Deposit Rate Advantages at the Largest Banks *

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Abstract

We estimate differences in funding costs between the largest banks and the rest of the industry. Using deposit rates offered at the branch level, we eliminate many non-risk related differences between banks. We document significant and persistent pricing advantages at the largest banks for comparable deposit products and deposit risk premiums. Between 2006 and 2008, the risk premium paid by the largest banks was 36 bps lower than at other banks under the baseline estimate after controlling for common risk variables. These findings are consistent with an economically significant too-big-to-fail subsidy paid to the largest banks through lower risk premiums on uninsured deposits.

Keywords: *Too big to fail; Risk premium; Deposits; Interest rates*

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1 Introduction

This paper provides three pieces of evidence informative to the public discourse on the differential competitive environment faced by the largest banks.[1] First, we show that the largest banks tend to offer lower interest rates on money market deposit accounts (MMDAs, hereafter). Second, we show that the market demands a lower premium for risky products from the largest banks. Finally, we show that, even after controlling for common balance sheet measures of risk, the largest banks receive a discount on risky deposits of approximately 36 bps relative to smaller banks. Our method and a battery of supporting tests rule out many candidate explanations for this observed discount. The evidence provided here is consistent with implicit or perceived government support of "too-big-to-fail" (TBTF) institutions from 2006-2008.

Given the dominant role of deposits in funding both large and small banks, the analysis of pricing advantages based on bank size would be incomplete without a careful consideration of deposits. However, the examination of comparable deposit rate differences is currently absent from the literature. Instead, existing papers compare bond (e.g. Penas and Ünal (2004)), equity (e.g. Gandhi and Lustig (2010)), or CDS spreads (e.g. Schweikhard and Tsesmelidakis (2012)) between large and small banks. Deposits are by far the largest source of funds for banks; much larger than equity or bonds. Pre-crisis (year-end 2006) deposits represented 65% of total assets for banks larger than $100 billion and 81% for the rest of the industry.[2] Similar (though senior) to subordinated debt, uninsured depositors face a potential loss in the event of failure, and therefore should require less compensation for risk from a bank they feel will likely receive government support. This paper establishes a statistically and economically significant large bank pricing advantage in deposit rates and deposit risk premiums.

Importantly, some of the measured differences in the cost of funding cannot be

[1] Throughout the paper, *bank* refers is used to refer to a depository institution (including thrifts) consolidated to the regulatory high holder. In the baseline definition, we use $200 billion in assets as the large bank threshold, though alternative thresholds are explored. See Subsection 3.1 for a discussion.

[2] Source: Call Report data

attributed to either differences in common balance sheet measures of risk or many often cited non-risk related factors, like a convenient network of branch locations, additional services, alternative funding options, differences in loan opportunities, or branding. Like other studies estimating a large bank benefit, we cannot directly test a causal hypothesis of TBTF as the source of these differences. Still, such a gap provides evidence consistent with an economically significant TBTF subsidy paid to the largest banks.[3] We find a 36 bps large bank deposit risk premium advantage in the baseline estimate, prior to the 2008 financial crisis. Of course, any risk premium advantage should be present in all of the bank's sources of funding. Had these banks received such preferential risk pricing on all of their uninsured funding, this advantage would have accounted for 70% of their pre-tax profits.

We leverage a largely unexplored dataset to add to existing papers that attempt to quantify a large bank discount. Further, we examine differences in interest rates offered on MMDAs with a minimum deposit of \$100K (hereafter, \$100K MMDAs and likewise for accounts with \$25K and \$10K deposit minima) versus \$25K MMDAs at a branch level. Using the within-branch differences to obtain a bank risk premium measure allows us to account for non-risk factors that other studies neglect. Prior to the fourth quarter of 2008, the major difference between these two products (other than the minimum balance) was that one was entirely insured, and therefore riskless, while the other was only partially insured. The differencing approach then removes many important non-risk factors that are constant between these two deposit products within the same bank, leaving a more isolated measure of the risk premium.

We exploit a statutory change to the insured deposit limit that lends additional support to the test for a large bank risk premium advantage. Under the *Emergency*

[3]Descriptions of observationally similar phenomena have been referred to variously as "too-systemically-important-to-fail" (Ueda and di Mauro (2012)), "too-complex-to-fail" (Herring (2002)), "too-difficult-to-fail-and-unwind" (Kane (2009)), and probably many others. For the purposes of this paper, we harbor no preference for one description over another. Here, we test for differences based on size as measured by assets, though this is likely correlated with measures of systemic importance or complexity.

Economic Stabilization Act (EESA) passed in the fourth quarter of 2008, the insurance limit covered interest and principal up to \$250K, thereby encompassing the \$100K accounts used in our construction of the risk premium. Consistent with the interpretation that the differences between the largest banks' and other banks' measured risk premiums can be attributed to risk disparities, the difference decreased markedly as the \$100K MMDAs became insured. The change in the measured risk premium advantage for large banks concurrent with this policy change significantly weakens many alternative non-risk explanations of the discount.

First, we examine differences in deposit interest rates between the largest banks and all other banks. We find that large banks pay a lower interest rate than other banks for comparable deposit products. In particular, we examine \$100K MMDAs between the first quarter of 2005 and the third quarter of 2010.[4] The interest rate that the largest banks offered on \$100K MMDAs was between 10 and 50 bps less than the rate offered by other banks. Since the government did not guarantee the interest on these deposits or principal over \$100K, any differences between banks in price will contain information on differences in perceived risk across institutions, possibly including expectations regarding TBTF policies.

While large banks may pay less than smaller banks for \$100K MMDAs on average, this difference is not necessarily attributable solely to risk. During the sample period, the large banks also paid 10 to 50 bps less for \$25K MMDAs than their smaller bank counterparts. This is in spite of the fact that the default risks associated with these deposits were identical, as the FDIC explicitly insures the entirety of these accounts for all banks up to the standard maximum deposit insurance amount (SMDIA). Therefore, this substantial difference must be attributable to any number of other factors unrelated to risk. Larger banks may then attain a lower cost of funding through these channels, even absent any TBTF subsidy. For example, consumers may value the geographic

[4]The particular analyses do not always use the full time span. Each subsection gives the beginning and end of the period used in the relevant analysis.

footprint at a large bank and would be willing to receive a lower interest rate on their accounts, *ceteris paribus*. Alternatively, larger banks likely face a different competitive environment than smaller banks, also enabling them to access funds at lower rates (see Park and Pennacchi (2009)). Either of these explanations forms an economies-of-scale type argument and demonstrate that bank funding costs may differ even when risk is held constant.

To isolate the risk premium, we examine the difference in interest rates offered for $100K MMDAs versus $25K MMDAs. Under an assumption that non-risk factors are constant between these two deposit products within the same bank, all that remains after differencing is the risk premium. Absent controls, we find that the largest banks paid a risk premium of up to 45 bps less than smaller banks prior to EESA. However, even the difference in risk premiums need not be due to a TBTF subsidy. Indeed, bank risk affects the prices they offer for deposit products. Even so, many differences in risk should be measurable from banks' financial reports. Using common balance sheet measures of risk, we re-examine the differences in banks' risk premiums.

We first run cross-sectional regressions to allow for a time varying risk premium gap. This analysis shows that the gap is statistically significant at a 90% level in five of the six quarters immediately preceding the failure of Lehman. The cross-sectional analysis also suggests that risk at large banks was not priced much differently from risk at other banks in the data prior to 2006. Moreover, the cross-sectional analysis suggests that a $100 billion threshold is too low to find meaningful pricing discrepancies across banks. Rather, systematic price differences are more evident using a higher threshold of $200 billion (the baseline). Under this specification, there are no banks in our sample between $200 and $500 billion prior to the crisis, so that this threshold is equivalent to a $500 billion threshold.[5] Nonetheless, we refer to this as a "$200 billion" threshold.

We then turn to a panel analysis to exploit the time dimension of the data set.

[5]This is in part a consequence of the absence of Washington Mutual and non-retail banks Bank of New York and State Street in the data. In addition, the baseline analysis excludes US Bancorp, as the bank posts a zero premium in every period in the data. See Section 5 for more details.

Fixing the banks we designate as large, the baseline estimate of the risk premium gap between those banks and others prior to the passage of the EESA is 36 bps and statistically significant. At the end of the year 2006, prior to the financial crisis, this discount translated to a $7.3 billion annual advantage for the largest banks on uninsured deposits alone. As a point of comparison, these banks' aggregate net income before taxes was $22 billion with aggregate interest expense of $42 billion during 2006. This implies that approximately 30% of these banks' pre-tax profit was a direct result of their funding advantage on uninsured deposits. Should the banks enjoy a similar risk premium on all of its consolidated uninsured funds, then the benefit would have been approximately $15 billion, roughly 70% of pre-tax profit. Given that $100K MMDAs are insured up to the deposit minimum, the estimates reflect the risk premium from the perspective of partially insured accounts. Thus, the results presented here may be considered conservative estimates of the true risk premium gap.

In robustness analysis, we exploit the geographical richness of the data. In particular, large and small banks tend to operate in different geographical markets. Therefore, one might expect that differences in $25K MMDA and $100K MMDA market characteristics across these regions could confound the baseline analysis. To address these concerns, we run our analysis aggregating bank-quarters to the MSA level rather than nationally and allow for MSA dummies. The magnitude of the large bank pricing advantage remains statistically significant (at 19 bps) from 2006-2008 and drops to an insignificant 1 bp disadvantage after the increase in the SMDIA. As a further control on market area differences, we also restrict attention only to single metropolitan areas for the five largest MSAs. We find that the results hold in four of the five largest areas (we report only NY and the lone exception is Chicago). Thus, accounting for geographic discrepancies between large and small banks does not eliminate our result.

The remainder of the paper is organized as follows. We review some of the existing literature and techniques for estimating the TBTF premium in Section 2. Next, in Section 3, provide an overview of some important institutional information surrounding our estimation. Section 4 describes the empirical model and technique. Section 5 describes the data. We present the empirical results in Section 6 and conclude in Section 7.

2 Literature Review

There have been a variety of methods used in the literature to measure size-related bank funding cost differences. The simplest way to compare the funding costs at large banks to others is to consider the average cost of funds (for examples, see Baker and McArthur (2009) and Li, Qu, and Zhang (2011); Acharya and Mora (2011) use the average cost of deposits). However, using the average cost of funds has a number of important limitations. First, it ignores differences in funding schemes across banks. Second, banks may differ in funding costs for many reasons that a simple average inherently and completely neglects. On the other hand, we use relatively standardized deposit products (MMDAs) and difference out many branch and bank specific non-risk factors to obtain and isolate a risk premium.

Another strand of literature measures TBTF by relying on credit agency ratings for banks. With this method, Acharya, Anginer, and Warburton (2013) estimate the funding cost advantage between 1990 and 2010 to be around 28 bps. Noss and Sowerbutts (2012) estimate the implicit subsidy to UK in 2009 banks to be in excess of $120 billion using a similar credit ratings approach. In either of the preceding examples, the identification strategy relies entirely on credit rating agencies' subjective determinations of both the targets and the extent of government support.

Alternatively, Hovakimian, Kane, and Laeven (2012) use market data modeling the systemic risk benefit of a particular bank as its contribution to a put option on the portfolio of aggregate bank assets. However, this technique is inherently backward looking, as it relies on the recent past of the volatility of stock returns to predict future volatility.

O'Hara and Shaw (1990) conduct an event study to estimate the value of the TBTF subsidy. They examine stock returns surrounding a 1984 congressional testimony from the Comptroller of the Currency in which he indicated that the eleven largest banks were subject to a TBTF policy. Following the testimony, the authors show that abnormal stock returns were higher for the indicated banks than for other publicly traded banks. While this study has the cleanest causal mechanism, absent a similar public statement, such an identification strategy is not possible around the 2008 financial crisis. Even still, this study can only measure the *marginal* effect of the announcement. If the market already considered the largest banks to be TBTF, such an announcement would have no effect.

Penas and Ünal (2004) study the large bank discount using bond returns following merger announcements. They show that when the incremental change from the merger causes the bank to cross the 2% of industry assets threshold, the institution's bond returns decline about 15 bps more than do the returns for banks that do not cross this threshold. Similarly, Brewer and Jagtiani (2011) use data from 1991-2004 to look for premium paid in the eight mergers that brought organizations over $100 billion in assets. They also perform an event study on abnormal stock returns following the announcement of such a merger and find that in eight mergers that brought to over $100 billion in assets acquirers paid a total premium of between $14 and $17 billion. Looking at equity prices following the passage of FDICIA, Kane (2000) uses a similar definition to show that, in "megamergers" between 1991 and 1998, the stocks of large bank acquirers gained value as the size of the target institution increased.

While not the focus of their paper, Acharya and Mora (2011) also consider the behavior of deposit rates during the crisis including those at the largest banks. However, their data do not allow them to analyze comparable deposits across banks or possible non-risk related determinants of deposit prices, as done here.

Finally, this paper has strong parallels with Imai (2006), which studies weekly data of uninsured deposit rates of Japanese banks surrounding a 2002 drop in the deposit insurance limit. That study finds that weak banks exhibit outflows of uninsured depositors even as they offer higher deposit rates. Furthermore, using a credit ratings approach as in Acharya, Anginer, and Warburton (2013), the study finds that this kind of market discipline is weaker at banks subject to implicit guarantees. We use similarly constructed deposit rate data and exploit a comparable change in the deposit insurance limit, though we focus on U.S. data and in the context of the 2008 financial crisis.

3 Institutional Details

This section provides background information on several factors surrounding our estimation strategy, namely: defining TBTF and describing MMDAs and EESA.

3.1 How big is too big to fail?

Being an *implicit* guarantee, a TBTF policy has no clear set threshold. In reality, it is probably the case that TBTF status is not a dichotomous variable defined around a threshold. Rather, an implicit TBTF subsidy would derive from a subjective expectation of the likelihood and extent of government support based on underlying variables such as size, complexity, etc. Thus, differences in any risk premium should go up gradually, as the market's estimate of the probability of being bailed-out goes to one. Nevertheless, a threshold of $100 billion in assets is commonly used as a proxy for these subjective beliefs. However, Washington Mutual, a thrift with $307 billion in 2008, *did* fail. Moreover, Lehman Brothers, a $639 billion asset investment bank, failed in September 2008, even though the government bailed-out the considerably smaller Bear Stearns earlier that same year. Given these facts, it would be difficult to justify the market believing that the government would rescue all banks over $100 billion in assets. Even *ex post*, the inconsistent applications of bailouts makes a precise definition of a TBTF threshold impossible.

In this paper, we purposefully avoid taking a particular stance on the definition of a TBTF bank and focus instead on a large bank discount. We adopt several definitions previously established in the literature or by policy makers, often based on absolute or relative asset size. The baseline definition of a large bank uses a threshold of $200 billion in 2008 dollars, though we supplement the analysis with the more common $100 billion threshold. The $100 billion definition is derived from the Federal Reserve Board's requirement of additional supervisory review through the Supervisory Capital Assessment Program (SCAP) and later the Comprehensive Capital Analysis and Review (CCAR) on all banks over $100 billion at the end of 2008 described by Bernanke (2009). We include similar tests using a $10 billion threshold merely as a point of comparison, though these banks are generally not considered to be TBTF.

3.2 Money Market Deposit Accounts

MMDAs are an important source of funding for commercial banks. At the 2005 start of the sample, MMDAs comprised approximately 23% of aggregate bank liabilities until the financial crisis in 2008. Following the crisis, MMDAs increased to approximately 29% of total bank liabilities.[6] As most MMDAs are insured, this increase mimics a general trend in this period toward insured deposits.[7]

The differencing approach used to isolate the risk premium requires that the non-risk factors associated with $100K MMDAs and $25K MMDAs be sufficiently uniform.

[6]Source: FDIC

[7]MMDAs are often the targets of swept accounts. These are an important type of account which should be (but often are not) accounted for in most analysis using MMDAs, but have no impact on this study in particular. Banks routinely sweep funds from checking accounts into MMDAs at the end of business days and back again before the start of the next business day, typically without the depositor's knowledge. The purpose of these sweeps is often to reduce banks' reserve requirements, as the reserves required on savings accounts are zero and positive for checking accounts. By creating these sweep account, banks can decrease their reserve requirement by up to 70% (see Anderson and Rasche (2001) and VanHoose and Humphrey (2001)). This type of MMDA represents some $800 billion (Source: Federal Reserve Bank of St. Louis) in the total value of savings accounts, but pay no interest. It is important to understand that these types of MMDAs are not applicable to this study, do not show up in the data, and are not a source of competition with retail MMDAs.

MMDAs are a type of savings deposit and therefore face a number of statutory restrictions making them relatively uniform across deposit minimums.[8] For all MMDAs, the depository institution may, at any time, require written notice of a withdrawal not less than seven days prior to the withdrawal. Moreover, like all savings accounts, MMDAs are allowed no more than six withdrawals or transfers per month. These restrictions on access are uniform across all banks and all MMDAs, and so limit the differences in service between different MMDA accounts.

Though we are unable to directly test the assumption above, there are reasons to believe it holds to some extent. First, we note that the existence of higher thresholds for MMDA accounts (e.g., $250K) at many banks implies that the markets for accounts with $25K and $100K minimums reflect the marginal difference in deposit products. Importantly, these minimums are relatively close; we are not comparing the markets for $10,000 accounts with $1,000,000 accounts. Second, within the range of deposit sizes that we consider, there is evidence of only modest differences across markets. For example, Kennickell, Kwast, and Starr-McCluer (1996) estimate that a decrease in the deposit insurance limit from $100K to $25K is not associated with a dramatic change many non-wealth household characteristics. Third, if there are systematic differences in the $25K MMDA and $100K MMDA depositor preferences or characteristics, one would expect that these differences to be relatively persistent over time (for example, differences in financial sophistication or valuation of large branch network). Consequently, if our results were driven by a violation of this assumption, we would not expect to see marked rapid changes in the estimates over time. However, the results show that differences in the risk premium paid by large banks quickly vanish following the passage of EESA.

[8] See 12 CFR §204.2(d)(2); Reg. D, 45 FR 56018, Aug. 22, 1980.

3.3 Emergency Economic Stabilization Act

A statutory change allows further examination of the strength of how well the risk premium measure incorporates a risk premium and to consequently weaken many non-risk related interpretations of the measured large bank discount prior to the crisis. On October 3, 2008, amidst the financial crisis and mounting bank failures, President George W. Bush signed the *Emergency Economic Stabilization Act* into law, which increased the SMDIA covered by the FDIC to $250K. Initially, the increase in SMDIA was set to expire on December 31, 2009. However, subsequent legislation extended the increase and ultimately made the increase permanent and retroactive to January 1, 2008 under the *Dodd-Frank Wall Street Reform and Consumer Protection Act* signed into law by President Barack Obama.

The data include both periods in which the $100K MMDAs are only partially insured and those after the crisis when they became fully insured (temporarily, retroactively, or permanently, depending on the coincident information). We support the validity of our approach by examining the effects surrounding the passage of the EESA. As the Act resulted in equivalent insurance to both $25K and $100K MMDAs, we would expect the differences across banks to decrease or even disappear. This is, indeed, exactly what is found in Section 6. However, due to the incremental nature by which the increase in the SMDIA became permanent and widespread market disruptions during this period, this robustness test should be interpreted cautiously.[9]

4 Model

A major difference between the explicit interest rate that a bank pays on $25K MMDAs, denoted r, and the rate that it pays on $100K MMDAs, denoted R, is that the depositor is entirely insured for the former product while the depositor in the latter case is not

[9] For example, if there are costs to switching banks/accounts, then a temporary change in the SMDIA may not be sufficient to eliminate differences in risk premiums between large and other banks.

(prior to fourth quarter 2008). Consequently, $p = R - r$ represents a measure of the risk premium for a particular bank.[10]

Our method constitutes a type of difference-in-difference technique (first across product, then across size). We will define a large bank discount on the risk premium as

$$p_{small} - p_{large} = (R_{small} - r_{small}) - (R_{large} - r_{large}),$$

where p_{large} indicates the average risk premium for large banks equivalent to the difference of R_{large}, the average rate offered for \$100K MMDAs by large banks (greater than \$200 billion in assets under the baseline specification), and r_{large}, the average rate offered for \$25K MMDAs by large banks. Subscript *small* variables are defined similarly for smaller banks.

An important benefit of using this technique is that it allows two dimensions of flexibility in the underlying assumptions. In particular, the analysis holds as long as *either* of the following two conditions holds. First, the error in the measurement of risk premiums using the difference between products does not differ between the largest banks and other banks in a systematic way. Second, other non-risk elements of price related to being large do not differ in a systematic way across deposit products. To the extent that *both* of these conditions are simultaneously violated in a meaningful way, we will not have accurately measured the large bank discount. Even so, robustness checks in 6 allow these assumptions to be somewhat relaxed. Further, to imply that there is no significant large bank discount, the double violation of these assumptions would have to be such that small banks' risk premiums are inflated relative to large banks.

For example, suppose that there were differences in financial sophistication between \$25K and \$100K depositors.[11] In that case, the measure of bank specific risk premiums

[10] The value p may also incorporate some level of liquidity risk. Even so, we expect liquidity risk to be minimal given the degree of accessibility to funds in a MMDA. See the discussion in Section 6. Nevertheless, in all analysis we control for liquidity risk.

[11] There is empirical evidence that this is not the case (as discussed in Subsection 3.2), however this supposition acts a useful illustrative tool.

would be inaccurate. However, so long as the same difference in financial sophistication between insured and uninsured depositors existed in large and small banks, the measurement of the large bank discount would hold. Similar arguments can be applied to many other partial violations (e.g., differences in market competition or funding preferences between large banks and others).

For the measure of the risk premium, p, to be meaningful, depositors in \$25K and \$100K MMDAs must truly face disparate levels of risk. The \$25K MMDAs were under the SMDIA and so explicitly guaranteed for the full span of the data. Insured deposits are backed by the full faith and credit of the United States. On the other hand, any principle and interest in excess of the SMDIA carries no explicit guarantee.

In addition to their legal distinction from insured deposits, uninsured deposits are exposed to real losses in practice. From the beginning of 2007 until the end of 2011, uninsured depositors saw losses at 32 banks. Nominal recovery rates at these banks averaged 33% as of the end of 2011[12].

However, the franchise value generated from deposits implies that they are generally treated more favorably in a failure than other forms of debt, even conditional on the hierarchy of claims. For this reason among others, acquiring banks will often assume many or all of a failing bank's uninsured deposits in addition to insured deposits. Through this resolution mechanism, the market may then independently "insure" the uninsured deposits of large banks by assuming them in the event of failure. Despite this possibility, uninsured depositors took losses even at some of the larger bank failures during the recent crisis. The largest such bank was IndyMac, a \$31 billion bank and the fourth largest bank failure in history, at which uninsured depositors were expected to see only a 50% recovery of uninsured deposits.[13] It should also be noted that even when uninsured depositors are repaid in full in nominal terms, the repayment process

[12] Source: FDIC

[13] In unreported analysis, we find that conditional on failure, there is no systematic relationship between size and the probability that uninsured depositors face losses. Consequently, it is unlikely that the results given here are driven by differential treatment across bank size of uninsured depositors in the event of failure.

may take years, while their insured counterparts have immediate and full access to funds in the event of failure.

4.1 Cross-Sectional Analysis

The model accounts for the risk premium p by looking at standard risk variables (X_{it} for bank i at time t) and determining whether being particularly large provides additional explanatory power on risk premiums. In the baseline model, the risk variables are the equity-asset ratio, merger adjusted asset growth rate[14], nonperforming loans-to-assets ratio, loan loss reserves-to-assets ratio, non-brokered insured deposits-to-assets ratio, liquid assets-to-assets ratio, trading assets plus trading liability-to-assets ratio, income before taxes-to-assets ratio, and growth volatility (see Table 1 for details). These variables are intended to capture to varying extents each of the CAMELS[15] components. We also control for potential difference in the liquidity premium or behavioral pricing rules by including the difference between the $25K MMDA rate and the $10K MMDA rate. We examine the following model cross-sectionally at each point in time. For a fixed t, let

$$p_{it} = \beta_t X_{it} + \gamma_t Large_{it} + \varepsilon_{it}, \tag{1}$$

where ε_{it} is the error term and we allow parameters to vary over time, including the large bank discount γ.

We run the regressions using alternative specifications for a large bank threshold, namely: $10, $100, and $200 billion in 2008 dollars. The first serves as a point of comparison and control, rather than as a threshold that we believe to be relevant with regard to implicit government support. A list of US owned banks meeting the $200 and

[14] There are a number of extreme values observed for asset growth. As such, asset growth rates are windsorized to a floor of -50% and a ceiling of 100%.

[15] Under the unified supervisory regime instituted under FDICIA, banks are evaluated according to six components of safety and soundness. CAMELS refers to each of these components: Capital adequacy, Asset quality, Management, Earnings, Liquidity, and Sensitivity to market risk.

$100 billion criterion can be found in Table 2.

We purposefully excluded one variable commonly associated risk from the baseline analysis: size. A simple diversification argument suggests that given a level of loan risk, a larger bank with a single portfolio would face less volatility than a similar smaller bank, even absent any external benefits that a bank may accrue from being very large. However, in such a context, size acts merely as a proxy for other measures of risk that should be observable in a bank's financial statements. For example, diversification benefits should be observable in lower asset volatility, or improved risk management should manifest in lower charge-off rates (the analysis accounts for both of these risk metrics). Thus, if diversification were responsible for the result, it would have to materialize in a manner not captured by the other controls. Meanwhile, including size as a regressor in addition to *Large* introduces an obvious multicollinearity problem.

4.2 Panel Analysis

For the panel analysis, we split the sample into two periods: a pre-EESA sample and a post-EESA sample. In the pre-EESA sample, p_{it} is expected to incorporate risk given that the $100K MMDA accounts are not fully insured. In the post-EESA sample, both types of accounts are equally insured and so p_{it} is not expected to reflect any differences in risk. However, this expectation is tempered by the fact that the increase in the SMDIA was not made permanent until late in the post-EESA sample and thus, p_{it} could feasibly still reflect some residual risk.

We consider a panel version of the model:

$$p_{it} = \alpha_t + \beta X_{it} + \gamma Large_i + \eta_i + \epsilon_{it}, \qquad (2)$$

where α_t captures time fixed effects, η_i captures bank fixed effects, and ϵ_{it} is the error term. We assume γ and β are constant over time to give the panel model some power relative to the cross-sectional specification. Furthermore, *Large* is fixed over time in the panel analysis and is a dummy defined using the mean asset observed for each sample (pre- and post-EESA). This is done to prevent the estimation of γ from being determined using within-variation of banks moving from below to above the threshold. That is, in the case that $Large$ were time variant, γ would be estimated by looking at banks that cross the admittedly arbitrary threshold, while ignoring systematic differences among the very largest banks and others.

However, fixing $Large_i$ over time and including fixed effects η_i introduces a collinearity problem so that η_i and γ cannot be estimated together. Rather, we obtain an estimate for γ by regressing the error terms from the within estimation on the $Large_i$ variable and imposing that η_i are mean zero. Letting $\check{x}$ denote the entity demeaned value of x and $u_{it} = \eta_i + \epsilon_{it}$, we run the following regressions:

$$\check{p}_{it} = \check{\alpha}_t + \beta \check{X}_{it} + \check{\epsilon}_{it}, \tag{3}$$

$$\hat{v}_{it} = p_{it} - (\hat{\alpha}_t + \hat{\beta} X_{it}) = \gamma Large_i + u_{it} \tag{4}$$

where $\hat{v}_{it}$, $\hat{\alpha}_t$, and $\hat{\beta}$ are the parameter estimates from the first regression.

5 Data

We use the previously little used RateWatch data of branch-level deposit product prices.[16] Customer banks request competitor-pricing data from RateWatch based on a particular market area. In assembling the data, RateWatch surveys target banks on the rates offered on various deposit products at the branch level. RateWatch describes the process by which it obtains the data as follows:

> RateWatch works with institutions to determine the schedule upon which rates/fees are updated. For deposit information, RateWatch tracks the day

[16] To the best of our knowledge, the only other paper utilizing this data set is Ben-David, Palvia, and Spatt (2011) who show that poorly capitalized banks actually paid lower deposit rates on CDs in 2009-2010.

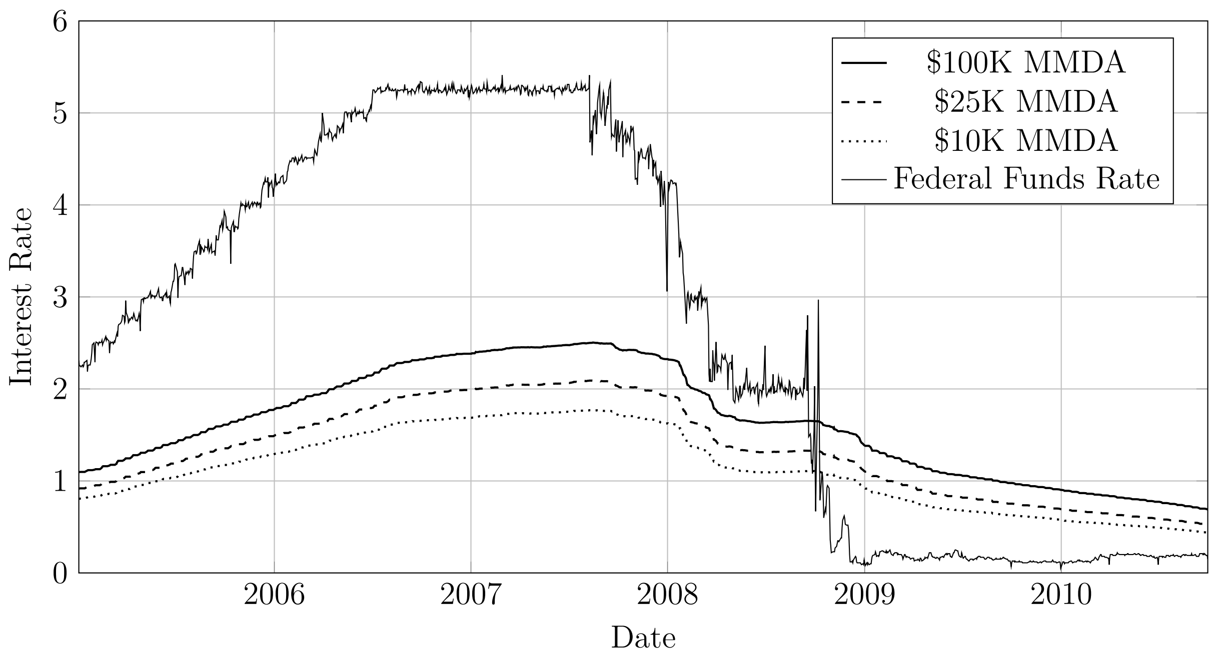

Figure 1: Mean interest rates. This figure gives the average interest rate paid on MMDAs with various minimum balances on a branch-by-branch basis from the beginning of 2005 until the third quarter of 2010. The effective Federal Funds rate is also given purely as a frame of reference.

> of the week rates are reviewed and obtains the rate information on or after that day, prior to a report's scheduled delivery. Market Research Specialists also verify the last change date when calling contacts and the effective dates of faxes, emails, and websites.[17]

The cross-sectional analysis runs from the first quarter of 2005 until the third quarter of 2010 for MMDAs with deposit minima of $10K, $25K and $100K. The mean MMDA rates from the RateWatch data are reported in Figure 1. The MMDA interest rates can be seen to broadly follow the movement of the effective Fed Funds rate, though are generally more stable, during this period.

Figure 2 gives the number of current branch level observations. The secular increase in the number branches reflects the increasing number of banks participating in the survey. The data set is large in terms of bank branch observations, steadily increasing

[17]http://www.rate-watch.com/faq.

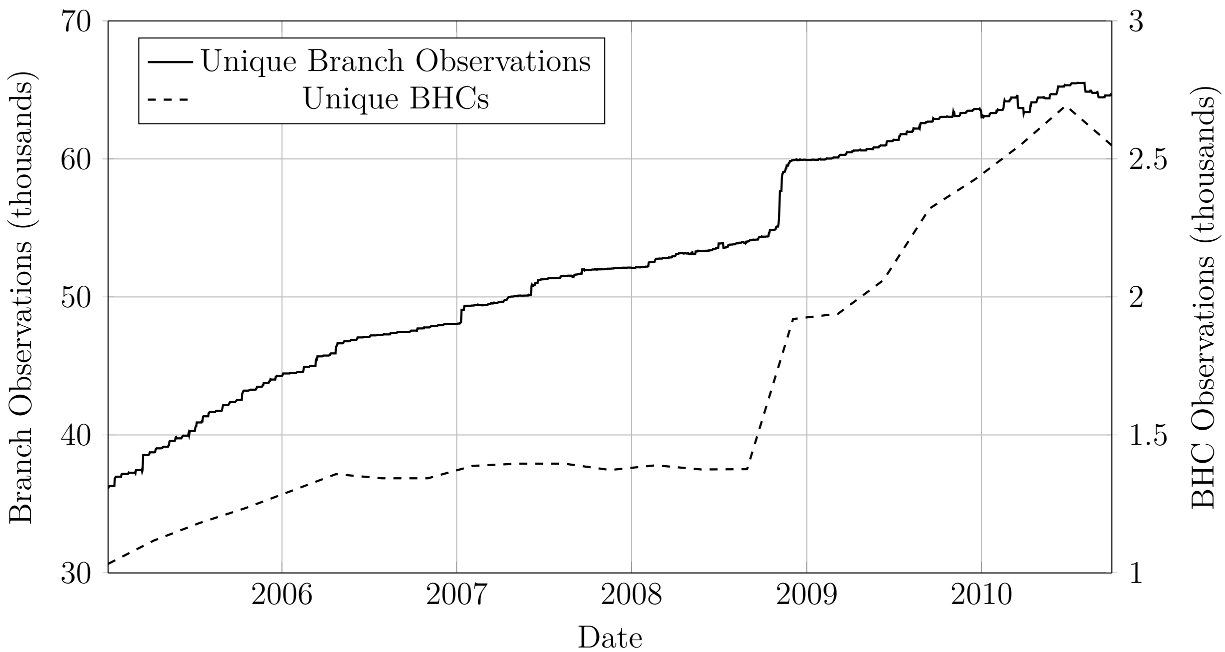

Figure 2: Daily number of branch and quarterly bank observations. This figure gives the total number banks and branches that are actively reporting interest rates. That is, the bank branch reported 10K, 25K, and 100K MMDA rates *before and after* a given date.

from around 35 thousand at the beginning of the sample to around 65 thousand by the end. The same figure also provides the total number of individual banks appearing in the data. By the end of the sample period, around 2,750 banks are in the RateWatch sample, or approximately 35% of all banks. However, the data contains almost all large banks and so covers the vast majority of the total industry assets, between 77% and 87%.[18]

Ultimately, the goal is to connect empirically a bank's risk premium with measures of that bank's level of risk. Therefore, we use balance sheet measures of risk from the Call Reports produced by all banks at the end of each quarter. First, we use the regulatory high holder as the appropriate decision-making entity, rather than the individual bank by charter. We do this since we expect large bank benefits (including any possible TBTF subsidy) to apply at the highest level of organization.

[18]See Table 2 for a list of the large banks that are found in the data.

We restrict attention to the last deposit rate observation for each branch-quarter to relate to the balance-sheet data. For 99% (73%) of branch-quarter observations, the most recent observed deposit rate was within the previous two (one) weeks of the quarter end. We also run the analysis using only deposit rate data from within a week of the quarter end and the (unreported) results are quantitatively similar. We then link these branch-quarter observations to the regulatory high holder and calculate the average risk premium (the $100K rate less the $25K rate) for each bank-quarter across all branches. For a particular bank, the risk premiums do not vary significantly across branches within a state, but may vary markedly across states.[19]

Bank level risk premiums for each quarter are obtained through a unit-weighted average across branches.[20] However, many banks do not post a $100K rate in the data, posting rates only for deposit products with lower minimums. As a result, bank coverage is more limited, especially early in the sample. The sample represents 14% of all banks in the first quarter of 2005 up to 38% in the third quarter of 2010. Still, this subset represents at least 77% of all banking industry assets. Coinciding with an increase in the SMDIA, the number of banks increases from 1,408 to 1,954 from the third to fourth quarter of 2008. Otherwise, the increase in the number of banks observed in the data is fairly steady. In robustness analysis, we re-perform the analysis focusing only on those banks observed at the initial period finding the results qualitatively unchanged. Looking only at banks which file a Call Report and for which a risk premium can be calculated leaves us with 29,936 bank-quarter observations over 23 quarters. Lastly, we include only US owned banks.

Table 3 reports sample statistics for the variables in the across all 23 quarters in the data set. This table can be used to compare the risk characteristics of large versus other

[19] This is consistent with Heitfield and Sabarwal (2004) and Park and Pennacchi (2009), among others.

[20] Weighting by deposits produces similar estimates for nearly all banks. For those banks where it makes a difference, the result is driven by branches offering deposit rates, but recording no deposits in the Summary of Deposits data. This may be the consequence of consolidated deposit recording across multiple branches in the SOD data.

banks. It shows that the distributions of the control variables have largely overlapping support across large and other banks, with the exception of trading assets. A list of the variable abbreviations can be found in Table 1. The median bank in the sample has assets of $330 million (in 2010 dollars). This suggests that the sample over-represents large banks, as this is more than twice the median bank observed for the same sample period in the population of banks. The equity-asset ratio, nonperforming loans-asset ratio, loan loss reserves-asset ratio, and merger-adjusted growth all have significant outliers. Still, we include these outliers in the analysis, though unreported robustness checks showed that excluding them did not materially affect the results. As expected, the average and median MMDA rate is increasing with the minimum deposit.

Approximately one third of bank-quarter observations have identical $25K and $100K rates every period, implying a risk premium of zero. For the 2,132 banks in the data prior to 2009, 646 always report a zero risk premium, 1,159 always report a strictly positive risk premium, and 327 report a mix of zero and strictly positive risk premiums (there are 11 instances of negative risk premiums). In the baseline analysis, we include only those banks that post a strictly positive risk premium in at least one period. We assume that banks that *never* differentially price their products must use a pricing rule that ignores the market's perceived risk of the institution. Those institutions that differentially price their products in *at least one* period are assumed to have a risk premium that conveys at least some information on the perceived risk of the institution and so are included in the baseline regression. As a robustness check, we run the analysis using all bank quarter observations and obtain similar results, if somewhat attenuated.

6 Results

The results are broken down into three parts. First, we show that large banks pay less for comparable products. Second, we show that large banks pay a lower risk premium than other banks. While the first two results are more descriptive in nature, we feel that establishing these as stylized facts is an important contribution to the literature in its own right. Third, we show that this difference in risk premiums cannot be attributed to usual balance-sheet measures of risk.

6.1 Levels

Figure 3 and 4 show the evolution of these rates over time for large banks and smaller banks along with the differences in means for each group over time. The trends for the $25K and $100K MMDAs are similar, rising until the second quarter of 2007 before falling to the sample minimums by the third quarter of 2010. However, as expected the rates for the $100K accounts are generally larger than for the $25K accounts.

Furthermore, it is important to note that there are systematic differences between $25K MMDA rates between the large banks and smaller banks. This is despite the fact that $25K deposits are explicitly insured for all banks, regardless of size or systemic importance. This difference suggests that at least part of large bank funding advantages emanate from factors unrelated to implicit government guarantees. That is, this difference in identical, riskless products may suggest that depositors extract (non-pecuniary) benefits from banking with a larger institution or that larger banks have access to other, cheaper funds. Moreover, taking this riskless deposit advantage along with the fact that large banks exhibit a lesser relative reliance on retail insured deposits suggests that their funding advantages may be even greater for uninsured funds.

Focusing on the difference between the $100K and $25K MMDA rates isolates the risk premiums from premiums paid for other potential benefits of being large (e.g., a larger branch network, a broader array of services).[21] It seems reasonable to assume

[21] Using the difference between the $100K and the $10K MMDA rates provides another measure of the risk premiums. However, whatever non-risk related differences exist between products would be less pronounced among $100K and $25K MMDAs due to their closer deposit minimums, thereby providing a better measure of risk premiums. Nevertheless, applying the same analysis give below except exchanging the $10K for the $25K MMDAs yields qualitatively similar results, with baseline estimates significant at around 30 bps.

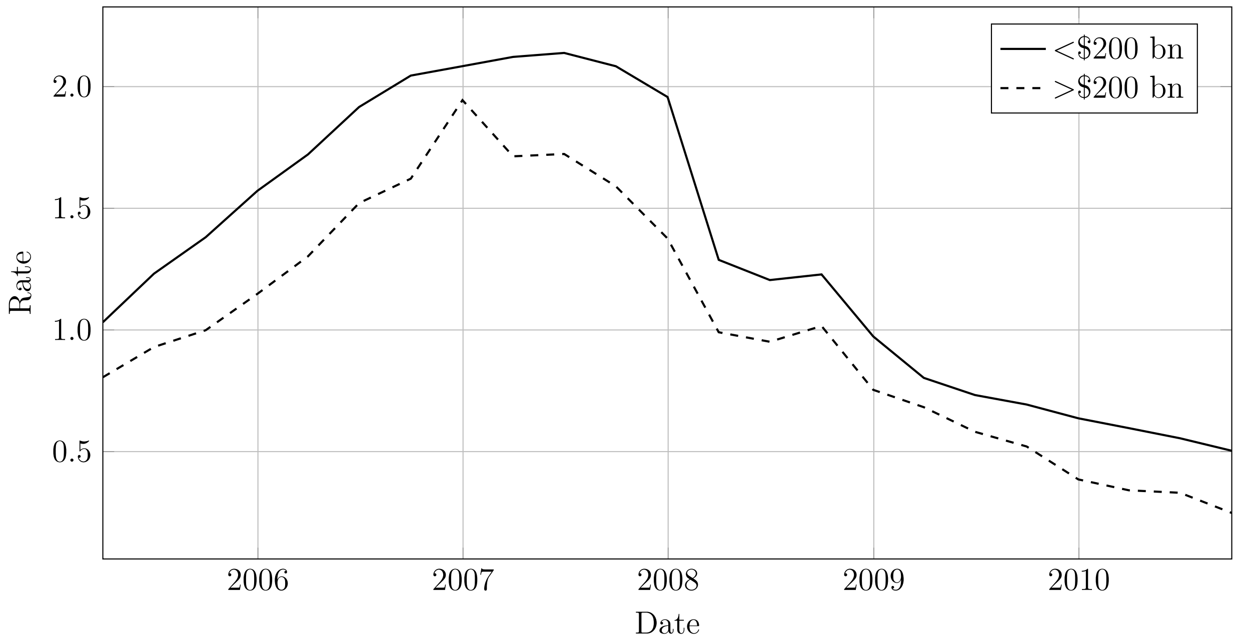

Figure 3: Mean interest rates on 25K MMDAs for Large and Other banks.

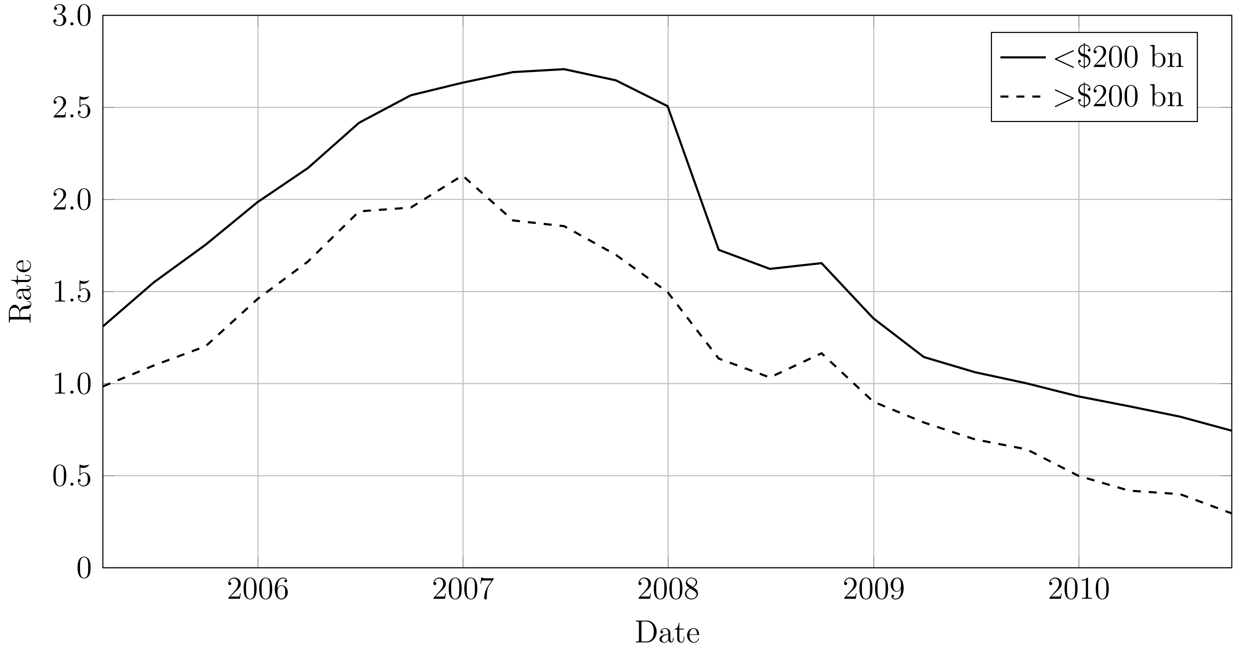

Figure 4: Mean interest rates on 100K MMDAs.

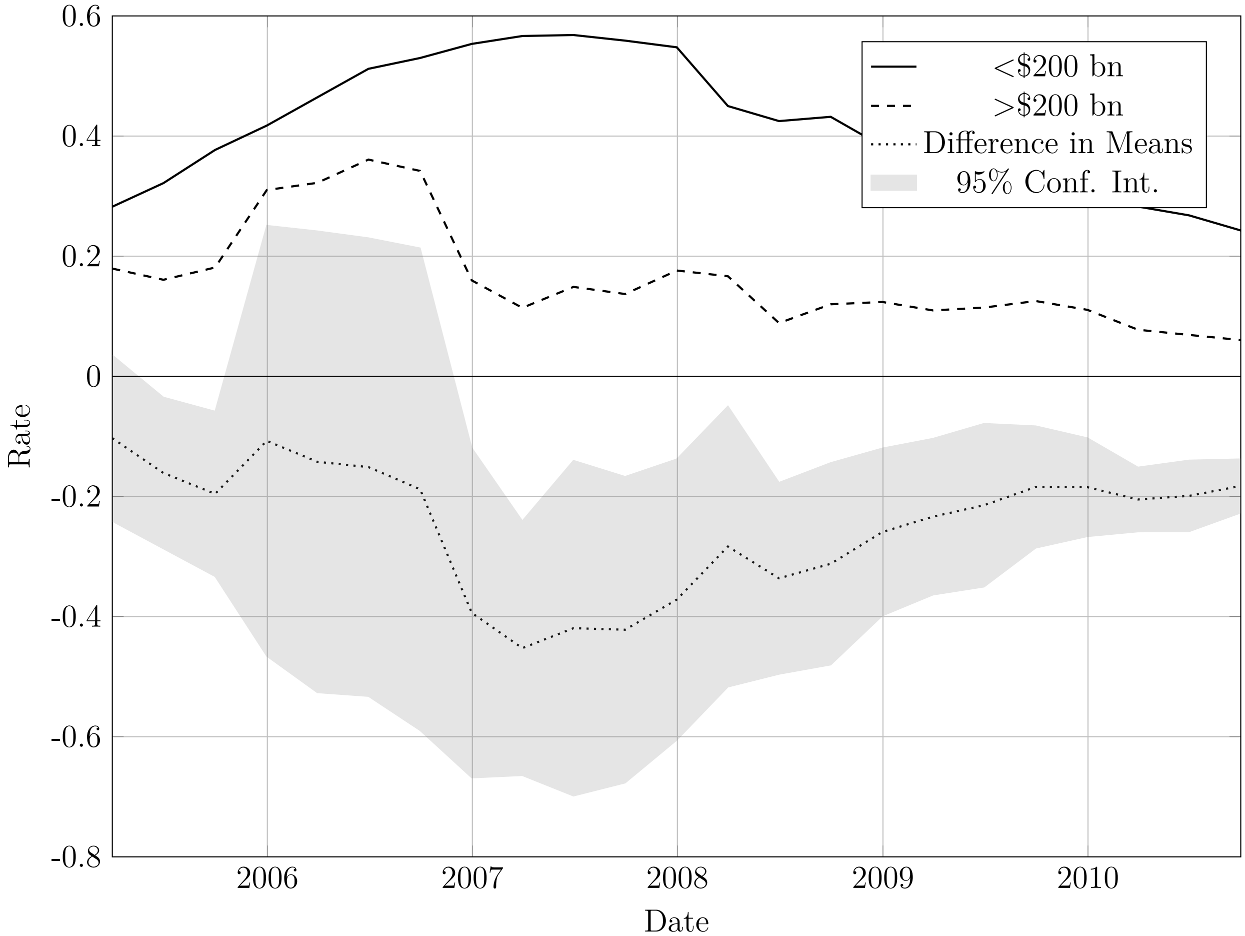

Figure 5: Mean premium on $100K MMDAs for Large and Other banks, as well as the difference. That is, the difference between the riskless $25K MMDAs and the risky $100K MMDAs. The shaded region represents the 95% confidence interval around the difference in means.

that non-risk related benefits from size are, at least, approximately equal across $25K and $100K MMDAs. To the extent that this is true, the difference in rates represents a measure of the risk premium paid by banks to attract funds into relatively risky deposit products. The differences in the risk premiums paid by the largest banks and other banks for uninsured deposits are shown in Figure 5. The average risk premium discount received by the largest banks rises to approximately 45 bps during 2007 before falling to about 20 bps at the end of the sample.

6.2 Risk Premium (Cross-Sectional)

First we run cross-sectional regressions to test for differences in the risk premium paid after accounting for other risk variables, as in Equation 1. Table 4 reports the coefficients on the *Large* term over the sample. The baseline analysis aggregates banks to the regulatory high holder across all branches, though we obtain similar results when aggregating banks at the MSA level and running regressions with MSA fixed effects. Under the baseline specification, large banks pay a notably lower risk premium after controlling for common balance sheet risk variables from 2007 through the increase in the SMDIA. Even with only seven banks over $200 billion in the sample prior to the crisis, this difference is statistically significant for three quarters of 2007 at 5% significance or more.

The other risk variables in the analysis are often insignificant through the cross sectional analysis, though generally have the expected sign. One reason may be that prices reflect the behavior of the marginal $100K MMDA depositor. We conjecture that such a depositor is less likely to spend time evaluating a bank's balance sheet to assess the bank's riskiness relative to the marginal bondholder for whom these risk variables are likely to be more evident. Such an effect would blunt much of the significance of usual risk variables. On the other hand, bank size is likely to be salient to all market participants. In addition, multicollinearity may be a problem with regard to the significance of the risk variables in the cross-sectional analysis.

We compare alternative thresholds in Figure 6: $200 billion, $100 billion, and $10 billion. The $10 billion threshold is used as a point of comparison to large banks that are not thought to be subject to implicit government support. While significance levels are not provided in the figure explicitly, standard errors are provided for the $200 billion threshold in Table 4; other thresholds are typically insignificant. There are four other important points to note from the figure.

Foremost, the behavior of the large bank discount for banks above $200 billion is large from mid-2006 until the crisis and vanishes entirely after fall 2008, coinciding with the increase in SMDIA. The drop in the risk premium begins in the fall of 2008, consistent with the interpretation that differences in the measured risk premium were indeed the product of differences in perceived risk between large banks and other banks. Given the chaotic financial and regulatory environment at that time, it is difficult to test directly the role of EESA in reducing the measured large bank risk premium advantage. Nevertheless, the reduction in the estimated large bank advantage during this time rules out many non-risk related explanations for the measured premiums in 2007.

Second, and related, the largest banks have systematic price differences from smaller banks, but these differences are unchanged under the increase in SMDIA in fall 2008. Though clearly not TBTF, $10 billion banks still seem to be priced differently from smaller banks. However, as opposed to the $200 billion threshold, the difference between banks above and below $10 billion is largely unrelated to risk, as this premium remains unchanged despite equal insurance following the increase in SMDIA.

Third, there is little evidence of differences in prices across any threshold prior to 2006. This result is consistent with the findings of Acharya, Anginer, and Warburton (2013) and Hovakimian, Kane, and Laeven (2012). In both studies, the measured risk premium is essentially non-existent prior to 2006 or 2007. From the perspective of bank deposits, the absence of a risk premium occurs during a time when there were zero bank failures (2005-2006) and little evidence of future bank stress.

Finally, the price differentials are most apparent at the $200 billion threshold and notable at the $100 billion threshold only due to the influence of those banks greater than $200 billion. Otherwise, there is no notable difference between $10 billion and $100 billion risk premiums.

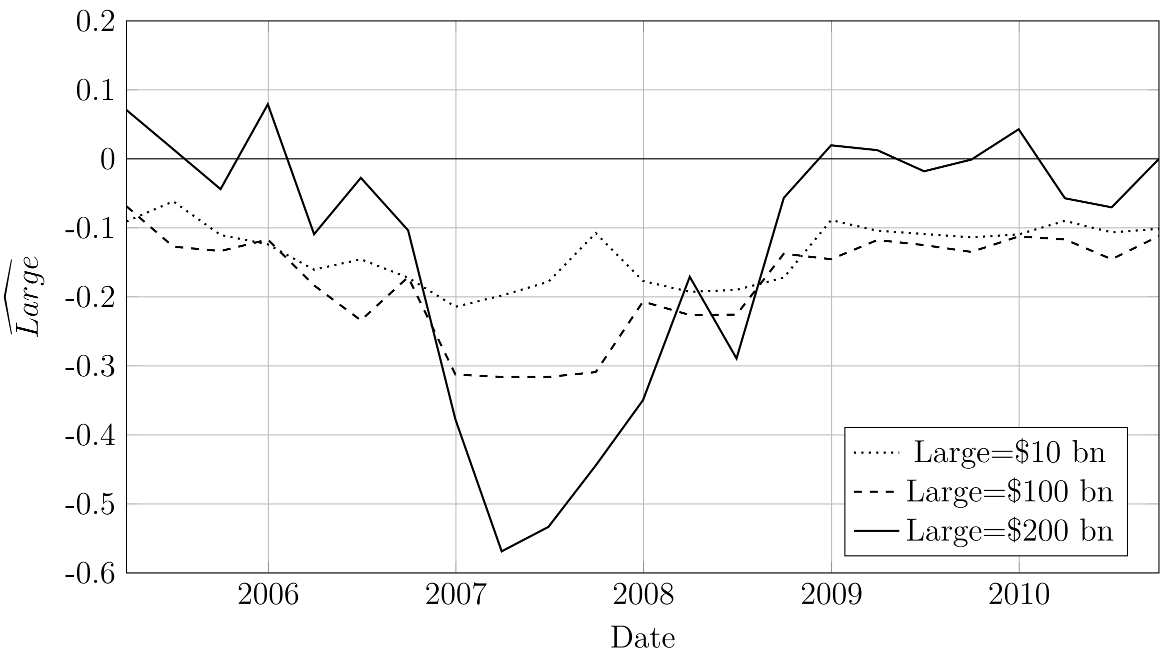

Figure 6: Cross-sectional estimated *Large* dummy parameter under different thresholds.

6.3 Risk Premium (Panel)

Table 6 reports the results from the panel estimation along with nine alternative specifications. Unless otherwise specified, each sample considers the period of first quarter 2006 until second quarter 2008. In the baseline analysis, we use a fixed effects method, a $200 billion threshold based on the cross-sectional analysis results, excluding those banks who post a zero premium in every quarter of the sample, and clustering errors at the bank level. After controlling for common balance-sheet risk measures, we estimate a large bank discount of approximately 36 basis points, which is significant at the 1% level. This number reflects the systematic risk pricing benefit obtained by these few largest banks that is not explained by the other measures of risk. This result is consistent with the hypothesis that these banks benefit from implicit (or perceived) government support. However, the analysis, like that of nearly every other paper in the literature, does not allow us to eliminate *all other* potential sources of the price discrepancy between large banks and other banks.

To examine alternative interpretations of the results, we consider nine other specifications. In column (2), we apply the baseline analysis to the period after the increase in the SMDIA; fourth quarter 2008 to third quarter 2010. Under our interpretation of the large bank discount as resulting from perceived differences in risk, the increase in the SMDIA eliminates any inter-bank differences in risk for $100K MMDA accounts, as all become explicitly insured. The second column reports that after the increase in the SMDIA the large bank discount notably drops by 33 bps.

It would be reasonable to suspect that some of the remaining differences in the risk premium between the largest banks and smaller banks may be attributable to the different markets in which these banks operate. Indeed, larger banks tend to operate in larger markets, and vice versa for smaller banks. To account for this possibility we exploit the geographical characteristics of the data, aggregating bank risk premiums to the MSA level, rather than the national level. To address these concerns, we perform the identical analysis, except allowing for MSA fixed effects. Table 6 reports results for the pre- and post-increase in SMDIA in Columns (3) and (4), respectively. Our point estimates in the pre-crisis period decrease to 19 bps, but remain statistically significant at the 95% level. Interestingly, when we run the analysis with MSA fixed effects following the increase in SMDIA, the large bank advantage vanishes altogether.

In Columns (5) and (6), we report the panel results using the baseline analysis but adjusting the definition of *Large*, using definitions of $100 billion and $10 billion, respectively. Partially consistent with our interpretation, the large bank discount rises as we increase the threshold. As should be expected, the estimate with a $100 billion reported in Column (3) is also significant, though lower than the baseline and between the estimate from the $10 billion and $200 billion specifications. Indeed, those banks larger than $200 billion entirely drive the differences between the $10 billion and the $100 billion definitions, as was seen in the cross section analysis.

However, the 24 bps large bank discount for $10 billion reported in Column (6) is more problematic to the interpretation of the estimate as the consequence of implicit government support. Historical precedent and common perception does not suggest that banks at this threshold would receive any extraordinary support.[22] Nevertheless, even if these 24 bps are the result of size related risk benefits not captured by the other controls, the estimates suggest a remaining 16 bps discrepancy between the $10 billion banks and those greater than $200 billion. As the literature has often found that banks exhaust economies of scale by $10 billion, this differential could be the consequence of such asset size benefits. Given the seniority of uninsured depositors, such a difference would still constitute a much larger funding advantage for subordinated claims. Furthermore, Column (7) suggests that the differences between $10 billion banks and others may not be attributable to economies of scale. In that specification, we examine $10 billion institutions after the increase in the SMDIA and show that the systematic differences between these institutions and smaller ones remains. This is in contrast to $200 billion banks, whose risk premiums fall sharply coincidentally with the higher insurance limits. Regardless, the analysis suggests that $200 billion and $10 billion banks behave differently.

Column (8) reflects a check on the exclusion of banks always paying a zero premium under our the baseline specification. When we include all banks in the baseline specification, including those that always post a zero premium the magnitude and statistical significance of the large bank discount estimate is comparable to that of the baseline specification.

To further support the results, we run the model using the $25K-$10K MMDA spread. Under our hypothesis, the $100K-$25K MMDA spreads reflect something about the riskiness of the depository institution. Following similar reasoning, running the baseline analysis with the $25K-$10K MMDA spread would be expected yield no large bank pricing advantage. Consistent with that logic, we obtain an insignificant 8 bps pricing discrepancy in the opposite direction and report results in Column (9).

As noted in Section 5, the set of banks in the data increases concurrently with

[22]For example, uninsured depositors took losses at IndyMac in July 2008.

the increase in SMDIA. Such an increase reflects either an increase in the number of banks whose pricing information is requested by their competitors or an increase in the number of banks offering rates for the $100K MMDA product. In either case, we perform additional tests to ensure that our pre- and post-EESA comparison is not driven by this compositional change. In particular, we run the analysis while fixing the set of banks to those that are in the data as of March 31, 2006 and Columns (10) and (11) show the results. The magnitude of the pre-EESA estimate remains largely unchanged, though the post-EESA estimate increases by 13 relative to our baseline. Nevertheless, the pre- to post-EESA drop-off remains large and demonstrates that the results are not simply a consequence of compositional changes in the data.

Column (12) reflects a check on the fixed effects methodology of the first stage of our the baseline specification. In this analysis, we obtain first stage estimates using a first differencing rather than a within differencing approach. Under this specification, the magnitude and statistical significance of the large bank discount estimate is comparable to that of the baseline specification.

We attempt to disassociate the large bank advantage from other size benefits (such as economies of scale) by including size as an alternative regressor in the panel analysis. In particular, it may be the case that true relationship is between premium and size and our *Large* variable is simply acting as its proxy. If this were the case, then size would likely be significant when included in the analysis. However, the results given in Column (13) show that this is not the case. Namely, the size variable is not statistically significant in the panel analysis. This finding supports the view that the baseline results are not simply reflective of generic benefits associated with increased size.

The results from Column (14) similarly establish a 11 basis point discrepancy between a subset of only larger banks and those above $200 billion. This specification includes only those banks greater than $1 billion in the analysis. The results show that these banks' risk premiums are on average 11 bps lower than large banks, though the result is not statistically significant. This finding somewhat weakens the interpretation.

Notwithstanding that result, including banks above $700 million and/or narrowing the time horizon to the peak period established in the cross sectional results, 2007 to EESA, obtains statistically significant results at magnitudes comparable to the baseline.

In the baseline analysis, we try to remain fairly parsimonious and chose variables to reflect individual CAMELS components. Column (15) reports results using one of the many specifications considered using alternative financial reporting data. In particular, this specification includes loan portfolio data intended to capture some of the *ex post* riskier exposures that banks held, viz. Construction and Development (CD), Commercial Real Estate (CRE), and Commercial and Industrial (CI) portfolios. Furthermore, to account for the seniority of uninsured depositors, this specification also includes a measure of all subordinated claims to assets (SubDebt) and a measure of uninsured deposits to assets (UnIns). Finally, it may be the case that large banks tend to offer products (wealth management, for instance) that affect the pricing behavior for large deposits. As a proxy for that possibility, the specification in Column (9) also includes fee income from investment banking and fiduciary investment activities (Fee). Including these alternative measures reduces the estimate, though it remains both statistically and economically significant at 25 bps.

We further test for geographical dependence by examining the deposit rates at banks for the same products *in the same market*; specifically New York City. The New York City MSA is a particularly ideal candidate for this analysis for many reasons. Among them, it is the largest MSA in terms of population and it has a large number and wide variety of banks. Allowing zero premium banks into the analysis,[23] the data include 51 different banks and four banks with more than $200 billion: CitiGroup, Bank of America, JP Morgan Chase, and Wachovia. Reported in Column (16), we find economically and statistically significant differences in the risk premium among retail deposits in in the New York City market alone of nearly 70 bps, suggesting that

[23]Ignoring zeros the result is even larger and significant, but forces the exclusion of one large bank which always posts a zero premium in the New York City MSA during the sample.

geographical differences are not driving the overall result. In unreported results, we conducted similar analysis of the remaining four of the five largest metro areas: Los Angeles, Chicago, Dallas, and Philadelphia. In four of the five metro areas, the results hold; Chicago being the lone exception.

7 Conclusion

This paper provides evidence that the largest banks pay significantly less on comparable deposits than their smaller bank counterparts. We demonstrate that this pricing advantage holds for both insured and uninsured deposit products. Furthermore, we find a large bank risk premium advantage using a differencing approach to remove many non-risk components potentially embedded in deposit rates. Finally, even after controlling for common balance sheet measures of risk, we show that the largest banks receive an economically and statistically significant discount on risky deposits of around 40 bps.

Each of these three conclusions is consistent with a TBTF subsidy paid to large banks. As is unavoidable with any analysis of TBTF, the difference in risk premiums is not necessarily a byproduct of TBTF policies. Indeed, it would be impossible to eliminate all alternatives. However, the difference remains even after eliminating many non-risk based bank characteristics through the differencing approach, accounting for many standard risk metrics, and a battery of robustness checks.

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Table 1: Control Variable Definitions

Abbreviation	**Description (ratios)**
Eq	equity to total assets
NP	loans which are 60-90 overdue or in non-accrual status to total assets
LLR	loan-loss reserves to total assets
Gr	merger adjusted asset growth top coded at 100% and bottom coded at -50%
GrVol	8 quarter backward looking variance of asset growth
Inc	before tax income to total assets
LiqAs	sum of cash, treasuries, and GSE debt divided by total assets
Trad	Trading assets plus trading liabilities divided by total assets
InsDep	Insured deposits less insured brokered deposits divided by total assets
LIQ	$25K MMDA rate less the $10K MMDA rate
CD	Construction and Development loans to total assets
CI	Commercial and Industrial loans to total assets
CRE	Commercial Real Estate loans to total assets
SubDebt	Total assets less deposits and secured funding to total assets
Fee	Fiduciary and investment banking fees to total assets
UnIns	Uninsured deposits to total assets
Large	Dummy equal to 1 if assets exceed $200bn in 2008 dollars and 0 otherwise

Table 2: List of Big banks

Bank size is the aggregation of a banking institution to the regulatory high holder (i.e. files a Call Report). A bank is called Large in our baseline specification if its consolidated holding company has greater than $200 billion of assets in 2008 dollars. A ‘2’ indicates the bank greater than $200bn and is in our sample, ‘1’ indicates the bank greater than $100bn and is in our sample (though is not Large in the baseline), a ‘0’ indicates the bank is greater than $100bn and is not in our sample, and an empty cell indicates the bank is smaller than $100bn. American Express, Countrywide, Goldman Sachs, MetLife, and Morgan Stanley are all bank holding companies which exceeded $100 billion in assets at some point during the sample period. However, none appear in our sample, likely because their retail deposit banking operations represent a relatively small portion of their activities. Of banks with significant retail components, only Washington Mutual is larger than our $200bn threshold and not present in the data. Our baseline definition also exclused US Bancorp, which is greater than the $200bn threshold but always posts a zero premium. AL=Ally; BA=Bank of America; BBT=BB&T; BNY=Bank of New York; C1=Capital One; CT=Citigroup; F3=Fifth Third; JP=JP Morgan; KC=KeyCorp; NC=National City; R=Regions; SS=State Street; ST=SunTrust; US=US Bancorp; WA=Wachovia; WM=Washington Mutual; WSB=World Savings Bank.

Date	AL	BA	BBT	BNY	C1	CT	F3	JP	KC	NC	PNC	R	SS	ST	US	WA	WF	WM	WS	TOTAL
05-03-31	.	2	1	1	.	2	1	2	1	1	.	.	0	1	2	2	2	0	0	12
05-06-30	.	2	1	1	.	2	1	2	1	1	1	.	0	1	2	2	2	0	0	13
05-09-30	.	2	1	1	.	2	1	2	1	1	1	.	0	1	2	2	2	0	0	13
05-12-31	.	2	1	1	.	2	1	2	1	1	1	.	0	1	2	2	2	0	0	13
06-03-31	.	2	1	1	.	2	1	2	1	1	1	.	0	1	2	2	2	0	0	13
06-06-30	.	2	1	1	.	2	1	2	1	1	1	.	0	1	2	2	2	0	0	13
06-09-30	.	2	1	1	1	2	1	2	1	1	1	.	0	1	2	2	2	0	0	14
06-12-31	.	2	1	0	1	2	1	2	.	1	1	1	0	1	2	2	2	0	.	13
07-03-31	.	2	1	0	1	2	1	2	.	1	1	1	0	1	2	2	2	0	.	13
07-06-30	.	2	1	0	1	2	1	2	.	1	1	1	0	1	2	2	2	0	.	13
07-09-30	.	2	1	1	1	2	1	2	1	1	1	1	0	1	2	2	2	0	.	15
07-12-31	.	2	1	2	1	2	1	2	1	1	1	0	0	1	2	2	2	0	.	14
08-03-31	.	2	1	2	1	2	1	2	1	1	1	1	0	1	2	2	2	0	.	15
08-06-30	.	2	1	2	1	2	1	2	1	1	1	1	0	1	2	2	2	0	.	15
08-09-30	.	2	1	2	1	2	1	2	1	1	1	1	0	1	2	2	2	.	.	15
08-12-31	.	2	1	2	1	2	1	2	1	.	2	1	0	1	2	.	2	.	.	13
09-03-31	1	2	1	2	1	2	1	2	.	.	2	1	0	1	2	.	2	.	.	13
09-06-30	1	2	1	2	1	2	1	2	.	.	2	1	0	1	2	.	2	.	.	13
09-09-30	1	2	1	2	1	2	1	2	.	.	2	1	0	1	2	.	2	.	.	13
09-12-31	1	2	1	2	1	2	1	2	.	.	2	1	0	1	2	.	2	.	.	13
10-03-31	1	2	1	0	1	2	1	2	.	.	2	1	0	1	2	.	2	.	.	12
10-06-30	1	2	1	0	1	2	1	2	.	.	2	1	0	0	2	.	2	.	.	11
10-09-30	1	2	1	0	1	2	1	2	.	.	2	1	0	0	2	.	2	.	.	11

Table 3: Descriptive Statistics

This table provides the mean, standard deviation, 5th and 95th percentiles of the sample for each variable. *Large* refers to banks larger than $200 billion in consolidated depository institution assets.

	Mean		Standard Deviation		5%		95%	
Variable	Other	Large	Other	Large	Other	Large	Other	Large
Asset Volatility	0.0058	0.0222	0.0219	0.0422	0.0002	0.0006	0.0209	0.1288
CRE Loans	0.1912	0.0360	0.0992	0.0264	0.0430	0.0054	0.3659	0.0776
C&D Loans	0.1032	0.0173	0.0898	0.0130	0.0062	0.0014	0.2853	0.0355
C&I Loans	0.0988	0.1023	0.0674	0.0251	0.0150	0.0706	0.2240	0.1604
Equity	0.0970	0.0943	0.0395	0.0126	0.0621	0.0754	0.1498	0.1167
Fee Income	0.0002	0.0007	0.0012	0.0003	0.0000	0.0003	0.0009	0.0014
Growth	0.0231	0.0361	0.0790	0.1386	-0.0510	-0.0487	0.1203	0.0949
Income	0.0008	0.0026	0.0068	0.0030	-0.0096	-0.0046	0.0056	0.0058
Insured Deposits	0.5459	0.2386	0.1612	0.1264	0.2583	0.0616	0.7838	0.4469
Liquid Assets	0.1250	0.1131	0.0927	0.0647	0.0236	0.0382	0.2970	0.2310
Liquidity Premium	0.2194	0.2106	0.3140	0.3508	0.0000	0.0000	0.7800	1.0520
Loan Loss Reserves	0.0103	0.0113	0.0064	0.0066	0.0039	0.0051	0.0225	0.0245
Non-Performing	0.0217	0.0160	0.0333	0.0144	0.0001	0.0028	0.0841	0.0439
Risk Premium	0.3894	0.1634	0.3675	0.2430	0.0000	0.0000	1.0100	0.7128
Subordinated Debt	0.1171	0.4230	0.0738	0.1420	0.0082	0.2163	0.2198	0.6878
Trading Assets	0.0008	0.1212	0.0073	0.0908	0.0000	0.0146	0.0002	0.2788
Uninsured Deposits	0.1880	0.1875	0.1090	0.0530	0.0399	0.0893	0.3954	0.2558
$100K MMDA	1.5948	1.2205	1.0391	1.0537	0.3500	0.0100	3.7500	3.8835
$10K MMDA	0.9834	0.8338	0.7790	0.6342	0.1500	0.0100	2.5000	2.3109
$25K MMDA	1.2033	1.0445	0.8832	0.9158	0.2112	0.0100	3.0000	2.9760

Table 4: Cross Sectional Regressions Premium

Results from OLS cross sectional regressions for 2005 Q1 through 2010 Q2. The independent variable is risk premium and the variable of interest is Large. The risk premium is defined as the branch level difference in the $100K MMDA rate and the $25K MMDA rate aggregated to the regulatory high holder. Each regression excludes banks that always post a zero premium and uses a *Large* threshold of $200 billion. Variables definitions appear in Table 1. N is the number of banks. Reporting robust standard errors.

Date	Large	Liq	Eq	Gr	NP	LLR	Inc	GrVol	Ins	LiqAs	Trad	R^2	N
05-03-31	0.0708	0.0601	-0.6503**	-0.1734	1.1177	0.5138	-11.273**	0.9135*	0.0225	0.1568	-1.2868**	0.0229	720
	(0.1083)	(0.0589)	(0.3239)	(0.1675)	(2.0153)	(3.8926)	(4.9826)	(0.4897)	(0.0805)	(0.1399)	(0.5736)		
05-06-30	0.0140	0.0831	-0.4043	0.1517	-1.8551	2.9052	-8.9953*	0.8216	-0.0280	0.2769*	-1.3706**	0.0269	784
	(0.0988)	(0.0544)	(0.4830)	(0.1242)	(1.5731)	(4.2163)	(4.5874)	(0.6708)	(0.0882)	(0.1640)	(0.6050)		
05-09-30	-0.0438	0.0084	-0.0432	0.0104	-1.5157	4.1205	-8.6351	1.1489	-0.0965	0.1508	-1.4206*	0.0134	832
	(0.1219)	(0.0486)	(0.4451)	(0.1714)	(1.7495)	(4.7687)	(6.3163)	(0.8490)	(0.0984)	(0.1719)	(0.7677)		
05-12-31	0.0792	0.0613	-0.7259*	0.0579	-1.8434	3.4633	-10.237	0.8197	-0.1244	0.2397	-1.8338*	0.0153	882
	(0.2223)	(0.0449)	(0.4283)	(0.2096)	(1.7855)	(4.8348)	(7.3139)	(0.6487)	(0.1021)	(0.1643)	(0.9460)		
06-03-31	-0.1091	0.0608	-0.4378	0.0410	-0.3103	-4.9480	-10.736	-0.3218	-0.2064**	0.1855	-0.6531	0.0142	920
	(0.2554)	(0.0376)	(0.4613)	(0.2619)	(1.7669)	(5.6752)	(8.0854)	(0.6278)	(0.0939)	(0.1607)	(1.6134)		
06-06-30	-0.0274	0.0299	-0.5706	0.3129	-2.5291	1.1310	-6.5874	-1.0965	-0.1801*	0.4929***	-1.1959	0.0186	973
	(0.2791)	(0.0346)	(0.4161)	(0.1975)	(2.0960)	(5.7767)	(9.4912)	(0.7616)	(0.1007)	(0.1812)	(1.6571)		
06-09-30	-0.1036	0.0249	-0.0666	0.4403**	-1.6983	0.8541	-16.307**	-1.2700	-0.0077	0.4249**	-0.4336	0.0321	974
	(0.2686)	(0.0322)	(0.3856)	(0.1841)	(2.0427)	(5.9734)	(6.5541)	(0.8422)	(0.1112)	(0.1720)	(1.7000)		
06-12-31	-0.3775*	0.0548	-0.3682	0.2945	-1.6573	-4.1458	-6.2314*	-0.3069	0.0237	0.3413*	-0.2088	0.0187	976
	(0.2208)	(0.0345)	(0.3775)	(0.2951)	(2.0752)	(5.8414)	(3.7751)	(0.7233)	(0.1136)	(0.1750)	(1.4153)		
07-03-31	-0.5687***	0.0616*	0.0440	-0.0798	-0.7228	2.8355	-8.3958	-0.4276	-0.0234	0.3596**	1.1741	0.0169	1,002
	(0.1770)	(0.0337)	(0.2852)	(0.1729)	(1.9750)	(6.0498)	(6.1611)	(0.5134)	(0.1165)	(0.1644)	(1.0451)		
07-06-30	-0.5333**	0.0661*	-0.3382	-0.1158	-1.3515	-0.9836	0.9867	-0.0265	-0.0692	0.4890***	0.8190	0.0166	1,011
	(0.2163)	(0.0348)	(0.3810)	(0.1484)	(1.6701)	(6.0196)	(3.1605)	(0.4483)	(0.1091)	(0.1867)	(1.1887)		
07-09-30	-0.4443**	0.0671*	-0.5197*	-0.1386	-1.6467	-1.8116	-0.8878	0.5502	-0.0588	0.5661***	0.0484	0.0214	1,020
	(0.2020)	(0.0348)	(0.2782)	(0.2013)	(1.4812)	(5.5045)	(3.1050)	(0.3498)	(0.0979)	(0.1898)	(1.0567)		
07-12-31	-0.3496*	0.0492	-0.8410***	0.0708	-1.3944	-5.3422	-3.6809	-0.3750	0.0286	0.3795**	-0.2515	0.0205	999
	(0.1885)	(0.0356)	(0.2738)	(0.1369)	(1.1181)	(4.7324)	(2.6731)	(0.4169)	(0.0929)	(0.1703)	(0.9968)		
08-03-31	-0.1708	0.0376	-0.4012	0.0718	-1.2990**	-3.9696	-7.3563**	0.2960	0.1028	0.0741	-0.5549	0.0154	1,014
	(0.1873)	(0.0400)	(0.3468)	(0.1463)	(0.6046)	(3.2832)	(3.6638)	(0.5888)	(0.0765)	(0.1268)	(0.8116)		
08-06-30	-0.2892*	0.0427	-0.3430	0.0834	-0.1358	-5.7132**	-1.6418	0.4986	0.0378	0.0539	-0.1816	0.0145	1,008
	(0.1657)	(0.0391)	(0.3065)	(0.1363)	(0.4773)	(2.5800)	(2.1184)	(0.6585)	(0.0782)	(0.1259)	(0.8940)		
08-09-30	-0.0564	0.0767*	-0.3051	0.1698	-0.5028	-4.0641*	-2.3621**	-0.1280	0.0435	0.0028	-1.7104**	0.0188	1,003
	(0.1647)	(0.0414)	(0.2682)	(0.1266)	(0.4739)	(2.3781)	(1.0998)	(0.4602)	(0.0832)	(0.1326)	(0.8346)		
08-12-31	0.0197	0.0399	-0.1508	0.0507	0.5899*	-7.6879***	-0.5697	0.1866	0.0247	-0.0594	-1.9183***	0.0205	1,350
	(0.1264)	(0.0379)	(0.2002)	(0.1100)	(0.3305)	(1.8948)	(1.0820)	(0.3667)	(0.0596)	(0.1077)	(0.6871)		
09-03-31	0.0127	0.0844*	-0.0841	0.2459**	0.6439**	-5.4688***	-0.0494	0.1427	0.0289	-0.0325	-1.7399***	0.0268	1,374
	(0.0925)	(0.0444)	(0.1911)	(0.1223)	(0.2677)	(1.5606)	(1.3294)	(0.2799)	(0.0565)	(0.0927)	(0.6744)		
09-06-30	-0.0180	0.1462***	0.0749	0.2096	0.3257	-4.2451***	-1.0710	0.4636	0.0574	0.0169	-1.6060**	0.0332	1,465
	(0.1011)	(0.0506)	(0.1856)	(0.1310)	(0.2186)	(1.2316)	(1.0525)	(0.3422)	(0.0533)	(0.0855)	(0.8116)		
09-09-30	-0.0010	0.0975**	0.0436	0.0636	0.2949	-3.2682***	-2.0109	0.5467**	0.0996**	-0.0730	-1.2543*	0.0212	1,652
	(0.0989)	(0.0445)	(0.1508)	(0.0702)	(0.1926)	(1.1149)	(1.2543)	(0.2609)	(0.0450)	(0.0660)	(0.6781)		
09-12-31	0.0430	0.1336***	-0.0175	0.1419**	-0.0534	-1.7312**	-1.7796**	0.1352	0.1132***	-0.0992	-1.5824**	0.0246	1,717
	(0.0867)	(0.0416)	(0.1600)	(0.0606)	(0.1604)	(0.7829)	(0.8411)	(0.2718)	(0.0434)	(0.0635)	(0.6612)		
10-03-31	-0.0571	0.1728***	-0.0470	0.0677	-0.0293	-2.6757***	-4.1414***	0.4073	0.1063***	-0.0391	-0.9353*	0.0327	1,773
	(0.0666)	(0.0422)	(0.1695)	(0.0831)	(0.1415)	(0.7530)	(1.2715)	(0.2779)	(0.0409)	(0.0601)	(0.4854)		
10-06-30	-0.0702	0.1707***	-0.2113	0.0657	0.1173	-1.4192**	-0.1914	0.4555	0.0971***	0.0093	-0.9243*	0.0256	1,872
	(0.0678)	(0.0391)	(0.1688)	(0.0826)	(0.1410)	(0.6200)	(0.3655)	(0.2865)	(0.0374)	(0.0550)	(0.5280)		
10-09-30	0.0001	0.1532***	-0.0174	0.0069	0.0421	-1.4425**	-1.7171*	0.0826	0.1025***	-0.0489	-1.1315**	0.0262	1,765
	(0.0627)	(0.0405)	(0.1662)	(0.0821)	(0.1427)	(0.7014)	(1.0091)	(0.2120)	(0.0371)	(0.0509)	(0.4855)		

* significant at 10%, ** significant at 5%, and *** significant at 1%

Table 5: Panel Regression Results

Results from a panel regression of the risk premium on risk variables, with a decomposition of errors by Large dummy. Risk premium is defined as the branch level difference in the $100K MMDA rate and the $25K MMDA rate aggregated to the regulatory high holder. The baseline estimation appears in Column (1) and uses data from 2006 Q1, until 2008 Q2, inclusive. It excludes banks that always post a zero premium and uses a TBTF threshold of $200 billion. It uses a demeaning approach to obtain fixed effects estimates. All other columns use these criteria unless noted otherwise. Column (2) reports results estimated after the policy change, 2008 Q4 to 2010 Q2. Column (3) reports estimates aggregating branches to the bank-MSA level and controls for MSA fixed effects. Column (4) reports estimates aggregating branches to the bank-MSA level and controls for MSA fixed effects after the policy change. Column (5) reports estimates using a $100 billion threshold. Column (6) reports estimates using a $10 billion threshold. Column (7) reports estimates using the $10 billion threshold in the time period after the policy change. Column (8) includes banks that always post a zero risk premium. Variables definitions appear in Table 1.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Large	-0.3637***	-0.0351	-0.1871**	0.0055	-0.2922***	-0.2396***	-0.1462***	-0.2531***
	(0.1059)	(0.0342)	(0.0737)	(0.0222)	(0.0584)	(0.0441)	(0.0178)	(0.0895)
Liq	0.0159	-0.0699**	0.0124	0.0506	0.0159	0.0159	-0.0705**	0.0231
	(0.0397)	(0.0341)	(0.0544)	(0.0590)	(0.0397)	(0.0397)	(0.0343)	(0.0362)
Eq	0.2089	-0.0996	0.4032	0.0720	0.2089	0.2089	-0.0980	0.2590
	(0.2231)	(0.1919)	(0.2758)	(0.2113)	(0.2231)	(0.2231)	(0.1932)	(0.2112)
Gr	0.0332	0.0331	0.0468	0.0109	0.0332	0.0332	0.0327	0.0316
	(0.0421)	(0.0265)	(0.0291)	(0.0178)	(0.0421)	(0.0421)	(0.0265)	(0.0365)
NP	0.1819	-0.0795	-0.4359	0.0770	0.1819	0.1819	-0.0790	0.0766
	(0.4404)	(0.1638)	(0.5926)	(0.2287)	(0.4404)	(0.4404)	(0.1641)	(0.3236)
LLR	1.9705	-0.4298	6.5536	-0.0684	1.9705	1.9705	-0.4682	1.4104
	(2.4416)	(0.7282)	(4.0885)	(0.8785)	(2.4416)	(2.4416)	(0.7361)	(1.7771)
Inc	-0.8727	-0.0781	0.2153	0.1209	-0.8727	-0.8727	-0.0787	-0.5056
	(1.0029)	(0.2701)	(1.0340)	(0.3857)	(1.0029)	(1.0029)	(0.2727)	(0.7727)
GrVol	0.1906	-0.2897*	0.5328	-0.8261*	0.1906	0.1906	-0.2905*	0.1022
	(0.4129)	(0.1740)	(0.3884)	(0.4941)	(0.4129)	(0.4129)	(0.1739)	(0.3738)
Ins	-0.1683*	-0.0212	-0.0441	-0.0003	-0.1683*	-0.1683*	-0.0231	-0.1385*
	(0.0917)	(0.0492)	(0.0974)	(0.0572)	(0.0917)	(0.0917)	(0.0495)	(0.0746)
N	1,037	1,663	942	1,655	1,037	1,037	1,655	1,393
Rsq	0.0120	0.0285	0.0222	0.0366	0.0120	0.0120	0.0288	0.0070
Time Dummy	YES	YES	YES	YES	YES	YES	YES	YES
MSA Dummy	NO	NO	YES	YES	NO	NO	NO	NO

* significant at 10%, ** significant at 5%, and *** significant at 1%

Table 6: Panel Regression Results (cont.)

Results from a panel regression of the risk premium on risk variables, with a decomposition of errors by Large dummy. Risk premium is defined as the branch level difference in the $100K MMDA rate and the $25K MMDA rate aggregated to the regulatory high holder. All other columns use these criteria from the baseline except as noted otherwise. Column (9) reports estimates using the $25K-$10K spread as the dependent variable. Column (10) reports estimates resticting the set of banks to those in the data in Q1, 2006. Column (11) reports estimates after the policy change resticting the set of banks to those in the data in Q1, 2006. Column (12) uses a first differencing approach to obtain estimates. Column (13) reports estimates from a panel FE estimation with size as a time varying control variable. Column (14) reports estimates using only those banks larger than $1 billion. Column (15) includes additional risk measures associated with the crisis (CD, CI, and CRE concentrations), measures for priority of claims relative to uninsured deposits (SubDebt, Unins), and a proxy for the presence of wealth management services for large depositors (Fee). Column (16) includes only branches in the New York City MSA and includes banks that post a zero risk premium. Variables definitions appear in Table 1.

Variable	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Large	0.0831	-0.3427***	-0.1679***	-0.3251***		-0.1083	-0.2008*	-0.6833***
	(0.2008)	(0.1034)	(0.0570)	(0.0986)		(0.1050)	(0.1132)	(0.1428)
Size					-0.0681			
					(0.0578)			
Liq		0.0343	0.0504	0.0202	0.0145	0.0083	0.0131	0.2516
		(0.0445)	(0.0519)	(0.0366)	(0.0399)	(0.0695)	(0.0397)	(0.2381)
Eq	0.2057	0.6716*	-0.0906	0.2253	-0.0107	0.7607	0.8125**	0.3012
	(0.2222)	(0.4069)	(0.4445)	(0.1961)	(0.2756)	(0.8478)	(0.3654)	(1.1186)
Gr	0.0325	0.0809	0.0468	0.0256	0.0523	0.0414	0.0331	-0.1290
	(0.0422)	(0.0529)	(0.0444)	(0.0284)	(0.0472)	(0.0649)	(0.0426)	(0.1012)
NP	0.1779	0.4339	-0.1577	-0.0805	0.1696	1.0716	0.2096	6.8318***
	(0.4424)	(0.4449)	(0.2789)	(0.3311)	(0.4382)	(1.1122)	(0.4410)	(2.1493)
LLR	1.9681	1.1855	0.9605	1.1037	1.5886	5.0090	2.2889	5.2020
	(2.4433)	(2.4755)	(1.2395)	(1.6846)	(2.5306)	(4.5346)	(2.4328)	(16.4182)
Inc	-0.8824	-0.8282	0.4167	-0.3369	-0.8951	0.3469	-0.6752	18.4210*
	(0.9991)	(1.0059)	(0.3515)	(0.4529)	(1.0079)	(0.8488)	(1.0065)	(10.2029)
GrVol	0.1890	-0.4263	-0.6284*	-0.0682	0.2810	-1.3262	0.2252	0.5222
	(0.4116)	(0.7530)	(0.3415)	(0.3150)	(0.4119)	(1.2757)	(0.4122)	(0.5385)
Ins	-0.1687*	-0.0878	-0.0727	-0.0901	-0.1755*	0.2397	-0.1557	-1.2476
	(0.0917)	(0.0915)	(0.0746)	(0.0675)	(0.0918)	(0.1605)	(0.1649)	(0.8046)
CD							0.2500	
							(0.2580)	
CI							-0.1100	
							(0.2830)	
CRE							-0.0384	
							(0.2350)	
Subdebt							-0.4945**	
							(0.2413)	
DepUnins							0.0330	
							(0.1983)	
Fee							-2.3227	
							(2.1348)	
N	1,037	738	552	1,037	1,037	299	1,025	51
Rsq	0.0119	0.0122	0.0333	0.0353	0.0121	0.0129	0.0125	0.0250
Time Dummy	YES	YES	YES	YES	YES	YES	YES	YES
MSA Dummy	NO	NO	NO	NO	NO	NO	NO	NO

* significant at 10%, ** significant at 5%, and *** significant at 1%