How Much Did Banks Pay to Become Too-Big-To-Fail and to Become Systemically Important?

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Abstract This paper estimates the value of the too-big-to-fail (TBTF) subsidy. Using data from the merger boom of 1991–2004, we find that banking organizations were willing to pay an added premium for mergers that would put them over the asset sizes that are commonly viewed as the thresholds for being TBTF. We estimate at least $15 billion in added premiums for the eight merger deals that brought the organizations to over $100 billion in assets. In addition, we find that both the stock and bond markets reacted positively to these TBTF merger deals. Our estimated TBTF subsidy is large enough to create serious concern, particularly since the recently assisted mergers have effectively allowed for TBTF banking organizations to become even bigger and for nonbanks to become part of TBTF banking organizations, thus extending the TBTF subsidy beyond banking.

Keywords Bank merger · Too-big-to-fail · TBTF subsidy · Systemically important bank

JEL Code G21 · G28 · G34

1 Introduction and background

Too-big-to-fail (TBTF) has become a heated topic of debate in recent years; see, for example, Stern (2009a, b), Stern and Feldman (2009), and Bernanke (2010). Should some financial institutions get special treatment from regulators and be perceived by the public as being TBTF? How big does an institution have to be in order to be considered TBTF?

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Should the public be informed about which financial institutions are TBTF? In return for their special privilege, should TBTF institutions be regulated differently? How much is it worth for a financial institution to become TBTF?

Prior to the financial crisis that started in mid-2007 and extended into 2010, there were debates about whether the TBTF policy, which was introduced by bank regulators in 1984 following the Continental Illinois National Bank crisis, was completely eliminated by the implementation of the Federal Deposit Insurance Corporation Improvement Act (FDICIA) of 1991.[1] The question of whether some institutions, even after FDICIA, may still be TBTF has become trivial in light of the dollars the federal government has recently poured into bailing out those banking organizations considered TBTF and/or too interconnected (e.g., Bear Stearns, American International Group [AIG], Citigroup, and Bank of America).

While FDICIA attempted to make it more difficult for the Federal Deposit Insurance Corporation (FDIC) to protect uninsured depositors and creditors at large failing banking organizations and TBTF banking organizations, it is evident that the TBTF policy still exists. In fact, one might argue that FDICIA has actually formalized the process for bailing out TBTF banking organizations by specifically allowing a TBTF bailout when the banking organization's failure "would have serious adverse effects on the economic conditions or financial stability" of the economy and by instituting a formal approval process with two-thirds of the FDIC Board, two-thirds of the Federal Reserve Board, the Secretary of the Treasury, and the President of the United States giving their backing. Kane (2000) describes these large banks as being "too-big-to-unwind" or "too-big-to-discipline-adequately (TBTDA)," suggesting that these banking organizations would be more likely to receive favorable treatment by both the market and regulators during a financial crisis. According to Ben Bernanke (2010):

> "Many of the vulnerabilities that amplified the crisis are linked with the problem of so-called too-big-to-fail firms…. Governments provide support to too-big-to-fail firms in a crisis not out of favoritism or particular concern for the management, owners, or creditors of the firm, but because they recognize that the consequences for the broader economy of allowing a disorderly failure greatly outweigh the costs of avoiding the failure…"

Beyond TBTF banking institutions, the TBTF notion has recently been extended to cover nonbank financial institutions as well. The rescue of Bear Stearns and AIG and the various new lending programs that gave nonbank institutions (such as primary dealers) access to the discount window marked a vast expansion of the government's financial safety net (access to the Federal Reserve System's discount window lending, federal government liability guarantee programs, and access to the payment system) beyond depository institutions. For the first time in the history of the Federal Reserve System, discount window access was extended to investment banks through the Primary Dealer Credit Facility during the financial crisis that started in mid-2007.[2]

In addition, more nonbanking institutions have come under the umbrella of TBTF banking institutions through the mergers supported by the federal government and bank regulators, for example, the regulator-assisted acquisitions of Merrill Lynch by

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[1] See Kaufman (1990, 1991a, and 2002) and Kane (2000) for a further discussion of TBTF.
[2] The Primary Dealer Credit Facility began operations on March 17, 2008, and was closed on February 1, 2010.

Bank of America and Bear Stearns by JPMorganChase and Company (JPMC). According to Macey (2008):

> "[t]he bailout of Bear Stearns creates an unfair competitive environment in U.S. financial markets that is worse than the unfairness that led to FDICIA. Not only are large firms being favored over small firms, but investment banks are getting for free a better government bailout than commercial banks receive only after paying insurance premiums to the FDIC. The result will further weaken the U.S. banking industry and lead to a wave of mergers among investment banks seeking to become too-big-to-fail."

During the pre-financial crisis period, Alan Greenspan (2001), former chairman of the Board of Governors of the Federal Reserve System, warned that policymakers must be "very cautious about purposefully or inadvertently extending the scope and reach" of the government's financial safety net. Similarly, Charles I. Plosser (2008), president of the Federal Reserve Bank of Philadelphia, has also warned that:

> "[p]olicy interventions in financial markets run the risks of increasing moral hazard and inhibiting efficient price discovery .... Interventions intended to quell instability can, by creating moral hazard, actually make instability more severe in the long run."

Furthermore, these policy interventions could have the unintended consequences of effectively subsidizing risk-taking by systemically important financial institutions. It should be pointed out that there is no such thing as a list of TBTF banks developed by U.S. banking supervisors or regulators. Therefore, it is not always clear which institutions are TBTF and would be rescued in the event of a crisis. This was evident recently when AIG and Bear Stearns received support while Lehman Brothers did not.[3] The general perception is that relatively larger institutions are more likely to be considered TBTF, although the specific TBTF threshold has never been officially defined.

Since these TBTF benefits granted to banking organizations may translate to potential costs to taxpayers, there have also been concerns about how to limit these subsidies (e.g., controlling banking organizations' size and making them smaller or focusing on managing the financial spillover better). The benefits of TBTF may be captured in numerous ways, such as gaining favor with uninsured bank creditors and other market participants, operating with lower regulatory costs, and increasing the chances of receiving regulatory forbearance. Access to the federal government's safety net allows TBTF institutions to operate with less capital and a lower funding cost relative to other institutions. To the extent that the public believes that the government would protect the TBTF banking organizations, their uninsured creditors do not charge as high a price for the use of their funds as they would in the absence of this perception.

Several studies have examined the impacts of the TBTF policy, but it remains unclear how much value the TBTF (and TBTDA) aspects have added to bank shareholders' wealth. Through the merger waves in the pre-financial crisis periods, banking organizations have become larger and more complex and increased their market share and market power. The perception is that these institutions may have become TBTF. This paper focuses on estimating the potential value of the TBTF subsidy. In other words, we focus on estimating the potential costs to taxpayers as a result of the TBTF policy. We generate estimates of the TBTF subsidy to large banking organizations, and we believe our estimates of the possible

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[3] At the end of November 2007, Lehman Brothers Holding Inc. had total assets with a book value of $691.1 billion, compared with $395.4 billion for Bear Stearns (about 55% of the size of Lehman Brothers).

subsidies to these TBTF institutions could serve a useful purpose for future public policy discussions.

If there is a significant value in achieving TBTF size, to capture expanded safety net access, banking organizations should be willing to pay more for those acquisitions that would enable them to reach such a size. Moreover, if there are a limited number of suitable acquisitions that would allow an organization to become TBTF and if the organization has to outbid other organizations with similar motivations, the added acquisition premium could provide an indication of the overall magnitude of large bank subsidies. This added premium could also imply that banking organizations see a strong benefit in reaching a threshold size large enough to become a key player in the market and to have control of their own fate (e.g., through increases in market power and political clout).

To test the hypothesis that banking organizations perceive benefits from reaching a TBTF threshold size, we use market pricing data and other financial information from the merger boom period, 1991–2004 (after FDICIA), during which a number of banking organizations greatly expanded their size by acquiring other banking organizations. We find that banks have paid at least $15 billion in added merger premiums for the eight merger deals during 1991–2004 that allowed the organizations to cross the perceived TBTF size threshold of $100 billion in assets. In addition, we conduct an event study to examine how the stock returns of target and acquiring banking organizations fare on or around the merger announcement that would enable the combined organization to become TBTF after the merger.

We find that the combined portfolio returns are significantly positive, suggesting that the market perceived the combination to be value enhancing. Moreover, after controlling for risk factors and economic environments, we find that the combined cumulative abnormal returns to the target and the acquiring banks increase significantly for those mergers that allow the merged firms to become TBTF. Furthermore, our analysis of bond spreads before and after the mergers also indicates that the combined banking organizations face a lower funding cost after becoming TBTF through the merger.

Section 2 provides a review of the relevant literature analyzing large bank subsidies. Section 3 develops an empirical model for measuring the potential TBTF subsidies. Section 4 discusses the empirical results, and the estimated dollar value of the TBTF benefits is presented in Section 5. Finally, the conclusions and policy implications are discussed in Section 6.

2 Literature review—market evidence on potential large bank subsidies

The scope and issue of TBTF have been influenced by a number of legislative and regulatory events. These events have had an important role in determining the existence and potential size of large bank subsidies. Among the most important of these have been the FDIC's financial assistance to prevent the closure of Continental Illinois National Bank in 1984, the passage of FDICIA, the Federal Reserve's intervention in resolving the capital shortage of Long Term Capital Management in 1998, and, most recently, the Federal Reserve's intervention to rescue several large banking and nonbanking financial institutions and to extend access to the discount window to nonbanking institutions for the first time in Federal Reserve history.

In 1984, the Comptroller of the Currency testified before the U.S. Congress on the bailout of Continental Illinois National Bank, implying that the banking agencies did not have the means to close any of the 11 largest multinational banks without the closure

having a significant impact on the U.S. financial system. This testimony thus provided an official acknowledgment of a TBTF policy, and it also indicated the type and size of banking organizations that might be considered TBTF. There have been concerns that regulatory agencies might have gone too far in protecting large banking organizations during the bank failures of the 1980s and 1990s, which led Congress to pass FDICIA in 1991. FDICIA sought to change how regulators could deal with failing banking organizations and, in particular, with TBTF banking organizations, but it obviously failed to eliminate the TBTF protection. Instead, it created a more formal and visible process for a TBTF bailout for some large U.S. banking organizations, as described earlier. It was not evident until the 2007–2009 financial crisis that the TBTF policy continued to exist after passage of FDICIA; several research studies that have examined various aspects of TBTF are summarized below.

2.1 Stock market's reactions to bank mergers and TBTF

Typically, the finance literature has established that the value of the target's stock increases relative to the acquirer's stock value on or around the merger announcement date. However, unlike in typical merger deals, Kane (2000) demonstrates that in a merger that involves very large banks (megabank mergers), stock of a megabank acquirer gains value at the announcement date. These megamerger gains arise in part from improved access to monopoly rents and regulatory subsidies, including lower funding costs and increased market capitalization.[4] Kane (2000) examines banking megamergers during the period 1991–1998 and finds evidence of TBTF benefits even in the post-FDICIA period. The conclusion is that institutions engaging in megamergers hope to become so large or complex that they and their creditors will benefit from FDICIA's systemic-risk exception and that FDICIA may not be sufficient to minimize the TBTF merger incentives, especially since the banking industry has become much more complex and globally involved.

In addition, Schmid and Walter (2006) examine the value of financial conglomerates and whether bigger and/or broader (through economies of scope) is better. They find that, overall, the negative elements present in financial conglomerates outweigh the positive elements, so that financial conglomerates generally trade at a discount relative to specialized financial firms. However, they find no conglomerate discount but a significant positive premium for firms whose total assets' book value is larger than $100 billion. They conclude that the TBTF perception exists.

2.2 Bond market's reactions to bank mergers and TBTF

Penas and Unal (2004) examine changes in adjusted bond returns at acquiring and target banking organizations in response to their merger announcements during the period 1991–1998. They also compare credit spreads (the difference between the bond yield at issue and the yield on comparable U.S. Treasury securities) on bonds issued before and after the merger. They find little change in either bond returns or credit spreads when the acquiring banks are either small or already TBTF (with assets of at least 2% of the banking industry).[5]

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[4] A megamerger is defined as a merger involving one of the 12 largest banks that increases the size of the merged organization by at least half the amount of assets or market capitalization. As of 1998, these banks were Chase Manhattan, Citicorp, NationsBank, J.P. Morgan, Bank of America, First Union, Bankers Trust, Banc One, First Chicago NBD, Fleet Financial Group, Wells Fargo, and Norwest Corp.
[5] Note that the asset size of 2% of the banking industry varies widely during the sample period, from $77 billion in 1991 to $142 billion in 1998.

However, when banks in these size ranges acquire another bank, Penas and Unal find that credit spreads decline significantly after the merger. They attribute this result to the benefits banks derive from reaching or getting closer to the TBTF status and from attaining a higher degree of diversification. These results thus provide evidence that bondholders attach a value to banks becoming TBTF through mergers.

2.3 The Continental Illinois National Bank evidence of TBTF

Using an event study methodology, O'Hara and Shaw (1990) investigate the effects of the Comptroller of the Currency's 1984 announcement that some banking organizations were TBTF. They find that banking organizations deemed to be TBTF experienced a statistically significant positive average abnormal return of 1.3% on the day the Comptroller's announcement was made, with the highest returns going to the riskiest and very largest organizations. In contrast, banking organizations not regarded as TBTF had median returns of −0.22% that day, and the banking organizations that were hurt the most were those just under the TBTF cutoff. These results thus suggest that becoming TBTF is valued by market participants and carries a wealth effect reflective of this perceived favorable treatment.

In addition, Morgan and Stiroh (2005) find that the naming of the TBTF banking organizations by the Office of the Comptroller of the Currency (OCC) in 1984 elevated the bond ratings of those banking organizations (bank holding companies) about one notch compared with non-TBTF organizations, with subordinated note investors showing even more optimism than the rating agencies about future support for TBTF banking organizations. Morgan and Stiroh further discover that this spread and rating relation continues into the 1990s, suggesting that FDICIA had little effect on how debtholders perceived the possibility of support for TBTF banking organizations.[6]

2.4 Other related studies

Brickley and James (1986) analyze how access to deposit insurance affects the common stock returns of financial institutions during a period of financial distress, using savings and loan association (S&L) data from 1976 to 1983 (the pre-FDICIA period). They find that stock returns for financially distressed S&Ls were less sensitive to market movements than other S&Ls. In fact, weaker S&Ls responded to modifications in the now-defunct Federal Saving and Loan Insurance Corporation closure policy as if deposit insurance were a valuable subsidy.

Rime (2005) examines the effect of TBTF on credit ratings, using a sample of large and small banks ($1 billion to $1.1 trillion) in 21 industrialized countries during the period 1999–2003. Moody's and Fitch assign two types of ratings to banks: with and without consideration of other external factors (including a possible external or federal support) that would influence the bank's capacity to repay its debt. Rime finds that the TBTF status of a bank (proxied by size and market share) has a significant, positive impact on the bank's credit rating, controlling for all the other external factors, such as explicit state guarantees. The largest banks in the sample get a rating "bonus" of several notches for being TBTF.

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[6] The rating agencies have acknowledged that they consider a bank's TBTF status when issuing their ratings. According to Moody's, "Institutional support…is a factor taken into account in the analytical mix underpinning banks' debt and deposit ratings… it is very likely that governments in developed markets, having both the capacity and the willingness to act, will continue to offer support to the country's largest financial institutions." See Moody's Investors Service: Global Credit Research, *Rating Methodology (An Analytical Framework for Banks in Developed Markets),* April 1999.

Kwast and Passmore (2000) demonstrate the critical role of bank size in explaining the equity to asset ratio across financial institutions, both before and after the FDICIA. Small bank holding companies (BHCs) hold more capital than large BHCs, and small nonbank financial firms hold more capital compared with small BHCs with equivalent S&P ratings. Safety net subsidy has real value to banking organizations, and it has even greater value to large banks.

Kane (2009) illustrates how financial firms could theoretically use financial engineering to get larger and more complex in order to increase their access to safety net subsidies. Financial firms have incentives to book risky positions in jurisdictions where supervisory loopholes would allow maximum benefits or subsidies. Kane (2009) suggests that government needs resolution powers to control these moral hazard behaviors where shareholders could be completely wiped out.

While several recent studies have found evidence of TBTF even after FDICIA, a few studies found no evidence of TBTF. For example, Angbazo and Saunders (1997) find that the systematic risk estimate for large banking organizations declined after FDICIA was passed, presumably, in part, because of the new incentives FDICIA gave uninsured depositors to monitor banks more closely. Flannery and Sorescu (1996) examine market discipline in the subordinated debt market for banking organizations in the pre- and post-FDICIA period and find some evidence of stronger market discipline (thus, little or no TBTF effect) in the post-FDICIA period. In addition, Ennis and Malek (2005) revisited the negative empirical relation between performance and asset size, which Boyd and Gertler (1994) document as the TBTF subsidy effect based on data in the 1984–1991 (pre-FDICIA) period. Ennis and Malek find no conclusive evidence of different TBTF performance for large (more than $10 billion) vs. small banks, based on data in the 1992–2003 (post-FDICIA) period. Also, Benston et al. (1995) examine the prices that acquirers were willing to bid to acquire target banks during the period 1980–1989 and find little evidence of a motive to enhance the TBTF subsidy. They conclude that most of the mergers in the 1980s were motivated by earnings diversification rather than an attempt to exploit the FDIC insurance subsidy.

2.5 Our objectives and findings

While the TBTF evidence so far has been inconclusive based on the banking literature (depending on the data, time period, and research methodology), the cost of TBTF distortions could be large.[7] The objective of our paper is to shed some light on the perceived TBTF threshold size and the magnitude of the TBTF subsidy. Following the basic model used in Benston et al. (1995), we re-specify the model to incorporate the variables designed to capture TBTF subsidies. In other words, we include additional variables that would separate out the TBTF effects that may have been embedded in other factors in their model, such as the market to book value variables. Interestingly, we find evidence consistent with our TBTF subsidy hypothesis, even when using more recent data in the post-FDICIA period.

3 Our research methodology

Our analysis is divided into two parts. First, we look at the purchase premiums that acquiring banking organizations are willing to offer to buy a target organization and

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[7] See Stern (2009a, b), Stern and Feldman (2004, 2009), and Mishkin (2006) for the various policy measures currently being discussed for reducing potential distortions induced by TBTF.

whether these premiums are higher when an acquisition enables an organization to reach a size that is perceived by the market as being TBTF. Second, we examine how the stock and bond markets react differently to those mergers that brought the combined firms over the TBTF threshold and those that do not.

3.1 Merger purchase premium to become TBTF

The analysis uses merger transactions among publicly traded banking organizations during the period 1991–2004 (post-FDICIA). These mergers and acquisitions, along with information about each transaction, are obtained from Thomson Financial Securities Data (formerly Securities Data Corporation (SDC)). To be included in this study, both the acquiring and target banks must be publicly traded. In all, the data set encompasses 406 merger transactions. Stock market information is obtained from the Center for Research in Security Prices (CRSP) database, and financial data are obtained from BHC Y-9 reports, call reports, and thrift financial reports for the 13 quarters prior to the merger announcement date.

   The basic framework of this study is adapted from that of Benston et al. (1995), which examines bank mergers in the 1980s.[8] They have two competing hypotheses: purchase premiums in bank mergers are driven by earnings diversification (risk-reducing strategy) vs. maximization of the value of the deposit insurance put option (risk-increasing strategy). Our model relates the purchase premiums that acquiring organizations pay to whether the merged organizations will become large enough to reach TBTF status. This is in addition to the various risk factors included in Benston et al. (1995). To the extent that investors place a value on TBTF banks, purchase premiums should be larger when the acquisition will help create a TBTF banking organization, provided adjustments are made for other relevant factors.[9] Our model will relate purchase premiums to the different merger scenarios regarding the TBTF status of the merging organizations while controlling for other characteristics of the acquiring and target banking organizations and for other possible merger motivations as in the following expression:

$$Purchase\ premium = f\ (TBTF\ status,\ Characteristics\ of\ the\ target,\ Characteristics\ of\ the\ acquirer,$$
$$Characteristics\ of\ the\ merger\ deal,\ Other\ control\ factors)$$

$$(1)$$

3.1.1 Purchase premium

We consider two definitions of purchase premiums. First, we follow Benston et al. (1995) model, where the purchase premiums (in $ million) are computed as purchase price less pre-consolidation market value. Specifically, purchase premiums are calculated by taking the difference between the announced offer price for a target organization and the market price of the target's common stock before the merger announcement, times the number of common shares outstanding. The purchase premium is intended to capture the dollar markup over a target's pre-acquisition stock price that the acquiring organization must pay to acquire control of the target. The target's market price is obtained for 5 and 20 business days prior to the merger announcement date. The different dates are meant to capture the

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[8] For a comprehensive literature on bank mergers, see DeYoung et al. (2009).
[9] This assumes that there are a limited number of appropriate targets and that other acquiring banks are also interested in these targets as a means of becoming TBTF.

most current market valuation of the target while acknowledging that many mergers may be anticipated or become known to investors before the announcement date.[10] Second, in addition to examining the dollar purchase premium, we control for the size effect on the bid premium by repeating the analysis but using the merger percentage purchase premium. Specifically, we perform an analysis using the 5-day percent purchase premium of a target bank computed as the difference in the offer price and price per share 5 trading days before the announcement date divided by price per share 5 trading days before the announcement.

3.1.2 TBTF factors/ merger scenarios

We divide bank mergers in the data set into four categories as described below.

Category 1: Both the target and the acquirer are not TBTF in the pre-merger period, but after the merger, their combined assets would reach or exceed the TBTF size threshold. In this case, our hypothesis would be that the acquirer would be willing to pay a higher purchase premium, given the potential benefits that would accrue to becoming TBTF to capture enhanced access to the federal safety net.[11] We construct an indicator variable ($DBECOME_{TBTF}$) to capture this hypothesized relation, and this variable takes on a value of one for each merger that creates a new TBTF organization and zero otherwise. A positive coefficient would be expected for $DBECOME_{TBTF}$ if the acquiring banking organizations are willing to pay more relative to those mergers that do not result in TBTF organizations.

Category 2: The acquirer is already TBTF before the merger takes place, while the target is not. Since the acquirer has already captured the benefits of being TBTF, the merger would not add the same value to the acquirer as in Category 1. In some cases, the target's shareholders and management might even be willing to accept somewhat lower premiums compared with other merger possibilities, particularly if they will be continuing their role in the merged organization and will receive long-run benefits from being part of a TBTF organization. We use the indicator variable, $DACQUIRER_{TBTF}$, to represent this case. This variable takes on the value of one when the acquirer is TBTF, but the target is not, and zero otherwise. It is expected to have a coefficient that is near 0 or possibly negative (as the target may be willing to accept a smaller premium or a discount in order to become part of a TBTF organization).

Category 3: This category is for megamergers where both the acquirer and the target are already TBTF before they merge. Consequently, neither organization is likely to capture significant additional regulatory benefits. Thus, the coefficient of this indicator variable is expected to be near zero. This variable, $DBOTH_{TBTF}$, takes on the value of one when both the acquirer and the target are already TBTF prior to the merger, and zero otherwise. Although the acquirers are already TBTF, there may still be an incentive to further maximize the value of the deposit insurance put option by acquiring a TBTF target whose returns are highly correlated with their own. This impact on the purchase premium is captured by an interactive variable $DBOTH_{TBTF} * COV_{t,a}$, which is a product of $DBOTH_{TBTF}$ and the covariance of the return on assets of the target and acquirer over the 13 quarters before the quarter of the merger announcement date ($COV_{t,a}$).

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[10] See Houston et al. (2001) and DeLong and DeYoung (2007) for information about market anticipation of bank mergers.

[11] The shareholders of the target organization could also experience a gain from becoming TBTF if they become part of the new organization. However, we hypothesize that these stockholders are fully aware of their value to the acquirer and other organizations nearing TBTF status and know that their stock can command a higher premium.

Category 4: Mergers assigned to this category are those in which the acquirer and the target are too small to create a TBTF banking organization after their merger, and this case provides the base case or the omitted variable to which the other merger categories will be compared.

3.1.3 Definitions of TBTF

Before we can assign values to the indicator variables described above, we must specify a definition of the size threshold for TBTF status. Selecting a TBTF size threshold is a conceptual matter. Since TBTF is not officially specified by law or regulatory policy, the judgments of regulators and the market perception could play an important role in determining the TBTF impact. The market (including investors and uninsured depositors) form their own perceptions, and TBTF impacts get incorporated into the market pricing process. We experiment with several different TBTF definitions. An initial guide to defining TBTF comes from the announcement following the Continental Illinois crisis in 1984, when the OCC implied that the largest 11 banks were TBTF. Since then, a number of these organizations have disappeared through mergers with other TBTF firms, thus leaving a smaller population of the "original" TBTF banking organizations. However, with rapid banking consolidation, a significant number of other banking organizations have reached fairly high size thresholds, and a number of these banks might now be judged as TBTF by market participants.

Interestingly, even the OCC's statement at that time led to some confusion in the market, where some took this to mean just the 11 largest national banks, while others thought the 11 largest banks in the country (with either state or national charters). O'Hara and Shaw (1990) find that the group of banks they used to examine market reactions to the OCC's announcement in 1984 was that suggested by the *Wall Street Journal*, and *NOT* the actual list of firms specified by the OCC. O'Hara and Shaw (1990) thus demonstrate that market perceptions of TBTF will influence firm values, even when those perceptions may in fact be different from those of the regulators. It is important to point this out, since no one really knows what the correct threshold size is for banks to become TBTF.

One of our objectives is to estimate a perceived TBTF threshold size based on the observed behavior of market participants during bank mergers of 1991–2004. In this study, we examine different TBTF size thresholds—including total assets' book value of $150 billion and $200 billion and market capitalization thresholds from $15 billion to $30 billion, both unadjusted and adjusted for inflation. We find that a TBTF threshold of $100 billion in total assets (with no inflation adjustment) was perceived by the market as an important criterion for becoming TBTF during the period of the 1990s and early 2000s. Note that the threshold of $100 billion book value of total assets used in this paper also provides a good dividing line for separating organizations with a national scope from regional organizations. Overall, we find that banking organizations seem to be willing to pay extra premiums in order to reach the TBTF threshold.

3.1.4 Control variables

The merger purchase premiums could be influenced by a variety of factors other than the TBTF factors, including both idiosyncratic risk and systematic risk of the target and the acquirer, as listed below.

- Volatility of returns: The premium is related to the value of the target, which is a function of its current market value and underlying riskiness as captured by the variability of profitability. These risk factors of the target are then augmented with

measures of the market value and underlying riskiness of the acquirer. The variances of return on assets for the target and acquirer over the 13 quarters prior to the merger announcement date are represented by $VROA_t$ and $VROA_a$, respectively.

- Covariability of the acquirer's and target's earnings: This is included to proxy for the extent to which the acquisition would increase or reduce the variability of the acquirer's earnings. The covariance of the returns on their assets is represented by $COV_{t,a}$.
- Economies of scale/size effect: The post-merger value of the combined firms also depends on the difficulty of merging the firms and the potential for cost savings. The measure of the potential scale economies and the relative difficulty of absorbing the target into the acquirer are given by the variable *Relative*, which measures the relative size of the two banks' total assets, allowing for other size-related non-TBTF benefits to be controlled for in the regression equation.
- Market-to-book value ratio: The market-to-book ratios for the target ($MVBV_t$) and the acquirer ($MVBV_a$) are included to capture how investors view the target's and acquirer's prospects, respectively.
- Book value capital-to-total asset (leverage) ratio, $CRATIO_a$, is also included to further capture the risk of the acquirer.
- Proxy for future growth: A proxy for the expected growth in the target's market, GTA_t, and the acquirer's market, GTA_a, are included. Both measures are calculated as the growth in the respective firm's total assets over the 13 quarters prior to the merger announcement.
- Systematic risk (non-diversifiable): Target's stock market beta, $BETA_t$, is included to capture its systematic risk in the past year (i.e., 300 business days). A negative coefficient would be expected to reflect smaller premiums for targets with greater systematic risk. The systematic risk measure of the acquirer, $BETA_a$, is also included in the analysis.[12]
- Means of payment: An indicator variable *STOCK* is equal to one if the target was paid at least partially in stock, and equal to zero otherwise.
- Regional impact: We include the regional indicator—*East, West, and Southeast*, with the *Midwest* providing the base for comparison or the omitted indicator variable—to capture the location of the target's headquarters. Targets located in faster growing regions of the country or those headquartered in key financial centers would be expected to command higher purchase premiums. In addition, the combined target assets in the region control for the demand pressure in the specific region.
- Interstate vs. Intrastate: While interstate acquisitions provide a chance to enter new markets and to achieve greater geographic diversification, in-state deals may increase market power and allow greater cost savings through the consolidation of operations and closing of duplicate offices. To test for these possible effects, we define an indicator variable (*Instate*) that takes on the value of one if the target and the acquirer have their headquarters in the same state and zero if they do not. Bank mergers are more likely to generate cost savings when the two banks' existing markets overlap.
- Merger of equals: We include an indicator variable that flags deals that involve the merger of equals, *MOE,* to capture the impact on the purchase premiums when the target and the acquirer are similar in terms of asset size. In a merger of equals, the target and the acquirer tend to have similar bargaining powers, and purchase premiums tend to be affected by their asset size. Wulf (2004) finds that the premiums paid to target shareholders for MOE transactions are also affected by the target CEO's trade-off

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[12] Hasan (1992) finds a significant positive relationship between Beta and credit losses for the sample of 32 publicly traded U.S. banks.

between power and purchase premium. We control for this by interacting the dummy variable MOE with the TBTF factors. The variable *OTHER MOE* is included to capture MOE transactions in the non-TBTF sample, and the variable is equal to one if the transaction is a merger of equals in the non-TBTF sample, zero otherwise.

- Year fixed effects: Year indicator variables *D1991–D2003* are included, with 2004 serving as the base year. Our purchase premium could depend in part on whether the mergers are announced at the beginning or end of the merger wave. The inclusion of annual fixed effects provides a control for merger wave dynamics as well as other possible effects due to the timing of the announcements.

The basic purchase premium specifications used to generate the effects of TBTF mergers are given in Eqs. 2.1 and 2.2 below.

$$
\begin{aligned}
\$\,PREM(5) = {} & a + b_1(VROA_t)(TA_t) + b_2(MVBV_t)(TA_t) + b_3(BETA_t)(TA_t) \\
& + b_4(GTA_t)(TA_t) + b_5(VROA_a)(TA_t) + b_6(MVBV_a)(TA_t) + b_7(BETA_a)(TA_t) \\
& + b_8(GTA_a)(TA_t) + b_9(CRATIO_a)(TA_t) + b_{10}(COV_{t,a})(TA_t) \\
& + b_{11}(Relative)(TA_t) + b_{12}(Instate) + b_{13}(STOCK) + b_{14}(East) + b_{15}(West) \\
& + b_{16}(Southeast) + b_{17}(D1990) + b_{18}(D1991) + \ldots + b_{30}(D2003) + b_{31}(DBECOME_{TBTF}) \\
& + b_{32}(DACQUIRER_{TBTF}) + b_{33}(DBOTH_{TBTF}) + b_{34}(DBOTH_{TBTF}*COV_{t,a}) \\
& + b_{35}(DBECOME_{TBTF})*MOE + b_{36}(DACQUIRER_{TBTF})*MOE \\
& + b_{37}(DBOTH_{TBTF})*MOE + b_{38}(OTHERMOE) + \varepsilon
\end{aligned}
$$

(2.1)

$$
\begin{aligned}
\%\,PREM(5) = {} & a + b_1(VROA_t)(TA_t) + b_2(MVBV_t) + b_3(LOGSIZE_t) + b_4(GTA_t) \\
& + b_5(VROA_a)(TA_t) + b_6(MVBV_a) + b_7(GTA_a) + b_8(CRATIO_a) \\
& + b_9(COV_{t,a}) + b_{10}(Relative) + b_{11}(Instate) + b_{12}(STOCK) + b_{13}(East) + b_{14}(West) \\
& + b_{15}(Southeast) + b_{16}(D1990) + b_{17}(D1991) + \ldots + b_{24}(D2003) \\
& + b_{30}(DBECOME_{TBTF}) + b_{31}(DACQUIRER_{TBTF}) + b_{32}(DBOTH_{TBTF}) \\
& + b_{33}(DBOTH_{TBTF}*COV_{t,a}) + b_{34}(DBECOME_{TBTF})*MOE \\
& + b_{35}(DACQUIRER_{TBTF})*MOE + b_{36}(DBOTH_{TBTF})*MOE \\
& + b_{37}(OTHER\ MOE) + \varepsilon
\end{aligned}
$$

(2.2)

where $LOGSIZE_t$ is the natural logarithm of the book value total assets of the target.

3.2 Reactions from the stock and bond markets

3.2.1 Stock market reactions

While larger merger purchase premiums may be an indicator that the acquirer is willing to pay more to become TBTF, that added value for becoming TBTF as perceived by the acquirer may not be the same as the market perception. What if the market's view is that the acquirer actually paid too much for the TBTF status? In that case, we would be able to observe the negative reaction from the stock market right around the merger announcement date. Therefore, we examine the relation between stock market abnormal returns and the TBTF status, controlling for the various risk characteristics of the target, the acquirer, and other details of the merger deal.

Using stock market returns around the merger announcement date, we examine the cumulative abnormal returns (*CARs*) to the targets, the acquirers, and the combined banking organization. This provides further understanding of the overall impact of TBTF and how the increased TBTF subsidies are divided between the target and the acquirer. We estimate the *CARs* over several event windows for targets, acquirers, and portfolios of the target and the

acquirer around the merger announcement date over the period 1991–2004. We examine the abnormal returns separately for each of the TBTF categories: (1) when both the target and the acquirer are not TBTF in the pre-merger period, but after the merger, their combined assets would reach or exceed the TBTF size threshold; (2) when the acquirer is already TBTF prior to the merger but the target is not; (3) when both the target and the acquirer are already TBTF prior to the merger; and (4) the base case where the target, the acquirer, and the combined firm are smaller than the TBTF threshold. Using standard event study methodology, we compute abnormal returns ($AR_{i,t}$) for bank i for the event day t.[13] The abnormal returns are calculated for each of the targets and for each of the acquirers. We then calculate the overall abnormal returns around the merger announcement date for the combined banking organization (referred to as portfolio abnormal returns). Following Houston and Ryngaert (1994), we define the abnormal portfolio return for each merger as in Eq. 3.1.

$$AR_{P_i,t} = \left[\frac{MV_{T_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right] x AR_{T_i,t} + \left[\frac{MV_{A_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right] x AR_{A_i,t}. \tag{3.1}$$

where $MV_{T,t}$ is the market value of the target firm t days before the merger bid for the target and $MV_{A,t}$ is the market value of the acquirer firm t days before the merger bid for the target.[14] The variance of each merger i's portfolio abnormal return is given in Eq. 3.2:

$$VAR(AR_{P_i}) = \left[\frac{MV_{T_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right]^2 x VAR(AR_{T_i}) + \left[\frac{MV_{A_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right]^2 x VAR(AR_{A_i})$$
$$+ 2x\left[\frac{MV_{T_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right] x \left[\frac{MV_{A_i,t}}{MV_{T_i,t} + MV_{A_i,t}}\right] x \rho_{A,T}(n_{A_i}/n_{T_i}) x \sqrt{[VAR(AR_{A_i}) x VAR(AR_{T_i})]}, \tag{3.2}$$

where $\rho_{A,T,}$ is the estimated correlation coefficient between acquirer and target market model residuals obtained over the estimation period, n_{A_i} is the number of days in the acquirer abnormal return window, and n_{T_i} is the number of days in the target abnormal return window. We then calculate the cumulative abnormal returns (CARs) over the event windows [−1, +1] and [−2, +1] for targets, acquirers, and the combined organization (i.e., portfolio of targets and acquirers) around the merger announcement date. The model specification we use to examine stock market reaction to TBTF mergers is presented in Eq. 4 below, where the dependent variables in these regressions are the cumulative abnormal returns (CARs) over the event windows [−1, +1] and [−2, +1] for the portfolio of targets and acquirers around the merger announcement date and the control factors are as defined earlier. The variable CAR (T1, T2) is the cumulative abnormal return for the event window [T1, T2].

$$
\begin{aligned}
CAR(T1, T2) =\ & a + b_1(VROA_t)(TA_t) + b_2(MVBV_t) + b_3(LOGSIZE_t) + b_4(GTA_t) \\
& + b_5(VROA_a)(TA_t) + b_6(MVBV_a) + b_7(GTA_a) + b_8(CRATIO_a) + b_9(COV_{t,a}) \\
& + b_{10}(Relative) + b_{11}(Instate) + b_{12}(STOCK_t) + b_{13}(East) + b_{14}(West) \\
& + b_{15}(Southeast) + b_{16}(D1990) + b_{17}(D1991) + \ldots + b_{29}(D2003) \\
& + b_{30}(DBECOME_{TBTF}) + b_{31}(DACQUIRER_{TBTF}) + b_{32}(DBOTH_{TBTF}) \\
& + b_{33}(DBOTH_{TBTF}*COV_{t,a}) + b_{34}(DBECOME_{TBTF})*MOE \\
& + b_{35}(DACQUIRER_{TBTF})*MOE + b_{36}(DBOTH_{TBTF})*MOE \\
& + b_{37}(OTHERMOE) + \varepsilon
\end{aligned}
$$
$$(4)$$

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[13] See Bradley et al. (1988) for a detailed discussion of this methodology.
[14] We compute the market values of the target and acquirer 20 days before the announcement date.

3.2.2 Bond market reactions

We examine the cost of funds (bond spreads) faced by the banks during the pre- and post-merger periods. We define bond spread as the yield on the nonconvertible bond minus the yield of a Treasury bond with a similar maturity. We include only nonconvertible bonds in order to ensure that the bonds would be priced by the market according to risks. For each category of TBTF mergers, we use nonconvertible bonds that were issued by the acquiring banks before and after the merger. The bond data and characteristics that we use in this examination are those used in Penas and Unal (2004).[15] Bond spreads, *OfferSpread*, are regressed on the various bond characteristics and the characteristics of the banking organization that issued the bonds, using Eq. 5 below:

$$OfferSpread = c_0 + c_1 MATURITY + c_2 CALL + c_3 SUB + c_4 ISSUESIZE + c_5 MARKET + c_6 VOLATILITY$$
$$+ c_7 FINLEV + c_8 NONPERFORM + c_9 SIZE + c_{10} RATING + c_{11} MERGER + \varepsilon$$

$$(5)$$

where

- *MATURITY* is the natural logarithm of years of maturity
- *CALL* is the natural logarithm of the years with call protection
- *SUB* is a binary variable that is equal to one if the bond is subordinated, zero otherwise.
- *ISSUESIZE* is the natural logarithm of the size of the issue.
- *MARKET* is the difference between the Merrill Lynch index of bond returns for the financial sector, excluding banks, and the 10-year Treasury bond rate.
- *VOLATILITY* is the volatility of the banking organization's equity return one year before the issue date for the bond issued before the merger announcement date and the volatility of the portfolio of the two merging banking organizations for bonds issued after the merger announcement date.
- *FINLEV* is the market value of financial leverage.
- *NONPERFORM* is the percentage of nonperforming loans over total assets.
- *SIZE* is the natural logarithm of the acquirer's pre-merger total assets.
- *RATING* is the bond rating of each bond.
- *MERGER* is a binary variable that is equal to one if issued post-merger, zero otherwise.

In addition to these characteristics, we also include in the regression analysis our three TBTF indicators ($DBECOME_{TBTF}$, $DACQUIRER_{TBTF}$ and $DBOTH_{TBTF}$), each interacted with MERGER to capture the three TBTF cases.

4 The empirical results

Some summary statistics of the data are presented in Table 1, based on all 406 bank mergers that were announced during 1991–2004. The average asset size of the targets is only about one-fourth that of the acquirer, and the purchase premium over the 5-day window is a little smaller than that over the 20-day window, and with smaller standard deviation (see Panel A). The average purchase premiums for those *Become TBTF* mergers are much larger (both in terms of dollar premiums and percent premiums) than the other cases; see Panel B (where the statistics are based on a TBTF threshold of $100 billion in assets). In terms of

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[15] We thank Haluk Unal for sharing these data with us.

Table 1 Descriptive characteristics for 406 bank acquisitions announced during the period 1991–2004

Panel A: Variable definitions and descriptive statistics for the entire sample

Characteristics	Mnemonic	Mean	Median	Maximum	Std. Dev.
Percent purchase premium – 5 days	%PREM5	28.60	26.13	108.00	21.19
Dollar purchase premium – 5 days per $1 million	PREM5	293.59	39.07	12,943.01	1,012.15
Dollar purchase premium – 20 days per $1 million	PREM20	338.65	49.22	15,500.04	1,178.06
Acquirer total assets prior to offer (Million)	TA_a	$37,503	$13,460	$1,057,657	$90,857
Target total assets prior to offer (Million)	TA_t	$8,806	$1,324	$326,563	$30,056
The variance of return on assets of the target over the 13 quarters before the quarter of the merger announcement date x 100,000	$VROA_t$	0.3314	0.0855	12.1060	1.1092
The target's ratio of market value of common stock to the book value of equity in the quarter before the quarter of the merger announcement date	$MVBV_t$	1.7117	1.6190	17.4862	1.0467
The target's Beta (measure of systematic risk) calculated from daily stock returns for the period beginning 300 days prior to the merger, using a one-factor market model	$BETA_t$	0.4743	0.4122	2.0084	0.4722
Growth rate of total assets of the target over the 13 quarters before the quarter of the merger announcement date	GTA_t	0.4434	0.3347	7.9598	0.6351
The variance of return on assets of the acquirer over the 13 quarters before the quarter of the merger announcement date x 100,000	$VROA_a$	0.1772	0.1415	3.7748	0.2410
The acquirer's ratio of market value of common stock to the book value of equity in the quarter before the quarter of the merger announcement date	$MVBV_a$	2.2288	1.9479	37.2474	1.9917
The acquirer's Beta (measure of systematic risk) calculated from daily stock returns for the period beginning 300 days prior to the merger, using a one-factor market model	$BETA_a$	0.7874	0.8143	2.1594	0.4390
Growth rate of total assets of the acquirer over the 13 quarters before the quarter of the merger announcement date	GTA_a	0.8455	0.6167	19.9130	1.3652
The acquirer's book value of capital-to-asset ratio in the quarter prior to the announcement date	$CRATIO_a$	0.0820	0.0809	0.1497	0.0151
Covariance of the return on assets of the target and acquirer over the 13 quarters before the quarter of the merger announcement date	$COV_{t,a}$	0.0033	0.0009	0.0313	0.0070
Target assets / Acquirer assets	*Relative*	0.2967	0.1762	1.7636	0.3453
Indicator variable equal to 1 if the acquirer and the target are in the same state, and zero otherwise	*Instate*	0.4532	0	1	0.4984
An indicator variable equal to 1 if it is a merger of equal, zero otherwise	*MOE*	0.0542	0	1	0.2266

Table 1 (continued)

An indicator variable equal to 1 if more than 50% of the value of the acquisition is paid in stock, zero otherwise	STOCK	0.8300	1	1	0.3760

Panel B: Summary statistics for key variables – comparing across TBTF (larger than $100 billion in assets) groups

	Min	Max	Mean	Std. Dev.	Median
Case 1: Become TBTF					
%PREM5	−1.74	89.27	36.22	29.67	32.03
PREM5	−$94	$5,367	$2,450	$2,045	$2,297
PREM20	$75	$5,798	$2,386	$2,069	$2,001
TA_t	$35,402	$94,820	$63,104	$20,623	$58,198
TA_a	$48,051	$99,066	$73,061	$18,669	$74,318
$BETA_t$	0.7700	2.0084	1.3280	0.3644	1.2971
$BETA_a$	0.9015	1.9350	1.2532	0.3913	1.1420
$VROA_t$	0.0093	1.8163	0.4919	0.6744	0.1701
$VROA_a$	0.0532	0.3243	0.1872	0.1045	0.1731
Case 2: Acquirer already TBTF					
%PREM5	−10.29	48.36	22.99	15.67	21.98
PREM5	−$41	$4,786	$909	$1,205	$353
PREM20	$3	$4,695	$919	$1,234	$465
TA_t	$257	$81,219	$23,574	$24,764	$16,836
TA_a	$104,554	$1,057,657	$211,442	$175,068	$182,557
$BETA_t$	−0.0918	1.9895	0.8118	0.5134	0.7580
$BETA_a$	0.7319	1.7800	1.2298	0.2679	1.2511
$VROA_t$	0.0039	0.9939	0.1312	0.1982	0.0633
$VROA_a$	0.0077	1.0970	0.1604	0.2020	0.1400
Case 3: Both already TBTF					
%PREM5	−1.21	37.61	15.32	13.32	13.29
PREM5	−$737	$12,943	$4,853	$5,025	$4,256
PREM20	$519	$15,500	$6,740	$5,256	$6,277
TA_t	$114,804	$326,563	$214,732	$86,334	$230,972
TA_a	$116,862	$770,912	$418,965	$277,663	$355,274
$BETA_t$	0.9082	1.8066	1.2201	0.3287	1.0905
$BETA_a$	0.9828	1.7616	1.2504	0.2686	1.1862
$VROA_t$	0.0019	0.5211	0.1379	0.1977	0.0479
$VROA_a$	0.0544	0.3329	0.1554	0.0963	0.1397
Case 4: Base case—no TBTF					
%PREM5	−39.62	108.00	29.11	21.39	26.88
PREM5	−$164	$2,705	$119	$302	$35
PREM20	−$64	$3,378	$139	$357	$41
TA_t	$44	$40,136	$2,969	$5,508	$1,141
TA_a	$127	$98,640	$15,975	$17,285	$9,755
$BETA_t$	−1.3245	1.9629	0.4151	0.4318	0.3674
$BETA_a$	−0.2801	2.1594	0.7328	0.4229	0.7633
$VROA_t$	0.0002	12.1060	0.3476	1.1675	0.0866
$VROA_a$	0.0009	3.7748	0.1787	0.2480	0.1429

Table 2 Cross-sectional determinants of the 5-day purchase premium

Independent variables	(1)		(2)	
	Total assets >$100 Bill		Largest 11 banks by total assets	
Intercept	−118.44	−103.50	−182.02	−217.43
	(−0.90)	(−0.76)	(−1.15)	(−1.45)
TBTF variables:				
$DBECOME_{TBTF}$	2760.68	2756.89	1068.60	1110.19
	(3.14)***	(3.04)***	(2.41)**	(2.37)**
$DACQUIRER_{TBTF}$	−41.35	−13.03	67.36	72.56
	(−0.45)	(−0.14)	(0.40)	(0.43)
$DBOTH_{TBTF}$	3252.77	4533.80	1643.72	1866.975
	(2.85)***	(3.53)***	(1.28)	(1.09)
$DBOTH_{TBTF}$ * $COV_{t,a}$	−38.60	−48.70	3.81	3.60
	(−0.80)	(−0.97)	(0.13)	(0.71)
Target's characteristics:				
$VROA_t$	17.42	68.46	375.79	453.24
	(0.08)	(0.34)	(0.75)	(0.71)
$MVBV_t$	−0.0064	−0.0046	−0.0094	−0.0086
	(−1.37)	(−1.06)	(−1.78)*	(−1.24)
$BETA_t$	–	0.0005	–	−0.0044
		(0.08)		(−0.37)
GTA_t	0.0234	0.0224	0.0215	0.0182
	(2.10)**	(1.60)	(1.48)	(1.26)
Acquirer's characteristics:				
$VROA_a$	−1523.88	−901.51	−1223.66	−1242.49
	(−2.59)***	(−1.46)	(−1.59)	(−1.42)
$MVBV_a$	0.0059	0.0020	0.0137	0.0127
	(1.47)	(0.47)	(2.09)**	(1.35)
$BETA_a$	–	−0.0090	–	−0.0008
		(−1.89)*		(−0.09)
GTA_a	−0.0070	−0.0052	−0.0008	−0.0003
	(−1.90)*	(−1.43)	(−0.16)	(−0.07)
$CRATIO_a$	0.0008	0.0009	0.0006	0.0007
	(5.53)***	(4.58)***	(3.05)***	(2.13)**
Target-acquirer relation:				
$COV_{t,a}$	0.2737	0.1551	0.0459	−0.0460
	(0.45)	(0.25)	(0.07)	(−0.07)
Relative	−0.0559	−0.0517	−0.0573	−0.0551
	(−4.65)***	(−4.17)***	(−4.69)***	(−3.724)***
Deal characteristics:				
MOE x $DBECOME_{TBTF}$	−1838.32	−1716.22	−894.87	−944.92
	(−2.79)***	(−2.49)**	(−0.82)	(−0.82)
MOE x $DACQUIRER_{TBTF}$	232.45	154.85	350.21	476.85
	(0.48)	(0.29)	(0.49)	(0.64)

Table 2 (continued)

Independent variables	(1)		(2)	
	Total assets >$100 Bill		Largest 11 banks by total assets	
MOE x DBOTH$_{TBTF}$	−6002.37	−7483.36	−3872.82	−3883.51
	(−4.04)***	(−3.89)***	(−2.97)***	(−2.51)**
OTHER MOE	228.76	174.15	261.96	247.74
	(1.75)*	(1.45)	(1.96)*	(1.80)*
Instate	−17.45	−10.49	−19.13	−20.01
	(−0.55)	(−0.36)	(−0.54)	(−0.56)
STOCK	−23.06	−22.98	−52.88	−55.74
	(−0.54)	(−0.55)	(−1.14)	(−1.18)
R-square (adjusted)	87.49%	87.91%	80.09%	80.03%
F-statistic	81.91***	80.61***	47.54***	44.88***
Observations	406	406	406	406

The dependent variable in these regressions is the 5-day purchase premium of a target bank ($ million) computed as the offer price less pre-consolidation market value 5 trading days before the announcement date, times the number of common shares outstanding of the target. The first column reports estimates using the $100 billion total assets threshold for TBTF institutions. The second column reports estimates using the 11 largest banking organizations as the threshold for TBTF. $DBECOME_{TBTF}$ is an indicator variable equal to one if the acquirer and the target are both not TBTF prior to the merger, but the combined banking firm will become TBTF after the merger, and zero otherwise; $DACQUIRER_{TBTF}$ is an indicator variable equal to one if the acquirer is already TBTF prior to the merger but the target is not TBTF, and zero otherwise; $DBOTH_{TBTF}$ is an indicator variable equal to 1 if both the acquirer and the target are already TBTF prior to the merger, and zero otherwise; $VROA_a$ ($VROA_t$) is the variance of the return on total assets of the acquirer (target) over the 13 quarters prior to the quarter of the merger announcement date; $MVBV_a$ ($MVBV_t$) is the ratio of market value of common stock to the book value of equity of the acquirer (target) in the quarter prior to the quarter of the merger announcement date; $BETA_a$ ($BETA_t$) is the acquirer's (target's) Beta (measure of systematic risk) calculated from daily stock returns for the period beginning 300 days prior to the merger, using the one-factor market model; GTA_a (GTA_t) is the growth rate of total assets of the acquirer (target) over the 13 quarters prior to the quarter of the merger announcement date; TA_t is the book value of total assets of the target; $CRATIO_a$ is the book value of capital-to-asset ratio of the acquirer in the quarter prior to the quarter of the merger announcement date; $COV_{t,a}$ is the covariance of the ROA of the target and acquirer over the 13 quarters prior to the quarter of the merger announcement date; $Relative$ is the ratio of the target's total assets to acquirer's total assets; $Instate$ is an indicator variable equal to one if the acquirer and the target are in the same state, and zero otherwise; $STOCK$ is an indicator variable equal to one if more than 50% of the acquisition value is paid in stock, zero otherwise; MOE is an indicator variable equal to one if it is a merger of equals, and zero otherwise; and $OTHER\ MOE$ is an indicator variable equal to one if the transaction is a merger of equals in the non-TBTF sample, and zero otherwise. Sample Period: 1991–2004 ($N=406$). The year and regional fixed effects are also included in the estimation but are not reported. The t-statistics using heteroscedasticity consistent standard errors are reported in parentheses

***, **, and * denote significance at the 1%, 5%, and 10% level, respectively

risk as measured by the volatility of returns and systematic risk exposure, it is interesting to note that targets in Case 1 (*Become TBTF*) are most risky on average, with the highest return volatility and the highest exposures to systematic risk compared with other cases.

Our analysis finds that the significance of the coefficients is quite similar across the length of window used in calculating the purchase premium. The 5-day window is likely to provide the most conservative measure of the TBTF subsidy because this shorter window is less likely to be affected by other (unrelated) events that occurred prior to the 5-day window and because the impact of the premium may be underestimated due to the market's

Table 3 Cross-sectional determinants of the 20-Day purchase premium

Independent variables	(1)		(2)	
	Total assets >$100 Bill		Largest 11 banks By total assets	
Intercept	−151.15	−128.03	−186.54	−164.68
	(−1.27)	(−1.10)	(−1.13)	(−1.28)
TBTF variables:				
$DBECOME_{TBTF}$	2125.90	2117.17	920.46	920.72
	(2.60)***	(2.47)**	(2.12)**	(2.01)**
$DACQUIRER_{TBTF}$	−100.37	−46.19	14.11	11.42
	(−1.10)	(−0.50)	(0.09)	(0.08)
$DBOTH_{TBTF}$	3698.79	6111.58	2348.60	2594.39
	(3.43)***	(5.40)***	(2.02)**	(1.57)
$DBOTH_{TBTF} * COV_{t,a}$	−121.85	−141.77	−48.88	−48.22
	(−2.94)***	(−3.47)***	(−1.72)*	(−1.67)*
Target's characteristics:				
$VROA_t$	1914.99	293.83	451.97	480.20
	(1.19)	(2.17)**	(1.14)	(1.03)
$MVBV_t$	−0.0100	−0.0065	−0.0118	−0.0110
	(−2.66)***	(−2.40)**	(−2.71)***	(−1.80)*
$BETA_t$	–	0.0006	–	0.0016
		(0.11)		(0.16)
GTA_t	0.0038	0.0013	0.0054	0.0066
	(0.37)	(0.11)	(0.44)	(0.53)
Acquirer's characteristics:				
$VROA_a$	−2778.00	−1613.15	−2222.17	−1999.82
	(−4.07)***	(−2.40)**	(−2.66)***	(−1.97)**
$MVBV_a$	0.0122	0.0047	0.0213	0.0220
	(3.04)***	(1.22)	(3.44)***	(2.36)**
$BETA_a$	–	−0.0170	–	−0.0029
		(−4.34)***		(−0.35)
GTA_a	−0.0067	−0.0034	−0.0005	−0.00005
	(−1.99)**	(−1.07)	(−0.12)	(−0.01)
$CRATIO_a$	0.0008	0.0010	0.0006	0.0006
	(4.94)***	(5.93)***	(2.90)***	(2.19)**
Target-acquirer Relation:				
$COV_{t,a}$	0.3618	0.1317	0.1241	0.1287
	(0.63)	(0.25)	(0.22)	(0.20)
Relative	−0.0381	−0.0299	−0.0509	−0.0509
	(−3.20)***	(−2.70)***	(−4.31)***	(−3.81)***
Deal characteristics:				
MOE x $DBECOME_{TBTF}$	−2753.17	−2518.26	−552.57	−608.78
	(−4.05)***	(−4.13)***	(−0.59)	(−0.61)
MOE x $DACQUIRER_{TBTF}$	1588.39	1449.04	1916.72	1858.48
	(3.06)***	(2.78)***	(2.90)***	(2.72)***

Table 3 (continued)

Independent variables	(1)		(2)	
	Total assets >$100 Bill		Largest 11 banks By total assets	
MOE x DBOTH$_{TBTF}$	−6718.96	−9509.67	−3832.78	−4145.06
	(−5.59)***	(−6.30)***	(−3.71)***	(−2.77)***
OTHER MOE	131.39	26.65	213.24	203.64
	(1.36)	(0.30)	(2.06)**	(1.76)*
Instate	−42.35	−28.96	−37.35	−37.62
	(−1.38)	(−1.09)	(−0.68)	(−1.08)
STOCK	2.17	2.31	−25.24	−25.88
	(0.07)	(0.08)	(−0.68)	(−0.68)
R-square (adjusted)	91.10%	92.34%	87.02%	87.02%
F-statistic	119.43***	132.98***	78.60***	74.36***
Observations	406	406	406	406

The dependent variable in these regressions is the 20-day purchase premium of a target bank ($ million) computed as (the offer price less pre-consolidation market value 20 trading days before the announcement date) times the number of common shares outstanding of the target. The first column reports estimates using the $100 billion total assets threshold for TBTF institutions. The second column reports estimates using the 11 largest banking organizations as the threshold for TBTF. $DBECOME_{TBTF}$ is an indicator variable equal to one if the acquirer and the target are both not TBTF prior to the merger, but the combined banking firm will become TBTF after the merger, and zero otherwise; $DACQUIRER_{TBTF}$ is an indicator variable equal to one if the acquirer is already TBTF prior to the merger but the target is not TBTF, and zero otherwise; $DBOTH_{TBTF}$ is an indicator variable equal to 1 if both the acquirer and the target are already TBTF prior to the merger, and zero otherwise; $VROA_a$ ($VROA_t$) is the variance of the return on total assets of the acquirer (target) over the 13 quarters prior to the quarter of the merger announcement date; $MVBV_a$ ($MVBV_t$) is the ratio of market value of common stock to the book value of equity of the acquirer (target) in the quarter prior to the quarter of the merger announcement date; $BETA_a$ ($BETA_t$) is the acquirer's (target's) Beta (measure of systematic risk) calculated from daily stock returns for the period beginning 300 days prior to the merger, using the one-factor market model; GTA_a (GTA_t) is the growth rate of total assets of the acquirer (target) over the 13 quarters prior to the quarter of the merger announcement date; TA_t is the book value total assets of the target; $CRATIO_a$ is the book value of capital-to-asset ratio of the acquirer in the quarter prior to the quarter of the merger announcement date; $COV_{t,a}$ is the covariance of the ROA of the target and acquirer over the 13 quarters prior to the quarter of the merger announcement date; Relative is the ratio of the target's total assets to acquirer's total assets; Instate is an indicator variable equal to one if the acquirer and the target are in the same state, and zero otherwise; STOCK is an indicator variable equal to one if more than 50% of the acquisition value is paid in stock, zero otherwise; MOE is an indicator variable equal to one if it is a merger of equals, and zero otherwise and OTHER MOE is an indicator variable equal to one if the transaction is a merger of equals in the non-TBTF sample, and zero otherwise. Sample Period: 1991–2004. The year and regional fixed effects are also included in the estimation but are not reported. The t-statistics using heteroscedasticity consistent standard errors are reported in parentheses

***, **, and * denote significance at the 1% level, 5%, and 10% level, respectively

anticipation of the merger, driving the target's share price up. Thus, if significance is found, using the 5-day window would likely underestimate the true impact.

Table 2 presents the results of our regression analysis based on the most conservative 5-day window and for both TBTF definitions, using the dollar merger purchase premium as dependent variables, following Benston et al. (1995) as shown in Eq. 2.1. The results for the 20-day window are presented in Table 3. Column 1 presents the results when using a TBTF size threshold of $100 billion book value of total assets. Column 2 presents the results when using the alternative TBTF threshold size of being one of the top 11 largest banking

Table 4 Cross-sectional determinants of the 5-day % purchase premium

Independent variables	(1) Total assets >$100 Bill	(2) Largest 11 banks by total assets
Intercept	0.0561	0.0353
	(0.46)	(0.28)
TBTF variables:		
$DBECOME_{TBTF}$	0.1914	0.0316
	(1.72)*	(0.75)
$DACQUIRER_{TBTF}$	−0.0458	−0.0299
	(−1.25)	(−0.76)
$DBOTH_{TBTF}$	0.1337	0.0498
	(1.48)	(0.60)
$DBOTH_{TBTF} * COV_{t,a}$	−59.31	−12.51
	(−2.91)***	(−0.80)
Target's characteristics:		
$VROA_t*TA_t$	−0.1006	−0.1057
	(−1.84)*	(−1.90)*
$MVBV_t$	−0.0117	−0.0117
	(−1.10)	(−1.12)
$LOGSIZE_t$	0.0054	0.0064
	(0.59)	(0.67)
GTA_t	−0.0112	−0.0081
	(−0.89)	(−0.63)
Acquirer's characteristics:		
$VROA_a*TA_t$	−0.0849	−0.0116
	(−0.82)	(−0.12)
$MVBV_a$	−0.0045	−0.0042
	(−2.28)**	(−2.13)**
GTA_a	0.0082	0.0096
	(1.09)	(1.36)
$CRATIO_a$	1.1569	1.1599
	(1.44)	(1.44)
Target-acquirer relation:		
$COV_{t,a}$	−1.1239	−1.3536
	(−0.71)	(−0.85)
Relative	0.0460	0.0517
	(1.14)	(1.35)
Deal characteristics:		
$MOE \; x \; DBECOME_{TBTF}$	−0.3884	−0.3539
	(−3.67)***	(−7.17)***
$MOE \; x \; DACQUIRER_{TBTF}$	0.0480	0.0245
	(0.78)	(0.38)
$MOE \; x \; DBOTH_{TBTF}$	−0.4195	−0.2827
	(−4.23)***	(−3.24)***
OTHER MOE	−0.1413	−0.1256
	(−2.70)***	(−2.69)***

Table 4 (continued)

Independent variables	(1) Total assets >$100 Bill	(2) Largest 11 banks by total assets
Instate	0.0082	0.0016
	(0.38)	(0.07)
STOCK	0.0265	0.0281
	(0.98)	(1.04)
R-square (adjusted)	9.88%	8.92%
F-Statistic	2.23***	2.10***
Observations	406	406

The dependent variable in these regressions is the 5-day percent purchase premium of a target bank computed as the difference in the offer price and price per share 5 trading days before the announcement date divided by price per share 5 trading days before the announcement. The first column reports estimates using the $100 billion total assets threshold for TBTF institutions. The second column reports estimates using the 11 largest banking organizations as the threshold for TBTF. $DBECOME_{TBTF}$ is an indicator variable equal to one if the acquirer and the target are both not TBTF prior to the merger, but the combined banking firm will become TBTF after the merger, and zero otherwise; $DACQUIRER_{TBTF}$ is an indicator variable equal to one if the acquirer is already TBTF prior to the merger but the target is not TBTF, and zero otherwise; $DBOTH_{TBTF}$ is an indicator variable equal to 1 if both the acquirer and the target are already TBTF prior to the merger, and zero otherwise; $VROA_a$ ($VROA_t$) is the variance of the return on total assets of the acquirer (target) over the 13 quarters prior to the quarter of the merger announcement date; $MVBV_a$ ($MVBV_t$) is the ratio of market value of common stock to the book value of equity of the acquirer (target) in the quarter prior to the quarter of the merger announcement date; GTA_a (GTA_t) is the growth rate of total assets of the acquirer (target) over the 13 quarters prior to the quarter of the merger announcement date; $LOGSIZE_t$ is the natural logarithm of the book value total assets of the target; $CRATIO_a$ is the book value of capital-to-asset ratio of the acquirer in the quarter prior to the quarter of the merger announcement date; $COV_{t,a}$ is the covariance of the ROA of the target and acquirer over the 13 quarters prior to the quarter of the merger announcement date; *Relative* is the ratio of the target's total assets to acquirer's total assets; *Instate* is an indicator variable equal to one if the acquirer and the target are in the same state, and zero otherwise; *STOCK* is an indicator variable equal to one if more than 50% of the acquisition value is paid in stock, zero otherwise; *MOE* is an indicator variable equal to one if it is a merger of equals, and zero otherwise; and *OTHER MOE* is an indicator variable equal to one if the transaction is a merger of equals in the non-TBTF sample, zero otherwise. Sample Period: 1991–2004. The year and regional fixed effects are also included in the estimation but are not reported. The t-statistics using heteroscedasticity consistent standard errors are reported in parentheses

***, **, and * denote significance at the 1% level, 5%, and 10% level, respectively

organizations in each year. The year indicator variables (*D1991… D2003*) are included in all columns of the table, but the coefficient estimates are not reported here. As expected, the coefficients of $DACQUIRER_{TBTF}$ are not significant, since the acquirer is already TBTF prior to the merger. Of the coefficients on $DBECOME_{TBTF}$ and $DBOTH_{TBTF}$ in Tables 2 and 3 six of the eight are significantly positive, suggesting that acquirers are willing to pay significantly extra premiums (measured in $mill) in mergers that would bring the combined banking firm over the TBTF threshold or when both the target and the acquirer were already TBTF prior to the merger.

Most of the coefficients on the control variables are statistically insignificant in Table 2. The only variables that are consistently significant are the acquirer's capital to asset ratio, $CRATIO_a$, and the ratio of target's assets to acquirer's assets, *Relative*. The coefficients on $CRATIO_a$ are positive and highly significant, suggesting that, on average, well-capitalized acquirers pay larger purchase premiums to acquire a target bank, controlling for the target's characteristics and the acquirer's other risk characteristics. The coefficients on *Relative* are significantly negative, a finding that is consistent with Benston et al. (1995) who argue that

Table 5 Cumulative abnormal returns to target, acquirer, and the combined firm around the merger announcement date

Panel 1: Both targets and acquirers become TBTF after the merger—8 observations

Year	Acquirer		Target
1991	Chemical Banking Corp.		Manufacturers Hanover Corp.
1991	NCNB Corp, Charlotte, NC		C&S/Sovran Corp.
1995	First Union Corp, Charlotte, NC		First Fidelity Bancorporation
1995	NBD Bancorp, Detroit, MI		First Chicago Corp, Illinois
1995	Wells Fargo & Co.		First Interstate Bancorp
1998	Washington Mutual Inc., Seattle		Ahmanson H.F. & Co., Irwindale, CA
1998	Norwest Corp		Wells Fargo
2000	Firstar Corp, Milwaukee		U.S. Bancorp, Minneapolis

Event window	Target	Acquirer	Combined
	14.88	−0.23	5.62
[−1, +1]	(13.56)	(0.58)	(6.93)
	15.37	−0.38	5.69
[−2, +1]	(13.77)	(0.31)	(6.84)

Panel 2: Acquirers are already TBTF prior to the merger – 30 observations

Year	Acquirer	Target
1991	Bank America Corp	Valley Capital Corp
1991	Bank America Corp	Security Pacific
1992	NationsBank Corp	MNC Financial
1994	Bank America Corp	Continental Bank Corp
1994	NationsBank Corp	RHNB Corp
1995	NationsBank Corp	Intercontinental Bank
1995	NationsBank Corp	Bank South Corp
1996	First Union Corp	Home Financial Corp
1996	NationsBank Corp	Charter Bancshares Inc
1996	First Union Corp	Center Financial Corp
1996	NationsBank Corp	Boatmen's Bancshares Inc.
1997	First Union Corp	Signet Banking Corp
1997	First Union Corp	Covenant Bancorp
1997	NationsBank Corp	Barnett Banks
1997	Banc One Corp	First Commerce
1997	First Union Corp	CoreStates Financial Corp
1999	Fleet Financial Group	BankBoston
1999	Wells Fargo	National Bancorp AK
2000	Wells Fargo	First Security Corp
2000	Wells Fargo	First Commerce Bancshares
2000	Wells Fargo	Brenton Banks Inc
2000	Washington Mutual	Bank United Corp
2000	FleetBoston Financial Group	Summit Bancorp Princeton
2001	First Union Corp	Wachovia Corp
2001	Washington Mutual Inc.	Dime Bancorp NY
2002	Citigroup	Golden State Bancorp
2003	Wells Fargo	Pacific Northwest Bancorp
2004	National City Corp	Provident Financial Group

Table 5 (continued)

2004	SunTrust Banks Inc.		National Commerce Financial Corp
2004	Wachovia Corp		SouthTrust Corp

Event window	Target	Acquirer	Combined
	10.58	−1.96	−0.43
[−1, +1]	(18.94)	(−4.98)	(−1.58)
	11.08	−2.12	−0.49
[−2, +1]	(17.77)	(−4.56)	(−1.35)

Panel 3: Both acquirers and targets are TBTF prior to the merger – 6 observations

1995	Chemical Bank		Chase Manhattan Bank
1998	Banc One Corp (Columbus, OH)		First Chicago NBD Corp
1998	NationsBank		BankAmerica Corp
2000	Chase Manhattan Corp		J.P. Morgan & Co
2003	BankAmerica		FleetBoston Financial Corp
2004	J.P. Morgan Chase & Co		Bank One Corp (Chicago)

Event window	Target	Acquirer	Combined
	10.69	−1.72	1.73
[−1, +1]	(10.54)	(−1.94)	(2.18)
	10.46	−2.07	1.45
[−2, +1]	(10.23)	(−2.35)	(1.69)

Panel 4: Non TBTF – 366 observations

Event window	Target	Acquirer	Combined
	13.73	−1.96	0.35
[−1, +1]	(77.35)	(−13.61)	(3.16)
	14.45	−1.91	0.49
[−2, +1]	(70.48)	(−11.41)	(3.87)

This table reports the cumulative abnormal returns (CARs) over the event windows [−1, +1] and [−2, +1] for targets, acquirers, and portfolios of targets and acquirers around the merger announcement date over the period 1991–2004 for the four TBTF cases using the $100 billion total assets threshold. The first panel provides the results for the merger combinations where the acquirer and the target are both not TBTF prior to the merger, but the combined banking firm will become TBTF after the merger; the second panel provides the results for the merger combinations where the acquirer is already TBTF prior to the merger but the target is not TBTF; the third panel provides the results for the merger combinations where both the acquirer and the target are already TBTF prior to the merger; and the fourth panel provides the results for the non-TBTF sample. We use standard event study methodology to compute abnormal return ($AR_{i,t}$) for event day t. See Bradley et al. (1988) for a discussion of this methodology. Following Houston and Ryngaert (1994), we define portfolio abnormal return for each merger as: $AR_{P_i,t} = \left[\frac{MV_{T_i,t}}{MV_{T_i,t}+MV_{A_i,t}}\right] x AR_{T_i,t} + \left[\frac{MV_{A_i,t}}{MV_{T_i,t}+MV_{A_i,t}}\right] x AR_{A_i,t}$. where $MV_{T,t}$ is the market value of the target firm 20 days before the merger bid for the target, $MV_{A,t}$ is the market value of the acquirer firm 20 days before the merger bid for the target. The variance of each merger i's portfolio abnormal return is given below: $VAR(AR_{P_i}) = \left[\frac{MV_{T_i,t}}{MV_{T_i,t}+MV_{A_i,t}}\right]^2 x VAR(AR_{T_i}) + \left[\frac{MV_{A_i,t}}{MV_{T_i,t}+MV_{A_i,t}}\right]^2 x VAR(AR_{A_i}) + 2x \left[\frac{MV_{T_i,t}}{MV_{T_i,t}+MV_{A_i,t}}\right] x \left[\frac{MV_{A_i,t}}{MV_{T_i,t}+MV_{A_i,t}}\right]$ $x\rho_{A,T}(n_{A_i}/n_{T_i})x\sqrt{[VAR(AR_{A_i})xVAR(AR_{T_i})]}$, where $\rho_{A,T}$, is the estimated correlation coefficient between acquirer and target market model residuals obtained over the estimation period, n_{A_i} is the number of days in the acquirer's abnormal return window, and n_{T_i} is the number of days in the target's abnormal return window. The Z-statistics are in parentheses below the abnormal returns

relatively larger targets offer fewer opportunities for new product introduction or fewer opportunities for merger-related efficiencies and, thus, receive smaller purchase premiums. Interestingly, the merger purchase premiums seem to be, on average, smaller for mergers of equal deals, as suggested by the significantly negative coefficients on the interactive variable for the *TBTF* and *MOE* binary variables (although some of the coefficients of this interactive variable are insignificant). This finding is consistent with Brewer et al. (2000) and Brewer et al. (2010), which suggest that mergers involving two banking organizations of equal sizes are more likely to have difficulty in melding their cultures after the merger.

Controlling for the size effect Table 4 presents the results based on the 5-day *percent* purchase premium of a target bank defined as the difference in the offer price and price per share 5 trading days before the announcement date divided by price per share 5 trading days before the announcement. This analysis is meant to control for the possibility that the significant extra purchase premium found in Table 2 may be driven by the effect of bank size, i.e., larger dollar premiums for larger banks. We continue to find evidence (at the 10% significant level) of TBTF premiums even when the premiums are measured as a percentage of the target's market price. The results from Table 4 indicate that the coefficients of $DBECOME_{TBTF}$ remain significantly positive (for a TBTF threshold of $100 billion), suggesting that the acquirers pay significantly larger purchase premiums (as a percent of the target's market price) in mergers that would allow the combined firm to become TBTF. In summary, the additional purchase premium to become TBTF is evident both in dollar terms and as a percent of the target's market price. In contrast, for mergers that involve a target and acquirer that were already TBTF prior to the merger, the extra purchase premiums observed earlier (in terms of dollar purchase premiums) seem to be driven by large asset size. The coefficients of $DBOTH_{TBTF}$ are now insignificant in both columns (regardless of how TBTF is defined).

Interestingly, we find that the coefficients of the cross-product term $DBOTH_{TBTF}$ * $COV_{t,a}$ are significantly negative (see Tables 3 and 4), indicating that the purchase premiums are significantly smaller when a TBTF acquirer merges with a TBTF target whose returns are highly correlated with those of the acquirer. These results suggest that TBTF acquirers do not look to increase their portfolio risk by merging with another TBTF banking organization. In fact, TBTF acquirers would be willing to pay higher purchase premiums to acquire a TBTF target whose return is less correlated with their own return and, therefore, would help improve the portfolio diversification of the combined banking organization. Overall, our findings so far indicate that there are significant extra premium for the mergers that would bring the combined banking firm over the TBTF threshold and to gain increased access to the federal safety net, controlling for other factors that are generally expected to affect the purchase premiums, thus supporting an argument that there are significant benefits from being TBTF.

Stock market reactions This portion of the analysis is designed to further support our earlier results related to the TBTF subsidies. We examine whether the markets view each merger positively or negatively based on the TBTF category of the mergers and controlling for the risk characteristics of the target, the acquirer, and the merger deal. Our overall results, based on the cumulative abnormal stock market returns around the merger, are consistent with our earlier findings. That is, there are significant benefits associated with being TBTF or being systemically important banking organizations.

Table 6 Market reactions to TBTF mergers—cross-sectional determinants of the CARs of the combined firm

Independent variables	(1)		(2)	
	Total assets >$100 Bill		Largest 11 banks by total assets	
	[−1, +1]	[−2, +1]	[−1, +1]	[−2, +1]
Intercept	0.0242	0.0229	0.0202	0.0151
	(0.91)	(0.86)	(0.75)	(0.56)
TBTF variables:				
$DBECOME_{TBTF}$	0.0530	0.0545	0.0435	0.0448
	(1.69)*	(1.72)*	(1.73)*	(1.85)*
$DACQUIRER_{TBTF}$	0.0124	0.0037	0.0079	−0.0022
	(1.22)	(0.35)	(1.11)	(−0.89)
$DBOTH_{TBTF}$	−0.0036	−0.0152	0.0814	0.0755
	(−0.08)	(−0.36)	(1.37)	(1.28)
$DBOTH_{TBTF} * COV_{t,a}$	8.50	13.78	−4.46	−2.13
	(0.68)	(1.15)	(−0.44)	(−0.20)
Target's characteristics:				
$VROA_t*TA_t$	0.0159	0.0160	−0.0004	−0.0035
	(0.52)	(0.51)	(−0.02)	(−0.15)
$MVBV_t$	0.0010	−0.0003	0.0013	−0.0001
	(0.73)	(−0.27)	(1.04)	(−0.05)
$LOGSIZE_t$	−0.0034	−0.0023	−0.0034	−0.0021
	(−1.86)*	(−1.28)	(−1.76)*	(−1.09)
GTA_t	−0.0002	0.0019	−0.0007	0.0013
	(−0.07)	(0.65)	(−0.24)	(0.43)
Acquirer's characteristics:				
$VROA_a*TA_t$	−0.0635	−0.0610	−0.0910	−0.0893
	(−1.23)	(−1.33)	(−1.51)	(−1.54)
$MVBV_a$	−0.0021	−0.0024	−0.0020	−0.0023
	(−1.92)*	(−3.28)***	(−1.99)**	(−3.43)***
GTA_a	−0.0018	−0.0029	−0.0018	−0.0028
	(−1.71)*	(−2.74)***	(−1.70)*	(−2.56)**
$CRATIO_a$	0.0958	0.0640	0.0849	0.0600
	(0.66)	(0.43)	(0.59)	(0.40)
Target-acquirer relation:				
$COV_{t,a}$	0.0570	0.1352	0.0580	0.1328
	(0.24)	(0.53)	(0.24)	(0.52)
Relative	0.0230	0.0257	0.0268	0.0287
	(2.69)***	(2.90)***	(3.25)***	(3.38)***
Deal characteristics:				
$MOE \; x \; DBECOME_{TBTF}$	−0.0050	−0.0179	−0.0068	−0.0212
	(−0.09)	(−0.34)	(−0.25)	(−0.72)
$MOE \; x \; DACQUIRER_{TBTF}$	0.0001	0.0064	0.0075	0.0148
	(0.01)	(0.33)	(0.49)	(1.00)

Table 6 (continued)

Independent variables	(1)		(2)	
	Total assets >$100 Bill		Largest 11 banks by total assets	
MOE x DBOTH_TBTF	0.0910	0.0919	−0.0277	−0.0388
	(1.66)*	(1.78)*	(−0.45)	(−0.63)
OTHER MOE	−0.0054	−0.0013	−0.0101	−0.0049
	(−0.37)	(−0.10)	(−0.71)	(−0.38)
Instate	0.0078	0.0042	0.0080	0.0041
	(1.78)*	(0.94)	(1.89)*	(0.97)
STOCK	−0.0041	0.0012	−0.0048	0.0007
	(−0.76)	(0.22)	(−0.87)	(0.12)
R-square (adjusted)	9.35%	9.21%	9.14%	9.57%
F-statistic	2.16***	2.14***	2.13***	2.19***
Observations	406	406	406	406

The dependent variables in these regressions are the cumulative abnormal returns (CARs) over the event windows [−1, +1] and [−2, +1] for the portfolios of targets and acquirers around the merger announcement date over the period 1991–2004. The first column reports estimates using the $100 billion total assets threshold for TBTF institutions. The second column reports estimates using the 11 largest banking organizations as the threshold for TBTF. $DBECOME_{TBTF}$ is an indicator variable equal to one if the acquirer and the target are both not TBTF prior to the merger, but the combined banking firm will become TBTF after the merger, and zero otherwise; $DACQUIRER_{TBTF}$ is an indicator variable equal to one if the acquirer is already TBTF prior to the merger but the target is not TBTF, and zero otherwise; $DBOTH_{TBTF}$ is an indicator variable equal to 1 if both the acquirer and the target are already TBTF prior to the merger, and zero otherwise; $VROA_a$ ($VROA_t$) is the variance of the return on total assets of the acquirer (target) over the 13 quarters prior to the quarter of the merger announcement date; $MVBV_a$ ($MVBV_t$) is the ratio of market value of common stock to the book value of equity of the acquirer (target) in the quarter prior to the quarter of the merger announcement date; GTA_a (GTA_t) is the growth rate of total assets of the acquirer (target) over the 13 quarters prior to the quarter of the merger announcement date; $LOGSIZE_t$ is the natural logarithm of the book value total assets of the target; $CRATIO_a$ is the book value of capital-to-asset ratio of the acquirer in the quarter prior to the quarter of the merger announcement date; $COV_{t,a}$ is the covariance of the ROA of the target and acquirer over the 13 quarters prior to the quarter of the merger announcement date; Relative is the ratio of the target's total assets to acquirer's total assets; Instate is an indicator variable equal to one if the acquirer and the target are in the same state, and zero otherwise; STOCK is an indicator variable equal to one if more than 50% of the acquisition value is paid in stock, zero otherwise; MOE is an indicator variable equal to one if it is a merger of equals, and zero otherwise; and OTHER MOE is an indicator variable equal to one if the transaction is a merger of equals in the non-TBTF sample, zero otherwise. Sample Period: 1991–2004. The year and regional fixed effects are also included in the estimation but are not reported. The t-statistics using heteroscedasticity consistent standard errors are reported in parentheses

***, **, and * denote significance at the 1%, 5%, and 10% level, respectively

The CARs to targets, acquirers, and the combined firm around the merger announcement date are reported in Table 5, reported by TBTF category (defined based on the $100 billion asset threshold). Our overall results on the abnormal returns to targets and acquirers may be considered typical, since they are consistent with the previous merger literature, which generally finds positive abnormal returns to the targets and negative abnormal returns to the acquirers around merger announcement dates. Specifically, we find that the target's CARs are positive and larger than the acquirer's CARs, which are mostly negative, around the merger announcement date, regardless of the TBTF category. The average CARs to the combined banking firm are largest for mergers that allow the combined firm to become TBTF (Panel 1). The average CARs are negative for mergers that involve a TBTF acquirer

and a non-TBTF target (Panel 2). Note that the variation in these CARs may also be driven by risk factors other than TBTF status.

To control for varying risk characteristics of the targets, the acquirers, and the deal, we conduct a regression analysis of the *CARs* relative to the various TBTF indicator variables (controlling for all risk characteristics), using the specification in Eq. 4; the results are presented in Table 6. The dependent variables in these regressions are the CARs over the event windows [−1, +1] and [−2, +1] for the portfolio of targets and acquirers around the merger announcement date. The coefficients of $DBECOME_{TBTF}$ are significantly positive in both columns, i.e., both when the TBTF threshold is defined based on $100 billion in assets and when using the alternative TBTF definition in Column 2. Overall, we find that the market reacts positively around the merger announcement date for mergers that result in a TBTF organization, thus supporting our earlier findings of TBTF subsidies.

Bond market reactions Our TBTF subsidy argument is supported not only by the CARs evidence from the stock markets but also by the bond market's reactions through the changes in the acquirer's funding cost (due to merger) in the bond market. We examine the

Table 7 Bond market reactions to TBTF mergers

	(1)	(2)
Intercept	−1.2902	−0.2099
	(−1.87)*	(−0.28)
MATURITY	0.4827	0.4980
	(8.15)***	(8.79)***
CALL	−0.3337	−0.3621
	(−4.92)***	(−5.91)***
SUB	0.0664	0.0633
	(1.51)	(1.50)
ISSURESIZE	0.0625	0.0680
	(2.21)**	(2.64)***
MARKET	0.8252	0.8105
	(19.70)***	(19.90)***
VOLATILITY	0.0282	0.0228
	(1.82)*	(1.34)
FINLEV	0.0163	0.0126
	(3.09)***	(2.66)***
NONPERFORM	0.1457	0.1647
	(5.27)***	(5.38)***
SIZE	−0.0626	−0.1326
	(−1.72)*	(−2.86)***
RATING	−0.0110	−0.0038
	(−0.53)	(−0.19)
MERGER	−0.0254	–
	(−0.88)	
*MERGER * DBECOME$_{TBTF}$*	–	−0.1802
		(−3.03)***

Table 7 (continued)

	(1)	(2)
MERGER * DACQUIRER$_{TBTF}$	−	−0.0003
		(−0.01)
MERGER *DBOTH$_{TBTF}$	−	0.1958
		(1.79)*
Number of observations	172	172
R^2	79.79%	81.08%
F-statistic	62.37***	57.38***

This table presents the relation between the offer spread and various bond and characteristics of the banking organization that issued the bonds. The dependent variable is defined as the difference between the yield on the bond minus the yield of a Treasury bond with a similar maturity. MATURITY is the natural logarithm of years of maturity; CALL is the natural logarithm of the years with call protection; SUB is a binary variable that is equal to one if the bond is subordinated, zero otherwise; ISSUESIZE is the natural logarithm of the size of the issue; MARKET is the difference between Merrill Lynch index of bond returns for the financial sector, excluding banks, and the 10-year Treasury bond rate; VOLATILITY is the volatility of the banking organization's equity return one year before the issue date for the bond issued before the merger announcement date and the volatility of the portfolio of the two merging banking organizations for bonds issued after the merger announcement date; FINLEV is the market value of financial leverage; NONPER-FORM is the percentage of non-performing loans over total assets; SIZE is the natural logarithm of the acquirer's pre-merger total assets; RATING is the bond rating of each bond; and MERGER is a binary variable that is equal to one if issued post-merger, zero otherwise. In addition to these characteristics, we also include in the regression analysis our TBTF indicators (DBECOME$_{TBTF}$, DACQUIRER$_{TBTF}$ and DBOTH$_{TBTF}$) each interacted with MERGER to capture the three TBTF cases. The definition of TBTF here is based on $100 billion assets size threshold. DBECOME$_{TBTF}$ is an indicator variable equal to one if the acquirer and the target are both not TBTF prior to the merger, but the combined banking firm will become TBTF after the merger, and zero otherwise; DACQUIRER$_{TBTF}$ is an indicator variable equal to one if the acquirer is already TBTF prior to the merger but the target is not TBTF, and zero otherwise; and DBOTH$_{TBTF}$ is an indicator variable equal to 1 if both the acquirer and the target are already TBTF prior to the merger, and zero otherwise. Robust t-statistics (with White's correction) are reported in parentheses

***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively

relation between the offer spread and the various bond characteristics and the characteristics of the banking organization that issued the bonds, using Eq. 5. The dependent variable is defined as the difference between yield on the bond minus the yield of a Treasury bond with a similar maturity. The results are reported in Table 7, where the robust t-statistics (with White's (1980) correction) are reported in parentheses.

Column 1 presents the regression of bond spreads with bond characteristics, issuer characteristics, and other control factors. In column 2, the three additional indicators are also included in the analysis to capture the TBTF impact on the bond spreads. These variables are the TBTF indicators interacting with the variable MERGER, so that the variable MERGER* DBECOME$_{TBTF}$ is equal to 1 if the acquirer becomes TBTF after the merger, and the observed spreads are for the bonds issued by the acquirer after the merger. We find the coefficient of this variable to be negative and significant, thus providing evidence that the acquirers were able to issue bonds at a significantly lower rate after becoming TBTF (through the merger) than they were able to previously.

As expected, the coefficient of the variable MERGER* DACQUIRER$_{TBTF}$ is not significantly different from zero, indicating that for those acquirers who were already TBTF prior to the merger, the acquisition of a non-TBTF target did not lower their funding cost. The coefficient of MERGER* DBOTH$_{TBTF}$ is positive and weakly significant (almost

missing the 10% level of significance), indicating that, for mergers between two TBTF
banking organizations, there may be an increase in funding cost to the TBTF acquirers,
probably due to the possible complexity of combining two very large institutions with
different corporate cultures. As in Penas and Unal (2004), we find that the bond offer
spread increases with the bond's maturity, the bank's financial leverage, and the bank's
percentage of nonperforming loans. Larger banks pay a lower offer spread in their bond
issues, and the longer is the number of years of call protection, the lower will be the offer
spread. Overall, the analysis of bond spreads before and after becoming TBTF supports our
earlier findings that there are significant subsidies to TBTF banking organizations.

5 How much are the potential TBTF subsidies worth to banks?

Our empirical results suggest that banking organizations are willing to pay an added
premium for mergers that will take them across the TBTF size thresholds. This additional
amount of purchase premium could provide some indication of the overall value of the
benefits an organization will get as it becomes TBTF. While the additional premiums could
also be tied to something other than more favorable regulatory treatment for large banks, we
have controlled for these impacts related to size and economies of scale in the regression
model. Even if we use the most conservative approach of allowing for a broader range of
TBTF benefits, there are reasons why the added premiums we estimated might still
understate the true value of potential subsidies to these large banks.

First, the overall benefits to TBTF banks might be expected to accrue to several parties
other than just the target's shareholders. A substantial portion of the benefits, for instance,
could go to shareholders of the acquiring bank, bondholders, and uninsured depositors. An
acquiring organization and its shareholders are likely to have the bargaining power to retain
many of the TBTF benefits, particularly since this organization may be able to select from a
variety of acquisition targets or combinations of targets in reaching the desired size
threshold. To the extent that this is true, the value of any retained benefits should be
reflected in greater investor interest and a higher share price for the acquirer. The uninsured
depositors and possibly the bondholders of both the target and acquiring organizations
would also anticipate receiving greater protection once they become part of a TBTF
organization, and the value of this protection would be an additional benefit (not accounted
for in our study). Second, another factor that could lead to our under-estimation of the
TBTF benefits is that investors may try to anticipate which acquisition targets would
provide a good stepping stone for organizations trying to become TBTF. These investors
may bid up the price of such targets well in advance of the windows we use to capture the
purchase premiums, thereby leading to lower estimated values for the additional purchase
premiums.[16] Third, our estimation of the total TBTF premium that the acquiring banks have
paid does not include several bank mergers that brought the combined banking organization
over the TBTF threshold, since the mergers occurred prior to the start of our sample period
(several merger parties were already TBTF prior to our sample period). Consequently, while
acquirers may pay greater purchase premiums to capture the expected benefits of TBTF, a
number of factors suggest that these added premiums may only be a starting point or lower
bound for estimating the overall TBTF subsidies.

Table 8 presents our estimated total dollar value of the TBTF premiums for all the
merger deals in our sample, which include bank mergers during 1991–2004. The dollar

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[16] Our results provide some support for the claim that investors may be bidding up the price of targets in advance.

Table 8 Estimated dollar value ($ million) of TBTF premiums

	Becomes TBTF after the merger (Case 1)	Acquirer and target already TBTF prior to the merger (Case 3)
$100 billion assets:	N=8	N=6
20-day premium:		
Offered purchase premium ($ mill)	$23,182.74	$43,849.70
Estimated TBTF premium ($ mill)	$15,341.55	$7,109.36
5-day premium:		
Offered purchase premium ($ mill)	$23,782.17	$31,132.91
Estimated TBTF premium ($ mill)	$23,814.94	$3,714.55
Largest 11 Banks:	N=10	N=8
20-day premium:		
Offered purchase premium ($ mill)	$19,118.73	n/a
Estimated TBTF premium ($ mill)	$11,633.98	n/a
5-day premium:		
Offered purchase premium ($ mill)	$18,545.95	n/a
Estimated TBTF premium ($ mill)	$14,028.08	n/a

The estimated TBTF premiums are calculated based on the coefficient estimates generated from estimation of our purchase premium equations for both the 5- and 20-day windows. The estimated premiums are inflation adjusted to 2005 dollar value. We compute the TBTF subsidy only if the coefficients on $DBECOME_{TBTF}$, $DACQUIRER_{TBTF}$, or $DBOTH_{TBTF}$ are significant at the 10% level or higher and use the coefficients on related variables that are significant at the 10% level or higher. We calculate the TBTF premiums that are associated with the coefficients on the following variables: $DBECOME_{TBTF}$, $DBECOME_{TBTF} * MOE_t$, $DACQUIRER_{TBTF}$, $DBOTH_{TBTF}$, $DBOTH_{TBTF} * MOE_t$, and $DBOTH_{TBTF} * COV_{t,a}$ for each of the merger deals

value of the TBTF premium is calculated for each TBTF category, based on our TBTF thresholds: $100 billion in total assets or being one of the 11 largest banking organizations. The estimated TBTF premiums are calculated based on the coefficient estimates generated from estimation of our purchase premium equations for both the 5- and 20-day windows, using the specifications in Eq. 2.1. We use only those coefficients that are significant at the 10% level or higher. We calculate the TBTF premiums that are associated with the coefficients on the following variables: $DBECOME_{TBTF}$, $DBECOME_{TBTF} * MOE_t$, $DACQUIRER_{TBTF}$, $DBOTH_{TBTF}$, $DBOTH_{TBTF} * MOE_t$, and $DBOTH_{TBTF} * COV_{t,a}$ for each of the merger deals.

We find that for mergers that allow the combined firm to cross the TBTF threshold more than half of the purchase premiums paid are associated with the TBTF subsidy. We estimate that during the period 1991–2004, acquirers paid at least $15.3 billion in extra TBTF premiums to the targets in the eight merger cases that brought the combined firm over the $100 billion TBTF threshold. It is important to stress that these estimated TBTF premiums are only a fraction of the total TBTF benefits captured by the banking organizations. The estimated TBTF premiums represent the portion of overall TBTF value that was given to shareholders of the target bank; by no means do they represent the total TBTF benefits that are likely to be captured by other parties, including the shareholders, bondholders, and other creditors of the targets and the acquirers.

Overall, our results indicate that significant benefits accrue to TBTF banking organizations. It is important to point out that these estimated TBTF benefits represent a lower bound estimate of the actual TBTF subsidies, since our calculation could not include

the benefits that have been captured by some banking organizations, such as Bank of America Corporation and Citigroup, which were already TBTF prior to our study period. In addition, our calculated TBTF benefits are those that accrue to the target's shareholders only; they do not include benefits that accrue to shareholders of the acquirers, bondholders, and other creditors. The true value of the potential TBTF benefits, therefore, is expected to be significantly larger than the estimates presented in this paper.

6 Conclusions and policy implications

The special treatment provided to TBTF institutions during the financial crisis that started in mid-2007 has raised concerns among analysts and legislators about the consequences for the overall stability and riskiness of the financial system. Stern (2009a) testified before the Committee on Banking, Housing, and Urban Affairs that:

> "TBTF arises when the uninsured creditors of systemically important financial institutions expect government protection from loss … If creditors continue to expect special protection, the moral hazard of government protection will continue. That is, creditors will continue to underprice the risk-taking of these financial institutions, overfund them, and fail to provide effective market discipline. Facing prices that are too low, systemically important firms will take on too much risk. Excessive risk-taking squanders valuable economic resources and, in the extreme, leads to financial crises that impose substantial losses on taxpayers."

It was unclear after FDICIA and before the financial crisis whether some banking organizations were TBTF. It is now evident that being viewed by the market (and regulators) as being TBTF, being too interconnected, or being systemically important could add significant value to banking firms. Since there has never been an official published list or definition of TBTF banks, the value of potential TBTF benefits is determined by the market's perception. This paper attempts to examine the market's perception of the TBTF threshold and the potential value of subsidies provided to TBTF banking institutions.

Our empirical results are consistent with the hypothesis that large banking organizations obtain advantages not available to other organizations. These advantages may include TBTF subsidies, since they are likely to gain favor with uninsured bank creditors and other market participants, operate with lower regulatory costs, and have greater chances of receiving regulatory forbearance.[17] We find that banking organizations are willing to pay an added premium for mergers that will put them over a TBTF threshold. This added premium amounted to an estimated $15 billion to $23 billion extra that eight banking organizations in our data set were willing to pay for acquisitions that enabled them to become TBTF (crossing the threshold of $100 billion in book value of total assets).

While these amounts are large, they are likely to underestimate the total value of the benefits that accrue to large banks. Organizations seeking to obtain TBTF benefits are not likely to be forced by the marketplace to pass on anywhere near the full value of these benefits to the shareholders of their acquisition targets. In addition, these estimated benefits apply only to the organizations that became TBTF during our study period. Benefits already obtained by banking organizations that became TBTF prior to our sample period are not

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[17] For further discussion on regulatory forbearance when the banking system is weak and when there are "too many to fail," see Brown and Dinc (2009) and Acharya and Yorulmazer (2007).

included in our calculations of TBTF benefits. As a result, the total subsidy value to TBTF banks could easily far exceed our estimates.

These estimates provide an aggregate measure of the benefits accruing to large banking organizations from exceeding a TBTF threshold and do not indicate the relative contribution of any particular regulatory advantage or individual policy. By themselves, our results do not point out which particular policy directions would be most effective in addressing the benefits that large banks may obtain once they become TBTF. However, our estimates of the benefits from exceeding a TBTF threshold appear large enough to cause increasing concerns as the megamerger trend continues in the U.S. banking industry. These trends could hinder the efficient allocation of financial resources across different sizes of institutions and, in turn, their customers and the overall macro-economy.[18]

Should these TBTF banking institutions be required to pay for the privilege? If so, should they be required to hold more capital (and contingent capital that would be converted to equity capital when needed) and/or be assessed higher FDIC insurance premiums than other banks? Since these payments could not be assessed to TBTF and systemically important banking organizations under the current regime of constructive ambiguity, should the TBTF list be made publicly available? Should systemically important nonbank organizations also be assessed similar payments? These are policy questions for further research. Ben Bernanke (2010), current chairman of the Board of Governors of the Federal Reserve System, pointed out that:

> "If the crisis has a single lesson, it is that the too-big-to-fail problem must be solved. Simple declarations that the government will not assist firms in the future, or restrictions that make providing assistance more difficult, will not be credible on their own…"

The Dodd-Frank Act (DFA) of 2010 was passed with the intention to end TBTF, which was considered one of the causes of U.S. financial instability, by discouraging banks' excessive growth and complexity through capital requirements, liquidity restrictions, and risk management.[19] Banks or bank holding companies with assets greater than $50 billion are considered systemically important under the DFA. The Financial Stability Oversight Council, created by the DFA, may require large banks to divest some of their holdings if their failures would pose a systemic risk to the U.S. financial system. In addition, some nonbank financial institutions may be supervised by the Federal Reserve if they are sufficiently large and interconnected to be considered systemically important. The DFA has (unintentionally) provided an official asset size threshold for becoming systemically important or TBTF, i.e., the $50 billion threshold that is half the asset size considered to be TBTF in our study.

Our empirical findings suggest that there are reasons for us to be concerned and cautious as the number of assisted mergers between weak TBTF financial institutions continues to grow in the wake of the financial crisis that started in mid-2007, resulting in TBTF banking organizations that are becoming even bigger than before the start of the crisis. In addition, a few of the recent assisted mergers were between TBTF banks and nonbank financial institutions, thus extending the federal safety net related to TBTF to cover those outside the commercial banking system. Furthermore,

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[18] See Hoenig (1999) and Carow et al. (2006) for further discussion.

[19] See Blinder (2009), Stern (2009a, b), Stern and Feldman (2009), Flannery (2000), Bruni and Paterno (1995), and Kaufman (1991b) for further discussion on potential effective policy reforms. Rosengren (2000) presents an alternative view, suggesting that government prudential supervision should utilize market discipline rather than using taxes or moral suasion.

the DFA has officially included nonbank financial firms in the TBTF list, since some large nonbank institutions will now be under the same regulatory and supervisory umbrella as other TBTF banking institutions. We are hopeful that the additional cost of becoming TBTF, as imposed under the DFA, will be effective and not outweighed by the TBTF subsidy.

References

Acharya V, Yorulmazer T (2007) Too many to fail – an analysis of time-inconsistency in bank closure policies. J Financ Intermediation 16:1–31

Angbazo L, Saunders A (1997) "The effect of TBTF deregulation on bank cost of funds," Wharton Financial Institutions Center: Working Paper 97–25

Benston G, Hunter WC, Wall L (1995) Motivations for bank mergers and acquisitions: enhancing the deposit insurance put option versus earnings diversification. J Money Credit Bank 27:777–788

Bernanke B (2010) "Causes of the recent financial and economic crisis," Speech before the Financial Crisis Inquiry Commission, Washington, D.C., September 2

Blinder A (2009) "It's broke, let's fix it: rethinking financial regulation," Working paper: Princeton University, presented at the Federal Reserve Bank of Boston Conference, October 23

Boyd J, Gertler M (1994) "The role of large banks in the recent U.S. banking crisis," Federal Reserve Bank of Minneapolis Quarterly Review (Winter), 319–368

Bradley M, Desai A, Kim EH (1988) Synergistic gains from corporate acquisitions and their division between the stockholders of target and acquiring firms. J Financ Econ 21:3–40

Brewer E, Jackson W, Jagtiani J (2010) Corporate Governance Structure and Mergers, Working paper, Federal Reserve Bank of Philadelphia WP# 10-26

Brewer E, Jackson W, Jagtiani J, Nguyen T (2000) Bank Mergers in the 1990s. Federal Reserve Bank of Chicago Economics Perspectives (March), 2-23

Brickley J, James C (1986) Access to deposit insurance, insolvency rules and the stock returns of financial institutions. J Financ Econ 16:345–371

Brown C, Dinc IS (2009) Too many to fail? Evidence of regulatory forbearance when the banking sector is weak. MIT-Sloan Working Paper, February 7

Bruni F, Paterno F (1995) Market discipline of banks' riskiness: a study of selected issues. J Financ Serv Res 9:303–325

Carow K, Kane E, Narayanan R (2006) How have borrowers fared in banking megamergers? J Money Credit Bank 38:821–836

DeLong G, DeYoung R (2007) Learning by observing: information spillovers in the execution and valuation of commercial bank M&As. J Finance 62:181–217

DeYoung R, Evanoff D, Molyneux P (2009) Mergers and acquisitions of financial institutions: a review of the post-2000 literature. J Financ Serv Res 36:87–110

Ennis HM, Malek HS (2005) Bank risk of failure and the too-big-to-fail policy. Federal Reserve Bank of Richmond Economic Quarterly 91:21–44

Flannery M (2000) Modernizing financial regulation: the relation between interbank transactions and supervisory reform. J Financ Serv Res 17:101–116

Flannery M, Sorescu SM (1996) Evidence of bank market discipline in subordinated debenture yields: 1983–1991. J Finance 51:1347–1377

Greenspan A (2001) "The financial safety net, Chicago: Federal Reserve Bank of Chicago," May 2001, 1–8

Hasan K (1992) The market's perception of the riskiness of large U.S. bank commercial letters of credit. J Financ Serv Res 6:207–221

Hoenig T (1999) Financial industry megamergers and policy challenges, Federal Reserve Bank of Kansas City. Econ Rev 84:7–13

Houston J, Ryngaert M (1994) The overall gains from large bank mergers. J Bank Finance 18:1155–1176

Houston J, James C, Ryngaert M (2001) Where do merger gains come from? bank mergers from the perspective of insiders and outsiders. J Financ Econ 60:285–331

Kane E (2000) Incentives for banking megamergers: what motives might regulators infer from event-study evidence? J Money Credit Bank 32:671–701

Kane E (2009) Extracting nontransparent safety net subsidies by strategically expanding and contracting a financial institution's accounting balance sheet. J Financ Serv Res 36:161–168

Kaufman G (1990) "Are Some Banks Too Large to Fail? Myth and Reality." Contemporary Policy Issues, October 1990, pp 1–14

Kaufman G (1991a) "Too Large to Fail, Too Costly to Continue." Consumer Finance Law Quarterly Report, Spring

Kaufman G (1991b) Capital in banking: past, present and future. J Financ Serv Res 5:385–402

Kaufman G (2002) "Too big to fail in banking: what remains." Quarterly Review of Economics and Finance (Summer):423–436

Kwast M, Passmore W (2000) The subsidy provided by the federal safety net: theory and evidence. J Financ Serv Res 17:125–145

Macey J (2008) "Brave new fed – a commentary by Jonathan Macey," Yale Law School: Commentary, March 31

Mishkin F (2006) How big a problem is too big to fail? J Econ Lit 44:988–1004

Morgan D, Stiroh K (2005) "Too big to fail after all these years," Federal Reserve Bank of New York, Staff Report No. 220 (September)

O'Hara M, Shaw W (1990) Deposit insurance and wealth effects: the value of being too big to fail. J Finance 45:1587–1600

Penas MF, Unal H (2004) Gains in bank mergers: evidence from the bond markets. J Financ Econ 74:140–179

Plosser CI (2008) "Financial econometrics, financial innovation, and financial stability," For the Inaugural Conference of the Society for Financial Econometrics, New York University Stern School of Business, New York, NY, June 5

Rime B (2005) "Do too-big-to-fail expectations boost large banks' issuer ratings?" Swiss National Banks, Systemic Stability Section: Working Paper (May 9)

Rosengren E (2000) Modernizing financial regulation: implications for bank supervision. J Financ Serv Res 17:117–123

Schmid MM, Walter I (2006) "Do financial conglomerates create or destroy economic value?" Working Paper, New York University Stern School of Business, September

Stern G (2009a) "Addressing the too-big-to-fail problem," Statement presented before the Committee on Banking, Housing, and Urban Affairs, U.S. Senate, Washington, D.C., May 6

Stern G (2009b) "Better late than never: addressing too-big-to-fail," Brookings Institution, Washington, D.C., March 31

Stern G, Feldman R (2004) Too big to fail: the hazards of bank bailouts. Brookings Institution, Washington, D.C

Stern G, Feldman R (2009) "Addressing TBTF by Shrinking financial institutions: an initial assessment," Federal Reserve Bank of Minneapolis: The Region, June, 8–13

White H (1980) A heteroscadasticity consistent covariance matrix estimator and a direct test for heteroscadasticity. Econometrica 48:203–223

Wulf J (2004) Do CEOs in mergers trade power for premium? Evidence from mergers of equals. J Law Econ Organ 20:60–101