more likely to become targets.

- *Liquidity: Liquidity Ratio*

Liquidity creates a buffer against negative shocks, and a high level of liquidity is essential to finance acquisitions. On the other hand, too many liquid assets may also imply poor asset allocation. Therefore, depending on which factor is stronger, liquidity may increase or decrease the likelihood of being an acquirer.

- *Sensitivity to Market Risk: Total Non-interest Income Ratio*

As DeYoung and Rice (2003) discuss, increases in non-interest income are associated with poorer risk-return trade-offs. Therefore, a higher non-interest income ratio is associated with higher sensitivity to market risk, implying a lower probability of being an acquirer and a higher likelihood of being a target.

Other Variables

- *Bank Size*

As discussed in DeYoung et al. (2009), due to their too-big-to-fail motive, we expect that larger banks are more likely to be acquirers. Moreover, Rosen (2004) finds that if CEO compensation increases with bank size, these banks tend to be acquirers more often. On the contrary, smaller banks are more likely to become targets.

- *Tangibility*

As Cole (2013) discusses, tangible assets can be used as collateral to obtain preferential financing through borrowing from different sources of credit. In addition, these assets experience smaller losses in liquidation. Therefore, a higher percentage of tangible assets indicates that a bank is generally healthier, resulting in the firm being able to borrow more easily, and therefore we expect that banks with higher tangibility are more likely to become acquirers and less likely to become targets.

- *Loans Ratio*

Berger and Mester (1997) found that banks with a higher ratio of loans to total assets were more profit efficient than other banks in the U.S. banking sector. Moreover, a high level of loans would indicate aggressive and strong market penetration; accordingly, we expect that a higher loans ratio is associated with a higher probability of being an acquirer and a lower probability of being a target.

- *Book Leverage*

Beltratti and Stulz (2012) find that large banks with less leverage during the pre-crisis periods performed better during the crisis. Therefore, we expect that the more debt a bank has, the less likely it will be an acquirer or a target.

4. Methodology and Data

4.1. Methodology

In this paper, we examine the probability that a bank will be involved in a merger as an acquirer or as a target. In addition to using a firm's pre-merger balance sheet data as an explanatory variable, we interact this data with a dummy variable for the crisis period in order to investigate whether there are any ex-ante differences between the balance sheets of the banks that merged during the crisis and those of the stable periods.

We estimate two sets of logistic regressions, one set for acquirers and the other for targets. A comparison of the coefficients and significance levels of these models will permit us to determine whether there are specific characteristics that make a bank more likely to be an acquirer or a target dependent on the bank subgroup at the time of the merger.

The first set of logistic regressions focuses on the likelihood that a bank will participate in a merger as an acquirer while the second set focuses on the probability that a bank will be a target. In both cases, the dependent variable in the regressions is discrete and is equal to 1 for an acquirer or a target during the year of the merger and a 0 otherwise. We use the explanatory variables which are commonly used in the literature and defined in [Table 1](#).⁴ We use four dummies in our analysis. In order to control for the economic environment during the merger, we use a dummy variable called "*Crisis*", which takes a value of 1 for the crisis period and 0

⁴See Hamman & Pilloff (2009), Wheelock & Wilson (2004).

otherwise. In order to control for the TARP banks during the crisis, we use a dummy variable called “*TARP*”. In our first specification, the dummy variable for TARP is equal to 1 for all banks that received the payment irrespective of timing, meanwhile in the second specification, the $TARP_{post}$ variable is equal to 1 only after the funds are received. The first specification is to capture whether there is any characteristic differences for banks that are chosen to receive those funds, while in the second specification we explore the effect that the additional liquidity the TARP funds provide. Lastly, “*Post – Crisis*” is equal to 1 for all observations after 2010 and 0 for all observations before 2007. We specifically focus on the interaction variables of these dummies with the control variables in order to capture any differences between subsamples.

Model Specification: Acquirer

$$Y_{i,t} = \beta_0 + \beta_i(X_{i,t}) + \gamma_i(\text{Crisis} \times X_{i,t}) + \mu_{1,i,t}$$

$$Y_{i,t} = \beta_0 + \beta_i(X_{i,t}) + \theta_i(\text{TARP} \times X_{i,t}) + \mu_{2,i,t}$$

$$Y_{i,t} = \beta_0 + \beta_i(X_{i,t}) + \alpha_i(TARP_{post} \times X_{i,t}) + \mu_{3,i,t}$$

$$Y_{i,t} = \beta_0 + \beta_i(X_{i,t}) + \rho_i(\text{Post-Crisis} \times X_{i,t}) + \mu_{4,i,t}$$

Model Specification: Target

$$Z_{i,t} = \phi_0 + \phi_i(X_{i,t}) + \zeta_i(\text{Crisis} \times X_{i,t}) + \mu_{5,i,t}$$

$$Z_{i,t} = \phi_0 + \phi_i(X_{i,t}) + \eta_i(\text{TARP} \times X_{i,t}) + \mu_{6,i,t}$$

$$Z_{i,t} = \phi_0 + \phi_i(X_{i,t}) + \psi_i(TARP_{post} \times X_{i,t}) + \mu_{7,i,t}$$

$$Z_{i,t} = \phi_0 + \phi_i(X_{i,t}) + \chi_i(\text{Post-Crisis} \times X_{i,t}) + \mu_{8,i,t}$$

Table 1: DEFINITIONS OF EXPLANATORY VARIABLES AND EXPECTED EFFECTS

| Variable | Definition | Expected Sign (Acquirer) | Expected Sign (Target) |
|----------------------------|---|-----------------------------|---------------------------|
| CAMELS | | | |
| Tier-1 Capital | The risk-adjusted capital ratio-tier-1 (multiplied by 100). | (+) | (-) |
| Non-performing Loans Ratio | Non-performing assets divided by total assets multiplied by 100 (ratio). | (-) | (-) |
| Operating Expense Ratio | Operating expenses divided by total assets multiplied by 100 (ratio). | (-) | (-) |
| Return on Assets | Net income divided by total assets multiplied by 100 (ratio). | (+) | (-) |
| Liquidity | Cash and short-term investments divided by total assets multiplied by 100 (ratio). | (+)/(-) | (+)/(-) |
| Sensitivity to Market Risk | Total non-interest income divided by total assets multiplied by 100 (ratio). | (-) | (+) |
| Other Variables | | | |
| Bank Size | The natural log of a bank's total assets (in millions). | (+) | (-) |
| Tangibility | Property, plant, and equipment divided by total assets multiplied by 100 (ratio). | (+) | (-) |
| Loans Ratio | Loans-net of total allowance for loan losses divided by total assets multiplied by 100 (ratio). | (+) | (-) |
| Book Leverage | Book value of debt divided by the market value of assets multiplied by 100 (ratio). | (-) | (-) |

4.2. Data

4.2.1. Merger Data

Regarding the construction of the merging bank sample, we use the Thomson ONE database and collect all domestic merger transactions between 1995 and 2019 that occurred within the

United States between acquirers with the Standard Industrial Classification (SIC) codes 6021-6036, 6712, and targets with the SIC codes 6000-6162. In other words, the composition of the sample involves acquiring firms that are either depository institutions or bank holding companies merging with target firms that are either depository or non-depository credit institutions. Furthermore, although important during the 2008 financial crisis, since the focus of this paper is bank consolidation, we make a simplifying restriction and do not include any security and commodity brokers, dealers, exchanges, and services in our sample. Moreover, we exclude FDIC-assisted mergers from our sample.

M&A deals were further restricted by requiring that the acquirer purchase at least 50 percent of the target firm and the deal value is at least \$10 million.

Likewise, mergers involving the same acquirer that occurred within the short period of a single month are entirely excluded, while for acquisitions that took place within six months of one another, only the transaction with the maximum deal value is kept. This is done to capture the transactions that most likely will have the clearest impact on the acquirer.

Furthermore, all of the mergers considered in this paper were announced and completed between the years 1995 and 2019. Since our analysis compares bank mergers that occurred during the 2008 financial crisis with those that transpired during stable market conditions, we first define these periods. We gather complementary data from the Federal Deposit Insurance Corporation (FDIC) regarding annual number of bank failures and bank failures by total assets. In this way, we determine the following windows in which mergers have been announced:⁵

| | |
|-----------------|----------------|
| Stable Periods: | Crisis Period: |
| 1995 – 2006 | 2007 – 2010 |
| 2011 – 2019 | |

4.2.2. Balance Sheet Data Construction

For acquirers, targets, and non-merging banks, we use the CRSP/Compustat Merged data et.⁶ Specifically, we match the bank sample in the Thomson ONE M&A dataset with the CRSP/Compustat Merged data set with respect to banks' six-digit CUSIP or issue CUSIP, depending on the availability. The CRSP/Compustat Merged dataset contains balance sheet

⁵The announcement date of the merger is used because the announcement is a conscious decision on the part of the acquirer to participate in a merger taking the economic climate into account.

⁶The CRSP/Compustat Merged database was accessed via Wharton Research Data Services (WRDS).

data for all acquirers in the sample, except for a negligible few while target data is missing for some banks. For acquirers, we take all available balance sheet data from Compustat for banks that match the list of acquirers from the Thomson ONE sample. Similarly, for targets, we take all available balance sheet data from Compustat to create a single dataset that matches the list of targets from the Thomson ONE sample. Lastly, to create the non-merging sample, we take balance sheet data for all banks from Compustat and, once again using the merger data from the Thomson ONE sample, remove all acquirers and targets. For all of the banks in the acquirer, target, and non-merging samples, time series data is created by collecting balance sheet data for all years available.

4.2.3. TARP Recipient Bank Sample Construction

We obtain the list of TARP recipient banks from the TARP Transactions Report on the U.S. Department of Treasury website. Specifically, we use the report dated 25 December 2015. We find 738 transactions, some of which include multiple transactions with the same bank. This data only includes the name and the state of the bank without any other identifier. In order to obtain the RSSD ID of these banks, we match the list of TARP recipient banks with the Summary of Deposits (SOD) dataset that is available on the FDIC website (<https://www7.fdic.gov/sod/dynaDownload.asp?barItem=6>). The SOD dataset includes banks' branch names, locations (both at the city and state level), and their RSSD IDs. We merge SOD datasets between 2007 and 2012 to obtain a full representation of bank names and their RSSD IDs. Even though most of the TARP payments are given to the bank holding companies, since some branches also received the TARP payments directly, we (fuzzy) match the TARP recipient bank sample with the SOD dataset at the branch and BHC level separately.

Moreover, we use the National Information Center (NIC) (<https://www.ffiec.gov/NPW>) and the Ibanknet website (<https://www.ibanknet.com/scripts/callreports/filist.aspx?type=tarp>) to check the correctness of the RSSD ID matches individually. After obtaining the bank name-RSSD ID matches for the TARP recipient banks, we match these banks with the ones in the Federal Reserve Bank of New York link table data using the RSSD ID. For the banks that do not match with respect to RSSD ID, we also conduct a fuzzy match with respect to bank name and use the National Information Center (NIC) (<https://www.ffiec.gov/NPW>) to check the correctness of the RSSD ID-permco matches individually. This method provides us with 284 RSSD ID-permco pairs for the TARP recipient bank dataset.

4.3. Summary Statistics for the Explanatory Variables

Table 2 shows the mean values of these explanatory variables for the acquirers, targets, and non-merging banks respectively. Comparing these different samples, we find that acquirers on average tended to be larger and more profitable as measured by ROA, with fewer non-performing loans, lower operating expenses, lower liquidity, higher tangibility, lower loans, lower leverage, and a higher non-interest income ratio than the non-merging banks. Meanwhile, targets on average were smaller in size than the acquirers, had lower tier-1 capital, higher non-performing loans and operating expenses, lower tangibility, and higher leverage, signaling that subpar performance may be an important characteristic in merger targets.

Table 2: SUMMARY STATISTICS

| | Acquirer | Target | Non-merging |
|----------------------------|----------|--------|-------------|
| Tier 1 Capital | 11.82 | 11.33 | 11.92 |
| Non-performing Loans | 0.79 | 1.00 | 1.28 |
| Operating Expense Ratio | 4.34 | 4.58 | 4.52 |
| ROA | 0.99 | 0.74 | 0.69 |
| Liquidity | 5.15 | 5.35 | 5.58 |
| Sensitivity to Market Risk | 1.13 | 0.86 | 1.00 |
| Bank Size | 7.96 | 6.90 | 7.11 |
| Tangibility | 1.60 | 1.48 | 1.58 |
| Loans Ratio | 64.60 | 64.78 | 65.46 |
| Book Leverage | 12.35 | 12.69 | 12.57 |

This table shows the mean values for the explanatory variables with respect to acquirers, targets, and non-merging banks, respectively.

5. Empirical Analysis

This section examines the determinants of bank mergers in three dimensions. Namely, we compare the mergers with respect to 1) crisis versus stable periods, 2) whether they received any government support, and 3) pre- and post-crisis.

5.1. Determinants of Mergers During the Crisis

Table 3 reports the results of a logistic regression to identify the key determinants of whether a bank will participate in a merger either as an acquirer or a target. The first column of each panel shows the results for the mergers that took place during the stable periods (i.e., 1995-2006 and 2011-2019). The second column shows the results for the mergers that took place during the crisis, while the third column combines these two subgroups and shows the results in the overall sample. The independent variables include the CAMELS variables as well as other important balance sheet characteristics commonly used in the literature. All results are reported in log-odds ratio; therefore, any positive coefficient implies that the variable increases the likelihood of being in a merger, and any negative coefficient would imply the opposite. Furthermore, in the third column of each panel, we include crisis interaction variables to capture the differences between the two subgroups. If the coefficient of a variable has the same sign with its crisis interaction, this variable had a pronounced impact on the likelihood of mergers during the crisis.⁷

5.1.1. Acquirers

In the first column, starting with the CAMELS, we find that tier 1 capital increases the likelihood of being an acquirer during stable periods. This finding is in line with the existing literature since a bank's proportion of capitalization is generally interpreted as a reflection of past performance and itself an index of managerial ability or efficiency (Wheelock and Wilson (2000)). Meanwhile, banks with higher non-performing loans, operating expense, and liquidity ratios are less likely to be acquirers. The increase in non-performing loans is an important indicator of a lack of financial soundness. A higher operating expense ratio implies managerial inefficiency. Lastly, too much liquidity indicates poor asset allocation and reduces the probability of being an acquirer.

Regarding the other variables, we find that bank size, tangibility, and loans ratio increase the likelihood of being an acquirer, while book leverage decreases it. Larger banks being more likely to become acquirers is a common finding in the literature. Typically, banks with a greater tangibility are regarded as healthier in general and thus can more easily borrow because they can offer their property, plant, and equipment as collateral on the loans. A higher loans ratio

⁷To analyze any multicollinearity problems, we report piece-wise correlation coefficients in Table 7. The absolute values of the correlation coefficients between explanatory variables are less than 0.5 except for the operating expense ratio and ROA, which is equal to -0.53.

demonstrates that a bank is engaged in more traditional forms of banking activities and itself is indicative of the owner's ability to earn profits (Wheelock & Wilson (2004)). This interpretation implies that banks more involved with core banking activities generally tended to be acquirers.

Considering the second column, regarding the CAMELS, we find that non-performing loans decrease the likelihood of an acquirer during the crisis. Unlike the stable period, during the crisis, the coefficient of ROA is also significant, which implies that profitability is an important determinant for an acquirer during periods of financial distress. The other variables, bank size and tangibility, increase the likelihood of being an acquirer while the book leverage ratio decreases it during the crisis.

Considering the interaction variables in the third column, which summarize the significance of the difference between stable and crisis periods, we find that the coefficients of the crisis interaction variables for ROA, non-performing loans, and book leverage are all significant and have the same sign with the coefficients of the actual variables. This finding implies that these variables have a distinctly stronger impact during the crisis. Namely, acquirers during the crisis were more profitable with higher ROA, had better loan quality, and had lower debt than the stable period counterparts.

5.1.2. Target

In the first column of Panel B, the only significant coefficient is tier-1 capital. This finding implies that the likelihood that a bank will be acquired during the stable periods is higher for banks with a lower tier-1 capital ratio. The negative relationship between tier-1 capital and the prospects for being acquired is quite a common finding in the literature (Wheelock & Wilson (2000)). Therefore, a low tier-1 capital ratio indicates to potential acquirers that greater performance gains are likely if the bank is acquired.

Conversely, banks with higher capital ratios were less likely to be acquired due to the perception that there was no room for said gains. In the second column, together with tier-1 capital, non-performing loans also decrease the probability of being a target during the crisis periods, implying that lower tier-1 capital and better loan quality increase the likelihood of being a target during the crisis. Moreover, the coefficient for the crisis interaction with the non-performing loans is negative and significant, implying that banks that were targets during the crisis had distinctly better loan quality than their stable period counterparts.

Table 3: LOGISTIC REGRESSION RESULTS FOR THE ACQUIRER AND THE TARGET (STABLE VERSUS CRISIS)

| | Acquirer | | | Target | | |
|-------------------------------------|-----------------------|-----------------------|-----------------------|----------------------|---------------------|----------------------|
| | Stable Periods | Crisis | Whole Sample | Stable Periods | Crisis | Whole Sample |
| <i>CAMELS</i> | | | | | | |
| Tier 1 Capital | 0.0222*** (0.005) | -0.00887 (0.765) | 0.0222*** (0.005) | -0.0321** (0.019) | -0.0788* (0.097) | -0.0321** (0.019) |
| Non-performing Loans | -0.0696* (0.096) | -0.295** (0.025) | -0.0696* (0.096) | 0.00114 (0.967) | -0.273** (0.019) | 0.00114 (0.967) |
| Operating Expense Ratio | -0.205*** (0.001) | -0.0834 (0.565) | -0.205*** (0.001) | -0.0432 (0.207) | 0.0493 (0.764) | -0.0432 (0.207) |
| ROA | 0.0899 (0.120) | 0.423*** (0.005) | 0.0899 (0.120) | -0.0438 (0.532) | -0.149 (0.122) | -0.0438 (0.532) |
| Liquidity | -0.0549*** (0.000) | -0.0353 (0.171) | -0.0549*** (0.000) | -0.0192 (0.135) | -0.0215 (0.562) | -0.0192 (0.135) |
| Sensitivity to Market Risk | 0.0541 (0.292) | -0.129 (0.383) | 0.0541 (0.292) | -0.116 (0.103) | -0.119 (0.351) | -0.116 (0.103) |
| <i>Other Variables</i> | | | | | | |
| Bank Size | 0.375*** (0.000) | 0.439*** (0.000) | 0.375*** (0.000) | -0.0529 (0.157) | 0.0196 (0.867) | -0.0529 (0.157) |
| Tangibility | 0.197*** (0.000) | 0.192* (0.065) | 0.197*** (0.000) | -0.109 (0.129) | -0.0930 (0.554) | -0.109 (0.129) |
| Loans Ratio | 0.00689** (0.037) | 0.0117 (0.166) | 0.00689** (0.037) | -0.00498 (0.197) | 0.00378 (0.707) | -0.00498 (0.197) |
| Book Leverage | -0.0160*** (0.001) | -0.0386*** (0.001) | -0.0160*** (0.001) | -0.00560 (0.334) | -0.0159 (0.287) | -0.00560 (0.334) |
| Crisis | | | -1.905 (0.117) | | | -1.055 (0.557) |
| Crisis x Bank Size | | | 0.0638 (0.333) | | | 0.0724 (0.550) |
| Crisis x Tier 1 Capital | | | -0.0311 (0.305) | | | -0.0467 (0.342) |
| Crisis x Non-performing Loans | | | -0.225* (0.098) | | | -0.274** (0.022) |
| Crisis x Operating Expense Ratio | | | 0.122 (0.451) | | | 0.0924 (0.582) |
| Crisis x ROA | | | 0.333** (0.032) | | | -0.105 (0.379) |
| Crisis x Liquidity | | | 0.0196 (0.420) | | | -0.00231 (0.953) |
| Crisis x Tangibility | | | -0.00552 (0.957) | | | 0.0160 (0.926) |
| Crisis x Loans Ratio | | | 0.00484 (0.562) | | | 0.00875 (0.410) |
| Crisis x Book Leverage | | | -0.0225* (0.050) | | | -0.0103 (0.516) |
| Crisis x Sensitivity to Market Risk | | | -0.183 (0.239) | | | -0.00221 (0.988) |
| Constant | -3.599*** (0.000) | -5.384*** (0.000) | -3.599*** (0.000) | -1.258** (0.012) | -1.923 (0.262) | -1.258** (0.012) |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 10200 | 2095 | 12295 | 9165 | 2003 | 11168 |
| Pseudo R^2 | 0.071 | 0.128 | 0.087 | 0.018 | 0.053 | 0.028 |

This table shows the logistic regression results for the acquirers (targets). The dependent variable is equal to 1 if the bank is an acquirer (target) for the given year and is equal to 0 otherwise. The crisis dummy is equal to 1 if the merger has taken place between years 2007 and 2010. Year fixed effects are included. Robust standard errors clustered by bank are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5.2. Determinants of Mergers with Respect to Government Support

Focusing on the crisis period only, we examine whether receiving government support has any effect on merger determinants. Specifically, we analyze the determinants of the mergers that involve banks that received TARP funds. [Table 4](#) and [Table 5](#) show the results with respect to banks that received the TARP funds and those that did not. In [Table 4](#) the dummy variable for TARP is equal to 1 for all banks that received the payment irrespective of its timing. Meanwhile, in [Table 5](#), the $TARP_{post}$ variable is equal to 1 only after the TARP fund is received. The first specification is to capture whether there are any characteristic differences for banks that are chosen to receive those funds, while in the second specification, we explore the effect of the additional liquidity that the TARP funds provide.

5.2.1. Acquirer

In [Table 4](#), the first column shows that during the crisis period, for banks that did not receive the TARP funds, among CAMELS variables, non-performing loans decrease the likelihood of being an acquirer. Moreover, considering the other variables, the book leverage decreases the likelihood of being an acquirer, while the bank size increases this probability. The second column shows that for banks that did receive TARP funds, similar to the non-TARP case, book leverage decreases the likelihood of being an acquirer, and bank size increases this likelihood. However, this time, non-performing loans do not have a distinct effect on the likelihood of being an acquirer, implying that among TARP banks, non-performing loans do not affect the likelihood of being an acquirer. Moreover, different from the non-TARP case, ROA is significantly positive, and sensitivity to market risk is significantly negative. This implies that among TARP banks, acquirers are more likely to be profitable and are less sensitive to market risk with regard to non-interest income. Considering the interaction terms in column three, we see that the coefficients of non-performing loans, ROA, and sensitivity to market risk are significant. In the non-TARP sample, the non-performing loans ratio has a negative coefficient while its interaction term with the TARP dummy is positive, making the overall effect insignificant for the TARP banks. In addition, the coefficient of sensitivity to market risk is significantly negative for the TARP banks, which implies that this variable has a more distinct negative effect on the TARP banks' probability of being an acquirer. Lastly, the positive coefficient of the interaction

variable with ROA implies that in the overall sample, TARP banks with higher probability are more likely to become acquirers. This implies that as compared to the non-TARP acquirers, TARP recipient acquirers tend to have higher ROA and lower total non-interest income.

Considering the first column of [Table 5](#), the results are similar to the previous case where non-performing loans and book leverage ratio decreases the likelihood of being an acquirer while bank size increases it. Different from [Table 4](#), loan ratio also increases the probability of a bank becoming an acquirer while the operating expense ratio decreases it. The second column shows that the results are similar to the previous case, with the exception that the coefficient of the book leverage is not significant anymore while the coefficient of the operating expense ratio is significant and positive. The rationale for the positive coefficient for the operating expenses is that in our sample, TARP banks that were acquirers received larger funds from the government, and as discussed in Harris et al. (2012), operational costs may increase due to a decline in asset quality and profitability caused by aggressive banking practices. Moreover, the efforts to comply with the TARP requirements may also increase operating costs. Considering the second column, together with the interaction terms in the third column, among TARP banks, acquirers tend to have higher profitability, higher operating expense ratio, and lower sensitivity to the market risk, which is proxied by the non-interest income. Lastly, the interaction term for the loans ratio is negative and significant, implying that among non-TARP banks, the loans ratio increases the probability of being an acquirer, while this effect disappears for the TARP banks.

5.2.2. Target

The Panel B of [Table 4](#) and [Table 5](#) shows the results for the targets. The first column shows that the tier-1 capital and non-performing loans reduce the probability of being a target among non-TARP banks, while in the TARP-recipient bank subsample, the coefficient of the tier-1 capital is positive and significant, implying that better-capitalized banks are more likely to become targets among the TARP-recipient banks. Lastly, in the third column, the interaction term of the tier-1 capital is positive and significant, explaining the positive coefficient of tier-1 capital in the second column. Panel B of [Table 5](#) shows that the results are similar to the previous TARP bank specification.

Table 4: LOGISTIC REGRESSION RESULTS FOR THE ACQUIRER AND THE TARGET (NON-TARP VERSUS TARP)
ALL TARP RECIPIENT BANKS

| | Acquirer | | | Target | | |
|-----------------------------------|----------------------|----------------------|----------------------|---------------------|---------------------|---------------------|
| | Non-TARP | TARP | Whole Crisis Sample | Non-TARP | TARP | Whole Crisis Sample |
| <i>CAMELS</i> | | | | | | |
| Tier 1 Capital | 0.0220 (0.412) | -0.0349 (0.653) | 0.0220 (0.412) | -0.114** (0.012) | 0.259** (0.037) | -0.114** (0.012) |
| Non-performing Loans | -0.455*** (0.009) | -0.0427 (0.802) | -0.455*** (0.009) | -0.342** (0.019) | -0.0786 (0.669) | -0.342** (0.019) |
| Operating Expense Ratio | -0.199 (0.380) | 0.0616 (0.757) | -0.199 (0.380) | 0.130 (0.413) | -0.341 (0.657) | 0.130 (0.412) |
| ROA | 0.135 (0.338) | 0.709*** (0.003) | 0.135 (0.338) | -0.0460 (0.604) | -0.712 (0.192) | -0.0460 (0.604) |
| Liquidity | -0.0107 (0.761) | -0.0486 (0.262) | -0.0107 (0.760) | -0.0473 (0.305) | 0.0287 (0.635) | -0.0473 (0.305) |
| Sensitivity to Market Risk | 0.131 (0.365) | -0.383* (0.074) | 0.131 (0.365) | -0.113 (0.396) | -0.0121 (0.976) | -0.113 (0.396) |
| <i>Other Variables</i> | | | | | | |
| Bank Size | 0.460*** (0.000) | 0.423*** (0.000) | 0.460*** (0.000) | 0.139 (0.225) | 0.0833 (0.842) | 0.139 (0.225) |
| Tangibility | 0.0981 (0.488) | 0.208 (0.182) | 0.0981 (0.487) | -0.0422 (0.796) | -1.123 (0.202) | -0.0422 (0.796) |
| Loans Ratio | 0.0163 (0.126) | 0.000371 (0.983) | 0.0163 (0.126) | 0.00795 (0.414) | 0.0196 (0.197) | 0.00795 (0.414) |
| Book Leverage | -0.0361** (0.012) | -0.0421** (0.032) | -0.0361** (0.012) | -0.0255 (0.108) | -0.00743 (0.895) | -0.0255 (0.108) |
| TARP | | | 1.569 (0.596) | | | -4.410 (0.502) |
| TARP x Tier-1 Capital | | | -0.0569 (0.488) | | | 0.372*** (0.005) |
| TARP x Non-performing Loans | | | 0.413* (0.090) | | | 0.263 (0.261) |
| TARP x Operating Expense Ratio | | | 0.260 (0.387) | | | -0.471 (0.548) |
| TARP x ROA | | | 0.573** (0.038) | | | -0.666 (0.228) |
| TARP x Liquidity | | | -0.0379 (0.495) | | | 0.0760 (0.317) |
| TARP x Sensitivity to Market Risk | | | -0.515** (0.046) | | | 0.101 (0.809) |
| TARP x Bank Size | | | -0.0363 (0.791) | | | -0.0560 (0.897) |
| TARP x Tangibility | | | 0.110 (0.601) | | | -1.081 (0.226) |
| TARP x Loans Ratio | | | -0.0159 (0.425) | | | 0.0117 (0.518) |
| TARP x Book Leverage | | | -0.00607 (0.803) | | | 0.0180 (0.757) |
| Constant | -6.075*** (0.000) | -4.506* (0.077) | -6.075*** (0.000) | -2.441 (0.128) | -7.185 (0.260) | -2.441 (0.128) |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 1160 | 935 | 2095 | 1149 | 446 | 1595 |
| Pseudo R^2 | 0.129 | 0.149 | 0.150 | 0.076 | 0.173 | 0.113 |

This table shows the logistic regression results for the acquirers (targets). The dependent variable is equal to 1 if the bank is an acquirer (target) for the given year and is equal to 0 otherwise. The TARP dummy is equal to 1 if the bank has received any TARP funds. Year fixed effects are included. Robust standard errors clustered by bank are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: LOGISTIC REGRESSION RESULTS FOR THE ACQUIRER AND THE TARGET (NON-TARP_{post} VERSUS TARP_{post}) BANKS AFTER THEY RECEIVE THE TARP FUNDS

| | Acquirer | | | Target | | |
|---|--------------------------|----------------------|-----------------------|--------------------------|----------------------|----------------------|
| | Non-TARP _{post} | TARP _{post} | Whole Crisis Sample | Non-TARP _{post} | TARP _{post} | Whole Crisis Sample |
| <i>CAMELS</i> | | | | | | |
| Tier 1 Capital | 0.0160 (0.572) | -0.175 (0.195) | 0.0160 (0.572) | -0.0968** (0.040) | 0.266** (0.035) | -0.0968** (0.040) |
| Non-performing Loans | -0.322** (0.021) | -0.112 (0.626) | -0.322** (0.021) | -0.295** (0.031) | -0.0827 (0.632) | -0.295** (0.031) |
| Operating Expense Ratio | -0.277* (0.095) | 0.585* (0.063) | -0.277* (0.095) | 0.104 (0.503) | -0.339 (0.659) | 0.104 (0.503) |
| ROA | 0.222 (0.154) | 1.175*** (0.001) | 0.222 (0.154) | -0.0661 (0.434) | -0.711 (0.191) | -0.0661 (0.434) |
| Liquidity | -0.0458 (0.148) | -0.00956 (0.873) | -0.0458 (0.148) | -0.0428 (0.353) | 0.0268 (0.657) | -0.0428 (0.353) |
| Sensitivity to Market Risk | 0.0848 (0.552) | -0.763*** (0.005) | 0.0848 (0.552) | -0.145 (0.262) | -0.00499 (0.990) | -0.145 (0.262) |
| <i>Other Variables</i> | | | | | | |
| Bank Size | 0.468*** (0.000) | 0.372*** (0.003) | 0.468*** (0.000) | 0.0819 (0.505) | 0.0613 (0.881) | 0.0819 (0.505) |
| Tangibility | 0.132 (0.251) | 0.321 (0.156) | 0.132 (0.251) | -0.0565 (0.730) | -1.071 (0.219) | -0.0565 (0.730) |
| Loans Ratio | 0.0234** (0.013) | -0.0373 (0.153) | 0.0234** (0.013) | 0.00504 (0.616) | 0.0199 (0.218) | 0.00504 (0.616) |
| Book Leverage | -0.0453*** (0.000) | -0.0318 (0.272) | -0.0453*** (0.000) | -0.0206 (0.193) | -0.00438 (0.939) | -0.0206 (0.193) |
| TARP _{post} | | | 2.097 (0.589) | | | -4.822 (0.456) |
| TARP _{post} x Tier-1 Capital | | | -0.191 (0.162) | | | 0.363*** (0.007) |
| TARP _{post} x Non-performing Loans | | | 0.210 (0.440) | | | 0.212 (0.335) |
| TARP _{post} x Operating Expense Ratio | | | 0.863** (0.012) | | | -0.443 (0.571) |
| TARP _{post} x ROA | | | 0.952** (0.012) | | | -0.645 (0.240) |
| TARP _{post} x Liquidity | | | 0.0363 (0.585) | | | 0.0695 (0.356) |
| TARP _{post} x Sensitivity to Market Risk | | | -0.847*** (0.003) | | | 0.140 (0.734) |
| TARP _{post} x Bank Size | | | -0.0960 (0.505) | | | -0.0206 (0.962) |
| TARP _{post} x Tangibility | | | 0.189 (0.440) | | | -1.014 (0.252) |
| TARP _{post} x Loans Ratio | | | -0.0608** (0.029) | | | 0.0149 (0.427) |
| TARP _{post} x Book Leverage | | | 0.0135 (0.660) | | | 0.0163 (0.783) |
| Constant | -5.602*** (0.000) | -4.331 (0.241) | -5.602*** (0.000) | -2.467 (0.144) | -5.991 (0.392) | -2.467 (0.144) |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 1483 | 612 | 2095 | 1417 | 364 | 1781 |
| Pseudo R ² | 0.147 | 0.113 | 0.144 | 0.042 | 0.160 | 0.066 |

This table shows the logistic regression results for the acquirers (targets). The dependent variable is equal to 1 if the bank is an acquirer (target) for the given year and is equal to 0 otherwise. The TARP_{post} dummy is equal to 1 after the bank has received any TARP funds.

Year fixed effects are included. Robust standard errors clustered by bank are in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

5.3. Determinants of Mergers with Respect to Pre- and Post-Crisis

Table 12 illustrates the results within the pre- and post-crisis periods. The post-crisis dummy takes a value of 1 if the observation year is after 2010 and takes a value of 0 if the observation year is before 2007.⁸

5.3.1. Acquirer

The first column of Panel A shows that among CAMELS variables, tier 1 capital increases the probability of being an acquirer for the pre-crisis period, while non-performing loans, operating expenses, and liquidity decrease it. Moreover, considering the variables other than the CAMELS, bank size, tangibility, and loans ratio increases the probability of being an acquirer while the book leverage ratio decreases it. The second column is in line with the first column except for the non-performing loans and tier-1 capital. This implies that while loan quality and tier-1 capital were an important determinants of being an acquirer in the pre-crisis period, after the crisis, they do not have a significant effect. Considering the post-crisis interaction variables, we find that the interaction term for bank size is negative and significant, implying that bank size has a smaller impact on the likelihood of being an acquirer in the post-crisis period. Moreover, an interaction term for liquidity and book leverage is significant and negative, implying that post-crisis, the negative impact of liquidity and book leverage is more pronounced. Lastly, the positive interaction term for the non-performing loans explains the insignificant coefficient of the non-performing loans during the post-crisis period.

5.3.2. Target

Panel B of Table 12 shows the results for the targets. The first column shows that during the pre-crisis, tangibility is the only factor that reduces the likelihood of being a target. In the second column, bank size and tier-1 capital reduce the probability of being a target in the post-crisis period. Considering the overall sample, the negative interaction term of the bank size shows that bank size significantly reduces the likelihood of being a target during the post-crisis periods.

⁸We exclude the crisis period in our analysis.

Table 6: LOGISTIC REGRESSION RESULTS FOR THE ACQUIRER AND THE TARGET (PRE-CRISIS VERSUS POST-CRISIS)

| | Acquirer | | | Target | | |
|--|-----------------------|-----------------------|-----------------------|----------------------|---------------------|----------------------|
| | Pre-Crisis | Post-Crisis | Whole Stable Sample | Pre-Crisis | Post-Crisis | Whole Stable Sample |
| <i>CAMELS</i> | | | | | | |
| Tier 1 Capital | 0.0304*** (0.000) | 0.00537 (0.807) | 0.0304*** (0.000) | -0.0216 (0.150) | -0.0568* (0.051) | -0.0216 (0.150) |
| Non-performing Loans | -0.225*** (0.001) | -0.0127 (0.808) | -0.225*** (0.001) | -0.0212 (0.673) | -0.0320 (0.507) | -0.0212 (0.673) |
| Operating Expense Ratio | -0.144** (0.045) | -0.309** (0.043) | -0.144** (0.045) | -0.0180 (0.720) | 0.0735 (0.699) | -0.0180 (0.720) |
| ROA | 0.0412 (0.602) | 0.141 (0.163) | 0.0412 (0.602) | 0.0151 (0.831) | -0.0987 (0.512) | 0.0151 (0.831) |
| Liquidity | -0.0361*** (0.001) | -0.0825*** (0.000) | -0.0361*** (0.001) | -0.0125 (0.415) | -0.0376 (0.107) | -0.0125 (0.415) |
| Sensitivity to Market Risk | 0.00269 (0.965) | 0.106 (0.398) | 0.00269 (0.965) | -0.135 (0.111) | -0.235 (0.245) | -0.135 (0.111) |
| <i>Other Variables</i> | | | | | | |
| Bank Size | 0.477*** (0.000) | 0.236*** (0.000) | 0.477*** (0.000) | 0.00656 (0.886) | -0.144** (0.031) | 0.00656 (0.886) |
| Tangibility | 0.149*** (0.003) | 0.258*** (0.004) | 0.149*** (0.003) | -0.161* (0.087) | -0.0173 (0.883) | -0.161* (0.087) |
| Loans Ratio | 0.00692* (0.064) | 0.0114* (0.080) | 0.00692* (0.064) | -0.00585 (0.189) | -0.00231 (0.794) | -0.00585 (0.189) |
| Book Leverage | -0.0150*** (0.004) | -0.0383*** (0.001) | -0.0150*** (0.004) | -0.00504 (0.413) | -0.0162 (0.297) | -0.00504 (0.413) |
| Post-Crisis | | | -0.0791 (0.934) | | | 0.510 (0.683) |
| Post-Crisis x Bank Size | | | -0.241*** (0.000) | | | -0.150* (0.059) |
| Post-Crisis x Tier 1 Capital | | | -0.0250 (0.288) | | | -0.0352 (0.280) |
| Post-Crisis x Non-performing Loans | | | 0.212** (0.011) | | | -0.0108 (0.875) |
| Post-Crisis x Operating Expense Ratio | | | -0.165 (0.313) | | | 0.0915 (0.641) |
| Post-Crisis x ROA | | | 0.0993 (0.434) | | | -0.114 (0.494) |
| Post-Crisis x Liquidity | | | -0.0464** (0.027) | | | -0.0251 (0.365) |
| Post-Crisis x Tangibility | | | 0.108 (0.251) | | | 0.143 (0.345) |
| Post-Crisis x Loans Ratio | | | 0.00447 (0.534) | | | 0.00354 (0.720) |
| Post-Crisis x Book Leverage | | | -0.0233* (0.065) | | | -0.0112 (0.500) |
| Post-Crisis x Sensitivity to Market Risk | | | 0.103 (0.463) | | | -0.0995 (0.651) |
| Constant | -4.425*** (0.000) | -3.571*** (0.000) | -4.425*** (0.000) | -1.769*** (0.003) | -1.459 (0.212) | -1.769*** (0.003) |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 6765 | 3435 | 10200 | 6084 | 3081 | 9165 |
| Pseudo R^2 | 0.081 | 0.075 | 0.079 | 0.015 | 0.029 | 0.022 |

This table shows the logistic regression results for the acquirers (targets). The dependent variable is equal to 1 if the bank is an acquirer (target) for the given year and is equal to 0 otherwise. The Post-Crisis dummy is equal to 1 if the year of the observation is greater than 2010. Year fixed effects are included. Robust standard errors clustered by bank are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5.4. Robustness Checks

To show that these results are valid and only apply to the mergers during the 2008 financial crisis, we conduct placebo tests where we alter the years of the crisis period. Specifically, we change the years of the crisis period from 2007-2010 to 2002-2005. These years do not coincide with other historical crisis periods that might be present in our sample. The results are reported in the online appendix. For the placebo period, the coefficients of the interaction variables of non-performing loans and ROA is reversed. Moreover, the coefficient for non-performing loans is positive and significant. This finding confirms that the relationship between determinants of bank mergers during the crisis is different from other periods.

For the analysis of the TARP recipient banks, as a robustness check, we only include the TARP banks that received funds larger than \$50 million. In this case, the results are in line with the previous analysis. Moreover, especially for the case where we only consider the TARP banks after receiving the funds, the coefficients of the interaction terms are more positive for operating expenses and ROA and more negative for the sensitivity to market risk and loans ratio. This result implies that acquirers that received larger TARP funds tend to have higher profitability, higher operating costs, and less market sensitivity proxied by non-interest income and less loans.

Lastly, for the analysis of pre- post-merger, we change the pre-crisis period from 1995-2006 to 2000-2006, and the post-crisis period from 2011-2019 to 2011-2017 to have the subgroups that have the same number of years in the pre- and post-crisis periods. The results are similar to the previous case, but the magnitude of the interaction variables and their significance are smaller. The coefficient for the interaction term for the bank size is still negative, implying that post-crisis mergers involve banks smaller in size. Considering the other coefficients that were significant in the main analysis, namely, non-performing loans, liquidity, and book leverage, we find that these coefficients are not significant anymore. For the targets, the negative coefficient of the interaction variable for bank size is still negative and significant, implying that post-crisis mergers included smaller targets. Moreover, in the new specification, we find that the post-crisis targets also have a lower operating expense ratio, lower ROA, higher loans ratio, and a higher sensitivity to market risk proxied by non-interest expense.

6. Conclusion

In this paper, we explored the nature and the determinants of these bank mergers. We first examined the characteristics that influenced the likelihood of being involved in a merger (either as an acquirer or as a target) during the 2008 financial crisis. Following this, we extended our analysis by focusing on banks that received TARP funds. Lastly, we examined whether these determinants have changed after the crisis compared to the periods before the 2008 financial crisis.

Using a logit model, we tested the differences in the merger determinants proxied by CAMELS variables and some additional variables commonly used in the literature. Comparing the acquirers of the crisis period with the acquirers of the stable period, we find that acquirers of the crisis tended to be more profitable and had lower non-performing loans and book leverage as compared to the acquirers of the stable periods. Comparing the targets of the crisis period with the targets of the stable period, we find that targets of the crisis period tend to have lower non-performing loans.

In our subsequent analysis, we focus on the mergers of the crisis period and examine whether the acquirers and targets differ with respect to whether they received TARP funds or not. Comparing the acquirers that received TARP funds with those that did not, we find that TARP recipient acquirers tended to be more profitable, had lower sensitivity to market risk proxied by the non-interest income ratio, but had higher non-performing loans as compared to the non-TARP acquirers. Comparing the TARP recipient targets with the targets that did not receive TARP, we find that TARP recipient targets tended to have more tier-1 capital.

Lastly, we exclude the crisis periods and compare the mergers of the pre-crisis periods with the post-crisis periods. Comparing post-crisis acquirers with pre-crisis acquirers, we find that acquirers of the post-crisis periods tend to be smaller in size. Moreover, the interaction terms for liquidity and book leverage are negative and significant, implying that acquirers of the post-crisis period tend to have lower liquidity and lower book leverage. Lastly, the positive interaction term for the non-performing loans indicates that post-crisis acquirers tended to have more non-performing loans than pre-crisis counterparts. However, this ratio is not significantly different compared to the non-acquirers of the post-crisis. Comparing post-crisis targets with the pre-crisis targets, we find that targets of the post-crisis periods tended to be smaller in size.

These findings have important financial implications and provide insight for future policy

making. Our analysis shows that during the crisis, acquirers tended to be more profitable banks that were able to transact despite the financial distress and often purchased higher quality targets as measured by better loan performance. This result indicates that during the crisis, banks with higher quality balance sheets are able to take advantage of high quality merger opportunities involving better quality targets. Within the crisis, acquirers that receive TARP funds were often more profitable, centered on more traditional banking activities (i.e., lower non-interest income), and had higher operating expenses due to TARP-related regulatory costs. Meanwhile, TARP banks that were acquired often had higher shares of tier-1 capital as compared to the non-TARP counterparts. Therefore, the liquidity provided by TARP funds were beneficial for the banks to either help them make acquisitions or become more attractive acquisition targets. After the crisis, the effect of bank size on the probability of being an acquirer is smaller. This result is possibly a reflection of greater regulation and a reduced too-big-to-fail incentive. In line with the acquirers, bank size had a negative impact on the likelihood of being a target after the crisis.

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