Market Reaction to Regulatory Merger Announcements: Operating Synergies and Certification Value

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Abstract

We analyze the post-merger operating performance of FDIC-assisted bank mergers (regulatory mergers). We find that regulatory merger combinations experience significant improvements in both profitability and cost efficiency up to two years following the merger transaction. In contrast, over the equivalent 2-year period, the post-merger performance of acquirers in non-regulatory mergers is not significantly different from the performance of their non-merger peer group. In addition, we examine the reaction of the market to regulatory merger announcements. We find that the common shares of regulatory acquirers experienced significant positive abnormal returns (average of 3.53%) on the day of the merger announcement and the following day (Days 0 and 1). Measuring the abnormal returns separately for first-time auction participants and repeat participants produces 4.33% and 2.44% abnormal returns respectively. Further, we examine the market reaction to the announcement of the list of unsuccessful bidders and find that first time failed bank auction bidders, without actually winning the bid, still experienced on average 1.41% abnormal return during the 2-day event window (Days 0 and 1). These results suggest that an invitation by the FDIC to a bank to participate in the auction creates "*Certification Value*" for the participant. Overall, we find that regulatory merger announcements are followed by significant positive market reactions and these reactions are the results of operating synergies and certification effects.

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Introduction

The literature on mergers and acquisitions (hereafter M&As) is inconclusive regarding the benefit of a merger for the acquiring firm. This conclusion applies to bank and non-bank mergers. However, bank merger studies, for example Cornett and Tehranian (1992), Knapp et al. (2006), DeLong and DeYoung (2007), and Al-Sharkas et al. (2008), often ignore regulatory mergers, those that involve acquiring a failed bank through the Federal Deposit Insurance Corporation (FDIC) failed-bank auction. As these mergers are less frequent than unassisted mergers (non-regulatory mergers), researchers often exclude them from the samples or treat them as normal bank mergers. The recent financial crisis prompted the largest industry-

wide consolidation in US banking industry. During 2008 to 2011[1], a total of 1,448 bank M&As occurred and a significant proportion (401) of these mergers were regulatory mergers. This provides a sufficient sample that allows us to compare the post-merger operating performance of regulatory and non-regulatory mergers.

During the study period, healthier peers acquired the majority of the failed banks through FDIC failed-bank auctions while the FDIC kept only a few failed banks and eventually liquidated them. The FDIC failed-bank auctions are special M&As events as the targets are in financial distress, the auction is closed (participation is by invitation only) with sealed bidding, the payment method is cash-only, and the FDIC is involved as both an insurer and a partner. Furthermore, the observations from the recent financial crisis are of special interest because the FDIC revealed information about all participants in the auction, the winning bidder and the unsuccessful bidders. We use this information to determine whether participating in a regulatory merger creates *"Certification Value"* even when the participant does not win the bid.

We contribute to the literature in two ways. First, we compare the post-merger operating performance of regulatory and non-regulatory mergers. We examine two performance measures, the return on assets (ROA) as a proxy for profitability and the cost-income ratio (CIR) as a proxy for cost efficiency. We use the Propensity Score Matching (PSM) method to identify two non-merger peer groups, one to control for regulatory acquirers and the other to control for non-regulatory acquirers. Our findings suggest that for at least 2 years following the merger transaction acquirers in regulatory mergers tend to experience improvements in both profitability and cost-income efficiency far superior than the improvements experienced by their non-merger peer group. In contrast, over the equivalent 2-year period following the merger transaction, the post-merger performance of acquirers in non-regulatory mergers is not significantly different from the performance of their non-merger peer group.

Our analysis of the post-merger operating performance complements the work of Cornett and Tehranian (1992), Knapp et al. (2006), DeLong and DeYoung (2007), and Al-Sharkas et al. (2008). They document positive improvement in the operating performance for the combined banks in non-regulatory bank mergers. This research is the first to analyze the improvements in the operating performance for the combined banks in regulatory mergers. Cornett and Tehraninan (1992) and DeLong and DeYoung (2007) find positive market reactions to the announcements of non-regulatory bank mergers and suggest that these

[1] This count includes only M&As at individual bank level. M&As that involve Bank Holding Companies either as a target or an acquirer, are excluded from this count and from our analysis.

reactions are associated with the expected improvements in operating performance. Our analysis extends their conclusions to regulatory mergers.

Our second contribution is to analyze the certification value. We propose that an invitation by the FDIC to participate in the auction implies that the FDIC certifies that the invited bank is in good financial condition. Our proposition follows if we assume that the participants get invitations to participate because the FDIC deems them financially and operationally suitable to acquire the failed target and perform well after the acquisition. The certification reduces information asymmetry about the invited bank, improves analysts' assessments of its financial strength, and lowers the risk premium investors demand to buy the bank's securities. We expect that investors would react positively to the news and bid up the price by an amount equal to the certification value. We use the event study methodology to examine our hypotheses and the results confirm our expectations. We find that the common shares of acquirers in regulatory mergers, in general, experienced significant positive abnormal returns (average of 3.53%) on the day of the merger announcement and the following day (days 0 and 1). Measuring the abnormal returns separately for first-time auction participants and repeat participants produces 4.33% and 2.44% abnormal returns respectively.[2] Furthermore, we examine the market reaction to the announcement of the list of unsuccessful bidders and find that first time failed-bank auction bidders, without actually winning the bid, still experienced on average 1.41% abnormal return during the 2-day event window (days 0 and 1). Overall, the results confirm our hypothesis and expectation regarding the certification effect.

Our analysis of the certification value extends the findings of several empirical studies that examine the market reaction to the announcements of FDIC-assisted mergers. Pettway and Trifts (1985), Giliberto and Varaiya (1989), and Zhang (1997) report negative abnormal returns experienced by acquirers, an observation they attribute to overbidding by acquirers. In contrast, James and Wier (1987), Bertin et al. (1989), Cochran et al. (1995), Christoffersen et al. (2012), and Cowan and Salotti (2015) report significant positive market reaction around the merger announcement date. These studies argue that the positive gains by acquirers are the results of underbidding by acquirers and propose that the positive gains are negatively related to the degree of competition in the auction. Furthermore, Christoffersen et al. (2012) suggest that underbidding is particularly significant during the recent financial crisis because the FDIC's capacity to manage failures was impaired giving acquirers more negotiating power to extract wealth from the FDIC. Cowan and Salotti (2015) attribute the underbidding during the recent financial crisis to the limited ability or willingness of the healthy banks to bid. Our results suggest that the

[2] We sort acquirers based on their experience with the FDIC failed bank auction between 2007 and 2013 including both successful and unsuccessful bidding experiences. We classify an acquirer as experienced as long as it participated in an earlier auction even if that attempt was not successful.

"certification value" is another factor that can explain a significant portion of the market reaction around the merger announcement.

We organize the remainder of this study as follows. Sections 2 and 3 review respectively the general process of the failed bank resolution and the relevant literature. Section 4 develops our hypotheses, and Section 5 contains a description of the data and the sample filtering process. We discuss the methodology and the empirical results in Sections 6 and 7 respectively. Section 8 concludes.

The Process of Failed Bank Resolution[3]

Federal or state banking regulators will consider an insured bank to be in financial distress if the bank is critically undercapitalized (having a ratio of tangible equity to total assets equal to or less than 2 percent) and has no feasible plan to restore capital to the required level or the bank cannot keep up with deposit outflows. Facing the impending failure of an insured bank, the chartering authority will notify the FDIC through a "failing bank letter". The FDIC, as required by law, will prepare an arrangement to dissolve the failing institution so that it would minimize the total cost to the Deposit Insurance Fund (DIF).

In general, the FDIC has three basic ways of dissolving a failing bank: open bank assistance, deposit payoff, and close bank assistance. Under the open bank assistance scenario, the FDIC will provide the failing bank with necessary assistance (make loans to, purchase assets from, or place deposits in the troubled bank) to maintain its operation and expects to be compensated for the assistance provided whenever possible. However, this mechanism of resolving a failing bank has become less efficient following the approval of new policies and critics argue that it promotes Too-Big-To-Fail banks[4]. As a result, the FDIC has rarely used this method after 1992. Under the deposit payoff scenario, the FDIC will use the Deposit Insurance Fund to pay off the insured depositors of the failing bank in full and retain the assets for later disposal. Depositors with remaining uninsured deposits and other creditors of the failing bank receive receivership certificates from the FDIC entitling them to proceeds from later liquidations of the failing bank's assets.

Under the close bank assistance strategy the FDIC enters into a Purchasing & Assumption (P&A) Agreement in which a healthier bank agrees to purchase some, or all, of the failing bank's assets while

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3 Information presented in this section is extracted from "*Managing the crisis: the FDIC and RTC experience 1980-1994*" published in 1998 by the Federal Deposit Insurance Corporation, Washington, D.C., and from the FDIC's website at https://www.fdic.gov/bank/individual/failed/

4 "Passage of the Financial Institutions Reform, Recovery, and Enforcement Act (FIRREA) in 1989 repealed many of the potential tax benefits associated with open bank assistance" and "The Competitive Equality Banking Act (CEBA) of 1987 authorized the FDIC to establish a bridge bank, which allowed the FDIC additional time to find a permanent solution for resolving a failing bank".

assuming some, or all, of the failing bank's liabilities, including all insured deposits. After being notified of the impending failure of an insured bank and appointed as the receiver, the FDIC will start its resolution process by requesting business and financial information from the failing bank and sending a team of specialists to perform further on-site analysis in order to prepare an information package to give to potential buyers of the failing bank. Concurrently, the FDIC will perform due diligence to estimate the disposal value of all assets and potential costs associated with direct deposit payoff on a discounted future cash flow basis. With all this information, the FDIC will then decide on the structure of a potential P&A agreement.

Then FDIC will begin its confidential marketing of the failing bank to as many qualified potential buyers as possible and invite them to the failed-bank auction. An important aspect of this auction is that it is a closed form auction. The FDIC will take the initiative to screen for qualifications[5] and only banks with an invitation could participate in the auction. The FDIC will provide all approved potential buyers with information related to the potential transaction. Following this step, potential buyers will do their own due diligence: estimate the price they are willing to pay for the failed bank assets, and submit sealed bids. "A bid has two parts: One amount, called the premium, is for the franchise value of the failed institution's deposits; the second amount is what the bidder is willing to pay for the institution's assets to be acquired." The final cash settlement from or to the FDIC for each winning bid would be calculated as liabilities assumed minus assets purchased minus the agreed upon premiums on deposits acquired.

Once all bids are gathered, the FDIC will compare them with its estimated cost of direct deposit payoff as the minimum bid level accepted and select the least-cost bid, regardless of other factors.[6] Once the FDIC selects a winning bidder and the FDIC Board of Directors approves, the FDIC will close the failing bank, transfer all assumed liabilities and purchased assets to the acquirer and retain the remaining liabilities and assets if any. Upon completion of this process, the FDIC will make a public announcement regarding both the closure of the failing bank and the final resolution method adopted. Essentially, the merger announcement date and the closing date are the same in failed bank mergers. The entire resolution process lasts 90 to 100 days and it remains confidential by all parties until the FDIC officially makes the announcement itself.

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5 The FDIC takes into account geographic location, competitive environment, minority owned status, overall financial condition, asset size, capital level, and regulatory ratings when screening for qualified buyers.

6 "The least cost is terminology used by the FDIC to refer to the bid alternative for a failing institution in which the total amount of the FDIC's expenditures and obligations incurred is the least costly to the deposit insurance fund of all possible resolutions for that failed institution." The requirement of selecting the "least cost" bid above direct deposit payoff cost level is in place since 1991. "Before 1991, the FDIC could accept any resolution transaction that is less costly than a deposit payoff."

On November 12th, 2009, the FDIC Board of Director determined that for all whole bank transactions and asset sales taking place subsequent to May 2009, the FDIC would announce the failed bank merger agreement and disclose bid summary information to the public. Specifically, the FDIC will provide information regarding the names of bidders and the bid amounts for the winning and the losing bids, and the general methodology for determining the least costly bid. Usually, the FDIC discloses the losing bids days and sometimes weeks after the announcement of the winning bid, except the cover bid (the second highest bid received by the FDIC) which is disclosed one year later. The FDIC imposes the 1-year moratorium to avoid impairment of the FDIC's statuary program for whole-bank resolutions and asset sales. For the same reason, the FDIC discloses the losing bids, but bidder names and bid amounts are delinked.[7]

Literature Review

Post-Merger Performance

Studies that examine the post-merger performance of merged entities usually examine the stock price performance around merger announcements or analyze the post-merger operating performance. Almost unanimously, the results on the stock performance of targets show that the target's shareholders experience positive abnormal returns following merger announcements (Campa and Hernando, 2006; Bendeck and Waller, 2007). However, the findings of the abnormal stock return of bidders/acquirers are less consistent. The majority report insignificant or negative abnormal returns for bidders and insignificant abnormal stock returns for the combined entities. However, studies focusing on U.S. failed bank mergers (James and Wier, 1987; Christoffersen et al., 2012; Cowan and Salotti, 2015), report positive abnormal returns. Many studies also suggest that the method of payment does matter and mergers with cash as the only method of payment do generate a more favorable response (Megginson, Morgan, and Nail, 2004).

Previous studies examine two hypotheses to explain abnormal returns experienced by acquirer banks. The synergy hypothesis argues that mergers allow the combined entities to benefit from aspects like cost reductions (Houston et al., 2001), increased market power (Hao, et al., 2012), and diversification opportunities through inter-state branching (Cochran et al., 1995). Yet, Cochran et al. (1995) fail to find support for the existence of scale or scope economics in bank mergers. Alternatively, the wealth transfer hypothesis argues that abnormal returns experienced by acquirer banks in failed bank mergers are mainly attributed to the wealth expropriation from the FDIC to the acquirer bank. James and Wier (1987) argue that the private auction with sealed bids limits competition, which supports the possibility of wealth transfer.

[7] Detailed discussion could be found from the Freedom of Information Act (FOIA) service center website at https://www.fdic.gov/about/freedom/biddocs.html

Christoffersen et al. (2012) argues that the acquisition prices of failed banks are significantly lower during the period of industry distress. During such periods, the FDIC is under pressure to manage the assets of failing banks quickly and that leads the FDIC to discount prices deeply allowing acquirer banks to benefit. Loveland (2016) suggests that during the 2008-2011 financial crisis, regulatory authorities may have showed significant forbearance that allowed failing banks to inflate consistently the values of their loan portfolios. The implications of this finding are that the reported values of the failed banks during the period leading to the seizure may have been significantly overestimated. Thus, the significant discounts in the values of the failed banks during the 2008-2011 crisis may have been necessary adjustments to obtain the fair values of the failed banks. These conclusions weaken the argument for the wealth transfer hypothesis. However, it is difficult to conclude that the synergy and the wealth transfer hypotheses are mutually exclusive or one is dominating the other, as it is quite possible that acquirer banks could benefit from both synergies and deep discounts.

While widely used, the market performance approach has several limitations. First, forward-looking factors affect the value of equity investments. Therefore, this approach may not reveal the actual changes in the operations of the business. Second, market measures make it hard to identify the sources of gains if there are any. Third, it is not possible to study non-public banks using stock market performance measures. Fourth, there is the possibility of investor overreaction and other market inefficiencies that could invalidate or bias the conclusion to some degree. For these reasons, a strand of studies have applied accounting-based measurements, either as complementary or as substitutes to stock market return measurement, to capture the realized economic gains resulting from M&A transactions. The results of these studies, however, are again mixed.

Healy et al. (1992) first adopted pre-tax operating cash flow as a proxy for operating performance in studying non-financial firms. Their results suggest that post-merger operating performance of merged firms is significantly improved and is consistent with reactions in the equity market. Several studies support these conclusions. Switzer (1996) uses a larger sample and finds results consistent with Healy et al (1995). Ghosh and Jain (2000) found evidence that the financial leverage of the combined firms increases significantly following merger activities, and equity markets respond positively. Their results also suggest that the increase in financial leverage mainly comes from increased debt capacity and only part of the increment is from unused pre-merger debt capacity. Megginson et al. (2004) argues that changes in post-merger operating performance are positively related to changes in corporate focus. Carline et al. (2009) find that the relation between operating performance improvements and board sizes is bell-shaped and the presence of outside block-holders contribute positively to the monitoring effects suggested by previous studies (Shleifer and Vishny, 1986).

In contrast, a stream of studies suggest a potential bias in the methodology of Healy et al. (1992). These studies propose that proper adjustments to the methodology would eliminate or significantly reduce the improvement in post-merger operating performance reported by earlier studies. Ghosh (2001) suggests that using the market value of assets as a deflator might introduce bias while using the industry median as a benchmark loses its credibility if merger companies are systematically outperforming the median level or if acquirers experienced superior performance right before the transaction. Following Barber and Lyon (1996) and Loughran and Ritter (1997), Ghosh (2001) compares the merged firms only with a peer group matched on pre-merger performance and size and scales measurements by total sales instead of the market value of assets. Introducing these adjustments eliminated the significant improvements in operating performance documented in Healy et al. (1992). Ghosh's adjustments are widely adopted by many subsequent studies (Fee and Thomas, 2004; Powell and Stark, 2005). Yet, despite the adjustments, Powell and Stark (2005) document evidence of improvements in post-merger operating performance and suggest that the results are sensitive to the methodology, operating performance proxy, benchmark, and deflator choices.

Researchers have studied bank mergers as a group separate from mergers of other corporations due to differences in regulations and operating characteristics. Researchers of bank mergers apply various adjustments to reflect differences between regular firms and banks and they find evidence of improved operating performance for the combined entities (Cornett and Tehranian, 1992; Campa and Hernando, 2006; Knapp et al., 2006; DeLong and DeYoung, 2007). Different studies have used different matrices of performance, for example, Cornett and Tehranian (1992) included marketable securities in the performance calculation, both Campa and Hernando (2006) and DeLong and DeYoung (2007) adopted multiple bank-specific measurements as performance proxies, and Knapp et al. (2006) took mean reversion into consideration when forming proxies.

Examining the sources of gains for bank M&As, Houston et al. (2001) found that merged banks benefit significantly more from cost reduction, such as eliminating overlapping operations, than revenue enhancement. Al-Sharkas et al. (2008) suggest that merger banks are enjoying improved productivity growth due to higher technological efficiency. DeLong (2003) shows that the stock market tends to favor focus-driven mergers over diversification-driven mergers and suggests that long-term performance of merged banks is only advanced in earning-stream focus deals.

The FDIC-assisted Bank Mergers

Several studies focus on the FDIC assisted mergers. James and Wier (1987) examine the possibility of wealth transfer in failed bank mergers. They report that the winning bidders in the FDIC-assisted mergers experience significant positive abnormal returns that are greater than the abnormal returns experienced by acquirers in non-assisted mergers. In addition, the abnormal return decreases as the number of bidding participants increases. The authors suggest that the results are evidence of wealth transfer. Many studies (Bertin et al., 1989; Christoffersen et al., 2012) report similar conclusions but argue that the total benefits to the FDIC may justify limiting the number of bidding participants and the associated positive abnormal returns. For example, with qualification screening and private invitation, the FDIC may lower the chances of future failure of acquirers, and the quicker resolution of transactions could prevent potential public losses. Abnormal returns to bidders might just be the price that the FDIC pays temporarily to prevent further costs.

Bertin et al. (1989) find evidence of underbidding and confirm a negative relationship between abnormally positive returns experienced by failed bank acquirers and the bidding competition. They attribute the positive market reactions to industry level factors such as reduced overall purchase power from survivor banks, increased supply of failed banks, and the removal of restrictions on interstate and intrastate branching. Other papers supporting the underbidding hypothesis include Cochran et al. (1995) and Cowan and Salotti (2015). Zhang (1997) studies bidder gains in the FDIC-assisted mergers and concludes that bidder firms learn through experience. In particular, first-time bidders do not seem to benefit from acquiring a failed bank from the FDIC while banks with experience in FDIC-assisted acquisitions seem to gain better abnormal returns. While most previous studies report positive abnormal returns following bank merger announcements, there are studies that report negative abnormal returns, which is consistent with the Winner's Curse hypothesis. For example, Pettway and Trifts (1985) and Giliberto and Varaiya (1989) report that bidders in the FDIC-assisted auctions tend to overbid.

Using the difference between the book value of assets and the realized value of assets as a loss proxy, James (1991) studies losses associated with bank failures. The author concludes that financial firms lose approximately 10% of their assets upon declaring bankruptcy, which is more significant than the losses experienced by non-financial firms. These results may explain why the FDIC favors whole bank transactions instead of declaring a bank insolvent and then selling its assets and liabilities at future dates.

Bennett and Unal (2011) contrast the liquidation option to the private-sector reorganization option that is available for the FDIC. The results suggest that the FDIC Improvement Act (1991) advanced cost-saving benefits that the private-sector reorganization provides. Also, they find that the FDIC involvement leads to

lower the cost of resolving failed banks. Granja (2013) proposes that the current practice of controlled disclosure creates information asymmetry that affects the overall cost of resolving a failed bank. The author proposes that uninformed bidders are less likely to participate in the FDIC failed-bank auctions unless they are geographically close to the target bank. Thus, proper disclosure requirements may attract more potential buyers and the higher competition could lower the total cost of resolution.

Christoffersen et al. (2012) study the FDIC's ability to resolve failing banks and conclude that it is easier for acquirers to expropriate wealth from the FDIC during a period of financial crisis. They argue that during an industry-level crisis, the FDIC itself may become financially distressed, hence more willing to sell a failed bank at a fire sale price. These fire sales allow acquirers to enjoy wealth transfer from the FDIC. The authors find the effects of the wealth transfer to be long-term and more significant if the acquirer is a public company. Acharya et al. (2011) report evidence consistent with the theory of Christoffersen et al. (2012). Studying the relation between economic activity and bank liquidity, they find that banks maintain a lower level of liquidity during economic booms and high level of liquidity during financial crisis. They interpret the higher liquidity during financial crises as planning to benefit from fire-priced assets of failed or distressed banks.

Although the US financial sector experienced major deregulation regarding interstate and intrastate branching since the 1990s, many papers still report evidence of a higher chance of bank failure in certain areas. Using data from the most recent crisis, Aubuchon and Wheelock (2010) study bank failures and their geographic distribution and conclude that certain states and regions produce more cases of failed banks than the other states. This conclusion is partially consistent with Bhuyan et al. (2010). Wheelock (2011a) finds that the concentration in the overall US banking industry is increasing overtime. Yet, local markets do not show obvious signs of increased concentration. Wheelock (2011b) concludes that the recent financial crisis and the dramatic increase in failed bank mergers had only little impact on the concentration level of the U.S. banking industry, even after including large transactions such as the acquisition of Washington Mutual Bank by JPMorgan Chase.

Hypotheses Development

This study has two objectives. First, we compare the operating performance of regulatory merger acquirers during the post-acquisition period with the performance of comparable non-merger banks and comparable non-regulatory merger acquirers. Second, we investigate the existence of a certification value in the post announcement abnormal returns of participants in the FDIC-assisted mergers.

Post-merger Operating Performance of Regulatory Bank Acquirers

Previous studies document positive improvement in the operating performance for the combined banks in non-regulatory bank mergers (Cornett and Tehranian, 1992; Knapp et al., 2006; DeLong and DeYoung, 2007; Al-Sharkas et al., 2008). We propose that this result will also hold for regulatory mergers. Thus, our first hypothesis is:

Hypothesis 1: *During the post-merger period, the operating performance of acquirers in regulatory mergers is superior to the operating performance of their non-merger peers.*

We further propose that the improvements in the post-merger operating performance of regulatory merger acquirers will exceed the improvements accomplished by non-regulatory merger acquirers.

First, the FDIC has privileged information regarding the possible synergies among insured banks. This advantage, along with the FDIC's experience in resolving failing banks, allows the FDIC to match buyers and failed banks to maximize the generation of economic synergies.

Second, in regulatory mergers the FDIC provides the same information to all participants. Thus, acquirers in regulatory mergers are subject to the least amount of agency, information asymmetry, and conflict of interest problems that may affect the acquisition price. This allows the bidders to make accurate assessments of the target's value. In contrast, the managements of the bidder and the target in non-regulatory mergers often negotiate under conditions of asymmetric information and agency problems between managements and their respective shareholders. For example, the management of the target may recommend a merger at a deep discount if the acquiring bank promises managers a sweet deal in the new combined firm. On the other hand, the management of the acquiring bank may be seeking acquisitions to expand its empire, hide internal problems, or become too-big-to-fail. Thus, they would be willing to pay a significant premium to secure a merger.

Third, during financial crisis, the supply of assets for sale increases while the demand for such assets drops (Cowan and Salotti, 2015) and the FDIC itself may become financially distressed (Christoffersen et al., 2012). Thus, potential acquirers may be able to pressure the FDIC to provide significant discounts on the auctioned assets and these discounts will lead to abnormal operating performance during the post-merger period. In contrast, Loveland (2016) suggests that during the 2008-2011 crisis, regulatory forbearance allowed all banks to underreport the magnitudes of their nonperforming assets. Under these circumstances, the market may have overestimated consistently the values of all banks leading acquirers in non-regulatory mergers to pay high prices for their targets.

Fourth, the typical agreement between the FDIC and the selected acquirers usually has a contingent provision similar to a forward contract that splits the gains and losses from certain assets between the FDIC and the acquirer. This feature allows the acquirer to expand its operations and achieve higher economies of scale and scope without undertaking additional risk.

Fifth, cash is the only accepted method of payment for all FDIC-assisted mergers. Paying cash places the entire risk of the transaction on the shareholders of the acquirer while using the acquirer's shares to pay the target's shareholders brings these shareholders to share the risks. Thus, the incentives of regulatory merger acquirers to minimize the bid price are stronger than the incentives of non-regulatory merger acquirers. Several authors who study non-bank mergers, for example, Myers and Majluf (1984), report that acquirers that pay in cash as opposed to common shares experience significantly positive post-announcement abnormal returns. Thus, we propose:

Hypothesis 2: *The post-merger operating performance of acquirers in regulatory mergers is superior to the post-merger operating performance of acquirers in non-regulatory mergers.*

In efficient markets, operating outperformance should translate into outperformance in the stock market. Consistent with Hypothesis 1, we propose that announcements of regulatory mergers will lead to positive post-announcement abnormal returns to the acquiring bank. Thus, we propose:

Hypothesis 3: *Acquirers in regulatory mergers would experience significant positive cumulative abnormal returns (CARs) around the merger announcement date.*

Previous studies examined Hypothesis 3 and found supporting evidence (James and Wier, 1987; Christoffersen et al., 2012; Cowan and Salotti, 2015). We revisit this hypothesis for two reasons. First, we like to confirm the results of previous studies using our dataset. Second, we use the results of this analysis to show that the observed abnormal returns to acquirers of regulatory mergers can be partially explained by the certification effect.

The Certification Effect

The FDIC failed-bank auction is a closed event open only to qualified candidates selected by the FDIC. A major objective of screening potential acquirers of failed banks is to lower the chance of future failure of the merged entities. This requires the FDIC to invite only financially healthy banks. We propose that an announcement of a bank's participation in an auction is equivalent to an announcement that the FDIC

certifies the subject bank to be in a good financial situation.[8] This certification should positively affect auction winners as well as those who participated in the auction but did not win. This information is valuable because it lowers the risk premium investors demand to buy the bank's securities and increases the bank's value. We further propose that the certification effect is only valuable for first-time bidders. Repeated bidders are not likely to experience the certification effect because the FDIC confirmed them to be financially healthy at an earlier auction. We examine the certification effect in two ways.

First, we compare the abnormal returns to acquirers who succeeded in their first auction participation with the abnormal returns to acquirers who succeeded after unsuccessful participation in a prior auction. We propose that the abnormal returns to successful first time participants are higher than the abnormal returns to other participants due to the certification value. These arguments lead to Hypothesis 4:

Hypothesis 4: *Acquirers in regulatory mergers who are first-time auction participants will earn positive post-announcement abnormal returns higher than the returns earned by acquirers who are not first-time auction participants.*

Second, we compare first-time unsuccessful bidders with unsuccessful bidders who had participated, successfully or not, in a previous FDIC failed-bank auction. We present this proposition as Hypothesis 5:

Hypothesis 5: *Unsuccessful bidders in regulatory mergers who are first-time auction participants will experience positive abnormal returns following the release of the participants' names while unsuccessful bidders who have participated in prior auctions will not experience similar abnormal returns.*

Data

This study uses bank merger data collected over the period 2004 to 2013 inclusive. Our focus is on the M&As that occurred in 2008-2011. The M&As information, including merger date, transaction details, and the names, IDs, locations, and the parents of the targets and the acquirers, are extracted from the M&As database of the Federal Reserve Bank of Chicago. We use the quarterly Call Reports to obtain the audited accounting information that are reported to the FDIC by insured US commercial banks and depository

[8] The FDIC releases the names of the unsuccessful participants and the details of the unsuccessful bids, except the information regarding the cover bidder and its bid, in the bid summaries. The release of bid summaries lags the release of merger details regarding the final winners and agreements between the FDIC and the acquirers. The lag is usually days or even weeks behind the actual closing date of a merger. The FDIC drafts, reviews, and posts bid summaries as soon as the FDIC's workload allows, but without a strict timeframe

institutions (mainly national banks, state member banks, and insured non-member banks). We obtained the Call Reports from the Federal Reserve Bank of Chicago and the Public Data Distribution site (PDD) of the Federal Financial Institutions Examination Council (FFIEC) Central Data Repository.

The Call Reports provide data on a quarterly basis. However, we measure our performance indicators on an annual basis. Therefore, we annualize the data obtained from the Call Report. For balance sheet items, we use data from the last quarter of each calendar year. If 4th quarter data is missing, we use 3rd quarter data instead. If 3rd quarter data is also missing, we drop the company-year observation from the dataset. For income statement items, we calculate the average over 4 quarters if available or 3 quarters if data for one quarter is missing and then we multiply the average by four. If data is missing for two or more quarters, we exclude the company-year observation from the dataset.

Our starting sample of bank merger data contains 3,416 records that occurred between 2004 and 2013 inclusive (transactions with multiple acquirers are stored as separate records). Our primary objective is to study regulatory M&As during the crisis period (2008-2011 inclusive) and to compare their performance with the performance of non-regulatory M&As that happened during the same period.[9] We further limit our sample by removing all transactions that took place between 2008 and 2011 inclusive and the acquirer had one or more other M&A transactions of any kind during the 4-year window surrounding the transaction date ([-2Y, +2Y]).[10] The purpose of this filter is to confirm that the pre- and post-merger performance of an acquiring bank is not affected by a transaction other than the M&A event we are studying. After these filtering steps, we remove all the remaining transactions that happened before 2008 or after 2011. This filtering reduces the sample to 376 non-regulatory M&As and 94 regulatory M&As for a total of 470 M&A transactions that occurred during 2008-2011.

In addition to the merger data, we construct a control group. Because the release date of bid summaries lags the actual merger announcement/closing date for regulatory mergers, we obtain a list of actual bid summary

9 Merger Code 1 (Charter Discontinued cases), is defined as "non-survivor transfers its assets to one or more survivors. Non-survivor ceases to exist as a head office. One charter has been discontinued, or will be discontinued in the near future. Non-survivor has not failed; government assistance is not involved". Merger Code 9 (Charter Retained cases), is defined as "non-survivor transfers 95 percent or more of its assets to one or more survivors. The charter that had been associated with non-survivor continues to exist and a new ID_RSSD is assigned to it. Non-survivor has not failed; government assistance is not involved". Merger Code 50 (Failure: Government Assistance Provided cases), is defined as "non-survivor fails and ceases to exist. Disposition was arranged by the FDIC, RTC, NCUA, or other regulatory agency. Assets may be distributed to other entities as well as the regulatory agency". More information on merger codes is available in the information file provided by the Federal Reserve Bank of Chicago along with the data file.

10 As a robustness check, we also use a 6-year no merger window [-3Y,+3Y].

release dates for each failed bank case from the FDIC through a special FDIC Freedom of Information Act (FOIA) request. The final sample is consolidated at the top holding company level. The merger sample contains only records of mergers with publicly traded acquirers. Yet, the targets can be public or private companies.

Methodology

Hypothesis 1 proposes a comparison of the post-merger operating performance of the regulatory merger acquirers and the operating performance of their non-merger peers during the same period. We measure the effect of the merger on operating performance by comparing the performance indicators during the post-merger period with the performance indicators during the pre-merger period. We use Years +1 and +2 separately as post-merger periods with Year 0 defined as the year during which the merger transaction took place. For the main test, we use Year -1 data to calculate the pre-merger performance indicators. As a robustness test, we calculate the performance indicators separately for Years -1 and -2 and then we average the results over the two years to calculate the pre-merger performance indicators. Similar to Behr and Heid (2011), we perform the comparison on two performance indicators: ROA as a proxy for profitability and CIR as a proxy for cost efficiency.

Propensity Score Matching

We use the Propensity Score Matching (PSM) method to construct two peer groups. PSM was first introduced by Rosenbaum and Rubin (1983) and it is used in evaluating merger effects in many bank merger studies (Egger and Hahn, 2010; Behr and Heid, 2011). The PSM method identifies peer banks that are closely similar to the treated bank except for the "treatment". In our analysis, the "treatment" refers to the merger activity and the treatment effect is the merger effect that acquirer banks would experience. Using the PSM method to identify the peer group allows us to conduct the comparative analysis without worrying about skewing group statistics by extreme samples or by other uncontrolled factors.

As the "treatment" in our analysis is a merger event, it involves two entities, the acquiring bank and the target bank. Behr and Heid (2011) handle this complexity by forming two peer groups, one that represents the acquiring banks and another one that represents the target group. Then, they compare the performance of the merged bank against the combined performance of the PSM-selected counterfactual target and counterfactual acquirer (as if they merged). This approach is not suitable for our analysis. The main problem is that a target in a regulatory merger event is a stressed bank (the target is either bankrupt or on the verge of being bankrupt). Therefore, it is difficult to find a peer bank that is closely similar and not facing a regulatory merger event of its own. As we exclude from the peer groups all banks that undergone mergers

of their own, the PSM method would select healthy banks as peers for the regulatory merger targets and such selection would generate unreliable results.

We manage this issue in a different way. As two banks involved in a merger transaction would report individual financial data before Year 0 but joint results after Year 0, we form joint characteristics for the pre-merger period following Cornett and Tehranian (1992) and DeLong and DeYoung (2007). For a given performance indicator (for example return on assets (ROA)), we use the weighted average performance indicator of the two banks in Year -1, with the weight for a bank determined as the asset size of the bank divided by the sum of the asset sizes of the two banks. This adjustment allows us to compare the joint performance measures of the pre-merger period with the performance measures of the merged bank during the post-merger period and to compare the acquiring bank against a comparable peer selected by the PSM method. In addition, this approach accounts for the difference in financial performance between the regulatory merger target and the acquirer. The weak financial situations of the regulatory merger targets before the mergers will almost certainly reduce the absolute performance level for the combined entities, at least in the short to medium term. The adjusted pre-merger benchmark would capture more accurately the changes coming from the merger synergy instead of simply correcting the bad performance of the targets. To be consistent, we follow the same procedure to conduct the performance analysis of non-regulatory mergers.

The first step of PSM is to assign banks into two groups: the treated (merger) group (Merger Dummy = 1) and the control group (Merger Dummy = 0). Then, we use a propensity score model to estimate the likelihood of a random bank being involved in a merger activity.[11] A PSM model is a Logit/Probit model with the merger dummy as the dependent variable and a vector Xs of independent variables. The model may be presented as follows:

$$p(Xs) = \quad prob(Merger = 1|Xs) = E(Merger|Xs) \tag{1}$$

Where *Xs* is a vector of seven different performance proxies as suggested by Behr and Heid (2011):

- ROA: return on assets measured as net income divided by lagged total book value of assets;
- Cost-income ratio (CIR): measured by sum of current interest and non-interest expenses divided by the sum of current interest and noninterest income;

[11] The treated group includes all banks remaining in the filtered merger sample. The control group includes only those that are not involved, neither as an acquirer nor as a target, in regulatory or non-regulatory mergers.

- LSize: measured by the logarithm of total current book value of assets;
- Interest Margin (IM): measured by the difference between the average interest rate on interest bearing assets and the average interest rate on interest-bearing liabilities;
- Equity Ratio (EQR): measured by total current book value of equity divided by lagged total book value of assets;
- Non-Performing Loans (NPL): measured by total current non-performing loans (loans past due 90 days or more but still accruing plus nonaccrual loans) divided by lagged total book value of assets;
- Liquidity Ratio (LQR): measured by total liquid assets (cash and cash equivalence, plus fed funds sold, plus securities available for sale plus securities held to maturity) divided by lagged total book value of assets.

Similar to Laeven and Majnoni (2003), when we have a ratio that involves stock and flow variables, we use the lagged value of the stock variable to calculate the ratio to avoid potential endogeneity problems. Therefore, we use the lagged total book value of assets to calculate ROA, EQR, NPL, and LQR.

We use equation 1 to determine a propensity score for every bank. It is essentially the conditional probability of a bank getting involved in a future merger activity given its performance measured by the vector *Xs*. Then, for an acquiring bank, we select the peer bank with propensity score closest to the propensity score of the acquiring bank. With each bank assigned a propensity score, we then find for every bank in the merger group matching bank(s) from the control group. Eventually, we compare the performance of an acquiring bank with the performance of the matching bank(s). With close propensity scores, we can hypothetically treat the matching bank(s) as the twin bank(s) for the merger bank and the performance of the twin bank(s) should approximate the performance of the merger bank without a merger transaction.

Once we identify the group of peer banks, we calculate the change in the performance of a bank by subtracting its pre-merger performance from its own post-merger performance. Then, we subtract the change in performance of the matching bank from the change in performance of its associated merger bank to form a difference-in-difference measure (the merger effects). The mathematical model may be presented as follows:

$$Merger\ Effect = \ E(P_{1a} - P_{1b}|Xs, Merger = 1) - E(P_{0a} - P_{0b}|Xs, Merger = 0) \quad (2)$$

Where:

- P indicates an operating performance measure, either ROA or CIR;
- Subscripts a and b indicate respectively the post- and pre-merger periods;

- 1 and 0 indicate respectively a merger bank and a matching bank;
- Xs denotes the vector of variables defined with Model (1).

We follow several restrictive rules to improve the quality of our peer selections. First, following Becker and Ichino (2002), we select the matching banks only from the same year in which the merger bank had its transaction. This restriction avoids year effects on banks' performances and the need to include year dummies in our propensity score estimation model. Second, we allow replacement so that a control bank could be the matching bank for multiple merger banks, and we employ the common support option so that we can perform the matching process only within the common range of propensity scores of merger and control banks. Third, we apply a hybrid matching method that combines the one-on-one nearest neighbor and radius matching methods. The nearest-neighbor method matches each merger bank with a single control bank that has the closest propensity score. In contrast, the radius matching method matches each merger bank with a set of control banks (equally weighted) whose propensity scores are within a pre-defined range (radius) of the propensity score of the merger bank. While the basic nearest neighbor matching strategy is very commonly used in the literature due to its simplicity (Egger and Hahn, 2010; Lemmon and Roberts, 2010; Petrova and Shafer, 2010), we employ radius matching to improve the quality of the matches. Specifically, it is likely that a matching bank obtained by the basic nearest neighbor method would be a poor approximation for the merger bank because of a closest yet very different propensity score. We impose a radius restriction (radius = 0.0001) so that the matching bank has a propensity score that is not only closest to but also within ±0.0001 of the propensity score of its associated merger bank.

The analysis required for Hypothesis 2 presents additional challenges. The treatment group is banks with regulatory mergers, the control group is banks with non-regulatory mergers, and the treatment effect should be the difference in performance changes between the two merger types. However, the sample size of the non-regulatory merger group for a given year of 2008 to 2011 is not significantly larger than the sample size of the regulatory merger group of the same year. Therefore, we cannot ensure the quality of the PSM matches as even the closest match selected from the non-regulatory merger group might still be significantly different from its counterparty from the regulatory merger group. When the quality of matches is poor, any treatment effects revealed may be meaningless.

We address this issue by separating our entire sample into three groups: acquirer banks from regulatory mergers, acquirer banks from non-regulatory mergers, and all remaining banks that were not involved in merger transactions, neither as an acquirer nor as a target. The three groups are filtered for the [-2Y,+2Y] window so that both acquirer groups consist of banks with only one merger that took place in Year 0 and the control group consists of all banks with no merger transactions, neither as an acquirer nor as a target,

during the entire period. The former two groups are treated groups and the last group is the common control group. We combine the regulatory merger group with the common control group to generate propensity scores and then we identify peer banks for the regulatory merger group. Similarly, we combine the non-regulatory merger group with the common control group to generate propensity scores and then we identify peer banks for the non-regulatory merger group. We obtain the results by conducting the difference in difference analysis suggested by Equation 2.

Regression

We conduct two regressions. First, we verify whether the results from the difference-in-difference analysis (Model 2) hold. The sample for this test includes acquirer banks from regulatory and non-regulatory mergers and their matching banks obtained using the PSM method. We use Models 3 and 4 to analyze the determinants of improvements in ROA and CIR respectively. Models 3 and 4 may be presented as follows:

$$\begin{aligned}\Delta ROA = \; & \alpha + \beta_1 * Reg\_Merger + \beta_2 * Nonreg\_Merger + \beta_3 * Premerger\_CIR \\ & + \beta_4 * Premerger\_LSize + \beta_5 * Premerger\_IM + \beta_6 * Premerger\_EQR \\ & + \beta_7 * Premerger\_NPL + \beta_8 * Premerger\_LQR + Year\_Controls + \varepsilon\end{aligned} \quad (3)$$

$$\begin{aligned}\Delta CIR = \; & \alpha + \beta_1 * Reg\_Merger + \beta_2 * Nonreg\_Merger + \beta_3 * Premerger\_ROA \\ & + \beta_4 * Premerger\_LSize + \beta_5 * Premerger\_IM + \beta_6 * Premerger\_EQR \\ & + \beta_7 * Premerger\_NPL + \beta_8 * Premerger\_LQR + Year\_Controls + \varepsilon\end{aligned} \quad (4)$$

Where:

- ΔROA is the change in a bank's ROA between the premerger year (Year -1) and Year +1 or Year +2 after the merger.
- ΔCIR is the change in a bank's CIR between the premerger year (Year -1) and Year +1 or Year +2 after the merger.
- Reg_Merger is a dummy variable that takes a value of 1 if a bank is a regulatory merger acquirer and 0 otherwise;
- Nonreg_Merger is a dummy variable that takes a value of 1 if a bank is a non-regulatory merger acquirer and 0 otherwise;
- Premerger_ROA, Premerger_CIR, Premerger_LSize, Premerger_IM, Premerger_EQR, Premerger_NPL, Premerger_LQR denote respectively ROA, CIR, LSize, IM, EQR, NPL, and LQR measured for the premerger year (Year -1);
- Year_Controls are a set of year dummies.

Second, we examine the determinants of the regulatory merger effects. Previous studies suggest that regulatory mergers involve transfer of wealth from the FDIC to the acquiring bank (James and Wier, 1987; Christoffersen et al, 2012, Cowan and Salotti, 2005). We use the equity discount defined as the difference between the sale price of equity and the last reported book value of equity of the target scaled by the last reported book value of the target's assets as a proxy for the wealth effect. We propose that the equity discount consists of two components. One is the inflated value of the assets of the regulatory merger target resulting from the regulatory forbearance during the crisis (Loveland, 2016). This component is simply an adjustment to obtain the fair market value of the target's assets. The other component is the wealth transfer amount. Unfortunately, it is difficult to estimate the wealth transfer amount from available data. We propose that the equity discount will capture the impact of the wealth transfer if the size of such transfer is a significant and relatively stable percentage of the equity discount.

Previous studies also suggest that the competition during the regulatory auctions is likely to determine the magnitude of the wealth transfer, hence the merger effect (Bertin et al., 1989; Christoffersen et al, 2012, Cowan and Salotti, 2005). We use the average of the number of bidders and the number of bids as an indicator of the level of competition during an auction.

Furthermore, we propose that the premerger differences between the performance indicators of the acquirer and the performance indicators of the matched bank will affect the magnitude and the direction of the merger effects on both ROA and CIR. Therefore, we calculate the premerger values of ROA, CIR, LSize, IM, EQR, NPL, and LQR for both the acquirer bank and its matched bank. Then, for each indicator we calculate the difference between the acquirer's indicator and the matched bank's indicator. We use the resulting differences as control variables that determine the merger effects on ROA and CIR.

The sample for this analysis includes all regulatory merger acquirers and their matching banks. For this analysis, we collect manually from the FDIC website the information on regulatory merger transactions including the equity discount, deposit premiums, the number of bidders, and the number of bids in the auction events.[12] Missing data forced us to reduce the sample of regulatory merger acquirers by 7.

We combine each acquirer bank observation with the observation of its matching bank to form measurements of differences, and our dependent variable becomes a difference-in-difference measurement. We use Models 5 and 6 to analyze the determinants of improvements in ROA and CIR respectively. Models 5 and 6 may be presented as follows:

[12] This data is available from the authors upon request.

$$\text{Merger Effect on ROA} = \alpha + \beta_1 * \text{Equity\_Discount} + \beta_2 * \text{Competition} + \beta_3 * \text{Premerger\_CIR\_DIF} + \beta_4 * \text{Premerger\_LSize\_DIF} + \beta_5 * \text{Premerger\_IM\_DIF} + \beta_6 * \text{Premerger\_EQR\_DIF} + \beta_7 * \text{Premerger\_NPL\_DIF} + \beta_8 * \text{Premerger\_LQR\_DIF} + \text{Year\_Controls} + \varepsilon \quad (5)$$

$$\text{Merger Effect on CIR} = \alpha + \beta_1 * \text{Equity\_Discount} + \beta_2 * \text{Competition} + \beta_3 * \text{Premerger\_ROA\_DIF} + \beta_4 * \text{Premerger\_LSize\_DIF} + \beta_5 * \text{Premerger\_IM\_DIF} + \beta_6 * \text{Premerger\_EQR\_DIF} + \beta_7 * \text{Premerger\_NPL\_DIF} + \beta_8 * \text{Premerger\_LQR\_DIF} + \text{Year\_Controls} + \varepsilon \quad (6)$$

Where:

- Merger Effect on ROA (CIR) stands for the difference in ROA (CIR) from Year -1 to Year +1 (or +2) between an acquirer bank and its matching bank;
- Equity_Discount is the difference between the sale price of equity and the last reported book value of equity of the target scaled by the last reported book value of the target's assets[13];
- Competition is a proxy for the intensity of the competition among bidders in a particular auction, calculated as the average of the number of bidders and the number of bids;
- Premerger_ROA_DIF is calculated as ROA of the acquirer in the premerger year minus ROA of the matched bank in the premerger year. We use the same procedure to calculate Premerger_CIR_DIF, Premerger_LSize_DIF, Premerger_IM_DIF, Premerger_EQR_DIF, Premerger_NPL_DIF, and Premerger_LQR_DIF;
- Year_Controls are a set of year dummies.

Event Study

We use the standard event study method developed by Brown and Warner (1985) to examine Hypotheses 3-5. The method estimates the cumulative abnormal returns for Stock i over an interval $[t_1,t_2]$, abbreviated as $CARs_i(t_1, t_2)$, as the sum of the daily abnormal returns of Stock i, denoted as $\widehat{AR}_{it}$. Formally,

$$CARs_i(t_1, t_2) = \sum_{t=t_1}^{t=t_2} \widehat{AR}_{it} \quad (7)$$

$\widehat{AR}_{it}$ is estimated in two steps. First, we use the one-factor market model to estimate for each stock the coefficients, $\hat{\alpha}_i \; and \; \hat{\beta}_i$, of the linear regression equation that defines the stock's returns as a function of market returns. Formally, we present the regression equation of the market model as:

$$R_{it} = \alpha_i + \beta_i * R_{Mt} + \varepsilon_{it} \quad (8)$$

[13] We scale this measurement by total assets because in many cases the target bank reported negative book value of equity in their last quarter and this makes percentage calculation based on total equity meaningless. Meanwhile, we also considered using market value of equity instead to estimate the equity discount. However, only one target bank in this sample traded publicly before the acquisition and we are forced to drop the idea.

Where R_{it} is the return to Stock i during Day t, R_{Mt} is the market return during Day t, α_i and β_i are the regression coefficients, and ε_{it} is a random error.

Second, once we determine $\hat{\alpha}_i \; and \; \hat{\beta}_i$ from Equation (8) we estimate the daily abnormal returns using the equation:

$$\widehat{AR}_{it} = \quad R_{it} - (\hat{\alpha}_i + \hat{\beta}_i * R_{Mt}) \tag{9}$$

We take the merger announcement (closing) date as Day 0 for a regulatory merger and the bid summary release date as Day 0 for an unsuccessful bidder. For each bank in our study sample, we estimate Equation (8), the standard market model, using data for trading Days -270 to -21 inclusive, approximately one year of market data.[14] We leave 20 trading days between the estimation window of the market model and Day 0 to avoid any abnormal market movements due to potential information leakage. We measure the cumulative abnormal returns over five event windows: [-10,-3], [-2,-1], [0,+1], [0,+2], and [+3,+10]. Then, we perform statistical tests with robust standard errors and bootstrapping.

We filter our sample to make sure that no acquiring bank or unsuccessful bidder in the sample had a second merger, either regulatory or non-regulatory, during the period from Trading Day -270 to Trading Day +10. However, we do allow an acquirer to have successive mergers as long as mergers beyond the first one closed within half a year (125 trading days) of the first merger in the series. We restrict these successive mergers to be at least 10 trading days apart so that the event window per merger is clean. When we include successive mergers, we take the announcement date of the first merger in the series as Day 0 and we estimate the market model for the series of events using the period [-270,-21]. In other words, a series of mergers share the same estimated market model, but the event window of a particular merger takes its own announcement date as Day 0. We employ the same treatment to the unsuccessful bidder group.

Results

Descriptive Statistics

We present descriptive statistics for the three bank samples included in the study. We report the results for the regulatory and non-regulatory merger samples respectively in Tables 1 and 2.

[Insert Table 1 about Here]
[Insert Table 2 about Here]

[14] We allow a minimum of 200 trading days as the estimation window for banks without enough public stock data available

We make several observations from these two tables. First, before having a merger, acquirers from both regulatory and non-regulatory merger groups were exhibiting similar characteristics (shown in Panels A and B in Tables 1 and 2 respectively) with the exception that the acquirers from the non-regulatory merger group are almost 3 times larger than those from the regulatory merger group. This result seems to be due to the presence of mega banks within the non-regulatory merger sample as suggested by the median statistics. Second, even though acquirers from the regulatory merger group are smaller than acquirers in the non-regulatory merger group the targets of the regulatory merger group are relatively bigger. Third, targets from the regulatory merger group are characterized by significantly lower profitability, lower cost efficiency, under capitalization, higher non-performing assets, and lower liquidity.

We report the results of the descriptive statistics related to the group of unsuccessful bidders in Table 3. A comparison between Tables 1 and 3 suggests that the characteristics of the regulatory acquirers are similar to those of the unsuccessful bidders. The unsuccessful bidders have slightly lower values for all variables except for the liquidity ratio.

[Insert Table 3 about Here]

We conduct pairwise t-tests to assess the quality of the matches produced by the PSM approach. Specifically, we examined the performance of the hybrid method of matching which matches a treated bank with the nearest neighbor and all others peers within a radius of 0.0001. We present the results in Table 4. The pairwise test results suggest that our merger banks and their matching banks share similar pre-merger firm characteristics in general, and they should perform similarly during the post-treatment period except for the effect of the mergers.

[Insert Table 4 about Here]

Comparison of post-treatment performance of the treated and matching groups

We compare the performance of the treated group with the performance of the matching group obtained with the hybrid matching strategy over the same observation window. For a given bank and a given variable, we calculate the difference between the value of the variable during the post-treatment period and the value of the variable during the pre-treatment period. Next, we compare the average change among the treated group with the average change among the matching group. Then we calculate t-tests to determine the significance of the differences. We present the results in Table 5. We conduct two sets of tests, one for the regulatory merger group and the other for the non-regulatory merger group. Then, for each group we repeat each test two times. First, we use performance from Year -1 as the benchmark (Panel A) and then we repeat the process using the average performance from Years -1 and -2 as the benchmark (Panel B).

[Insert Table 5 about Here]

Table 5 shows significant differences between the changes in performance of the regulatory and non-regulatory groups. In comparison with their peers from the matching sample, the regulatory merger acquirers experience significantly better improvements in both profitability and cost efficiency. Furthermore, these superior gains, which we attribute to the merger event, seem to continue for at least 2 years after the transaction. In contrast, the non-regulatory merger acquirers do not seem to obtain any abnormal improvements in profitability and cost efficiency following the merger (compared to their matching peer).

Panel B of Table 5 reports the results of comparing the post-merger performance indicators in Years +1 and +2 to the average of the performance indicators over Years -1 and -2. For improvements experienced during Year +1, Panel B confirms the results reported in Panel A. However, for improvements experienced during Year +2, Panel B shows that the improvements in ROA for both regulatory and non-regulatory mergers are respectively similar to those of the matching samples. In contrast, the improvements in the cost efficiency ratio experienced by both regulatory and non-regulatory mergers are respectively significantly better than the improvements experienced by the matching samples.

Multivariate analysis

We use regression analysis to control for transaction specific characteristics and year effects. Table 6 shows the results when we use the full sample of regulatory and non-regulatory acquirer observations and their matching peers. The table shows that the regulatory merger dummy is statistically significant with the correct sign. In contrast, the non-regulatory merger dummy is not significant in determining the return on assets but it is significant in determining the abnormal change in cost efficiency ratio during Year +2. These results suggest that regulatory merger acquirers experienced abnormal profitability improvements after the merger transaction while non-regulatory merger acquirer banks did not.

[Insert Table 6 about Here]

Furthermore, Table 6 shows that the improvements in return on assets are negatively related to the pre-merger size of the acquirer and positively related to pre-merger cost efficiency, nonperforming loans, and liquidity. In contrast, the gains in cost efficiency are negatively related to the equity ratio and positively related to the premerger size of the non-performing loans and return on assets.

As a robustness test, we repeat this analysis after limiting the sample to the regulatory acquirers and their matching peers. The result confirms our findings in Table 6 (see Table A1 in the Appendix) with one

exception. The interest margin becomes positive and significant in determining the improvements in the return on assets following regulatory mergers.

According to the literature, potential bidders are more likely to acquire failed banks from the FDIC auction at a discount, which will generate a wealth transfer from the FDIC to the successful bidder (James and Wier, 1987; Christoffersen et al, 2012, Cowan and Salotti, 2005). We employ Model (5) to determine whether the auction discount is a significant determinant in the post-merger operating gains of the acquirer banks. If the discount has a significant coefficient in the equation, it implies that underpricing is important in determining the post-merger operating performance of a failed bank acquirer. Previous studies also suggest that the competition during the regulatory auctions is likely to determine the magnitude of the equity discount, hence the merger effect (Bertin et al., 1989; Christoffersen et al, 2012, Cowan and Salotti, 2005). We use regression Models 5 and 6 to examine the impact of the equity discount and the competition in determining the post-merger abnormal changes in operating performance. Table 7 shows the results of these regressions.

[Insert Table 7 about Here]

Table 7 shows that the coefficients of the equity discount and competition variables are statistically insignificant in determining the abnormal changes in operating performance. This finding implies that the equity discount and the level of competition during an auction do not contain useful information regarding the post-merger operating performance of the combined banks. Therefore, we cannot confirm the propositions regarding the wealth transfer effects (James and Wier, 1987; Christoffersen et al. (2012); Cowan and Salotti, 2015). However, this result does not mean there is no wealth transfer effects. It means that our equity discount measure may not be a good proxy for the magnitude of the wealth transfer or other terms of the purchase agreement between the FDIC and the acquirer must be considered to improve the model.

Table 7 also shows that an acquirer bank with smaller size and less nonperforming loans in comparison to its matched peer before the merger transaction will experience higher abnormal improvements in its return on assets. In addition, the higher the CIR of the acquiring bank relative to its matched peer the higher will be the merger effects on the return on assets. In contrast, an acquirer banks that is larger and has lower return on assets in comparison to its close peer before the merger transaction will experience larger abnormal improvements in cost-income efficiency. These observations are consistent with our expectations that as smaller banks are more likely to benefit from mergers that lead to an increase in their market share

and larger banks are more likely to benefit from mergers that help to improve operations and management efficiency.

Event Study Results

The results of analyzing the abnormal stock returns of regulatory merger acquirers are shown in Table 8. We find significantly positive abnormal market reactions responding to merger announcements. Our observation is consistent with the findings of many previous studies (James and Wier, 1987; Christoffersen et al, 2012; Cowan and Salotti (2015). Specifically for the 2-day window [0,+1] with full sample (Panel A), acquirers on average experienced 3.53% abnormal return with 66 acquirers experiencing positive abnormal returns and only 28 experiencing negative abnormal returns. Similarly, abnormal returns over the 3-day window [0,+2] are also consistent with this conclusion. In contrast, there is no significant abnormal market movement prior to Day 0. This is not surprising given that the entire failed bank resolution process is confidential by all parties with participants signing agreements that prohibit information leakage to the public or insiders until after the FDIC's official announcement. The positive CARs for [0,+1] window could be rationalized by our findings from the operating performance tests. We showed that acquirers from regulatory mergers tended to experience abnormal performance in both profitability and cost efficiency. Thus, positive results from the event study indicate that investors are indeed expecting such synergies and rewarding the mergers by bidding up the acquirers' share price.

[Insert Table 8 about Here]

We repeat the same event study analysis using the first time failed-bank auction participants (Panel B of Table 8) in one sample and the experienced auction participants (Panel C of Table 8) in another sample. Panels B and C show that the abnormal stock reaction is much higher for first-time auction participants as compared to senior auction participants (4.33% versus 2.44% over the [0,+1] window and 4.38% versus 3.19% over the [0,+2] window). This is interesting because according to Zhang (1997), acquirer firms learn through experience. In particular, the author found that first-time acquirers did not seem to benefit from acquiring failed banks from the FDIC. However, as they continue to participate in future auctions, their chance of achieving positive abnormal returns improves. Our results show the opposite. We attribute the difference to the method of grouping first time and senior participants. Zhang (1997) classifies an acquirer as either a first time or an experienced failed-bank auction participant based on whether or not the acquirer has acquired a peer bank through a previous failed-bank auction. Instead, we classify a bank to be an experienced participant if it participated, successful or not, in a previous failed-bank auction. For example, Zhang (1997) classifies an acquirer who is a second-time failed-bank auction participant but a first-time

failed-bank auction winner as a first time auction participant. We classify the same acquirer as an experienced participant.

We propose that the certification effect explains a portion of the difference between the CARs in Panel B and the CARs in Panel C. For first time failed-bank auction participants, investors reward the bidders, successful or not, for receiving an invitation from the FDIC to participate in an auction because the invitation signals their financial strength. At the same time, investors rewarded the first-time participants who are successful bidders first for being invited and second for winning performance-enhancing mergers. In other words, the first time bidders, successful or not, received the certification value while the first time successful bidders received the certification value plus the premium for a value-enhancing merger. In contrast, there is no certification value for senior auction participants since the information about their financial strength is already public knowledge. Thus, the abnormal return to senior auction participants is solely resulting from the merger effect.

We examine the market reaction to the announcement of unsuccessful bidders in the failed-bank auction to support further our proposition that participation in a failed-bank auction is valuable whether a participant wins the merger auction or not. If the FDIC's certification of the financial health of a bidding bank is valuable information to the market, then unsuccessful first time bidders would also experience significant positive abnormal returns after the announcement of their names as participants in a failed-bank auction. In contrast, an announcement of participation by an experienced participant would not result in a significant market reaction. The results reported in Table 9 confirm that the first time participants who were unsuccessful bidders experience positive and significant returns during the announcement day and the day after while the senior participants do not experience such market reaction. We realize that the sample of the unsuccessful first time bidders is small

[Insert Table 9 about Here]

Following Cowan and Salotti (2015), we perform a robustness check by extending our market model estimation window to trading days [-345,-91], leaving 90 trading days before the event date to avoid any abnormal market movements due to potential information leaks. The results from these event studies (see Tables A2 and A3 in the appendix) confirm our results regarding the certification effect.

Conclusion

This study investigates whether FDIC's involvement in auctioning failed banks creates value for the participants in the auction. First, we examine whether acquiring a failed bank through an FDIC-assisted

transaction improves post-merger operating performance. Second, we investigate whether FDIC's involvement is value creating for the non-winning participants. Overall, our research contributes to the discussion regarding the role of a deposit insurer in the resolution of bank failures.

We use a sample of failed bank mergers that occurred during the 2008-2011 period. Our focus is on the period of the recent financial crisis because a large number of failed-bank auctions took place during this period. We examine whether there is tangible evidence of profitability and cost efficiency improvements one year and two years after the merger. We construct peer groups using the propensity score matching method. We find that banks that engaged in regulatory mergers had significant abnormal profitability and cost efficiency improvements during the two years following the mergers while the acquirers of non-regulatory mergers did not show any such evidence during the same period. We confirm these results even after controlling for factors that may influence the efficiency enhancements.

A unique finding of this study is that the non-winning first time bidders experience a positive wealth effect from their participation in a failed-bank auction while repeated participants do not experience a similar wealth effect. We attribute this extra wealth to the certification effect as it is a consequence of the FDIC inviting a bank for the first time to participate in the auction and implicitly certifying that the bank is financially healthy. Repeat bidders do not experience the certification effect because they were certified to be financially healthy at a prior invitation. This result confirms that the FDIC creates value for the auction participants even when participation does not lead to a successful bid.

Previous studies, for example Cowan and Salotti (2015), have argued that the outperformance documented in the recent literature is due to underpricing of assets in the FDIC auction. In this study, we analyze the impact of the equity discount that the acquirers receive on the accounting measures of outperformance after controlling for other factors. Our analysis shows that the relation is not significant.

There are several implications of our findings. First, our results show that the FDIC is successful in placing failed bank assets and liabilities within banks where they can generate economic synergies. Therefore, our study supports the view that the FDIC is successful in managing the failed-bank auctions and fulfilling its mandate to reduce the impact of bank failures on the financial system. Second, FDIC's information about a bank's financial health is credible information of value to the market particularly during financial crisis. Thus, if given the opportunity, bank managers should participate in a failed-bank auction even if they have a slim chance to win. Participation helps healthy banks to obtain the certification effect and differentiate themselves from banks with financial difficulties.

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Table 1: Descriptive statistics related to the regulatory merger group

	Acquirers				Targets			
Panel A: Year -2								
Variable	N	Mean	Median	StdDev	N	Mean	Median	StdDev
Size	67	527,893	260,139	718,566	67	273,599	98,286	859,509
ROA	67	0.0263	0.0291	0.0318	65	-0.0254	-0.0174	0.0547
CIR	67	0.7763	0.7496	0.1306	67	1.0102	0.9557	0.4282
IM	67	0.0859	0.0847	0.0231	67	0.0823	0.0823	0.0258
EQR	67	0.1218	0.1103	0.0510	65	0.0998	0.0919	0.0422
NPL	67	0.0124	0.0078	0.0162	65	0.0506	0.0416	0.0424
LQR	67	0.2644	0.2393	0.1176	65	0.2237	0.1883	0.1690
Panel B: Year -1								
Size	67	567,120	309,173	766,405	67	244,808	96,535	746,424
ROA	67	0.0225	0.0268	0.0289	67	-0.1012	-0.0925	0.0993
CIR	67	0.7674	0.7344	0.1541	67	0.7156	1.1361	4.8415
IM	67	0.0911	0.0880	0.0308	67	0.0814	0.0789	0.0309
EQR	67	0.1166	0.1053	0.0408	67	0.0437	0.0331	0.0368
NPL	67	0.0143	0.0104	0.0160	67	0.0845	0.0738	0.0637
LQR	67	0.2857	0.2814	0.1274	67	0.1955	0.1618	0.1125
Panel C: Acquirers, Year +1								
Size	67	746,443	425,708	1,050,832				
ROA	67	0.0264	0.0268	0.0264				
CIR	67	0.6974	0.6882	0.1329				
IM	67	0.1019	0.0972	0.0211				
EQR	67	0.1080	0.1046	0.0238				
NPL	67	0.0251	0.0181	0.0226				
LQR	67	0.3152	0.3001	0.1305				
Panel D: Acquirers, Year +2								
Size	67	753,974	421,297	995,660				
ROA	67	0.0262	0.0269	0.0238				
CIR	67	0.6897	0.6898	0.1176				
IM	67	0.0956	0.0928	0.0187				
EQR	67	0.1116	0.1046	0.0236				
NPL	67	0.0187	0.0138	0.0219				
LQR	67	0.3311	0.3315	0.1298				

1. This table includes the M&As sample filtered for propensity score matching. The cases are selected so that only one merger transaction is associated with the acquirer during the [-2Y,+2Y] window. We structure all merger cases with the merger year as Year 0. We exclude all mergers with missing value(s) for any of the variables.
2. Size represents the absolute value of total assets in thousands. We use the natural logarithm of size in propensity score matching calculations. ROA is the return on assets, CIR is the cost-income ratio, IM is interest margin, EQR is equity ratio, NPL is non-performing loans, and LQR is the liquidity ratio.

Table 2: Summary statistics related to the non-regulatory merger group

	Acquirers				Targets			
Panel A: Year -2								
Variable	N	Mean	Median	StdDev	N	Mean	Median	StdDev
Size	353	1,580,325	268,718	10,511,853	353	202,641	74,010	757,193
ROA	351	0.0291	0.0280	0.0381	349	0.0292	0.0193	0.2850
CIR	353	0.7684	0.7551	0.1600	353	0.8641	0.8112	0.2697
IM	353	0.0858	0.0852	0.0208	353	0.0849	0.0832	0.0235
EQR	351	0.1146	0.1036	0.0499	349	0.1262	0.1020	0.0918
NPL	351	0.0070	0.0044	0.0084	349	0.0101	0.0037	0.0166
LQR	351	0.3106	0.2743	0.1831	349	0.3589	0.3300	0.1904
Panel B: Year -1								
Size	353	1,700,904	298,289	11,493,103	353	205,988	75,567	738,078
ROA	353	0.0262	0.0261	0.0329	353	0.0344	0.0157	0.4727
CIR	353	0.7722	0.7656	0.1048	353	0.8771	0.8308	0.2232
IM	353	0.0838	0.0838	0.0212	353	0.0754	0.0800	0.1359
EQR	353	0.1151	0.1038	0.0461	353	0.1234	0.1041	0.0745
NPL	353	0.0087	0.0054	0.0110	353	0.0118	0.0045	0.0181
LQR	353	0.3066	0.2758	0.1658	353	0.3498	0.3207	0.1809
Panel C: Acquirers, Year +1								
Size	353	2,108,940	450,256	13,218,283				
ROA	353	0.0163	0.0217	0.0361				
CIR	353	0.7834	0.7528	0.1738				
IM	353	0.0885	0.0865	0.0312				
EQR	353	0.1115	0.1061	0.0305				
NPL	353	0.0167	0.0105	0.0187				
LQR	353	0.3008	0.2722	0.1655				
Panel D: Acquirers, Year +2								
Size	353	2,106,243	456,273	13,127,927				
ROA	353	0.0127	0.0197	0.0389				
CIR	353	0.7804	0.7439	0.2049				
IM	353	0.0896	0.0885	0.0312				
EQR	353	0.1085	0.1054	0.0286				
NPL	353	0.0174	0.0106	0.0219				
LQR	353	0.3140	0.2778	0.1627				

1. This table includes the M&As sample filtered for propensity score matching. The cases are selected so that only one merger transaction is associated with the acquirer during the [-2Y,+2Y] window. We structure all merger cases with the merger year as Year 0. We exclude all mergers with missing value(s) for any of the variables.
2. Size represents the absolute value of total assets in thousands. We use the natural logarithm of size in propensity score matching calculations. ROA is the return on assets, CIR is the cost-income ratio, IM is interest margin, EQR is equity ratio, NPL is non-performing loans, and LQR is the liquidity ratio.

Table 3: Summary statistics related to the unsuccessful bidders in regulatory merger

Variable	N	Mean	Median	StdDev
Panel A: Unsuccessful bidders, Year -2				
Size	57	497,720	294,507	516,163
ROA	57	0.0257	0.0271	0.0214
CIR	57	0.7780	0.7746	0.0958
IM	57	0.0846	0.0839	0.0204
EQR	57	0.1140	0.1044	0.0370
NPL	57	0.0102	0.0058	0.0137
LQR	57	0.2968	0.2818	0.1551
Panel B: Unsuccessful bidders, Year -1				
Size	57	530,726	322,527	546,217
ROA	57	0.0233	0.0228	0.0165
CIR	57	0.7596	0.7436	0.0878
IM	57	0.0854	0.0835	0.0182
EQR	57	0.1106	0.1048	0.0263
NPL	57	0.0110	0.0059	0.0133
LQR	57	0.3254	0.2994	0.1539
Panel C: Unsuccessful bidders, Year +1				
Size	57	599,520	381,836	611,704
ROA	57	0.0202	0.0223	0.0214
CIR	57	0.7340	0.7132	0.1101
IM	57	0.0884	0.0872	0.0184
EQR	57	0.1130	0.1081	0.0279
NPL	57	0.0142	0.0079	0.0174
LQR	57	0.3632	0.3504	0.1635
Panel D: Unsuccessful bidders, Year +2				
Size	57	616,605	395,101	617,753
ROA	57	0.0221	0.0235	0.0221
CIR	57	0.7294	0.7146	0.1252
IM	57	0.0876	0.0848	0.0186
EQR	57	0.1115	0.1036	0.0274
NPL	57	0.0165	0.0072	0.0272
LQR	57	0.3621	0.3344	0.1549

1. This table includes the M&As sample filtered for propensity score matching. The cases are selected so that only one merger transaction is associated with the acquirer during the [-2Y,+2Y] window. We structure all merger cases with the merger year as Year 0. We exclude all mergers with missing value(s) for any of the variables.
2. Size represents the absolute value of total assets in thousands. We use the natural logarithm of size in propensity score matching calculations. ROA is the return on assets, CIR is the cost-income ratio, IM is interest margin, EQR is equity ratio, NPL is non-performing loans, and LQR is the liquidity ratio.

Table 4: Pairwise tests to assess the quality of propensity score matching using the hybrid nearest neighbor plus radius (0.0001) matching

Panel A: Differences between the treated and matched samples using Year -1 statistics

Variables	Regulatory Merger Samples				Non-regulatory Merger Samples			
	N	Treated	Matched	Difference	N	Treated	Matched	Difference
LSize	51	12.7150	12.7634	-0.0483	216	12.5801	12.5834	-0.0033
				-0.33				-0.12
ROA	51	-0.0038	0.0026	-0.0064	216	0.0206	0.0178	0.0027
				-0.88				0.77
CIR	51	0.9243	0.8040	**0.1204**	216	0.8025	0.8068	-0.0043
				1.90*				-0.35
IM	51	0.0880	0.0949	-0.0069	216	0.0837	0.0787	0.0050
				-0.74				1.46
EQR	51	0.0966	0.0983	-0.0018	216	0.1155	0.1200	-0.0045
				-0.32				-0.85
NPL	51	0.0288	0.0294	-0.0006	216	0.0115	0.0105	0.0010
				-0.15				0.89
LQR	51	0.2787	0.2671	0.0116	216	0.3232	0.3065	0.0167
				0.44				0.85

Panel B: Differences between the treated and matched samples using average statistics over Years -1 and -2

	Regulatory Merger				Non-regulatory Merger			
	N	Treated	Match	Difference	N	Treated	Match	Difference
LSize	56	12.8196	12.5274	**0.2922**	211	12.5179	12.4916	0.0263
				2.19**				0.99
ROA	56	0.0050	-0.0067	**0.0118**	211	0.0203	0.0175	0.0027
				2.11**				1.24
CIR	56	0.8635	0.8766	-0.0131	211	0.8051	0.8109	-0.0058
				-0.35				-0.43
IM	56	0.0898	0.0847	0.0051	211	0.0838	0.0849	-0.0011
				0.88				-0.31
EQR	56	0.1031	0.0954	0.0077	211	0.1153	0.1123	0.0029
				1.67				0.73
NPL	56	0.0266	0.0301	-0.0036	211	0.0104	0.0104	0.0000
				-1.16				0.01
LQR	56	0.2635	0.2446	0.0190	211	0.3210	0.3137	0.0073
				0.77				0.48

1. We perform the pairwise test on all pairs determined using PSM with nearest neighbor matching plus radius (0.0001) matching strategies. The sample is filtered to leave only the cases where the underlying merger transaction is the acquirer's only transaction during the [-2Y,+2Y] window. Each pair in this sample consists of one merger bank and its matching bank and both banks are from the same year. We combine all the pairs from Years 2008, 2009, 2010, and 2011 into one large sample.
2. LSize is the natural logarithm of the absolute value of total assets. ROA is the return on assets, CIR is the cost-income ratio, IM is interest margin, EQR is equity ratio, NPL is non-performing loans, and LQR is the liquidity ratio.
3. Significance level is determined by comparing the t values to 2-tail critical t values. ***, **, and * denote respectively significance at the 1%, 5%, and 10% levels.

Table 5: The differences in changes in performance of the treated and the matching groups during the post-treatment period

Panel A: Changes in performance: Year -1 compared to each of Years +1 and +2

	Regulatory merger							Non-regulatory merger				
		ROA			Cost-Income Ratio				ROA		Cost-Income Ratio	
# of years post-merger	N	Merger effects	t value		Merger effects	t value		N	Merger effects	t value	Merger effects	t value
1yr	51	**0.0220**	**2.97**	***	**-0.2147**	**-3.54**	***	216	0.0012	0.43	-0.0012	-0.09
2yr	51	**0.0244**	**3.36**	***	**-0.2359**	**-4.00**	***	216	0.0016	0.56	-0.0134	-1.07

Panel B: Changes in performance: average of Years -1 and -2 compared to each of Years +1 and +2

	Regulatory merger							Non-regulatory merger				
		ROA			Cost-Income Ratio				ROA		Cost-Income Ratio	
# of years post-merger	N	Merger effects	t value		Merger effects	t value		N	Merger effects	t value	Merger effects	t value
1yr	56	**0.0152**	**2.05**	**	**-0.1987**	**-4.30**	***	211	0.0007	0.24	-0.0119	-0.67
2yr	56	0.0105	1.44		**-0.1715**	**-3.89**	***	211	0.0009	0.30	**-0.0281**	**-1.66** *

1. This table includes the M&As sample filtered for propensity score matching. The cases are selected so that only one merger transaction is associated with the acquirer during the [-2Y,+2Y] window. We structure all merger cases with the merger year as Year 0. We exclude all mergers with missing value(s) for any of the variables.
2. We calculate the merger effects by subtracting non-merger group's statistics from merger group's statistics. Peer groups are determined by nearest neighbor plus radius (0.0001) matching strategies.
3. Significance level is determined by comparing the t-values to 2-tail critical t values. ***, **, and * denote respectively significance at the 1%, 5%, and 10% levels.

Table 6: The differences in changes in performance of the treated and the matching groups during the post-treatment period: regression analysis to control for transaction specific attributes and year effects

	(1) ΔROA+1Y	(2) ΔROA+2Y	(3) ΔCIR+1Y	(4) ΔCIR+2Y
Reg_Merger	**0.0153*** **	**0.0154*** **	**-0.1899*** **	**-0.2132*** **
	(3.20)	**(3.06)**	**(-3.58)**	**(-4.16)**
Nonreg_Merger	-0.0005	0.0013	-0.0134	**-0.0285** **
	(-0.18)	(0.45)	(-0.98)	**(-2.35)**
Premerger_LSize	**-0.0032***	**-0.0036***	0.0013	-0.0030
	(-1.83)	**(-1.73)**	(0.20)	(-0.39)
Premerger_ROA			**1.6315** **	**1.4631** **
			(2.22)	**(2.02)**
Premerger_CIR	**0.0699*** **	**0.0627** **		
	(2.82)	**(2.44)**		
Premerger_IM	0.1114	0.0082	-0.0883	0.3705
	(0.97)	(0.06)	(-0.31)	(1.07)
Premerger_EQR	-0.0766	-0.0668	**-0.5197** **	**-0.7174*** **
	(-1.01)	(-0.74)	**(-2.05)**	**(-3.69)**
Premerger_NPL	0.1711	**0.2539***	**2.4882*** **	**2.3162*** **
	(1.32)	**(1.83)**	(3.01)	(3.16)
Premerger_LQR	**0.0310** **	0.0134	-0.0033	0.0595
	(2.30)	(0.86)	(-0.05)	(1.04)
Constant	-0.0278	-0.0041	-0.0337	-0.0167
	(-0.60)	(-0.08)	(-0.38)	(-0.16)
Year_Controls	Yes	Yes	Yes	Yes
N	534	534	534	534
R-squared	0.3676	0.3028	0.1967	0.2037

1. The sample includes all regulatory and non-regulatory merger acquirer banks and their matching peers. ΔROA+1Y (ΔCIR+1Y) stands for the change in ROA (CIR) of a bank between Year -1 and Year +1, ΔROA+2Y (ΔCIR+2Y) stands for the change in ROA (CIR) of a bank between Year -1 and Year +2, Reg_Merger is a dummy variable that takes the value 1 if a bank is a regulatory merger acquirer and 0 otherwise, Nonreg_Merger is a dummy variable equal to 1 if a bank is a non-regulatory merger acquirer and 0 otherwise, Premerger_X indicates the value of Variable X measured in the year prior to the merger year (Year -1), LSize is the natural logarithm of the absolute value of total assets, ROA is the return on assets, CIR is the cost-income ratio, IM is interest margin, EQR is equity ratio, NPL is non-performing loans, LQR is the liquidity ratio, and Year_Controls are a set of dummy variables to control for the year of the merger.
2. The number reported on the same line as the parameter name is the coefficient and the number reported below is the robust t statistics. *, **, *** denote statistical significance at the 10%, the 5%, and the 1% level, respectively, using a two-tail test.

Table 7: Determinants of Merger Effects on ROA and CIR

	Merger Effects on ROA		Merger Effects on CIR	
	Year -1 to Year +1	Year -1 to Year +2	Year -1 to Year +1	Year -1 to Year +2
	(1)	(2)	(3)	(4)
Equity_Discount	-0.0299	0.0559	0.6486	0.4561
	(-0.44)	(0.90)	(0.98)	(0.70)
Competition	0.0028	0.0040	0.0266	0.0117
	(1.11)	(1.38)	(1.38)	(0.58)
Premerger_LSize_Diff	**-0.0416*** **	**-0.0288*** **	-0.3361	**-0.3820***
	(-3.79)	**(-3.46)**	(-1.49)	**(-1.81)**
Premerger_ROA_Diff			**7.0720***	**5.8391***
			(1.97)	**(1.70)**
Premerger_CIR_Diff	**0.0443*** **	**0.0281*** **		
	(5.39)	**(3.58)**		
Premerger_IM_Diff	0.1090	0.0972	-2.8560	-2.3226
	(0.72)	(0.65)	(-1.32)	(-1.15)
Premerger_EQR_Diff	0.3096	0.3346	2.5544	1.7132
	(1.21)	(1.27)	(0.79)	(0.57)
Premerger_NPL_Diff	**-0.7869** **	**-0.5424** **	-4.0601	-5.4415
	(-2.06)	**(-2.07)**	(-0.80)	(-1.15)
Premerger_LQR_Diff	0.0245	0.0033	-0.1893	-0.1012
	(0.52)	(0.07)	(-0.38)	(-0.22)
Constant	0.0025	0.0148	**-0.2124***	**-0.2352** **
	(0.20)	(1.03)	**(-2.02)**	**(-2.39)**
Year_Controls	Yes	Yes	Yes	Yes
N	44	44	44	44
R-squared	0.5574	0.4148	0.4770	0.4798

1. We compare each acquirer bank observation with the observation of its matching bank to measure the difference. The dependent variable is the difference-in-difference.
2. Merger Effects on ROA (CIR) measures the difference in the change in ROA (CIR) from Year -1 to Year +1 or Year 2 between an acquirer bank and its matching bank, Equity_Discount is the difference between sale price of Equity and last reported book value of Equity of the acquired bank scaled by last reported book value of assets of the target, Competition is the average between number of bidders and number of bids in a failed-bank auction, Premerger_Y_Diff indicates the differences between an acquirer bank's variable Y and the matching bank's Variable Y in Year -1, ROA is the return on assets, CIR is the cost-income ratio, LSize is the natural logarithm of the absolute value of total assets, IM is interest margin, EQR is equity ratio, NPL is non-performing loans, and LQR is the liquidity ratio. Year_Controls are a set of dummy variables to control for the year of the merger.
3. The number reported on the same line as the parameter name is the coefficient and the number reported below is the robust t statistics. *, **, *** denote statistical significance at the 10%, the 5%, and the 1% level, respectively, using a two-tailed test.

Table 8: FDIC failed-bank auctions: winning bidders' abnormal returns

Window	N	Mean CAR	Median CAR	Positive: Negative	Z test, bootstrapped
Panel A: Full sample					
[-10,-3]	94	-1.25%	-1.55%	35:59	-1.92
[-2,-1]	94	-0.08%	-0.10%	45:49	-0.25
[0,+1]	94	**3.53%**	1.80%	66:28	**4.37*** **
[0,+2]	94	**3.88%**	2.40%	65:29	**4.15*** **
[+3,+10]	94	0.01%	-0.34%	46:48	0.01
Panel B: First time failed-bank auction participants					
[-10,-3]	54	-1.50%	-1.68%	20:34	-1.51
[-2,-1]	54	0.21%	0.40%	30:24	0.37
[0,+1]	54	**4.33%**	2.74%	37:17	**4.97*** **
[0,+2]	54	**4.38%**	3.60%	38:16	**3.89*** **
[+3,+10]	54	-0.49%	-1.68%	22:32	-0.47
Panel C: Senior failed-bank auction participants					
[-10,-3]	40	-0.92%	-1.41%	15:25	-1.18
[-2,-1]	40	-0.46%	-0.35%	15:25	-0.72
[0,+1]	40	**2.44%**	0.92%	29:11	**4.18*** **
[0,+2]	40	**3.19%**	1.41%	27:13	**2.75*** **
[+3,+10]	40	0.68%	0.51%	24:16	1.01

1. We consider the regulatory merger announcement (closing) date as Day 0. For each bank in our sample, we estimated a standard OLS market model using data over the 250 trading days ending with trading Day -21, approximately one year of market data. We performed our market reaction tests over five event windows: [-10,-3], [-2,-1], [0,+1], [0,+2], and [+3,+10]. We filtered the sample to make sure that the acquirer bank did not have a second merger activity, neither regulatory nor non-regulatory, during the entire 280 trading days ending with trading day +10. However, we include merger cases involving the same acquirer as long as these mergers were closed within half a year (roughly 125 trading days) of the first merger and at least 10 trading days apart from an earlier transaction. For these successive merger cases, the estimation window takes the announcement date of the first case in the series as Day 0 (they are sharing the same estimated market model), and their event window takes the actual announcement date of their own merger event as Day 0.
2. Statistical test is with robust standard errors control and bootstrapping. Significance level is determined by comparing the t values to 2-tail critical t values. ***, **, and * denote respectively significance at the 1%, 5%, and 10% levels.

Table 9: FDIC failed-bank auctions: Unsuccessful bidders' abnormal returns

Window	N	Mean CAR	Median CAR	Positive: Negative	Z test, bootstrapped
Panel A: Full sample					
[-10,-3]	80	-0.72%	-0.79%	36:44	-0.73
[-2,-1]	80	0.32%	-0.04%	40:40	1.09
[0,+1]	80	0.27%	0.08%	41:39	0.73
[0,+2]	80	0.16%	-0.04%	39:41	0.38
[+3,+10]	79	-0.32%	0.31%	42:37	-0.57
Panel B: First time failed-bank auction participants					
[-10,-3]	19	-2.03%	-0.44%	9:10	-0.89
[-2,-1]	19	-0.46%	-0.49%	7:12	-0.94
[0,+1]	19	**1.41%**	0.29%	12:7	**1.72***
[0,+2]	19	0.88%	0.43%	10:9	0.92
[+3,+10]	19	1.11%	0.31%	10:9	1.1
Panel C: Senior failed-bank auction participants					
[-10,-3]	61	-0.31%	-1.08%	27:34	-0.37
[-2,-1]	61	0.56%	0.13%	33:28	1.59
[0,+1]	61	-0.08%	-0.14%	29:32	-0.26
[0,+2]	61	-0.07%	-0.09%	29:32	-0.18
[+3,+10]	60	-0.77%	0.36%	32:28	-1.00

1. We consider the regulatory merger announcement (closing) date as Day 0. For each bank in our sample, we estimated a standard OLS market model using data over the 250 trading days ending with trading Day -21, approximately one year of market data. We performed our market reaction tests over five event windows: [-10,-3], [-2,-1], [0,+1], [0,+2], and [+3,+10]. We filtered the sample so that the underlying merger bank will not have a second merger activity, neither regulatory nor non-regulatory, for the entire 280 trading days ending with trading day +10. However, we include merger cases involving the same acquirer as long as these mergers were closed within half a year (roughly 125 trading days) of the first merger but at least 10 trading days apart from an earlier transaction. For these successive merger cases, the estimation window takes the announcement date of the first case in the series as Day 0 (they are sharing the same estimated market model), and their event window takes the actual announcement date of their own merger event as Day 0.
2. Statistical test is with robust standard errors control and bootstrapping. Significance level is determined by comparing the t values to 2-tail critical t values. ***, **, and * denote respectively significance at the 1%, 5%, and 10% levels.

Appendix I: Additional Tables

Table A1: The differences in changes in performance of the regulatory merger acquirers and the matching group during the post-treatment period: regression analysis to control for transaction specific attributes and year effects

	(1) ΔROA_+1Y	(2) ΔROA_+2Y	(3) ΔCIR_+1Y	(4) ΔCIR_+2Y
Reg_Merger	**0.0175*** **	**0.0209*** **	**-0.1967*** **	**-0.2202*** **
	(2.98)	**(2.94)**	**(-3.60)**	**(-3.87)**
Premerger_LSize	**-0.0086** **	**-0.0069* **	-0.0281	-0.0504
	(-2.29)	**(-1.83)**	(-0.81)	(-1.43)
Premerger_ROA			3.4259	3.0526
			(1.45)	(1.23)
Premerger_CIR	**0.0483** **	**0.0384** **		
	(2.52)	**(2.06)**		
Premerger_IM	**0.3537*** **	**0.2961*** **	0.1031	0.3927
	(4.32)	**(3.46)**	(0.19)	(0.56)
Premerger_EQR	-0.2014	-0.1610	**-2.0056** **	**-2.3620*** **
	(-1.22)	(-0.98)	**(-2.47)**	**(-2.78)**
Premerger_NPL	0.2613	0.3157	**3.7781* **	3.0222
	(1.19)	(1.32)	**(1.87)**	(1.61)
Premerger_LQR	**0.0446* **	0.0379	0.1611	0.1435
	(1.68)	(1.05)	(0.96)	(0.86)
Constant	0.0480	0.0343	0.3807	0.7058
	(0.83)	(0.62)	(0.85)	(1.55)
Year Effect	Yes	Yes	Yes	Yes
N	102	102	102	102
R-Squared	0.4901	0.4311	0.2643	0.2679

1. The sample includes all regulatory merger acquirer banks and their matching peers. ΔROA+1Y (ΔCIR+1Y) stands for the change in ROA (CIR) of a bank between Year -1 and Year +1, ΔROA+2Y (ΔCIR+2Y) stands for the change in ROA (CIR) of a bank between Year -1 and Year +2, Reg_Merger is a dummy variable that takes the value 1 if a bank is a regulatory merger acquirer and 0 otherwise, Premerger_X indicates the value of Variable X measured in the year prior to the merger (Year -1), LSize is the natural logarithm of the absolute value of total assets, ROA is the return on assets, CIR is the cost-income ratio, IM is interest margin, EQR is equity ratio, NPL is non-performing loans, LQR is the liquidity ratio, and Year_Controls are a set of dummy variables to control for the year of the merger.
2. The number reported on the same line as the parameter name is the coefficient and the number reported below is the robust t statistics. *, **, *** denote statistical significance at the 10%, the 5%, and the 1% level, respectively, using a two-tail test.

Table A2: Abnormal returns of successful bidders in the FDIC failed-bank auctions – robustness check using an extended period to estimate the market model

Window	N	Mean CAR	Median CAR	Positive: Negative	Z test, bootstrapped
Panel A: Full sample					
[-30,-1]	87	-1.73%	0.44%	48:39	-1.34
[0,+1]	87	**2.92%**	1.52%	59:28	**3.83*** **
[0,+2]	87	**3.13%**	1.54%	57:30	**3.55*** **
[+3,+30]	87	-0.25%	1.33%	51:36	-0.19
Panel B: First time failed-bank auction participants					
[-30,-1]	53	-1.66%	1.41%	33:20	-1.08
[0,+1]	53	**3.95%**	1.84%	38:15	**3.34*** **
[0,+2]	53	**3.71%**	2.42%	37:16	**3.34*** **
[+3,+30]	53	-0.96%	0.70%	30:23	-0.44
Panel C: Senior failed-bank auction participants					
[-30,-1]	34	-1.83%	-1.33%	15:19	-1.26
[0,+1]	34	**1.32%**	0.30%	21:13	**1.81***
[0,+2]	34	**2.23%**	0.38%	20:14	**2.04****
[+3,+30]	34	0.86%	1.86%	21:13	0.59

1. We consider the regulatory merger announcement (closing) date as Day 0. For each bank in our sample, we estimated a standard OLS market model using data over the 255 trading days ending with trading Day -91, approximately one year of market data. We performed our market reaction tests over five event windows: [-30,-1], [0,+1], [0,+2], and [+3,+30]. We filtered the sample so that the underlying merger bank will not have a second merger activity, neither regulatory nor non-regulatory, for the entire 375 trading days ending with trading day +30.
2. Statistical test is with robust standard errors control and bootstrapping. Significance level is determined by comparing the t values to 2-tail critical t values. ***, **, and * denote respectively significance at the 1%, 5%, and 10% levels.

Table A3: Abnormal returns of unsuccessful bidders in the FDIC failed-bank auctions – robustness check using an extended period to estimate the market model

Window	N	Mean CAR	Median CAR	Positive: Negative	Z test, bootstrapped
Panel A: Full sample					
[-30,-1]	49	0.52%	1.84%	27:22	0.51
[0,+1]	49	0.57%	0.21%	27:22	1.28
[0,+2]	49	-0.01%	0.15%	26:23	-0.02
[+3,+30]	49	0.58%	-0.63%	22:27	0.5
Panel B: First time failed-bank auction participants					
[-30,-1]	20	-0.96%	2.59%	13:7	-0.47
[0,+1]	20	**1.69%**	0.97%	13:7	**1.74***
[0,+2]	20	1.00%	0.40%	11:9	0.79
[+3,+30]	20	3.35%	2.83%	13:7	1.45
Panel C: Senior failed-bank auction participants					
[-30,-1]	29	**1.91%**	2.40%	15:14	**1.8***
[0,+1]	29	-0.09%	-0.01%	14:15	(-0.20)
[0,+2]	29	-0.38%	0.20%	16:13	(-0.57)
[+3,+30]	29	-1.04%	-1.05%	10:19	(-1.08)

1. We consider the regulatory merger announcement (closing) date as Day 0. For each bank in our sample, we estimated a standard OLS market model using data over the 255 trading days ending with trading Day -91, approximately one year of market data. We performed our market reaction tests over five event windows: [-30,-1], [0,+1], [0,+2], and [+3,+30]. We filtered the sample so that the underlying merger bank will not have a second merger activity, neither regulatory nor non-regulatory, for the entire 375 trading days ending with trading day +30.
2. Statistical test is with robust standard errors control and bootstrapping. Significance level is determined by comparing the t values to 2-tail critical t values. ***, **, and * denote respectively significance at the 1%, 5%, and 10% levels.