Federal Deposit Insurance Corporation • Center for Financial Research

Working Paper Series

# Deposit Insurance and Bank Funding Stability: Evidence from the TAG Program

Ajay Palvia
*Federal Deposit Insurance Corporation*

George Shoukry
*Federal Deposit Insurance Corporation*

Anna-Leigh Stone
*Samford University*

April 2024

FDIC CFR WP 2024-02

fdic.gov/cfr

# Deposit Insurance and Bank Funding Stability: Evidence from the TAG Program

Ajay Palvia [a], George Shoukry [a], and Anna-Leigh Stone [b]

[a] Federal Deposit Insurance Corporation, Center for Financial Research

[b] Brock School of Business, Samford University

04/15/2024

## Abstract

We study the effects on bank funding from the unlimited deposit insurance provided by the Transaction Account Guarantee (TAG) program. We find that opting out of the program caused strong and persistent declines in noninterest-bearing deposits (NIBDs). Further, we find that weak growth in NIBDs reduced banks' likelihood of opting out of the TAG program, suggesting that banks believed the program could bolster their NIBD funding. Our results suggest that targeted deposit insurance protections can be successful in stemming deposit outflows during periods of stress, and that such protections are valued by banks suffering deposit outflows.

Keywords: Deposit Insurance, Federal Deposit Insurance Corporation, Transaction Account Guarantee Program

JEL Classification: G01, G21, G28

*Views and opinions expressed in this paper reflect those of the authors and do not necessarily reflect those of the FDIC or the United States.*

We thank Rosalind Bennett, Christopher Martin, Alex Ufier, Luke Watson, and FDIC seminar participants for helpful comments and suggestions.

## 1. Introduction

During the 2008 financial crisis, the federal government enacted several programs to help restore confidence in the banking system. Such programs included the U.S. Department of Treasury's Troubled Asset Relief Program (TARP), the Federal Reserve's Term Auction Facility, and the Federal Deposit Insurance Corporation (FDIC) Debt Guarantee Program. However, bankers and policymakers were also concerned about depositors pulling funding from banks, particularly small banks, and placing them at institutions perceived to be "too big to fail." Of particular concern were business-owned noninterest-bearing deposits (NIBDs) which often had balances greater than the FDIC insurance limit.[1] On October 14, 2008, the FDIC implemented the Transaction Account Guarantee (TAG) program, which provided full FDIC insurance coverage on noninterest-bearing transaction accounts until December 31, 2010 when the program expired.[2] While this program did not provide unlimited insurance exclusively to small institutions, it was one of the few that purposefully included them.

In this paper, we study the implications of the TAG program for bank funding. We exploit two unique features of the TAG program. The first being that the program was mostly voluntary. Except for an initial short time period in which all insured banks were covered by the TAG program without paying additional TAG fees, participation in the program was optional, and banks had several opportunities to opt out of the program and its extensions. The second feature is that the program's unlimited coverage applied to only certain kinds of deposits, allowing us to better isolate the effects of the program. Banks choosing to remain in the program had unlimited deposit insurance coverage for certain types of accounts (generally, noninterest bearing transaction accounts), with a surcharge applying to amounts not otherwise covered by

[1] See https://www.fdic.gov/regulations/resources/TLGP/101608.html for details.
[2] The Dodd-Frank Act created an unlimited insurance guarantee for noninterest-bearing transaction accounts, which was in effect from December 31, 2010 through December 31, 2012. The Dodd-Frank Act guarantee program differed from the TAG program in important ways (see Section 2 in this paper for more details).

the standard FDIC insurance.[3] In this paper, we use NIBDs reported on banks' public quarterly filings as a proxy for the types of deposits covered by the TAG program.[4]

We begin the analysis by discussing aggregate trends in NIBDs from 2002 until 2010. We document that NIBDs, as well as the ratio of NIBDs to total deposits, increased during the period of unlimited insurance, primarily during the extensions of the TAG program. Further dividing the data into small and large banks, defined by a cutoff of $10 billion in total assets, we show that small institutions were losing NIBDs leading up to the unlimited insurance increase.[5] At the same time, large institutions were gaining NIBDs, suggesting a flight to large institutions was taking place. During the unlimited insurance period, however, NIBDs at both small and large banks grew, particularly during the TAG program extensions. In addition, we show that while participation in the program was initially very high, large banks began opting out of the program during the first extension. These large banks exiting the program drastically changed the percentage of deposits that were covered by unlimited insurance during the last year of the TAG program.

Our primary analysis consists of three main parts. First, we study the direct effects of the unlimited insurance on bank funding. We exploit the voluntary periods of the program and compare TAG participants with non-participants to estimate the effects of opt-out decisions on NIBD levels. In this part of the analysis, we implement a trimming procedure to ensure that the TAG participants and non-participants in our sample are comparable. Using both difference-in-differences and the Callaway and Sant'Anna (2021) estimator, we document that NIBDs at banks that opted out declined compared to banks that never opted out. The results are stronger for banks that opted out at the start of the program and during the first extension. We find that

[3] Specifically, the coverage applied to noninterest bearing transaction accounts, low-interest Negotiable Order of Withdrawal (NOW) accounts, and Interest on Lawyers Trust Accounts (IOLTAs). For these accounts, the TAG program insured only amounts above the limit of $250,000; amounts below the limit were insured under the standard FDIC insurance. See https://www.fdic.gov/regulations/resources/TLGP/faq.html for details.

[4] Reported totals for NIBDs make no distinction between amounts insured by the standard FDIC coverage and amounts above the standard FDIC limit that were insured by TAG. In addition, they may include uninsured amounts, such as matured time deposits that did not automatically renew or transfer to a different account (time deposits were not covered by the TAG program). Nevertheless, NIBDs are a convenient proxy for our analysis because noninterest-bearing transaction accounts covered by TAG were a subset of total NIBDs, and NIBDs were reported by both TAG participants and nonparticipants.

[5] The cutoff of $10 billion in total assets is used by the Federal Reserve to differentiate between community banks and larger institution. See https://www.federalreserve.gov/supervisionreg/community-and-regional-financial-institutions.htm for details.

NIBD declines were persistent, that is, NIBDs continued to decline over time for banks that opted out. Our results do not appear to be driven by pre-existing trends, specifically our results do not suggest pre-trends of declining NIBDs at banks that chose to opt out of the TAG program. An additional analysis, discussed below, explores pre-trends more fully.

Second, we use variation in risk-based TAG fees to instrument for the decision to opt out of TAG, and we find results that further confirm the previous ones. During the extensions of the TAG program, TAG participants were charged different TAG fees depending on their risk levels. We use confidential supervisory data on banks' risk categories and we exploit differentials in TAG fees around risk category thresholds to instrument for the decision to opt out of TAG. Restricting the sample to banks close to the thresholds, we find that among risky banks, those facing higher premiums to remain in the TAG program were more likely to opt out, and we find that opting out led to lower NIBDs.

Lastly, we conduct a detailed study of how opt-out decisions were influenced by changes in banks' levels of NIBD funding. This part of the analysis allows us to understand pre-trends in NIBD levels, and whether banks were motivated to continue to participate in TAG in the hope of attracting NIBDs. For this set of results, we use a separate two-stage instrumental variable approach to consider the extent to which weak market availability of NIBDs affects bank NIBD growth, and we assess the link between a bank's NIBD growth and the subsequent participation decision in the TAG program. We show that market NIBD growth is strongly associated with bank NIBD growth and that weak NIBD growth causes banks to not opt-out of the TAG program, further confirming that our first set of main results are not driven by existing trends of declining NIBDs at banks that opted out of TAG. Our results suggest that banks took advantage of the TAG program when they were facing difficulty in growing or maintaining NIBD deposits, consistent with the program's goals. In additional tests, we show that the results are driven by participation in 2010 rather than 2009, by banks with less than $10 billion in assets, by banks that have a high dependence on uninsured deposits relative to overall deposits, and by banks with heavier dependence on NIBDs for funding.

These results are unique in the literature, as empirical analysis on the TAG program has been limited.

Schich (2008) provides a summary of the full insurance guarantee (and the implications for extending the insurance). Hoskins (2012) discusses the unlimited insurance guarantee and the potential impact upon its expiration. In addition, both Bank of America and Goldman Sachs have published reports discussing the implications of full insurance.[6] However, these papers included limited empirical analysis and were published primarily to promote the TAG program and provide evidence for its extension. While Boyle et al. (2015) do not directly examine the TAG program, they examine whether the onset of deposit insurance during a crisis might help reduce the amount of runs at institutions. However, they find that additional insurance does not affect deposit withdrawals in the short run. Martin, Puri, and Ufier (2022) find that the TAG program reduced the outflow of deposits, but the results are for a single institution. This paper studies the effects of the TAG program on all FDIC-insured institutions. While Stone (2020) finds that corporations might have provided most NIBDs covered by unlimited insurance, the implications for banks are not examined.

Some studies examine Massachusetts-chartered institutions covered by private deposit insurance, and find evidence that privately insured institutions experienced relatively stronger deposit inflows during the financial crisis (Stone (2021) and Danisewicz et al (2022)). These studies differ from our analysis of the TAG program in several ways. First, unlike the TAG program, the insurers were private, industry-sponsored companies and not guaranteed by either the state or the federal government. Second, private insurers in Massachusetts insured only savings and cooperative institutions, and the institutions had to be Massachusetts-chartered, so the number and types of Massachusetts institutions that were privately insured during the crisis are necessarily limited. In contrast, the TAG program was available to all FDIC-insured institutions.

Better understanding the impacts and effectiveness of the TAG program's unlimited insurance is important for policymakers when deciding future actions that could be taken during financial crises. While

[6] Goldman Sachs Research Department published "US Daily: FDIC Deposit Guarantees: Another Year-End Risk" on September 4, 2012. See http://www.goldmansachs.com/gsam/pdfs/GLM/research-FDIC-deposit-guarantees.pdf for details. Bank of America published "Life After Full FDIC Insurance" in April 2012. See https://corp.bankofamerica.com/documents/10157/67594/LifeAfterFDIC.pdf for details.

not executed, in March 2020 during the Covid-19 pandemic, Section 4008 of the Coronavirus Aid, Relief, and Economic Security (CARES) Act temporarily provided the FDIC Congressional approval through December 31, 2020, to implement a debt guarantee program, to include a guarantee of deposits held in noninterest-bearing transaction accounts, as authorized under the FDI Act. After the failure of Silicon Valley Bank in March 2023, a discussion about deposit insurance reform was reignited. In a 2023 report, the FDIC concluded that if reform was necessary for the deposit insurance system, a "targeted coverage" structure similar to the TAG program could be the preferred approach to stabilize bank funding (FDIC (2023)). Thus, it is beneficial to study whether this type of program was helpful during the 2008 financial crisis to prevent deposit withdrawals and protect banks.

## 2. The Transaction Account Guarantee Program

The FDIC was established in response to the Great Depression, primarily to reassure the public that deposits held in financial institutions were safe, thus preventing future bank runs. However, during the 2008 recession and following a determination of systemic risk, to avoid or mitigate serious adverse effects on economic conditions or financial stability, the FDIC provided additional reassurances to depositors by implementing the TAG program on October 14, 2008.[7]

The initial TAG program's coverage started from October 14, 2008 and went through December 31, 2009. Figure 1 shows a timeline of the implementation of the TAG program and its extensions. The program was extended for six-month increments twice: first to June 30, 2010 and ultimately to December 31, 2010. (A separate guarantee program, mandated by the Dodd-Frank Act and discussed further below, was in place from December 31, 2010 through December 31, 2012.) Under the TAG program, all banks were automatically enrolled and covered free of charge until December 5, 2008 (extended from November 12, 2008). After this date, institutions could voluntarily opt out of the program, which meant insurance on these deposits returned to the $250,000 limit.[8] Once a bank opted out of the TAG program, it was excluded through each subsequent extension.

[7] 73 FR 64179 (Oct. 29, 2008). See https://www.govinfo.gov/content/pkg/FR-2008-10-29/pdf/E8-25739.pdf for details.
[8] Additionally, participating banks had until November 2, 2009 to make a decision regarding participation in the first extension and until April 30, 2010 to make a decision regarding participation in the second extension.

The unlimited insurance offered by the TAG program applied to noninterest-bearing transaction accounts, which were defined as accounts "with respect to which interest is neither accrued nor paid and on which the insured depository institution does not reserve the right to require advance notice of an intended withdrawal", as well as low-interest Negotiable Order of Withdrawal (NOW) accounts, and Interest on Lawyers Trust Accounts (IOLTAs).[9] As previously mentioned, we use noninterest-bearing deposits (NIBDs) to proxy for the types of accounts covered by the TAG program.

In her opening remarks during a teleconference held on October 16, 2008, then-chairman of the FDIC, Sheila Bair, clarified why the TAG program did not apply to a wider range of deposit types. She stated, "we've seen a lot of stress in the business accounts, the payroll accounts, which typically need to be just by necessity of the nature of them over $250,000. We're trying to stabilize this source of liquidity, especially for the smaller banks."[10]

Bank participation in the program after December 5, 2008 was voluntary, and the insurance was funded by an additional fee paid by each bank. A summary of the TAG fees compared to the annual deposit insurance assessment rates is provided in Table 1. From December 6, 2008 until December 31, 2009, the additional assessment fee was a flat 10 basis points on deposits over the $250,000 insurance limit, regardless of risk. Banks in the riskiest categories paid less for the additional insurance than their annual assessment rates. In the first quarter of 2009, when the FDIC raised annual assessment rates, the TAG fee rate was lower than the annual deposit insurance assessment rate across all risk categories. When annual assessment rates were changed again during the second quarter of 2009, the difference between the TAG fee rate and the annual assessment rates generally became even more stark. During the first and second extensions of the TAG program in 2010, the additional TAG fee was increased from a flat 10 basis points to a risk-varying 15–25 basis points. At that time, the TAG fee rates were higher than the annual assessment rates for some

[9] See https://www.fdic.gov/regulations/resources/TLGP/faq.html for details.
[10] See https://www.fdic.gov/regulations/resources/TLGP/101608.html for details.

banks in the lowest risk categories, but remained lower than annual assessment rates for banks in the highest risk categories.[11]

While the TAG program was allowed to expire on December 31, 2010, the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank) extended the unlimited insurance on NIBDs from December 31, 2010 through December 31, 2012. However, this Dodd-Frank extension has some major differences from the original TAG program. The most important for the purposes of this study is that the Dodd-Frank extension did not charge additional deposit insurance premiums on qualifying accounts over the FDIC limit, it covered all banks, and it did not allow banks to opt out of the insurance.[12] Because the Dodd-Frank extension applied to all banks, we would not be able to analyze the causes and consequences of banks' opt-out decisions in the same way as we do in the current paper. In addition, Stone (2022) finds that banks during the Dodd-Frank extension experienced an increase in deposit flows over the FDIC limit, but that NIBDs as a percentage of total deposits continued to increase despite the expiration of the unlimited insurance. Thus, Stone (2022) concludes that the Dodd-Frank unlimited insurance encouraged additional deposits to flow into banks. For these reasons, this paper focuses on the TAG program prior to the Dodd-Frank extension. An exception to this is the analysis of Section 6.1, which extends beyond 2010, into the era of the alternate Dodd-Frank guarantee program.

## 3. Trends in Aggregate Noninterest-Bearing Deposits

Figure 2 plots the sum of domestic NIBDs across all FDIC insured banks from 2002 until 2010. Our sample includes all FDIC-insured institutions that filed Call Reports, excluding insured branches of foreign banks. The bars break the graphs into four sections: the pre-TAG era, the TAG program, the first extension, and the second extension. We document that NIBDs slightly increased up until mid-2005, when aggregate deposits leveled off in the years leading up to the unlimited insurance. NIBDs then increased in the quarter prior to the TAG program and continued to increase throughout the program and its extensions. The increase in

[11] The FDIC reported that they collected $1.2 billion in fees under the TAG Program. Cumulative estimated losses due to bank failures under the TAG Program were $1.5 billion in 2018. See https://www.fdic.gov/regulations/resources/tlgp/ for details.

[12] The Dodd-Frank Act also changed the assessment base from adjusted total deposits to total liabilities.

NIBDs suggests the program may have not only prevented withdrawals of NIBDs, but may have encouraged growth in NIBDs.

### 3.1. Small Banks

According to Sheila Bair, the TAG program was implemented with the hope of preventing significant deposit withdrawals, particularly at small institutions. It is therefore necessary to examine if small banks benefited from the program by not seeing a further drawdown in funds in these accounts. Figure 3 provides total domestic NIBDs and the mean ratio of domestic NIBDs to total domestic deposits for small and large institutions. We define small banks as institutions with assets less than or equal to $10 billion and large banks as institutions with assets greater than $10 billion. Panels A and B show NIBDs for small and large banks. Prior to the unlimited insurance, NIBDs for small banks started declining around 2006 and continued until around 2008. When the unlimited insurance was implemented, deposits were slow to increase, but eventually increased during the second extension of the TAG program. This finding is also consistent with findings in Acharya and Mora (2015). The trend for large banks is similar with the exception that large banks did not see a decline in NIBDs prior to the passage of unlimited insurance. In fact, there is even an increase in NIBDs immediately prior to the passage of the TAG program, perhaps suggesting a flight to deposits at large institutions perceived to be "too big to fail."

In Panel C, the mean measure of NIBDs to deposits is presented for both small and large banks. For small banks, a similar trend is seen as in Panel A. NIBDs become a smaller percentage of domestic deposits leading up to the crisis. NIBDs then start increasing around the passage of the extensions of the unlimited insurance. Despite the continual increase in aggregate NIBDs at large banks, NIBDs as a percentage of total domestic deposits at small banks declined until around 2007, leveled off, and then increased during the periods of unlimited insurance.

## 4. Participation in the TAG Program

Recall that the TAG program provided unlimited insurance from October 14, 2008 until December 31, 2010 and allowed banks to exit the program voluntarily after December 5, 2008. By December 31, 2010, a total of 2,072 banks had opted out of the program: 1,110 banks during the original TAG program, 521 during the

first extension, and 441 during the second extension.[13] Figure 4 presents the total domestic NIBDs held at institutions that remained in the TAG program. The dashed line provides the total amount of domestic NIBDs held at all institutions from the first quarter of 2009 until the fourth quarter of 2010, regardless of participation in the TAG program. This is the same total provided in Figure 2. The solid line presents the sum of domestic NIBDs across only participating institutions. During the initial periods of the TAG program, the two series are nearly identical, but after the first extension, the portion of total NIBDs held by TAG participants declines dramatically. At the end of the program, less than 20 percent of all NIBDs were held at institutions participating in the TAG program.

One might next wonder which institutions were leaving the TAG program. Table 2 provides statistics on bank participation separated by the size of the institutions. The total participation of smaller institutions remained very high throughout these periods. During the first quarter of full insurance protection, more than 85 percent of institutions with less than $10 billion in assets participated and by the fourth quarter of 2010, close to 75 percent were still participating. Institutions with assets greater than $10 billion had a very high participation rate of more than 93 percent during the initial periods of the program. The participation rate then fell to less than 65 percent during the first extension and experienced a further decline to around 32 percent during the final extension. The high participation rate of large institutions in the initial quarters shows that these banks judged the benefits of the program to outweigh the fees in the initial periods; however, their large decline in participation demonstrates that something caused large banks to reevaluate the benefits of the program.

The noticeable decline in participation by large banks is very interesting and could potentially bias an estimate of the effect that the TAG program had on banks. Table 2 also presents statistics on the percentage of total NIBDs held by banks that participated based on bank size. Even though several thousand small

[13] These totals do not account for some activity, such as mergers, that may have occurred after opting out but before the end of the quarter in which opt-out decisions were submitted. In addition, de novo institutions may have submitted opt-out decisions prior to filing Call Reports. Consequently, opt-out counts in our empirical analysis differ slightly from the totals reported here. Because we rely heavily on Call Reports, our sample in each quarter includes FDIC-insured institutions that filed Call Reports, and excludes insured branches of foreign banks. Insured branches of foreign banks were allowed to opt out of TAG, but we exclude them because of missing data on key variables. The opt-out lists are provided online. See http://www.fdic.gov/regulations/resources/TLGP/optout.html for details. We assume that banks duplicated across lists opted out at the earliest listed date.

institutions participated in the program, they held less than 20 percent of total NIBDs. On the other hand, despite the initial participation of only about 100 large institutions, they held 79 percent of all NIBDs. However, during the extensions, the portion of total NIBDs at participating large banks dropped to 18 percent and further to 4 percent. Thus, there is a need to control for bank size when examining banks exiting the program and the effect of the TAG program. Figure 5 breaks down the NIBDs at TAG participants based on bank size. Whereas Figure 4 showed a large decline in NIBDs at TAG participants, Figure 5 shows that the decline was due to large institutions exiting the program, not smaller institutions.

In addition to exploring the size of the institutions that participated, we also examine if there was any regional variation in participation. Figure 6 provides state level average participation rates for all banks headquartered in that state across the TAG program. Overall, participation in the program was very high at the state level—Idaho had the most banks participate at 100 percent while Kentucky had the lowest at around 71 percent. We see evidence to suggest some regional variation. For example, banks located in the Western United States had slightly higher participation rates at around 87 percent, whereas banks located in the Midwest had lower participation at around 80 percent. In one of our analyses, we further consider the drivers of participation more generally and consider the extent to which bank NIBD growth affects the decision to opt-out. This analysis, described in Section 7, suggests a causal relation between NIBD growth and opting out of the TAG program.

## 5. Data and Descriptive Statistics

Our data is constructed primarily using quarterly bank Call Reports. In Section 6.2, we use confidential supervisory data on banks' risk categories, which are based partly on confidential data on banks' CAMELS ratings.[14] Our sample includes all FDIC-insured institutions that filed Call Reports, with the exclusion of insured branches of foreign banks. Although they were allowed to participate in the TAG program, we

[14] CAMELS ratings are confidential supervisory ratings with six components: Capital Adequacy, Asset Quality, Management Quality, Earnings, Liquidity, and Sensitivity to Market Risk. In addition to the six components, each bank is assigned a composite CAMELS rating. Both the component and composite ratings range from 1 (best) to 5 (worst). The composite rating summarizes a bank's overall health and may differ from a simple average of the component ratings.

exclude insured branches of foreign banks because of missing data on key variables.[15] We also use the FDIC's Summary of Deposits (SOD), state-level economic data produced by the Bureau of Labor Statistics (BLS), and housing price index data from the Federal Housing Finance Agency (FHFA) to construct various measures used in some of our analysis.[16] Descriptive statistics at the bank-quarter level for key variables are shown in Table 3. The statistics show that during 2009-2010, about 18 percent of bank-quarters are classified as opting out of the TAG program.[17]

## 6. Effects of the TAG Program on NIBD Funding

In this section, we compare banks that opted out of the TAG program with those that did not to see if participation in the TAG program led to changes in banks' NIBDs. While the program was intended to stop the withdrawal of deposits at banks, it is of interest to test if it was successful in achieving this or if it might have drawn in additional deposits.

### 6.1. Difference-in-Differences Estimates

Our sample in this section extends from the first quarter of 2007 through the fourth quarter of 2011. Over the lifetime of the TAG program, there were three opt-out opportunities. Thus, banks can be classified into four groups, those that: (1) never opted out, (2) opted out in 2009 Q1, (3) opted out in 2010 Q1, and (4) opted out in 2010 Q3.[18]

To mitigate endogeneity from selection inherent in the opt-out decision, we trim the sample based on average propensity scores over 2007 to ensure the banks in the sample are comparable. We use a pooled logit model over all quarters of 2007 with the dependent variable being an indicator of whether a bank ever opted out of TAG (1 for ever opt out, and 0 for never opt out). The regressors include the log of asset size, ROA, noncurrent loans to loans ratio, equity to assets ratio, RWA to assets ratio, core deposits to liabilities ratio, liquid assets to assets ratio, and the ratio of uninsured deposits to total deposits. Following Crump et

[15] While our data includes both banks and thrifts, for brevity we often refer these institutions as just banks.
[16] BLS data is obtained through Haver.
[17] Unreported tabulation by year shows substantially less participation during 2010 (76 percent) relative to 2009 (85 percent).
[18] In this section, we define the opt-out quarter to be the first full quarter following the quarter in which opt-out decisions had to be submitted.

al. (2009), we drop banks with average propensity score below 0.1 or above 0.9. The trimming procedure excludes 612 institutions, or about 6.9 percent of the sample of insured institutions. Our trimmed sample contains a total of 8,324 insured institutions, 2,011 of which opted out of the TAG program at some point, and 6,313 that never opted out.

Our framework used in this analysis is difference-in-differences, where we use both OLS and more advanced estimators designed to address concerns with staggered treatment timing. Figure 7 shows that there is significant overlap in the average propensity scores between banks that opted out and those that never opted out. The overlap in Figure 7 shows that for a large mass of banks, the decision to opt out may have been largely driven by idiosyncratic factors, which supports the exogeneity of the opt-out decision in the difference-in-differences framework.

Our OLS specifications are of the following form:

$$Log(NIBD_{it}) = \alpha + \beta\left(\mathbf{1}_{i\in G(t_0)} \times \mathbf{1}_{t\geq t_0}\right) + \gamma \boldsymbol{x}_{it} + c_i + d_t + \varepsilon_{it} \quad (1)$$

$$Log(NIBD_{it}) = \alpha + \sum_{k=2007Q2}^{k=2011Q4} \beta_k\left(\mathbf{1}_{i\in G(t_0)} \times \mathbf{1}_{t\geq k}\right) + \gamma \boldsymbol{x}_{it} + c_i + d_t + \varepsilon_{it} \quad (2)$$

where $Log(NIBD_{it})$ is the log of NIBDs for bank i in quarter t, $G(t_0)$ denotes all the banks that opted out in quarter $t_0$, $\boldsymbol{x}_{it}$ contains controls at the bank-quarter level (the same set of control variables used in the propensity score trimming), $c_i$ is a bank fixed effect, and $d_t$ is a quarter fixed effect. The coefficient of interest in specification (1) is $\beta$. Specification (2) is a dynamic version of (1) that allows for a time-varying coefficient $\beta_k$ that we illustrate graphically. The opt-out quarter, $t_0$, can be one of three values: 2009Q1, 2010Q1, or 2010Q3. In each case, the OLS specifications (1) and (2) only keep one of the three opt-out groups and exclude the other two; that is, the comparison group in these specifications is always the banks that never opted out of the TAG program. However, in addition to OLS specifications (1) and (2), we use an estimator proposed by Callaway and Sant'Anna (2021), which allows us to combine all banks regardless of their opt out date while avoiding the biases discussed in Baker et al. (2022).[19]

[19] With several opt-out groups and opt-out dates, OLS is a weighted average of several comparisons between banks in the TAG program and banks not in the TAG program. These comparisons include groups of banks that opted out earlier as effective controls for groups of banks that opted out later, leading to a "bad comparisons" problem and causing bias if there is a time-

Table 4 reports the results from specification (1). It shows that NIBDs declined after opting out for banks that opted out in either 2009Q1, 2010Q1, or 2010Q3, when compared to banks that never opted out. The effects are stronger when considering banks that opted out in 2009Q1 or 2010Q1, and not very strong (though still directionally consistent) for banks that opted out in 2010Q3. This may be explained by the fact that the Dodd Frank Act of 2010 replaced the TAG program and guaranteed NIBDs after 2010, so opting out of the TAG program in 2010Q3 was effectively only an opt out for at most 6 months (the second half of 2010).

Figure 8 shows estimates from the Callaway and Sant'Anna (2021) estimator with all banks in the trimmed sample included regardless of their opt-out date. There is a clear and persistent negative effect from opting out of the TAG program on the levels of NIBDs at banks that opt out. The magnitude of the decline is similar to the ones estimated by OLS in Table 4. The figure also reveals time-heterogeneity in the effect of opting out. NIBDs continue to decline over time for banks that opted out, and there is not simply a "one-time" decline followed by stabilization. This phenomenon likely explains why the OLS estimates in Table 4 are larger in magnitude for banks that opted out earlier.

Figure 9 shows the effects of opting out of the TAG program on NIBDs for three samples, one for each of the three opt out groups, with each sample containing banks that never opted out as a comparison group. Figure 9 shows the dynamic estimates over time from both the Callaway and Sant'Anna (2021) estimator and the OLS specification (2). Consistent with the results above, the figures show a stronger negative effect of opting out on NIBDs for banks that opted out earlier. Interestingly, the figures suggest there may have even been a trend reversal after opting out, where NIBDs were relatively increasing at banks that opted out and started relatively declining at the same banks after they opted out of the TAG program. Again, the weaker effects for banks that opted out later may be due to the expected implementation of the Dodd-Frank version of an alternate guarantee program after 2010.

varying effect of opting out. These problems do not exist in the case of only two groups and one opt out date, which is why the sample for specifications (1) and (2) is restricted to only banks that never opted out and one additional opt out group (all three opt out dates considered separately).

### 6.2. Using Risk-Based TAG Fees to Instrument for Opt-Out Decisions

In this subsection, we consider an alternate source of variation that might have affected banks' decisions to opt out of the TAG program through an arguably exogenous channel—the insurance premiums that banks had to pay to remain in the TAG program in 2010. We use this variation as an IV to isolate the effect of opting out of the TAG program on NIBDs. Specifically, we exploit the implementation within the TAG program of risk-based premiums—a pricing system that has been shown to have several benefits, such as limiting moral hazard (Shoukry (2024)).

For the first five quarters of the TAG program from 2008Q4 until 2009Q4 the additional fee for the program was a flat 10 basis points, however, during the extensions in 2010 the rate varied from 15 to 25 basis points based on risk. Throughout 2010, there were four "risk categories" (RCs) that served as a classification of banks based on their risk levels. These RCs ranged from 1 to 4, with 1 being the best, and were defined by capital group and CAMELS rating.[20] There were three different premium levels, with two risk-category-dependent thresholds between them. One threshold separated RC 1 banks from RC 2 banks (we call this the "first" threshold), and the other threshold separated RC 2 banks from banks with RC 3 or 4 (we call this the "second" threshold). Figure 10 illustrates the risk-based TAG program premiums of 2010.

We consider each threshold separately and consider only banks close to the threshold (see below for the precise definition of our chosen distance metric). With sufficient controls, banks close to a particular threshold are arguably similar except for facing different premiums on TAG program participation. We thus use the premiums as an instrument for the opt-out decision to estimate the effect of opting out of TAG on NIBDs within an IV framework.

One difficulty with this approach is defining a metric of "closeness" to a risk category threshold. As previously mentioned, risk categories were defined clearly based on a bank's capital ratios and composite CAMELS rating (a bank's CAMELS ratings are known only by the bank and its regulators). Thus, each

[20] The risk assessment structure for the FDIC is based on two items. The first is the Capital Group in which there are three groups: 1 (Well Capitalized), 2 (Adequately Capitalized), and 3 (Under Capitalized). The second is the Supervisory Subgroup. There are three subgroups based on a bank's CAMELS rating: A, B, and C. Where A includes banks with a rating of 1 or 2, B includes banks with a rating of 3, and C includes banks with a rating of 4 or 5.

bank knew its own risk category, and could easily infer how its risk category would change because of a hypothetical change in its own capital ratios or composite CAMELS rating. However, within each risk category there were potentially many banks with varying levels of risk. For our purpose, understanding the relative riskiness of those banks (i.e., how "close" each of them was to a particular threshold) requires further analysis.[21]

To obtain a closeness metric, we build a separate machine-learning model for each threshold that predicts the probability that a particular bank will be misclassified as being on the other side of the threshold. This misclassification probability will naturally increase as a bank becomes more similar to banks on the other side of the threshold (illustrated by the bell curves in Figure 10), allowing us to measure closeness in a data-driven, objective way.

For each threshold, the machine-learning model (a random forest) is estimated on data from 2009 with a dependent variable being an indicator for whether a bank's RC is "above" or "below" the threshold. Predictors in the model include the financial variables from Section 6.1, as well as the six CAMELS components and three capital ratios that are used in the determination of the risk categories. Because we know the true RC for each bank in each quarter of 2010, we use the model estimated on 2009 data to predict (for each bank-quarter pair in 2010) the probability that the bank would be misclassified as being on the "wrong" side of the threshold.

The IV regression analysis restricts the sample to 2010, the year in which the TAG program premiums were risk-based. We use the maximum misclassification probability for each bank over 2010 as a metric for closeness to the thresholds. For each threshold, banks with a maximum misclassification probability of at least 0.1 (10 percent) are kept in the IV regressions. We also report results with different probability cutoffs (0.15 and 0.20). The 10 percent threshold is analogous to the threshold proposed by Crump et al. (2009).

[21] Consider, for instance, two hypothetical banks with a composite CAMELS rating of 3, but bank A's component ratings are 1-1-3-3-2-4 and bank B's component ratings are 1-2-3-1-3-4. It is unclear which of the two banks in this hypothetical example is closer to becoming 4-rated (having a composite rating of 4). As previously mentioned, composite ratings reflect a bank's overall health and may differ from a simple average of the component ratings. In this hypothetical example, bank A has two component ratings that are better than bank B's (Asset Quality and Liquidity), but has one component rating that is significantly worse (Earnings). Although both banks have the same composite rating of 3, the likelihood of each of the two banks being downgraded to a composite rating of 4 depends on the weightings assigned to each of the component ratings by bank examiners, which may in turn depend on several qualitative and historical characteristics of the banks.

Similarly, the endogenous variable in the IV regressions is based on the maximum of a bank's risk category over 2010. There are two reasons we use maximums of the risk category and probability of misclassification in the IV regressions. First, opting out of the TAG program was an absorbing state, so banks that opted out could not opt back in. Second, banks that may have foreseen a heightened chance of deterioration in their risk category may have opted out of the TAG program earlier in 2010 to avoid higher premiums.

The two stages of the IV regression are defined as follows:

$$OPT\text{-}OUT_{it} = \alpha_1 + \beta_1 \mathbf{1}_{\max(RC)\epsilon P_{high}} + \gamma_1 \boldsymbol{x}_{it} + d_t + \epsilon_{it} \quad (3)$$

$$Log(NIBD_{it}) = \alpha_2 + \beta_2 \widehat{OPT\text{-}OUT}_{it} + \gamma_2 \boldsymbol{x}_{it} + c_t + \varepsilon_{it} \quad (4)$$

where $OPT\text{-}OUT_{it}$ is an indicator with a value of 1 if bank i was a non-participant in the TAG program in quarter t and 0 otherwise, $\mathbf{1}_{\max(RC)\epsilon P_{high}}$ is an indicator for whether the bank's maximum risk category would have caused it to be on the "high" premium side of the threshold, $\boldsymbol{x}_{it}$ is a vector of controls containing the same set of variables used in Section 6.1, and $d_t$ and $c_t$ are quarter fixed effects.

Table 5 shows the IV regression for the first threshold. The odd-numbered columns show the first stage regressions, and the even-numbered columns show the IV regressions. The results in Table 5 are generally weak and inconclusive. The first stage regressions are weak, with small F-statistics, and they show an unexpected sign on the instrument (banks facing higher TAG program premiums are less likely to opt out of the TAG program). As we discuss below, it is likely that the decision to opt out of the TAG program around the first threshold (the threshold separating RC 1 banks from RC 2 banks) was driven primarily by other factors and the premium difference was not a significant component in those banks' decision to opt out of the TAG program.

In contrast, Table 6 shows strong and consistent results at the second threshold (separating RC 2 banks from RC 3 or 4). First stage results suggest that banks facing higher premiums are significantly more likely to opt out of the TAG program, and the effect is consistent across different cutoff probabilities. The IV regressions show a strong negative effect of opting out of the TAG program on institutions' NIBDs.

There are several reasons to expect that the IV results may be stronger around the second threshold. Banks closer to the second threshold were more likely to be smaller and less well established than those closer to the first threshold. Differentials in premiums may have had a larger impact on small banks, particularly those troubled enough to be close to the second threshold. In addition, these banks were less likely to benefit from implicit government guarantees, potentially making their decision to opt out of the TAG program more salient for customers with large transaction deposit accounts. Conversely, large banks opted out of TAG at a significantly faster pace than small banks, with a decline in participation rate roughly 5 times that of small banks (see Table 2), suggesting that their opt-out decisions were not primarily driven by differentials in TAG fees.

## 7. Impact of Weak NIBD Growth on Participation

Banks facing declines or weak growth in their deposit funding, such as their NIBDs, amidst market stress are more likely to have incentives to seek-out government safety nets to assure potential depositors and maintain such funding. In this section, we consider the extent to which weak market availability of NIBDs affects bank NIBD growth, and we assess the link between a bank's NIBD growth and the subsequent participation decision in the TAG program. The primary goal is to understand the relation between bank NIBD growth and TAG program participation. This analysis considers a specific sub-period of the program, 2009Q1 to 2010Q4, which represents the portion of the TAG program where participation was voluntary, and banks could opt out.[22] The analysis is based on about 63,000 bank-quarter observations over the eight-quarter sample period.

A key challenge is addressing potential endogeneity in our analysis as we expect bank NIBD growth and program participation to be jointly determined by common factors such as bank financial condition, liquidity, size, and market share. We address this identification challenge by exploiting the geographic and time variation in NIBD growth across the markets in which banks operate to create a market-based

[22] The program started on October 14, 2008 (2008Q4) but all banks were covered free of change until December 5, 2008. A version of the program also continued beyond 2010 as part of the Dodd-Frank-Act and required zero additional premiums, which effectively covered all banks and thrifts, leaving no participation decisions to examine.

instrument which proxies for the availability of NIBD deposits. Specifically, we estimate market NIBD growth using state and quarter variation in NIBD growth as follows:

(i) For single-state banks, which represent roughly 92 percent of bank-quarters in our sample, we estimate a bank's market NIBD growth to be the average NIBD growth of all other single-state banks operating in the same state.

(ii) For multi-state banks, we estimate the market NIBD growth as the weighted average market NIBD growth, again using all single state banks in each market (state), for all markets in which the bank operates; weights are based on shares of deposits for the bank in the various markets (states).

Our market-based instrument for NIBD growth has two important features. First, market factors influencing the supply of NIBDs at banks are a likely first order determinant of bank NIBD growth.[23] Second, market NIBD growth should proxy for exogenous NIBD supply effects which are unlikely to directly affect bank participation in the TAG program; thus, we expect market NIBD growth to only impact a bank's decision to opt out through bank NIBD growth, thereby meeting the exclusion restriction. Our modeling approach can be summarized by equations (5) and (6) below.

$$\text{Bank NIBD Growth}_{(t,\,t-1)} = a_0 + a_1\text{Market NIBD Growth}_{(t,\,t-1)} + a_2X_{(t-1)} + a_3FE + u \quad (5)$$

$$\text{Opt-Out}_{(t)} = b_0 + b_1\,\widehat{\text{Bank NIBD Growth}}_{(t,t-1)} + b_3X_{(t-1)} + a_4FE + v \quad (6)$$

We utilize two key variables to measure bank NIBD growth: quarter-over-quarter change in log NIBD and quarter-over-quarter change in NIBD Ratio, computed as total NIBDs divided by total deposits. We also use two indicators of market NIBD growth, a continuous measure denoting average market NIBD growth and a dummy denoting a decline in average NIBD growth. We estimate the link between bank NIBD growth and market NIBD growth according to equation (5) for all bank-quarters of the sample. In the second stage, we use the instrumented or predicted NIBD growth from the first stage in estimating the impact of bank NIBD growth on opting out as shown in equation (6).

[23] While market factors are likely to be linked to supply of all types of deposits, we expect such effects to be especially large for NIBDs as banks typically cannot, by definition, seek to attract NIBDs through bidding up deposit rates.

Our multivariate regressions use a series of controls, denoted by the vector X, capturing core bank financial indicators such as bank size, solvency, and liquidity. This vector also includes other bank indicators denoting recent asset growth and organizational structure. Lastly, the control vector also includes a set of indicators measuring local economic conditions; these latter controls are important to ensure that our market NIBD measure captures the incremental impact of market NIBD supply constraints rather than local economic conditions. We control for size and growth using Log Assets and change in Log Assets respectively. We measure earnings using bank return on assets (ROA) and asset quality as the ratio of noncurrent loans to total loans. We measure solvency using the ratio of equity to assets and risk-weighted assets (RWA) to assets, liquidity using the ratio of liquid assets to total assets and the ratio of core deposits to total liabilities, and deposit insurance coverage using the ratio of uninsured to total deposits.[24] Organizational controls include log of bank age and dummies for multi-bank-holding company (MBHC) affiliation, subchapter-S status, and involvement in a merger in the prior year.[25] Competition is proxied by the Herfindahl–Hirschman Index (HHI), which is estimated for Combined Statistical Area (CSA) and non-CSA counties. Local economic condition indicators include unemployment rate, per-capita income (PCI), and housing price index, as well as quarter-over-quarter changes in these metrics; all local-economic variables are based on state-quarter observations and weighted by state-deposit share for banks operating in multiple states. All variables are defined in Appendix Table A.1. We winsorize all bank-level financial variables at the 1st and 99th percentiles.[26] Lastly, unless stated otherwise, all regressions include time and

[24] The level of uninsured deposits is an estimate, reported in Call Reports, of the amount in deposit accounts above the coverage limits, which were $100,000 prior to late 2008 and $250,000 thereafter. However, due to a lag in reporting requirements, the categorization thresholds did not change to $250,000 until 2010Q1. Thus, during 2009, our estimate of uninsured deposits includes those above $100,000 and will therefore overstate the true ratio of uninsured deposits. Note that the definition of "large" time deposits, which are excluded from core deposits, is also based on deposit insurance thresholds and suffers from the same limitation.

[25] All banks within a MBHC were required to make uniform decisions in terms of participation in the program. https://www.fdic.gov/regulations/resources/TLGP/faq.html "All eligible entities within a U.S. Banking Holding Company or a U.S. Savings and Loan Holding Company structure must make the same decision regarding continued participation in each component of the program (the TAGP component and the DGP component) or none of the members of the holding company structure will be eligible for participation in that component of the program."

[26] We do not winsorize local economic condition indicators or our instruments. Our instruments, while technically varying at the bank-level for banks operating in multiple states, are based of averages across numerous banks and the adjustment for bank outliers does not apply.

state fixed-effects, denoted by FE.[27]

### 7.1 Preliminary Analysis

For this analysis, the main variables of interest include log NIBD Change and NIBD Ratio Change. Table 7 Panel A shows that on average banks have about a 2.3 percent increase in NIBDs quarter over quarter but there are substantial variation with the lowest 10th percentile facing about a 15 percent decline and the highest 10th percentile experiencing about 20 percent growth. The mean increase in the NIBD ratio is 0.1 percent even as the 10th to 90th percentile range is large at about -1.9 percent to 2.0 percent. Our state-based market measures of NIBD growth show, not surprisingly, a similar mean of about 2.4 percent growth on average. About 26 percent of bank-quarters have declines in market NIBD growth.[28]

We begin our analysis with a univariate look at the association between our state-based NIBD exposure variables and bank-level NIBD growth. Table 7 Panel B has two columns based on market NIBD growth. Column (1) and (2) denote sub-samples with non-negative growth in NIBDs (No Decline) and negative growth (Decline) in NIBD deposits quarter-over-quarter respectively. The first row includes all years, but we also divide the sample further into the two-year intervals. The results show that bank NIBD growth is strongly related to market NIBD growth. For example, we find that Log NIBD growth among banks in markets experiencing NIBD growth is on average about 6 percentage points higher than among banks in markets experiencing NIBD declines. The change in the ratio of NIBD deposits is similarly lower by 0.007 (i.e. 0.7 percent). This is a substantial difference relative to the mean of 0.1 percent and standard deviation of 2.0 percent shown in Panel A. These results suggest market NIBD supply is strongly linked to bank NIBD growth.

### 7.2 Opt-Out Decision, Core Results

We next conduct OLS regressions considering the link between bank NIBD growth and market NIBD growth and show the results in Table 8. Columns (1)–(3) and (4)–(6) consider the link between market

[27] State fixed effects correspond to the state the bank is headquartered.
[28] Since quarter-over-quarter declines in market NIBD represent about 25 percent of the sample, for robustness we also consider 20th percentile and 30th percentile definitions as alternative measures of low market NIBD growth. The untabulated results are generally very similar.

NIBD growth and Change in Log (NIBD) and Change in NIBD Ratio respectively. Columns (2) and (5) consider the effect of our continuous market NIBD growth indicator (i.e. Market Change Log NIBD) and columns (3) and (6) utilize our dummy indicator, Decline-Market NIBD. The substantial increase in adjusted R-square in columns (2)–(3) relative to (1) and (5)–(6) relative to (4) demonstrate the strong impact of market NIBD growth on bank NIBD growth. The results show a strong statistical association between market and bank NIBD growth conditional on our large set of controls. The economic effect is large; a 1 percent increase in market NIBD growth is associated with a 0.779 percent increase in bank NIBD growth and associated with a 0.082 percentage point increase in NIBD ratio. Columns (3) and (6) suggest banks operating in markets with declines in NIBD have nearly 5 percent lower NIBD growth and 50 basis point decline in NIBD ratio.

We also find that bank NIBD growth is positively linked to size, although not consistently statistically significant across specifications. In addition, both growth in the amount of NIBDs and the ratio of NIBDs appears to be linked to lower levels of core deposits and at least for the first NIBD growth measure, lower liquid assets as shown in columns (1)–(3). However, we find inconsistent results with respect to bank financial condition. NIBD growth is statistically linked to lower noncurrent loan ratio and higher equity to assets but also linked to greater asset risk, as measured by RWA/Assets; also, the coefficients are only significant in columns (1)–(3). We find no association or no robust association between NIBD growth and the other reported bank financial or structural indicators.[29]

Next, we turn to our second stage analysis where we consider the link between bank NIBD growth and opting out while instrumenting bank NIBD growth with market NIBD growth. Results are reported in Table 9. Columns (1)–(3) present OLS results and columns (4)–(7) present two-stage regressions results using our two related instruments. The OLS results depict a negative relation between bank NIBD growth and opting out of the TAG program. However, the IV results show a positive association of much greater magnitude.

[29] For brevity, we do no report coefficients for the five structural controls (Log Assets Change, HHI, Merger, Sub-Chapter S, MBHC, and Log Bank Age) or the six local economic condition metrics (levels and differences of state unemployment rate, PCI, and HPI). However, in unreported tests, we see some of these metrics have significant coefficients. For example, NIBD growth is generally associated with lower unemployment rates and higher per-capita-incomes.

Columns (4) and (5), for example, suggest a 1 percent increase in NIBD increases the likelihood of opting out by 10.5 percent or 23.2 percent depending on the instrument (i.e., IV1 or IV2). Columns (6) and (7) suggest a one standard deviation increase in NIBD Ratio leads to an increase in likelihood of opting out by 2.0 percent or 4.4 percent depending on the instrument.[30] Both of these represent economically significant increases in opting out propensity.

TAG participation appears to be strongly linked to bank financial condition. Both ROA and Equity Capital Ratio are strongly negatively linked with participation across all specifications. Banks opting out also have less risky assets (lower RWA/Assets). Larger banks are also much less likely to opt out whereas large banks (assets greater than $10 billion) are much more likely to opt out. The latter result is consistent with the analysis presented Section 4 and consistent with substantially different incentives and funding strategies for such institutions. We find the other bank level indicators are not associated with opting out.

**7.3 Differences in TAG Program Participation by Year and Bank Size**

We look at differences in our results based on year. We do this for two reasons. First, the degree of economic turmoil varies substantially over the short sample. While 2009 represents the height of the financial crisis, 2010 represents a transition period where technically the economy is out of recession but both banks and consumers are still facing financial difficulties. Additionally, though both years of the sample had voluntary TAG participation, there were also notable differences. For example, in 2009, the additional fee for TAG program participation was flat and did not depend on bank risk. In 2010, the additional premium varied based on risk, i.e. based on capital levels and CAMELS rating, which could have dissuaded the most troubled banks from participating. Table 10 presents the second stage results estimated by year. The first stage results are depicted in Panel A of Appendix Table A.2 and show virtually no differences with respect to statistical significance and magnitude of the various coefficients. This suggests that despite some variation in economic condition, the impact of market NIBD growth on bank NIBD growth is similar across years.

[30] These calculations are based on the standard deviation value of 0.020 of the Change in NIBD Ratio variable from Table 7, Panel A. This standard deviation is multiplied by the coefficient estimates from columns (6) and (7) of Table 9.

The second stage results show very significant differences by year in the second stage results. Columns (9)–(12) of Table 10 document that the results appear to be driven by TAG participation in 2010. While the coefficients for the IV regressions estimated for 2009 show positive coefficients (columns 3–6), the magnitudes are small and the coefficients are not statistically significant. In contrast, all the results for 2010 are strong and statistically significant. One possible explanation for these results is that riskier banks, which had to pay a higher fee for the TAG program in 2010, were more likely to pursue the program in 2010 only if they suffered a substantial NIBD decline.

Next, we consider the impact of bank size. Smaller banks, which typically have a greater reliance on deposit funding, may be more susceptible to market NIBD shocks and more likely to seek to increase NIBD funding if required. We consider this possibility by re-estimating the models (5) and (6) for subsamples of banks based on size. We define these samples as small and large using the median asset size, which is about $150 million over the two years of our sample. Additionally, we define a third category as large excluding $10 billion plus banks; the large ($10 billion plus) banks are likely to have more limited reliance on deposit funding, have access to public financial markets, and face greater regulatory scrutiny especially following Dodd-Frank. Thus, it is unclear if small and large banks respond to NIBD shocks in ways similar to $10 billion plus banks.[31]

We relegate the first stage results to Panel B of Appendix Table A.2; the first stage results, as before, show that bank NIBD growth responds to market NIBD shocks similarly for each of our size categories. The second stage IV results are provided in Table 11. Columns (3)–(6), (9)–(12), and (15)–(18) provide results for small, large, and large excluding $10 billion plus respectively. We find the impact of bank NIBD growth on opting out does not appear to vary qualitatively based on size. We find bank NIBD growth has a somewhat stronger positive link with opting out for larger banks for specifications using the continuous

[31] We do not estimate results using only $10 billion plus banks, as the sample size would be too small for meaningful estimation; banks with assets of $10 billion or more represent about 1.4 percent of our observations. As a result, for these tests the cutoff point is the median asset size and the definition of "small" is different from that in section 3.3 which uses a the $10 billion cutoff. Since the $10 billion cutoff is still potentially economically relevant given Dodd-Frank regulations that apply only to banks above this cutoff, we consider the effect of the these $10 billion plus banks indirectly by considering the subsample of large banks that are below $10 billion, i.e. our third subsample.

market NIBD growth IV; for example, the coefficient in column (9) is more than double that of column (3). However, this result is not robust as specifications using the second market NIBD growth IV (i.e., "IV2"), have coefficients in a similar range for small and large subsamples. Interestingly, we find slightly stronger results in most specifications when we remove banks with assets greater than $10 billion from the sample; larger banks, excluding the $10 billion plus banks, seem to have a stronger link between weak NIBD growth and participation than smaller banks. This suggests that while the $10 billion plus banks may be less likely to find the TAG program necessary or beneficial, most other banks do. Importantly, despite differences, statistical and economic significance remains strong for both small and large banks.

**7.4 Differences by Degree of Uninsured Deposits Dependence**

Our results thus far suggest that TAG participation is driven by NIBD outflows or weak NIBD growth. The implicit assumption in our interpretation of these results is that a lack of implicit or explicit deposit insurance coverage causes fearful depositors to either to flee or to not open accounts at banks not participating in the TAG program. Ideally, we would want to assess heterogeneity in our analysis based on ex-ante TAG uninsured deposit percentages. An inherent limitation of our analysis, however, is that we cannot accurately observe the proportion of NIBD deposits that are in uninsured accounts, i.e. above the deposit insurance threshold of $250,000.[32] As an attempt to gain a better understanding of the role of deposit insurance coverage in TAG participation, we split the sample using an indicator of lagged level of uninsured deposits, which we measure as the average early-crisis, defined as 2007Q1 to 2008Q3, uninsured deposit ratio. We then classify banks into those where this measure was below the 75th percentile, denoting relatively low uninsured deposit dependence, and above the 75th, indicating relatively high uninsured deposit dependence.[33] We use the early-crisis average uninsured deposit ratio for two reasons. First, there is the potential for significant measurement error in the uninsured deposit ratio between 2008Q4 and 2010Q1.

[32] While the Call Reports include an indicator of such deposits beginning in 2009, it is a required field only for participants and thus not useful to identify drivers of participation. The insured deposit limit, per account, was raised to $250,000 per account in late 2008 on a temporary basis but made permanent following the Dodd-Frank Act in 2010.

[33] Our categorization of high-dependency as being above the 75th percentile of the distribution corresponds to about 30 percent uninsured on average across our sample. For robustness, we also consider using 70th percentile and 80th percentile to classify "high" vs "low" uninsured deposit dependency and find similar results.

Specifically, the increase in the insurance limit to $250,000 in 2008Q4 would likely lead to substantial upward bias in uninsured ratio estimates in 2009, which is a critical year in the observation period for our analysis. Using the early crisis average uninsured deposit ratio allows us to gauge more accurately bank dependency on uninsured deposits while circumventing this problem. Second, the percentages of uninsured deposits is likely to be endogenous and at least somewhat persistent with respect to NIBD growth. Using a substantially lagged version and this ratio before a significant event, i.e., the deposit insurance threshold change of late 2008 substantially alleviates this problem.

We estimate first and second stage results for the subsamples in the bottom 75th and top 25th percentiles separately. First stage results, shown in Panel C of Appendix Table A.2, are again very similar regardless of sub-category. We highlight our second stage results in Table 12, which shows that there are substantial differences by the degree of uninsured deposit growth. Banks that have high ex-ante uninsured deposits relative to overall deposits the prior quarter are found to be much more likely to participate in the TAG program. Coefficients for the IV results in columns (3)–(6) are about twice as high compared to those reported in columns (9)–(12). In contrast, banks that have low uninsured deposit ratios in the prior quarter do not have as strong an association between TAG program participation and declines in NIBD growth. To the extent that uninsured deposit ratios for the bank overall are a suitable proxy for uninsured TAG deposit ratios, at least ex ante (prior to opting out), our results suggest that not opting out of TAG is not just driven by weak NIBD growth, but weak NIBD growth attributable to high uninsured deposit dependency.[34] Another possibility is that if non-NIBD uninsured deposits are high, banks may participate to avoid the same fate for NIBD uninsured deposits. In either case, participation in the program is driven by the banks wishing to increase uninsured NIBD deposits.

**7.5 Alternative Reasons for Participation and NIBD Dependence**

Our analysis thus far suggests that banks that suffer weak NIBD growth or NIBD declines are less likely to opt out of the TAG program. We interpret weak NIBD growth as difficulty in maintaining or attracting

[34] In the sample of participating banks, where we can tabulate the percentage of uninsured NIBD deposits, we find a high correlation with the overall uninsured deposit ratio at 44 percent.

uninsured depositors. Another possible explanation is that banks with low NIBD growth or NIBD declines have low levels of NIBD implying a low proportion of uninsured NIBDs. This would in turn substantially lower the cost of the TAG program participation because the TAG premium is a function of uninsured deposit volume. If cost were a primary driver of TAG participation, we would expect dependence on NIBDs to be positively associated with opting out.

On the other hand, the propensity to opt out could be affected by the degree of existing NIBD deposits to protect a critical funding source. For example, if NIBD deposits make up a greater portion of a bank's business mix, then one would expect such a bank to be less likely to opt out in the wake of NIBD declines, to maintain this important funding source. The cost and dependence explanations lead to opposite predictions with respect to the association between opting out and NIBD levels. Thus, it is an empirical question, which we address by again sub-dividing the sample, this time based on lagged NIBD ratios, and run further tests. For consistency with the prior analysis, we use the long-run average NIBD ratio between 2007Q1 and 2008Q3. While there is no direct measurement issue with NIBD ratios linked to lagging data reporting requirements, using a long-term substantially lagged average still has the benefit of being a less noisy measure of dependency not affected by unpredictable post-deposit insurance change events and is less likely to be endogenous.

In Table 13, we show that the link between NIBD growth and opting out is similar qualitatively across the two sub-samples; the coefficients are also statistically significant in all cases. On the other hand, the coefficients are notably higher in most specifications for the sample with high past NIBD levels. This result implies a greater likelihood of opting out amidst positive NIBD growth and a reduced likelihood of opting out amidst negative NIBD growth for banks that have historically depended more for NIBD deposits for funding. We interpret this as banks highly reliant on NIBDs being more sensitive to their recent NIBD flows when making their opt-out decisions, suggesting they care relatively more about NIBDs and how TAG affects NIBD flows. The result is inconsistent with the cost explanation and is more consistent with the NIBD dependence explanation. The first stage results show that market NIBD growth has a very similar impact on bank NIBD growth regardless of past average NIBD levels; first stage results are reported in

Panel D of Appendix Table A.2. An implication of these results is that on net, the cost explanation does not drive our results, so that our results are more likely driven by the desire to strengthen NIBD growth and in particular, uninsured NIBD growth.

**7.6 Additional Tests and Extensions**

Our regressions consider the extent to which one-quarter NIBD and NIBD ratio changes are associated with participation and instrument for NIBD changes with contemporaneous changes in market NIBD growth measures. Because we expect that over the longer term, banks would be able to adjust funding sources as required if NIBD deposits were more difficult to acquire, we assume that acute NIBD growth difficulties faced by banks will drive TAG program participation. Thus, our analysis focuses on a one-quarter window. For robustness, we also consider two-quarter and four-quarter windows as well. These tests are analogous to those depicted in equations (5) and (6) except that we consider NIBD changes for the different time windows. In Appendix Table A.3 we report results using the two-quarter changes in NIBD and NIBD Ratio; for consistency, we lag right hand side variables by two-quarters, as well. In Appendix Table A.4 we report these results again using four-quarter changes. Both first and second stage results using the two-quarter window are very similar to our one-quarter results. The four-quarter results however, while being directionally similar, are much less robust and only statistically significant in a few specifications. The weaker results for longer NIBD growth windows is consistent with the view that TAG participation is driven by short-term difficulties in securing NIBD deposits.[35]

We also consider the alternative possibility that TAG participation is driven more so by peer effects than by acute liquidity needs. For example, bank participation in TAG may reflect a bank's inclination to participate if other neighboring banks are participating to not be at a competitive disadvantage. In such a scenario, market NIBD growth would reflect peer bank participation rather than an indicator of NIBD supply shocks. To consider this possibility, we assess the geographic distribution of TAG participation. Figure 6 shows that there is no substantial concentration in participation by geographical region so that our

[35] The first stage results also suggest weak market NIBD growth is a less robust impact on bank NIBD at longer horizons suggesting identification is also an issue at longer horizons.

results are not likely due to our IV capturing peer effects rather than NIBD shocks. In further analysis, we define an additional indicator to capture peer effects, *Market Opt-Out Rate*, which represents the opt-out rate of other banks in the markets in which a given bank operates.[36] The results, shown in Appendix Table A.5, suggest that including the market opt-out rate as a control variable does not meaningfully affect the results, further suggesting peer effects do not drive the results.

## 8. Conclusion

This paper examines the periods of unlimited FDIC insurance guarantee provided by the TAG program. To start, we show that aggregate NIBDs increased during the periods of unlimited insurance as well as NIBDs as a percentage of total deposits. Leading up to the passage of the TAG program, deposits were leaving smaller banks and entering larger banks suggesting a flight to institutions perceived to be "too big to fail" was taking place. We show that the TAG program stabilized NIBDs as a source of funding for banks. However, we document that the percentage of deposits covered by unlimited insurance declined over the TAG program as large banks exited the program.

Next, we examine if banks that opted out of the TAG program had significant subsequent differences in NIBDs. Using both difference-in-differences and the Callaway and Sant'Anna (2021) estimator, we document that NIBDs at banks that opted out declined compared to banks that never opted out. Using a separate two-stage instrumental variable model, instrumenting for the opt out decision with risk-based TAG premiums, we find that among more risky banks, those facing higher premiums were more likely to opt out and again show that opting out of TAG led to reductions in NIBDs.

To understand banks' decisions to opt out or remain in TAG, we consider the extent to which weak market availability of NIBDs affects bank NIBD growth, and assess the link between a bank's NIBD growth and subsequent participation in the TAG program. We show that market NIBD growth is strongly associated with bank NIBD growth and that weak NIBD growth causes bank participation in TAG program. Our results suggest banks took advantage of the TAG program when they were facing difficulty in growing or maintaining NIBD deposits, consistent with the program's goals.

[36] The methodology for defining this indicator is similar to that of the IVs.

These results have implications for policymakers. As revealed in legislation such as the CARES Act of 2020, policymakers continue to consider targeted, temporary extensions of deposit insurance as part of their crisis response toolkit. In addition, with the renewed interest in examining potential reform to the deposit insurance system after the March 2023 bank failures, the FDIC recommended that a viable approach might be one similar in structure to the TAG program (FDIC (2023)). The approach that the FDIC (2023) indicated was the most promising, "targeted coverage," would significantly expand the coverage for business payment accounts. However, as noted in the FDIC's report, targeted coverage faces challenges, including being able to distinguish between deposits used for business payments and other deposits, and limiting avenues of arbitrage. Any reform of deposit insurance design faces a unique set of challenges and opportunities, giving rise to a need for a full consideration of the tradeoffs involved. Our results directly inform the debate on deposit insurance reform by providing a deeper understanding of the economic outcomes of the TAG program.

## REFERENCES


Acharya, V. V. and N. Mora, 2015, A Crisis of Banks as Liquidity Providers. *Journal of Finance*, 70, 1-43.

Baker, Andrew C, David F Larcker, and Charles CY Wang (2022), How much should we trust staggered difference-in-differences estimates?, *Journal of Financial Economics*, 144, 370–395.

Boyle, G., R. D. Stover, A. Tiwana, and O. Zhylyevskyy, 2015, The impact of deposit insurance on depositor behavior during a crisis: A conjoint analysis approach, *Journal of Financial Intermediation*, 24, 590-601.

Callaway, Brantly and Pedro HC Sant'Anna (2021), Difference-in-differences with multiple time periods. *Journal of Econometrics*, 225, 200–230.

Crump, Richard K, V Joseph Hotz, Guido W Imbens, and Oscar A Mitnik (2009), Dealing with limited overlap in estimation of average treatment effects. *Biometrika*, 96, 187–199.

Danisewicz, Piotr, Chun Hei Lee, and Klaus Schaeck (2022), Private deposit insurance, deposit flows, bank lending, and moral hazard. *Journal of Financial Intermediation*, 52, 100967.

Federal Deposit Insurance Corporation, 2023, Options for Deposit Insurance Reform, https://www.fdic.gov/analysis/options-deposit-insurance-reforms/.

Hoskins, S. M., 2012, An overview of the Transactions Account Guarantee (TAG) program and the potential impact of its expiration of extension, Congressional Research Service, R42787.

Martin, C., M. Puri, and A. Ufier, 2022, Deposit inflows and outflows in failing banks: The role of deposit insurance, FDIC Center for Financial Research Working Paper 2018-02.

Schich, A., 2008, Financial crisis: Deposit insurance and related financial safety net aspects, *Financial Market Trends*, 2, 1–39.

Shoukry, G. F., 2024, Insurance Pricing, Distortions, and Moral Hazard: Quasi-Experimental Evidence from Deposit Insurance, *Journal of Financial and Quantitative Analysis*, 59, 896–932.

Stone, A. L., 2020, Unlimited FDIC insurance and the implications for corporate cash, *Quarterly Journal of Finance*, 10, 2040001.

Stone, A. L., 2021, Double the insurance, double the funds? *Journal of Banking & Finance*, 133, 106284.

Stone, A. L., 2022, Dodd-Frank and unlimited deposit insurance, *Finance Research Letters*, 47, 1–7.

Fig. 1 Timeline of the TAG Program

This figure shows a timeline of the Transaction Account Guarantee Program (TAGP). The top portion of the timeline notes events of particular relevance for our analysis. The bottom portion notes the TAG fee structure for initial TAG program and its extensions. For more details on the events surrounding the implementation of the TAG program and its extensions, see https://www.fdic.gov/regulations/resources/TLGP/archive.html.

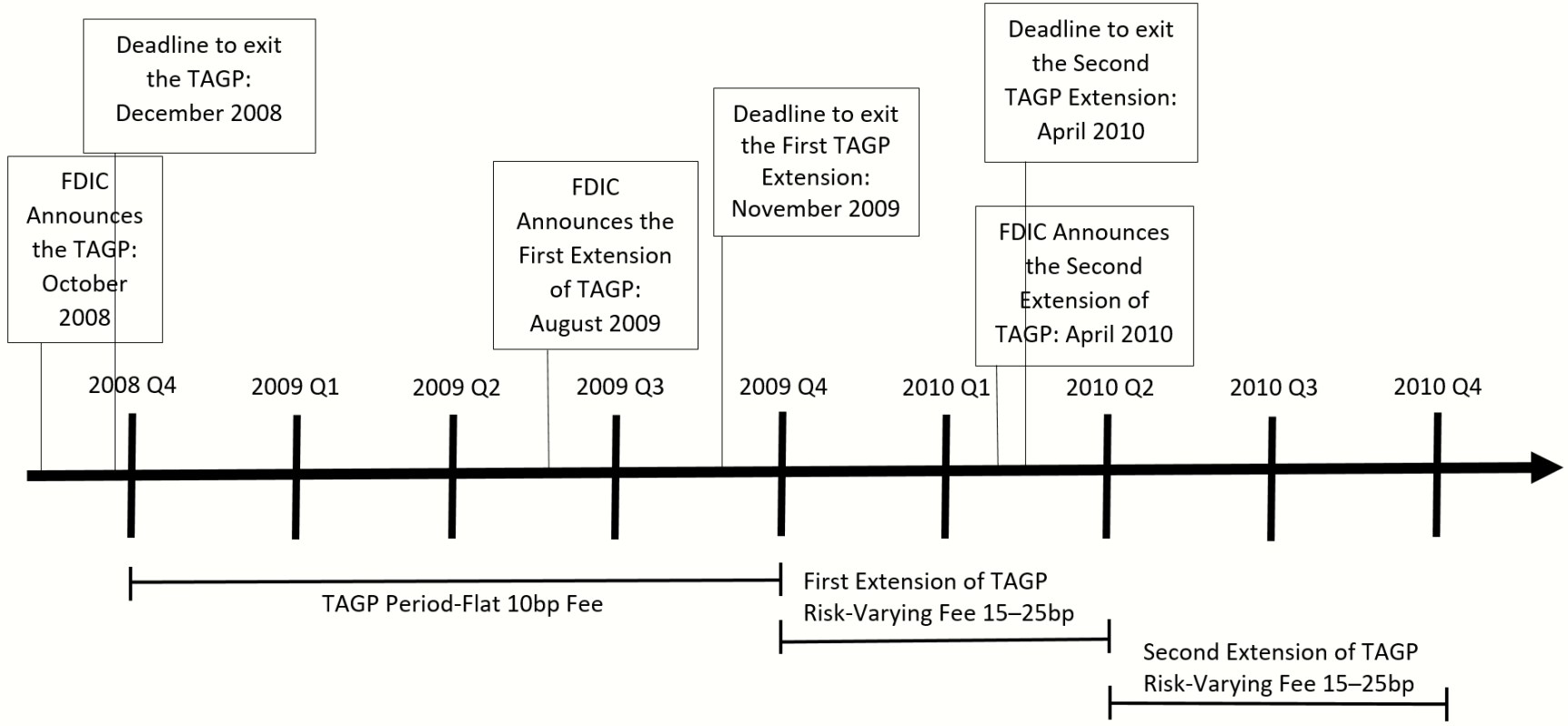


Fig. 2 Domestic Noninterest-Bearing Deposits

This figure plots the aggregate amount of domestic NIBDs, reported in billions of dollars, as reported by all FDIC-insured banks from January 2002 until December 2010. The vertical bars separate the initial TAG program and its first and second extensions, and denote the quarters with opt-out decision deadlines.

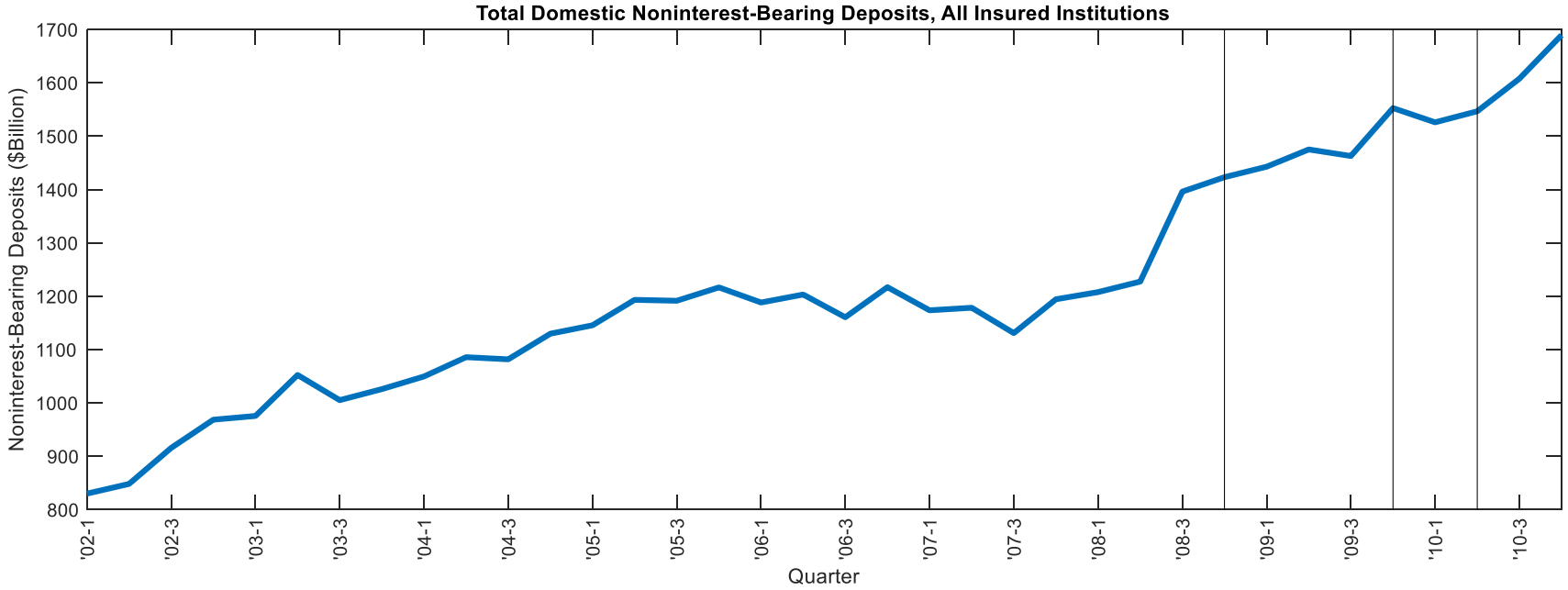


Fig. 3 NIBDs for Banks Based on Size

This figure plots multiple measures of NIBDs from January 2002 until December 2010. Panels A and B plot the aggregate amount of domestic NIBDs broken down by small and large banks. Small (large) banks are defined as having total assets less than or equal to (greater than) $10 billion. Panel C plots the mean ratio of domestic NIBDs to total domestic deposits. The vertical bars separate the initial TAG program and its first and second extensions, and denote the quarters with opt-out decision deadlines.

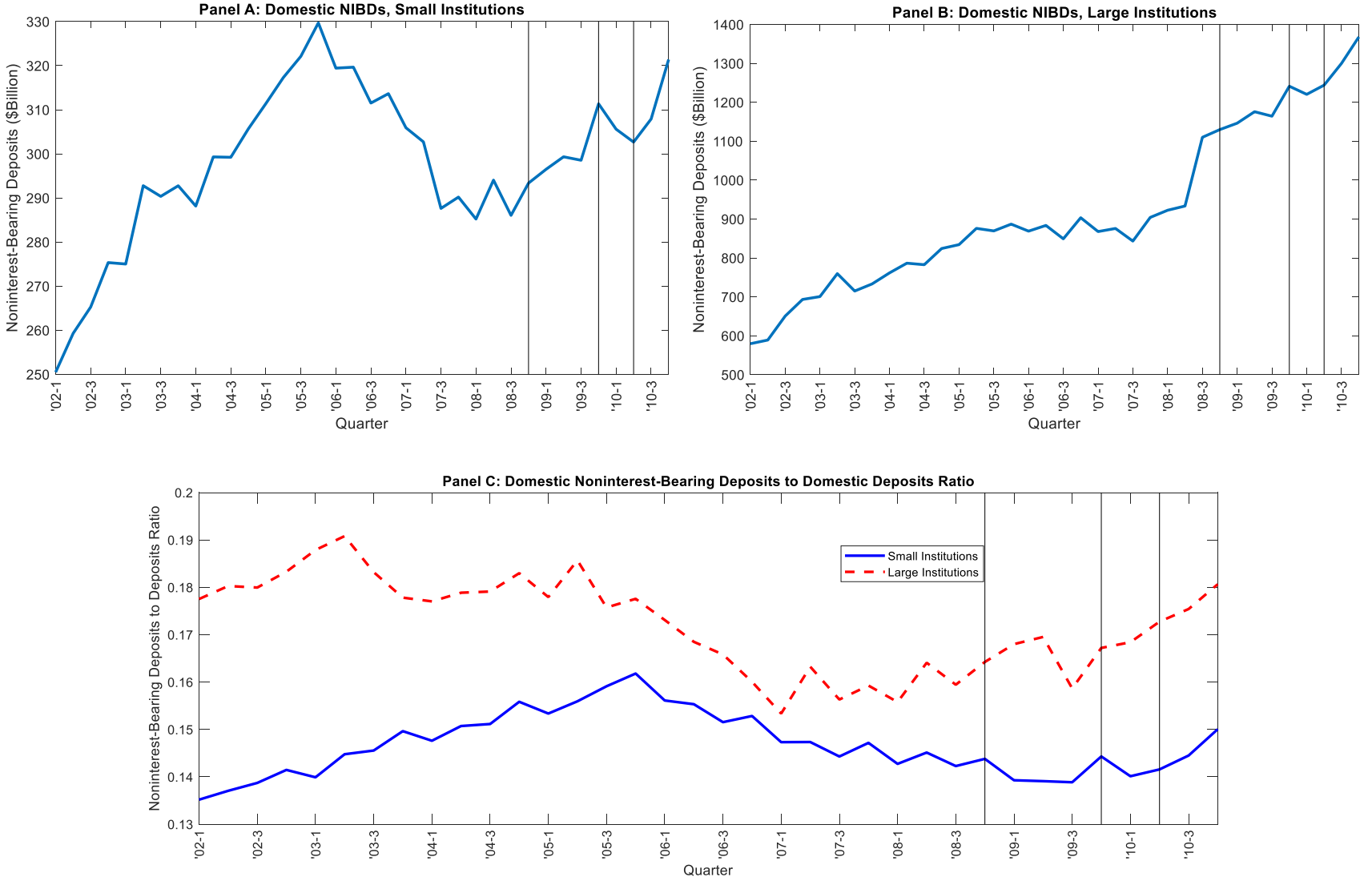


Fig. 4 Domestic NIBDs during the TAG Program

This figure plots total domestic NIBDs at all institutions in our sample and at the subset of institutions that participated in the TAG program. Both series are reported in billions of dollars.

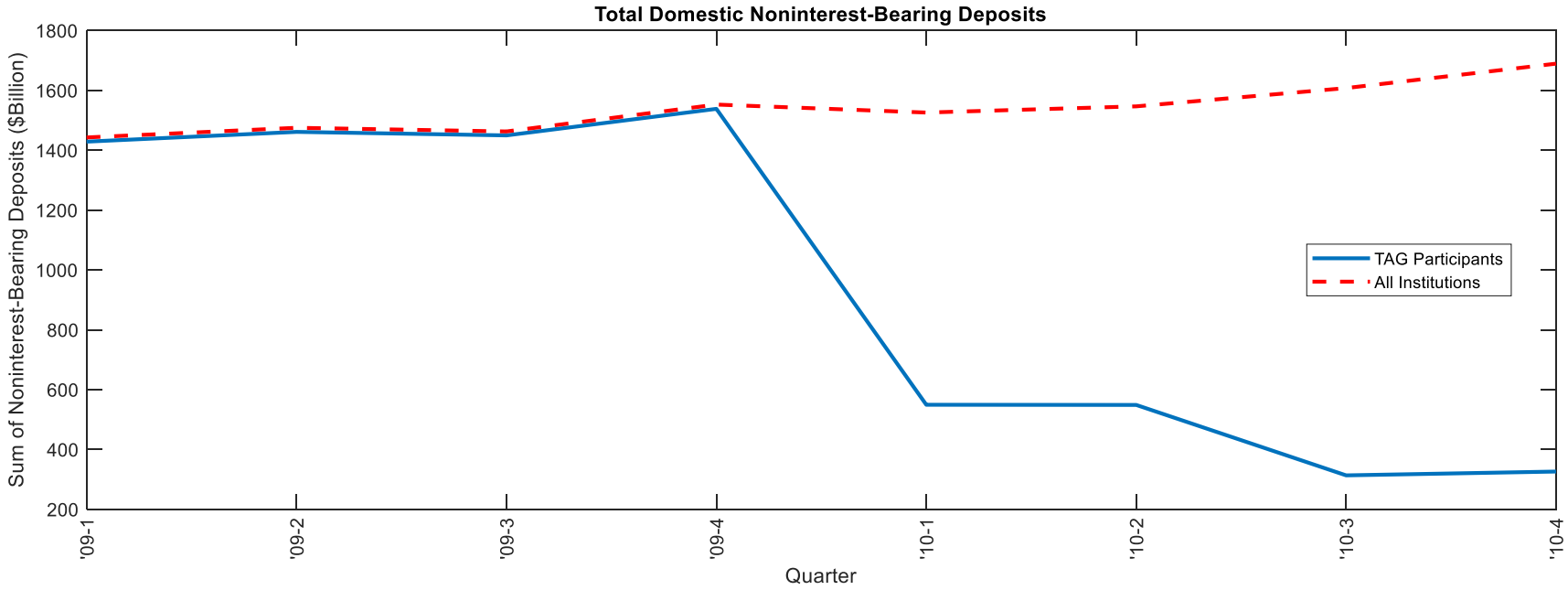


Fig. 5 Domestic NIBDs at TAG Participants Based on Size

This figure plots aggregate amounts of domestic NIBDs, reported in billions of dollars, held at banks that participated in the TAG program and broken down by bank size. Small (large) banks are defined as having total assets less than or equal to (greater than) $10 billion.

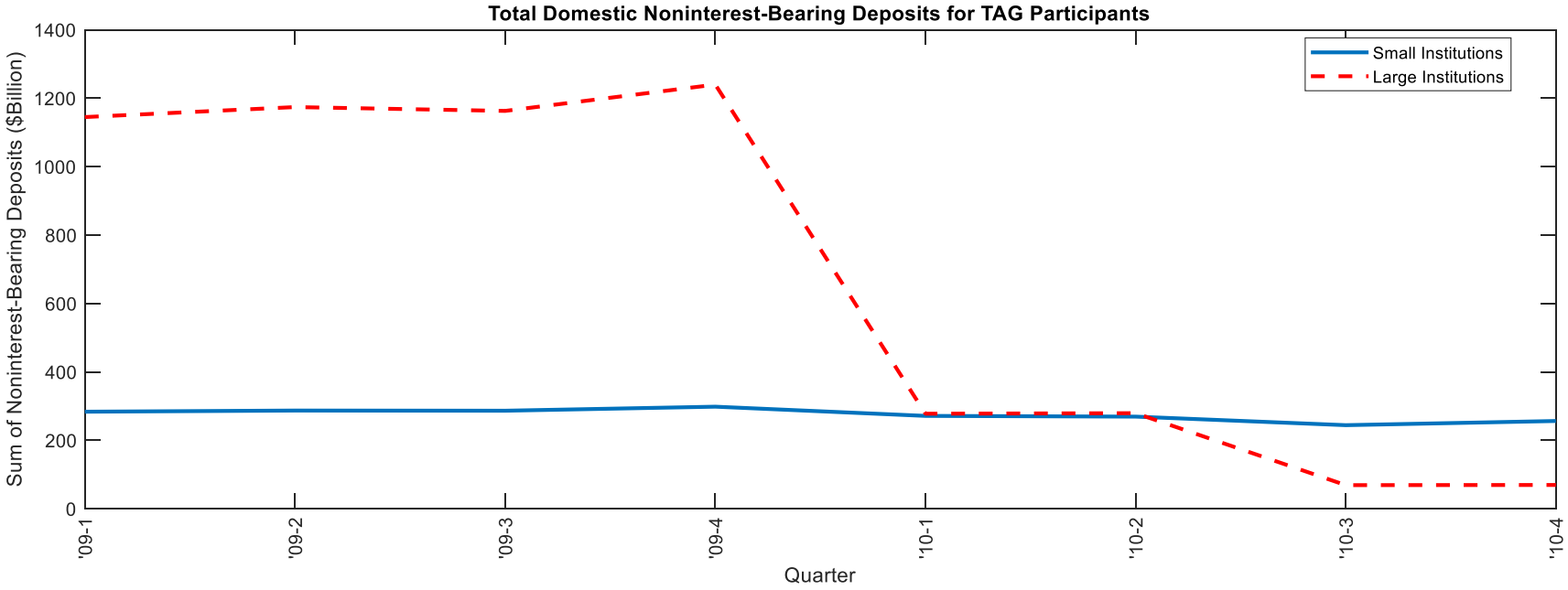


Fig. 6 Program Participation by State

This figure plots the TAG program participation rate by state. Participation rates are averaged between the first quarter of 2009 and the fourth quarter of 2010 based on banks headquartered in the state. While United States territories were allowed to participate in the TAG Program, they are not represented on the map.

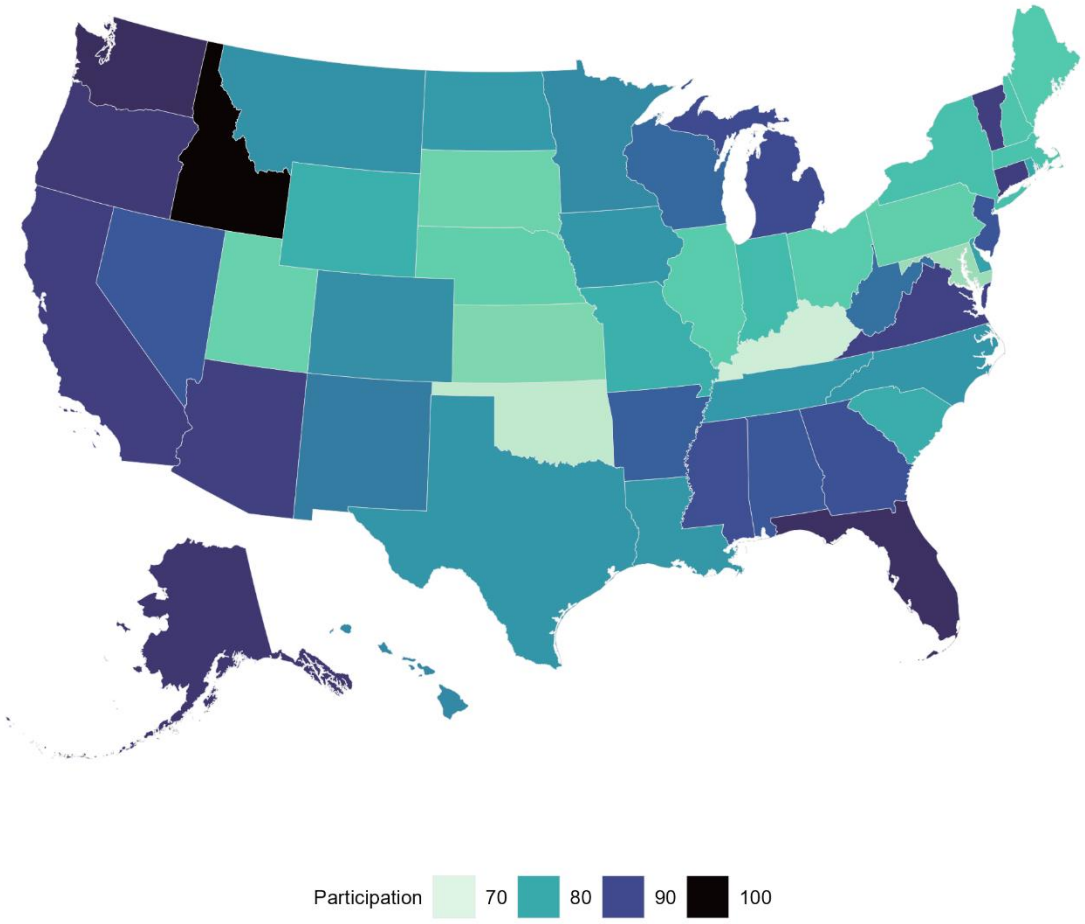
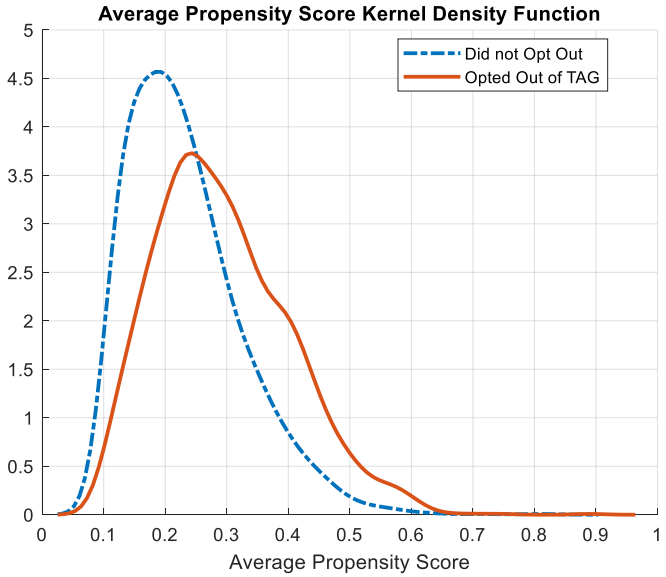


Fig. 7 Average Propensity Score Distributions

Propensity scores are derived from a pooled logit model with a dependent variable being an indicator for whether the institution ever opted out, and regressors include core financial ratios used throughout this paper. The sample for the logit regression is 2007, and each institution's average propensity score is the in-sample average of its predictions from the logit model over all the quarters of 2007. The left panel shows a kernel density estimate of the average propensity scores, and the right panel shows the histograms for banks that ever opted out and those that never opted out.



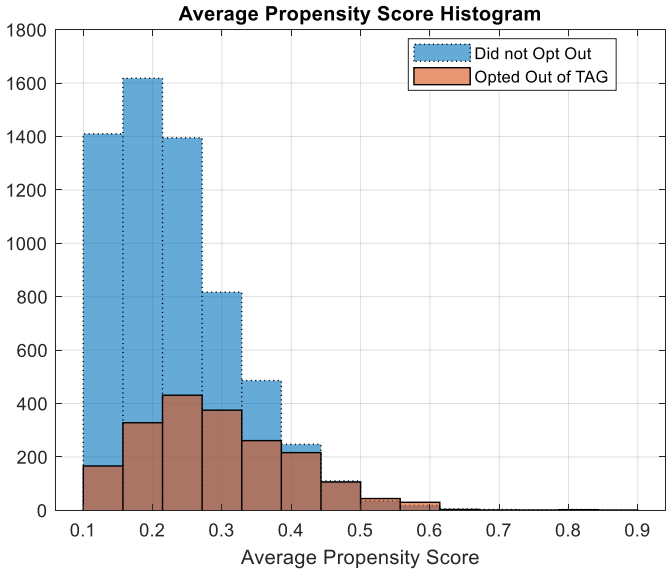



Fig. 8 Combined Effect of Opting Out of TAG on NIBDs

The figure shows the effect of opting out of the TAG program institutions' NIBDs (in log form), from the Callaway and Sant'Anna (2021) estimator. Controls include the core financial variables. The sample combines all institutions regardless of their opt-out choices.

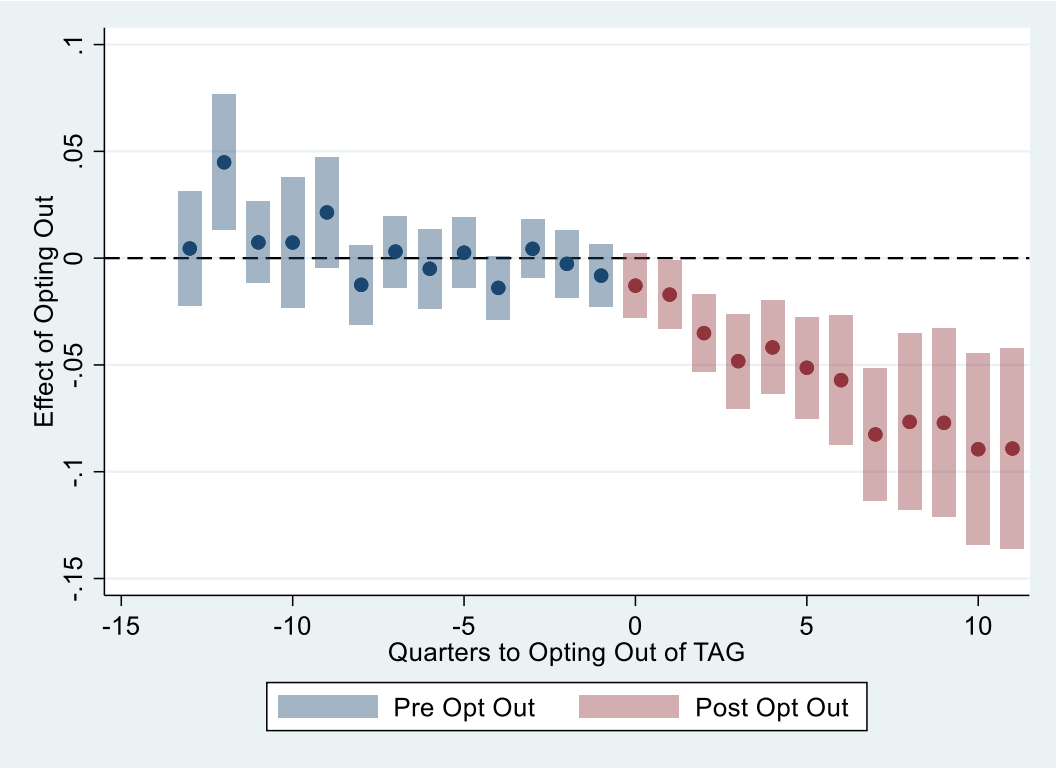
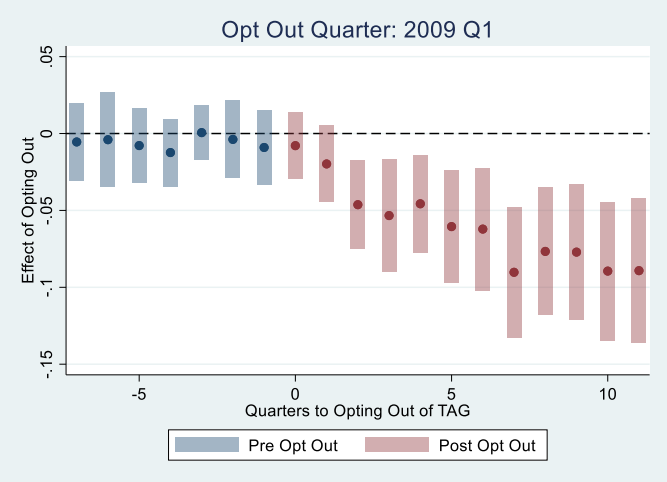
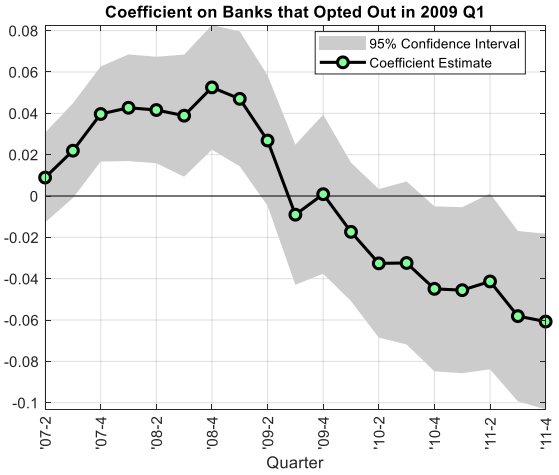


Fig. 9 Effect of Opting Out of TAG on NIBD

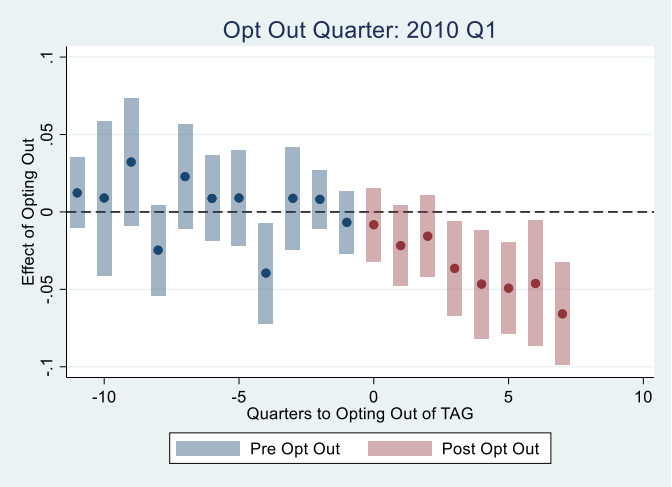
The dependent variable is the log of an institution's noninterest bearing deposits, and the controls for all panels include the core financial variables. The left figures show estimates from the Callaway and Sant'Anna (2021) estimator. The right figures show estimates from specification (2) with quarter and institution fixed effects, and with standard errors clustered at the institution level.

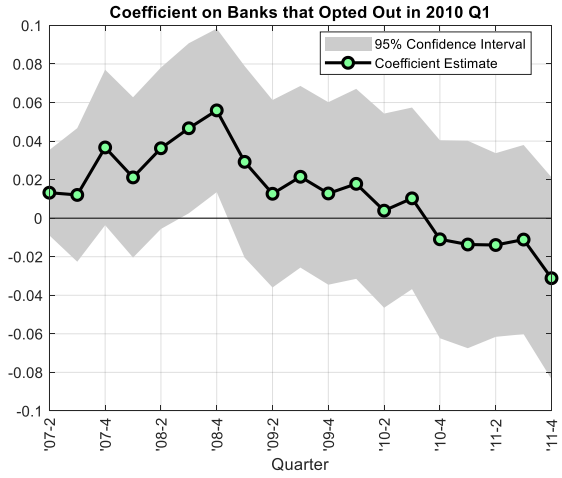
Panel A. 2009Q1 Opt-Out Sample



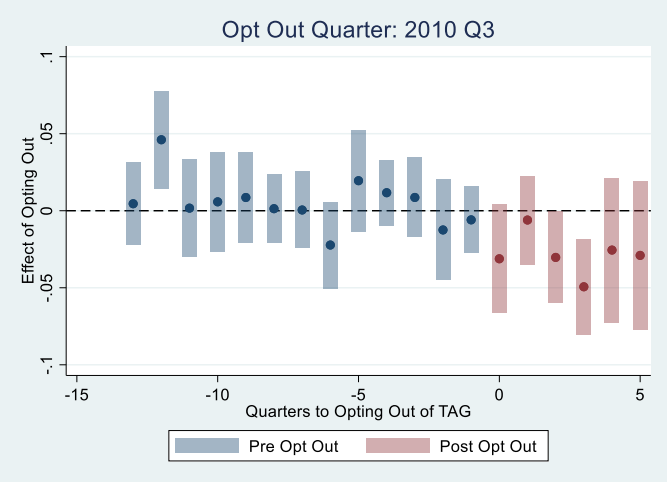




Panel B. 2010Q1 Opt-Out Sample




Panel C. 2010Q3 Opt-Out Sample



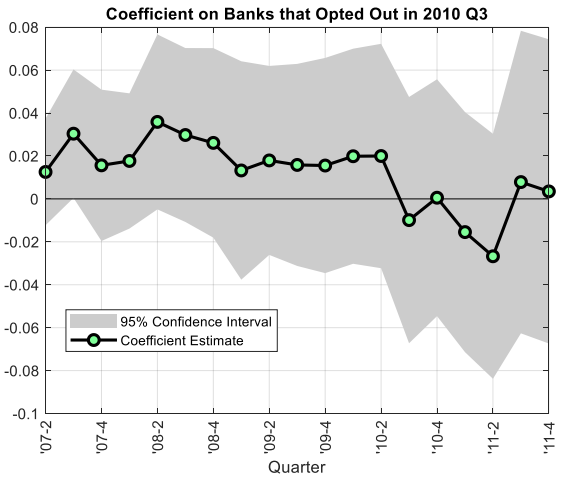



Fig. 10 Illustration of Risk Categories (RC) and TAG Program Premiums in 2010

This figure illustrates the risk-based premiums for TAG program participation that banks faced in 2010. Premiums increased based on Risk Category (RC). There were two thresholds, one separating RC 1 banks from RC 2 banks and the other separating RC 2 banks from RC 3 or 4 banks. The bell-shaped curves around each threshold illustrate the misclassification probability distribution that we obtain from a machine-learning model (estimated separately for each threshold). These probabilities allow us to obtain an objective, data-driven metric to measure the closeness of banks to each of the thresholds.

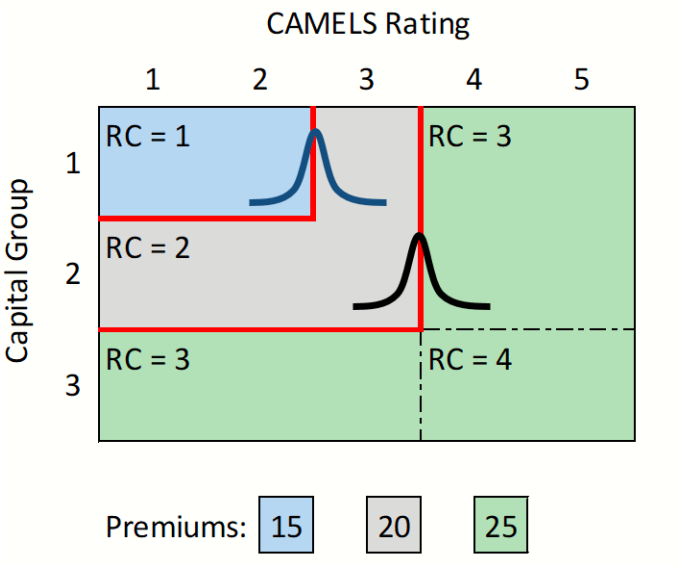


Table 1 FDIC Deposit Insurance Premiums

The table presents a summary of regular annual assessment rates and TAG fees for deposit insurance where bps stands for basis points. Beginning in April 2009, Annual Assessments Rates reflect the Total Base Assessment Rate. All data is gathered from the FDIC. See https://www.fdic.gov/deposit/insurance/historical.html#20070101 for details.

| | | Risk Category 1 | Risk Category 2 | Risk Category 3 | Risk Category 4 |
|---|---|---|---|---|---|
| 12/6/2008-12/31/2008 | Annual Assessment Rates | 5-7 bps | 10 bps | 28 bps | 43 bps |
| | TAG Program | 10 bps | | | |
| 1/1/2009-3/31/2009 | Annual Assessment Rates | 12-14 bps | 17 bps | 35 bps | 50 bps |
| | TAG Program | 10 bps | | | |
| 4/1/2009-12/31/2009 | Annual Assessment Rates for Established Institutions (Insured 5 years of More) | 7-24 bps | 17-43 bps | 27-58 bps | 40-77.5 bps |
| | Annual Assessment for Newly Insured Institutions (Insured Less Than 5 years Without a CAMELS Rating) | 14-21 bps | 22-43 bps | 32-58 bps | 45-77.5 bps |
| | Annual Assessment for Newly Insured Institutions (Insured Less Than 5 years With a CAMELS Rating) | 12-24 bps | 22-43 bps | 32-58 bps | 45-77.5 bps |
| | TAG Program (4/1/2009-12/31/2009) | 10 bps | | | |
| 1/1/2010-12/31/2010 | Annual Assessment Rates for Established Institutions (Insured 5 years of More) | 7-24 bps | 17-43 bps | 27-58 bps | 40-77.5 bps |
| | Annual Assessment for Newly Insured Institutions (Insured Less Than 5 years) | 16-24 bps | 22-43 bps | 32-58 bps | 45-77.5 bps |
| | TAG Program (1/1/2010-12/31/2010) | 15bps | 20 bps | 25 bps | |

## Table 2 Statistics on Banks Participating in the TAG Program by Size

The table presents statistics on depository institutions separated by bank assets and participation in the TAG program each quarter. *Participants* are banks that participated in the TAG program and *Non-Participants* are banks that opted out. A bank that opted out is counted as a non-participant in the first quarter in which opt-out decisions became effective (2008 Q4 for the initial program, 2010 Q1 for the first extension, and 2010 Q3 for the second extension). *Number of Observations* is the number of observations each quarter for each category. *Percent of NIBDs* is the ratio of domestic NIBDs in each category to total domestic NIBDs by quarter. *Percent Participating* is the percentage of each asset group that participated in the TAG program.

| Time | Depository Institutions with Assets ≤ $10 Billion | | | | | Depository Institutions with Assets > $10 Billion | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Participants | | Non-Participants | | | Participants | | Non-Participants | | |
| | Number of Observations | Percent of NIBDs | Number of Observations | Percent of NIBDs | Percent Participating | Number of Observations | Percent of NIBDs | Number of Observations | Percent of NIBDs | Percent Participating |
| 2008 Q4 | 7093 | 19.75% | 1098 | 0.86% | 86.60% | 107 | 79.31% | 7 | 0.08% | 93.86% |
| 2009 Q1 | 7032 | 19.67% | 1100 | 0.88% | 86.47% | 108 | 79.36% | 7 | 0.09% | 93.91% |
| 2009 Q2 | 6981 | 19.47% | 1098 | 0.82% | 86.41% | 109 | 79.60% | 7 | 0.11% | 93.97% |
| 2009 Q3 | 6893 | 19.60% | 1094 | 0.81% | 86.30% | 105 | 79.50% | 7 | 0.09% | 93.75% |
| 2009 Q4 | 6817 | 19.22% | 1088 | 0.83% | 86.24% | 99 | 79.86% | 8 | 0.09% | 92.52% |
| 2010 Q1 | 6267 | 17.80% | 1562 | 2.23% | 80.05% | 67 | 18.21% | 38 | 61.76% | 63.81% |
| 2010 Q2 | 6175 | 17.42% | 1550 | 2.15% | 79.94% | 66 | 18.07% | 39 | 62.36% | 62.86% |
| 2010 Q3 | 5705 | 15.20% | 1947 | 3.95% | 74.56% | 36 | 4.30% | 73 | 76.55% | 33.03% |
| 2010 Q4 | 5643 | 15.19% | 1908 | 3.83% | 74.73% | 34 | 4.12% | 73 | 76.85% | 31.78% |

Table 3 Descriptive Statistics

The table reports the descriptive statistics for key variables between 2009 Q1 and 2010 Q4. All variables are defined in Appendix Table A.1.

| variable | N | mean | sd | p10 | p25 | p50 | p75 | p90 |
|---|---|---|---|---|---|---|---|---|
| Opt-Out | 62577 | 0.18 | 0.38 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| Log (NIBD) | 61871 | 9.68 | 1.45 | 8.11 | 8.83 | 9.61 | 10.42 | 11.32 |
| NIBD Ratio | 62577 | 0.139 | 0.085 | 0.041 | 0.082 | 0.128 | 0.180 | 0.244 |
| Log Assets | 62577 | 12.039 | 1.273 | 10.544 | 11.182 | 11.912 | 12.729 | 13.639 |
| ROA | 62577 | 0.001 | 0.020 | -0.018 | 0.000 | 0.006 | 0.011 | 0.016 |
| Non Current Loans/Total Loans | 62577 | 0.027 | 0.032 | 0.001 | 0.006 | 0.016 | 0.035 | 0.064 |
| Equity/Assets | 62413 | 0.109 | 0.038 | 0.075 | 0.086 | 0.100 | 0.122 | 0.155 |
| RWA/Assets | 62577 | 0.687 | 0.132 | 0.505 | 0.603 | 0.701 | 0.784 | 0.844 |
| Core Deposits/Liabilities | 62577 | 0.771 | 0.131 | 0.601 | 0.688 | 0.782 | 0.869 | 0.936 |
| Liquid Assets/Total Assets | 62577 | 0.239 | 0.137 | 0.092 | 0.140 | 0.210 | 0.308 | 0.431 |
| Uninsured Deposit Ratio | 62577 | 0.172 | 0.130 | 0.035 | 0.076 | 0.143 | 0.233 | 0.346 |

## Table 4 Effect of Opting Out of TAG on Noninterest Bearing Deposits

This table shows estimates from specification (1), comparing institutions that opted out of TAG to those that never opted out. Three samples are considered, one for each of the three opt-out dates. Variables are winsorized at the 1 percent and 99 percent levels within each quarter. Standard errors clustered at the bank level in parentheses.
*** p <0.01, ** p <0.05, * p <0.1.

| | Dependent Variable: Log(Noninterest Bearing Deposits) | | | | | |
|---|---|---|---|---|---|---|
| | Opt Out in 2009 Q1 | | Opt Out in 2010 Q1 | | Opt Out in 2010 Q3 | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Post Opt Out of TAG | -0.081*** | -0.052*** | -0.046*** | -0.031** | -0.051** | -0.026 |
| | (0.014) | (0.012) | (0.018) | (0.014) | (0.021) | (0.018) |
| Asset Size (log) | | 0.866*** | | 0.873*** | | 0.872*** |
| | | (0.021) | | (0.022) | | (0.023) |
| ROA | | 0.973*** | | 0.876*** | | 0.933*** |
| | | (0.110) | | (0.098) | | (0.096) |
| Noncurrent Loans/Total Loans | | -0.283** | | -0.308*** | | -0.268** |
| | | (0.117) | | (0.116) | | (0.116) |
| Equity/Assets | | -1.498*** | | -1.466*** | | -1.530*** |
| | | (0.115) | | (0.123) | | (0.120) |
| RWA/Assets | | 0.092 | | 0.063 | | 0.070 |
| | | (0.078) | | (0.067) | | (0.067) |
| Core Deposits/Liabilities | | 0.508*** | | 0.525*** | | 0.517*** |
| | | (0.050) | | (0.053) | | (0.050) |
| Liquid Assets/Total Assets | | 0.017 | | -0.013 | | 0.004 |
| | | (0.080) | | (0.065) | | (0.069) |
| Uninsured Deposits Ratio | | 0.205*** | | 0.165*** | | 0.192*** |
| | | (0.052) | | (0.050) | | (0.050) |
| Observations | 140,373 | 140,065 | 129,942 | 129,598 | 128,476 | 128,128 |
| R-squared | 0.938 | 0.959 | 0.936 | 0.959 | 0.938 | 0.960 |
| Bank FE | YES | YES | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES | YES | YES |
| R-squared (Adjusted, Within) | 0.00163 | 0.295 | 0.000288 | 0.320 | 0.000269 | 0.319 |

## Table 5 Effect of Opting Out of TAG on NIBDs (IV Estimates, First Threshold)

This table shows estimates from an IV regression where TAG premiums are used as an instrument for the decision to opt out of TAG. The premium threshold considered in this table is the one separating Risk Category 1 banks from Risk Category 2. Only banks that are close to the threshold are included in the sample, and the table shows estimates for three different cutoffs for the misclassification probability. The misclassification probability is used as a distance metric to measure closeness to the threshold. It is derived from a model of the probability of a bank on one side of the threshold being misclassified to be among the group on the other side of the threshold. Odd-numbered columns show the first stage results (specification (3)) and even-numbered columns show the second stage results (specification (4)). Variables are winsorized at the 1 percent and 99 percent levels within each quarter. Standard errors clustered at the state-quarter level in parentheses. *** p <0.01, ** p <0.05, * p <0.1.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Cutoff Probability: 0.10 | | Cutoff Probability: 0.15 | | Cutoff Probability: 0.20 | |
| VARIABLES | Opt Out | Log(NIBD) | Opt Out | Log(NIBD) | Opt Out | Log(NIBD) |
| Opt Out of TAG | | -0.873 | | -0.119 | | 3.257 |
| | | (0.547) | | (0.664) | | (3.419) |
| High Premium Indicator | -0.0504*** | | -0.0429*** | | -0.0188 | |
| | (0.0111) | | (0.0146) | | (0.0172) | |
| Asset Size (log) | -0.0200*** | 0.892*** | -0.0210*** | 0.928*** | -0.0111 | 0.950*** |
| | (0.00625) | (0.0171) | (0.00707) | (0.0182) | (0.00844) | (0.0493) |
| ROA | 2.359*** | 5.205*** | 2.176*** | 3.216 | 2.326*** | -4.022 |
| | (0.588) | (1.853) | (0.678) | (1.973) | (0.739) | (9.231) |
| Noncurrent Loans/Total Loans | -0.885*** | 0.235 | -0.940*** | 1.253 | -1.005*** | 4.071 |
| | (0.257) | (0.761) | (0.322) | (0.893) | (0.356) | (4.186) |
| Equity/Assets | 1.021*** | -1.744** | 0.866*** | -3.020*** | 0.590** | -4.808* |
| | (0.182) | (0.699) | (0.199) | (0.728) | (0.236) | (2.639) |
| RWA/Assets | -0.142 | 1.960*** | -0.157 | 1.935*** | -0.291** | 3.276*** |
| | (0.107) | (0.296) | (0.108) | (0.315) | (0.118) | (1.114) |
| Core Deposits/Liabilities | -0.138** | 1.894*** | -0.136** | 2.221*** | -0.125* | 2.184*** |
| | (0.0600) | (0.166) | (0.0634) | (0.181) | (0.0723) | (0.593) |
| Liquid Assets/Total Assets | 0.120 | 2.073*** | 0.0696 | 2.144*** | -0.142 | 2.892*** |
| | (0.0900) | (0.251) | (0.0902) | (0.304) | (0.103) | (0.763) |
| Uninsured Deposits Ratio | -0.0211 | 2.059*** | -0.106 | 1.902*** | -0.214** | 2.725*** |
| | (0.0718) | (0.181) | (0.0889) | (0.228) | (0.0928) | (0.789) |
| Observations | 3,368 | 3,368 | 2,547 | 2,547 | 1,941 | 1,941 |
| Quarter FE | YES | YES | YES | YES | YES | YES |
| First Stage F-Statistic | 12.40 | | 6.498 | | 0.928 | |

## Table 6 Effect of Opting Out of TAG on NIBDs (IV Estimates, Second Threshold)

This table shows estimates from an IV regression where TAG premiums are used as an instrument for the decision to opt out of TAG. The premium threshold considered in this table is the one separating Risk Category 2 banks from Risk Category 3 or 4. Only banks that are close to the threshold are included in the sample, and the table shows estimates for three different cutoffs for the misclassification probability. The misclassification probability is used as a distance metric to measure closeness to the threshold. It is derived from a model of the probability of a bank on one side of the threshold being misclassified to be among the group on the other side of the threshold. Odd-numbered columns show the first stage results (specification (3)) and even-numbered columns show the second stage results (specification (4)). Variables are winsorized at the 1 percent and 99 percent levels within each quarter. Standard errors clustered at the state-quarter level in parentheses. *** p <0.01, ** p <0.05, * p <0.1.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Cutoff Probability: 0.10 | | Cutoff Probability: 0.15 | | Cutoff Probability: 0.20 | |
| VARIABLES | Opt Out | Log(NIBD) | Opt Out | Log(NIBD) | Opt Out | Log(NIBD) |
| Opt Out of TAG | | -3.679*** | | -2.784*** | | -2.980*** |
| | | (0.913) | | (0.731) | | (1.020) |
| High Premium Indicator | 0.0789*** | | 0.0909*** | | 0.0809*** | |
| | (0.0152) | | (0.0175) | | (0.0205) | |
| Asset Size (log) | -0.00133 | 0.854*** | -0.00382 | 0.846*** | 0.00603 | 0.852*** |
| | (0.00668) | (0.0295) | (0.00794) | (0.0310) | (0.00903) | (0.0355) |
| ROA | -0.372 | -0.560 | -0.401 | 0.896 | -0.300 | 1.225 |
| | (0.347) | (1.730) | (0.414) | (1.595) | (0.469) | (1.793) |
| Noncurrent Loans/Total Loans | -0.00167 | -0.729 | 0.360 | 0.307 | 0.0676 | -0.187 |
| | (0.225) | (0.989) | (0.247) | (1.164) | (0.253) | (1.110) |
| Equity/Assets | -0.496** | -3.952*** | -0.531** | -3.587*** | -0.545** | -4.680*** |
| | (0.200) | (1.324) | (0.231) | (1.175) | (0.271) | (1.347) |
| RWA/Assets | -0.301*** | -0.452 | -0.295*** | 0.0497 | -0.351*** | -0.387 |
| | (0.0717) | (0.541) | (0.0867) | (0.446) | (0.101) | (0.603) |
| Core Deposits/Liabilities | 0.103* | 2.104*** | 0.154** | 1.911*** | 0.0697 | 1.470*** |
| | (0.0564) | (0.329) | (0.0638) | (0.360) | (0.0749) | (0.375) |
| Liquid Assets/Total Assets | 0.102 | 1.863*** | 0.207* | 2.013*** | 0.196 | 2.116*** |
| | (0.105) | (0.502) | (0.117) | (0.490) | (0.137) | (0.602) |
| Uninsured Deposits Ratio | -0.0807 | 2.313*** | -0.175*** | 1.853*** | -0.281*** | 1.532*** |
| | (0.0613) | (0.312) | (0.0460) | (0.281) | (0.0561) | (0.386) |
| Observations | 1,471 | 1,471 | 1,112 | 1,112 | 922 | 922 |
| Quarter FE | YES | YES | YES | YES | YES | YES |
| First Stage F-Statistic | 19.41 | | 19.49 | | 12.67 | |

Table 7 Summary Statistics–Bank NIBD Growth and Market NIBD Growth during 2009–2010

The table summarizes the key indicators of NIBD growth depending on whether the markets the bank operates in had negative or non-negative NIBD growth. Panel A summarizes the distribution two NIBD growth indicators between 2009Q1 and 2010Q4. Panel B shows the differences in the market growth variables depending on whether market NIBD declined or did not decline. Statistical significance is denoted by *, **, and *** which corresponds to p-values of below 10 percent, 5 percent, and 1 percent respectively.

**Panel A - NIBD Growth and Market NIBD Growth**

| variable | N | mean | sd | p10 | p25 | p50 | p75 | p90 |
|---|---|---|---|---|---|---|---|---|
| Change in Log(NIBD) | 61846 | 0.023 | 0.179 | -0.147 | -0.056 | 0.015 | 0.092 | 0.203 |
| Change in NIBD Ratio | 62577 | 0.001 | 0.020 | -0.019 | -0.007 | 0.000 | 0.008 | 0.020 |
| Market -Change in Log (NIBD) | 62577 | 0.024 | 0.047 | -0.024 | -0.001 | 0.024 | 0.048 | 0.078 |
| Decline- Market NIBD | 62577 | 0.258 | 0.438 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 |

**Panel B - Bank NIBD Growth by Market NIBD Growth**

| | | Market NIBD (t,t-1) | | |
|---|---|---|---|---|
| | | No Decline | Decline | Diff |
| | | (1) | (2) | (1) vs. (2) |
| | | N=45,846 | N=16,000 | |
| Both | Change in Log(NIBD) (t,t-1) | 0.039 | -0.023 | -0.062 *** |
| Years | Change in NIBD Ratio (t,t-1) | 0.003 | -0.005 | -0.007 *** |
| | | N=21,876 | N=9,626 | |
| 2009 | Change in Log(NIBD) (t,t-1) | 0.043 | -0.019 | -0.061 *** |
| | Change in NIBD Ratio (t,t-1) | 0.002 | -0.004 | -0.006 *** |
| | | N=23,970 | N=6,374 | |
| 2010 | Change in Log(NIBD) (t,t-1) | 0.036 | -0.029 | -0.065 *** |
| | Change in NIBD Ratio (t,t-1) | 0.003 | -0.005 | -0.008 *** |

Table 8 First Stage: Do Market NIBD Shocks Affect Bank NIBD Growth?

This table shows regressions of our indicators of NIBD growth on market NIBD growth measures from t to t-1. The control variables are measured at time t-1 and are defined in Appendix Table A.1. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | **Change in Log(NIBD) (t,t-1)** | | | **Change in NIBD Ratio (t,t-1)** | | |
| Market -Change in Log (NIBD) (t,t-1) | | 0.779*** | | | 0.082*** | |
| | | (0.024) | | | (0.003) | |
| Decline- Market NIBD (t,t-1) | | | -0.048*** | | | -0.005*** |
| | | | (0.002) | | | (0.000) |
| Log Assets (t-1) | 0.000 | 0.001 | 0.000 | 0.000*** | 0.000*** | 0.000*** |
| | (0.001) | (0.001) | (0.001) | (0.000) | (0.000) | (0.000) |
| Assets Gr 10 B (t-1) | 0.001 | 0.002 | 0.000 | -0.001 | -0.001 | -0.001 |
| | (0.008) | (0.008) | (0.008) | (0.001) | (0.001) | (0.001) |
| ROA (t-1) | -0.074 | -0.052 | -0.072 | -0.008* | -0.006 | -0.008 |
| | (0.048) | (0.047) | (0.048) | (0.005) | (0.005) | (0.005) |
| Non Current Loans/Total Loans (t-1) | -0.329*** | -0.309*** | -0.323*** | -0.005* | -0.003 | -0.004 |
| | (0.027) | (0.027) | (0.027) | (0.003) | (0.003) | (0.003) |
| Equity/Assets (t-1) | 0.308*** | 0.294*** | 0.304*** | -0.001 | -0.002 | -0.001 |
| | (0.020) | (0.020) | (0.020) | (0.002) | (0.002) | (0.002) |
| RWA/Assets (t-1) | 0.026*** | 0.026*** | 0.025*** | 0.001 | 0.001 | 0.001 |
| | (0.009) | (0.009) | (0.009) | (0.001) | (0.001) | (0.001) |
| Core Deposits/Liabilities (t-1) | -0.056*** | -0.049*** | -0.054*** | -0.003*** | -0.002*** | -0.002*** |
| | (0.006) | (0.006) | (0.006) | (0.001) | (0.001) | (0.001) |
| Liquid Assets/Total Assets (t-1) | -0.024*** | -0.019** | -0.022*** | 0.001 | 0.001 | 0.001 |
| | (0.008) | (0.008) | (0.008) | (0.001) | (0.001) | (0.001) |
| Uninsured Deposit Ratio (t-1) | -0.012* | -0.014** | -0.012* | 0.000 | -0.000 | 0.000 |
| | (0.007) | (0.007) | (0.007) | (0.001) | (0.001) | (0.001) |
| Structural Controls | YES | YES | YES | YES | YES | YES |
| Local Economic Controls | YES | YES | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES |
| N | 61516 | 61516 | 61516 | 62193 | 62193 | 62193 |
| R^2A | 0.038 | 0.064 | 0.047 | 0.042 | 0.065 | 0.050 |
| rmse | 0.174 | 0.171 | 0.173 | 0.019 | 0.019 | 0.019 |

Table 9 Second Stage: Does NIBD Growth Affect Participation?

This table shows results for our models estimating the impact of our NIBD growth measures from t to t-1 on participation at time t. The control variables are measured at time t-1 and are defined in Appendix Table A.1. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

| | **OLS** | **OLS** | **OLS** | **IV1** | **IV2** | **IV1** | **IV2** |
|---|---|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** |
| | Opt-Out (t) | | | | | | |
| Change in Log(NIBD) (t,t-1) | | -0.018*** | | 0.105*** | 0.232*** | | |
| | | (0.006) | | (0.023) | (0.039) | | |
| Change in NIBD Ratio (t,t-1) | | | -0.090* | | | 0.994*** | 2.210*** |
| | | | (0.050) | | | (0.216) | (0.369) |
| Log Assets (t-1) | -0.050*** | -0.047*** | -0.050*** | -0.047*** | -0.047*** | -0.050*** | -0.050*** |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
| Assets Gr 10 B (t-1) | 0.351*** | 0.340*** | 0.350*** | 0.340*** | 0.340*** | 0.352*** | 0.353*** |
| | (0.031) | (0.032) | (0.031) | (0.032) | (0.032) | (0.031) | (0.031) |
| ROA (t-1) | 0.579*** | 0.584*** | 0.578*** | 0.594*** | 0.603*** | 0.587*** | 0.597*** |
| | (0.128) | (0.128) | (0.128) | (0.128) | (0.129) | (0.128) | (0.129) |
| Non Current Loans/Total Loans (t-1) | -0.131 | -0.160 | -0.131 | -0.120 | -0.078 | -0.126 | -0.120 |
| | (0.115) | (0.115) | (0.115) | (0.115) | (0.115) | (0.115) | (0.115) |
| Equity/Assets (t-1) | 1.008*** | 0.950*** | 1.008*** | 0.912*** | 0.873*** | 1.009*** | 1.010*** |
| | (0.116) | (0.117) | (0.116) | (0.118) | (0.119) | (0.116) | (0.116) |
| RWA/Assets (t-1) | -0.340*** | -0.271*** | -0.340*** | -0.274*** | -0.277*** | -0.341*** | -0.343*** |
| | (0.049) | (0.049) | (0.049) | (0.049) | (0.049) | (0.049) | (0.049) |
| Core Deposits/Liabilities (t-1) | -0.018 | -0.007 | -0.018 | 0.000 | 0.008 | -0.015 | -0.012 |
| | (0.032) | (0.032) | (0.032) | (0.032) | (0.032) | (0.032) | (0.032) |
| Liquid Assets/Total Assets (t-1) | -0.017 | 0.031 | -0.017 | 0.034 | 0.037 | -0.017 | -0.018 |
| | (0.049) | (0.050) | (0.049) | (0.049) | (0.049) | (0.049) | (0.049) |
| Uninsured Deposit Ratio (t-1) | -0.081** | -0.075** | -0.081** | -0.074** | -0.072** | -0.081** | -0.081** |
| | (0.033) | (0.033) | (0.033) | (0.033) | (0.033) | (0.033) | (0.033) |
| Structural Controls | YES | YES | YES | YES | YES | YES | YES |
| Local Economic Controls | YES | YES | YES | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES | YES |
| N | 62193 | 61516 | 62193 | 61516 | 61516 | 62193 | 62193 |
| R^2A | 0.121 | 0.114 | 0.121 | 0.088 | 0.078 | 0.095 | 0.085 |
| rmse | 0.361 | 0.358 | 0.361 | 0.359 | 0.361 | 0.361 | 0.363 |
| idp | | | | 0.000 | 0.000 | 0.000 | 0.000 |
| cdf | | | | 1689.899 | 572.085 | 1516.169 | 515.221 |

Table 10 Second Stage: Variation by Year

This table shows results analogous to Table 6, but estimates results for 2009 and 2010 separately. The control variables are included, as before, but not shown. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

| | **2009** | | | | | | **2010** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **OLS** | **OLS** | **IV1** | **IV2** | **IV1** | **IV2** | **OLS** | **OLS** | **IV1** | **IV2** | **IV1** | **IV2** |
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** | **(9)** | **(10)** | **(11)** | **(12)** |
| | Opt-Out (t) | | | | | | | | | | | |
| Change in Log(NIBD) (t,t-1) | -0.013* | | 0.046** | 0.030 | | | -0.020** | | 0.147*** | 0.174*** | | |
| | (0.007) | | (0.023) | (0.026) | | | (0.010) | | (0.040) | (0.059) | | |
| Change in NIBD Ratio (t,t-1) | | 0.035 | | | 0.413* | 0.270 | | -0.185** | | | 1.451*** | 1.735*** |
| | | (0.063) | | | (0.221) | (0.247) | | (0.084) | | | (0.383) | (0.551) |
| Controls | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| N | 31278 | 31630 | 31278 | 31278 | 31630 | 31630 | 30238 | 30563 | 30238 | 30238 | 30563 | 30563 |
| R^2A | 0.115 | 0.125 | 0.091 | 0.092 | 0.102 | 0.103 | 0.104 | 0.109 | 0.069 | 0.067 | 0.075 | 0.072 |
| rmse | 0.316 | 0.319 | 0.316 | 0.316 | 0.319 | 0.319 | 0.395 | 0.396 | 0.395 | 0.395 | 0.397 | 0.397 |
| idp | | | 0.000 | 0.000 | 0.000 | 0.000 | | | 0.000 | 0.000 | 0.000 | 0.000 |
| cdf | | | 737.897 | 282.711 | 688.291 | 258.837 | | | 830.000 | 283.859 | 705.498 | 260.624 |

## Table 11 Second Stage: By Size

This table shows results analogous to Table 6, but estimates results separately based on size; we use three categories of size: (i) Small (below median assets in given year), (ii) Large (above median assets in given year), and (iii) Large Excluding $10B plus banks. The control variables are included, as before, but not shown except that the Gr $10 B dummy indicator drops out from the "Small" and "Large Excluding $10B" subsample so is only including in the "Large" subsample. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

| | **Small** | | | | | | **Large** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **OLS (1)** | **OLS (2)** | **IV1 (3)** | **IV2 (4)** | **IV1 (5)** | **IV2 (6)** | **OLS (7)** | **OLS (8)** | **IV1 (9)** | **IV2 (10)** | **IV1 (11)** | **IV2 (12)** |
| | Dependent Variable = Opt-Out(t) | | | | | | Dependent Variable = Opt-Out(t) | | | | | |
| Change in Log(NIBD) (t,t-1) | -0.023*** | | 0.075** | 0.287*** | | | -0.014* | | 0.179*** | 0.234*** | | |
| | (0.009) | | (0.035) | (0.068) | | | (0.009) | | (0.044) | (0.063) | | |
| Change in NIBD Ratio (t,t-1) | | -0.129* | | | 0.767** | 2.698*** | | -0.060 | | | 1.762*** | 2.337*** |
| | | (0.068) | | | (0.324) | (0.612) | | (0.071) | | | (0.450) | (0.658) |
| Controls | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| N | 30580 | 31075 | 30580 | 30580 | 31075 | 31075 | 30936 | 31118 | 30936 | 30936 | 31118 | 31118 |
| R^2A | 0.119 | 0.129 | 0.082 | 0.066 | 0.091 | 0.072 | 0.087 | 0.090 | 0.055 | 0.049 | 0.059 | 0.052 |
| rmse | 0.400 | 0.402 | 0.400 | 0.404 | 0.402 | 0.406 | 0.303 | 0.305 | 0.304 | 0.305 | 0.306 | 0.307 |
| idp | | | 0.000 | 0.000 | 0.000 | 0.000 | | | 0.000 | 0.000 | 0.000 | 0.000 |
| cdf | | | 848.456 | 230.016 | 732.542 | 211.170 | | | 570.911 | 238.427 | 486.129 | 200.408 |

| | **Large Excluding $10B+** | | | | | |
|---|---|---|---|---|---|---|
| | **OLS (13)** | **OLS (14)** | **IV1 (15)** | **IV2 (16)** | **IV1 (17)** | **IV2 (18)** |
| | Dependent Variable = Opt-Out(t) | | | | | |
| Change in Log(NIBD) (t,t-1) | -0.017* | | 0.197*** | 0.287*** | | |
| | (0.009) | | (0.042) | (0.061) | | |
| Change in NIBD Ratio (t,t-1) | | -0.088 | | | 2.017*** | 2.952*** |
| | | (0.070) | | | (0.438) | (0.650) |
| Controls | YES | YES | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES |
| N | 30202 | 30339 | 30202 | 30202 | 30339 | 30339 |
| R^2A | 0.078 | 0.080 | 0.042 | 0.029 | 0.044 | 0.029 |
| rmse | 0.299 | 0.301 | 0.301 | 0.303 | 0.303 | 0.305 |
| idp | | | 0.000 | 0.000 | 0.000 | 0.000 |
| cdf | | | 589.596 | 245.946 | 485.706 | 202.564 |

## Table 12 Second Stage: By Average Early Crisis Uninsured Deposit Ratio

This table shows results analogous to Table 6, but estimates results separately based on our proxy for dependence on uninsured deposits, measured as the average early-crisis (2007Q1 to 2008Q3) uninsured deposit ratio. The first 6 specifications denote low dependence, measure as being in the bottom 75 percentile and the last six specifications denote high dependence, or the top 25 percentile of 2007Q1 to 2008Q3 average uninsured deposit ratio. The control variables are included, as before, but not shown. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

| | Average UnInsured Deposit Ratio (2007q1-2008q3) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bottom 75 percentile | | | | | | Top 25 Percentile | | | | | |
| | OLS | OLS | IV1 | IV2 | IV1 | IV2 | OLS | OLS | IV1 | IV2 | IV1 | IV2 |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| | Opt-Out (t) | | | | | | | | | | | |
| Change in Log(NIBD) (t,t-1) | -0.020*** | | 0.085*** | 0.179*** | | | -0.012 | | 0.177** | 0.401*** | | |
| | (0.007) | | (0.024) | (0.041) | | | (0.010) | | (0.072) | (0.135) | | |
| Change in NIBD Ratio (t,t-1) | | -0.124* | | | 0.795*** | 1.689*** | | -0.048 | | | 1.833** | 4.079*** |
| | | (0.064) | | | (0.222) | (0.375) | | (0.083) | | | (0.754) | (1.453) |
| Controls | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| N | 45984 | 46588 | 45984 | 45984 | 46588 | 46588 | 15359 | 15428 | 15359 | 15359 | 15428 | 15428 |
| R^2A | 0.103 | 0.112 | 0.083 | 0.078 | 0.092 | 0.087 | 0.137 | 0.137 | 0.079 | 0.025 | 0.072 | -0.013 |
| rmse | 0.380 | 0.383 | 0.380 | 0.381 | 0.383 | 0.384 | 0.276 | 0.277 | 0.278 | 0.286 | 0.280 | 0.292 |
| idp | | | 0.000 | 0.000 | 0.000 | 0.000 | | | 0.000 | 0.000 | 0.000 | 0.000 |
| cdf | | | 1526.184 | 502.691 | 1563.195 | 519.172 | | | 152.645 | 53.318 | 91.550 | 32.071 |

## Table 13 Second Stage: By Average Early-Crisis NIBD Ratio

This table shows results analogous to Table 6, but estimates results separately based on the proportion of NIBD deposits in the pre-crisis period (2007Q1 to 2008Q3), categorized as low and high based on the 25th and 75th percentile. The control variables are included, as before, but not shown. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

| | **Average NIBD Ratio (2007q1-2008q3)** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Bottom 75 percentile** | | | | | | **Top 25 Percentile** | | | | | |
| | **OLS** | **OLS** | **IV1** | **IV2** | **IV1** | **IV2** | **OLS** | **OLS** | **IV1** | **IV2** | **IV1** | **IV2** |
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** | **(8)** | **(9)** | **(10)** | **(11)** | **(12)** |
| | Opt-Out (t) | | | | | | | | | | | |
| Change in Log(NIBD) (t,t-1) | -0.016** | | 0.076*** | 0.193*** | | | 0.159** | 0.362*** | | 0.362*** | | |
| | (0.007) | | (0.024) | (0.042) | | | (0.076) | (0.120) | | (0.120) | | |
| Change in NIBD Ratio (t,t-1) | | -0.160*** | | | 0.756*** | 1.927*** | | | 1.096** | | 1.096** | 2.555*** |
| | | (0.059) | | | (0.238) | (0.406) | | | (0.521) | | (0.521) | (0.860) |
| Controls | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| N | 45874 | 46536 | 45874 | 45874 | 46536 | 46536 | 15469 | 15480 | 15469 | 15469 | 15480 | 15480 |
| R^2A | 0.110 | 0.121 | 0.085 | 0.077 | 0.096 | 0.089 | 0.145 | 0.145 | 0.092 | 0.075 | 0.091 | 0.070 |
| rmse | 0.356 | 0.359 | 0.356 | 0.357 | 0.359 | 0.360 | 0.362 | 0.362 | 0.362 | 0.366 | 0.362 | 0.367 |
| idp | | | 0.000 | 0.000 | 0.000 | 0.000 | | | 0.000 | 0.000 | 0.000 | 0.000 |
| cdf | | | 1344.589 | 444.127 | 1504.577 | 511.414 | | | 279.680 | 97.545 | 212.488 | 70.943 |

# Appendix

Table A.1 Variable Definitions

| Variable | Definition |
|---|---|
| Log(NIBD) | Natural log of domestic noninterest-bearing deposits (NIBDs) |
| NIBD Ratio | Total domestic NIBDs to total domestic deposits |
| Change in Log(NIBD) | One quarter change in log NIBD |
| Change in NIBD Ratio | One quarter change in the NIBD ratio |
| Market-Change in Log(NIBD) | Average market NIBD growth |
| Decline- Market NIBD | Dummy variable equal to one if the market experienced a decline in average NIBD growth and zero otherwise |
| Market Opt-Out Rate | The opt-out rate of other banks in the markets in which a given bank operates |
| Opt-Out | A dummy variable equal to one if the bank did not participate in the TAG program that quarter and zero otherwise |
| Log Assets | Natural log of total assets |
| Assets Gr 10 B | A dummy variable equal to one for banks with asset size of at least $10 billion, and zero otherwise |
| Log Assets Change | One quarter change in Log Assets |
| ROA | Net income after securities gains or losses, extraordinary gains or losses, and applicable taxes divided by total assets |
| Noncurrent Loans/Total Loans | Loans 30 or more days past due plus nonaccruals to total loans |
| Equity/Assets | Total equity to total assets |
| RWA/Assets | Risk-weighted assets to total assets |
| Core Deposits/Liabilities | Core deposits divided by total liabilities where core deposits are defined as all domestic deposits less brokered deposits and large time deposits. |
| Liquid Assets/Total Assets | Liquid assets divided by total assets where liquid assets are defined as the total of cash balances, fed funds and repos sold, and US treasuries. |
| Uninsured Deposit Ratio | Uninsured deposits to total deposits where the level of uninsured deposits is an estimate, reported in Call Reports, of the amount in deposit accounts above the coverage limits, which were $100,000 prior to late 2008, and $250,000 thereafter. |
| Log Bank Age | Natural log of bank age |
| MBHC | Dummy variable equal to one if the bank is an affiliate of a multi-bank-holding company and zero otherwise |
| Subchapter-S | Dummy variable equal to one if the bank has a subchapter-S status and zero otherwise |
| Merger Year | Dummy variable equal to one if the bank was involved in a merger in the prior year. |
| HHI | The weighted average HHI based on the bank's county-level deposit market area as defined by the FDIC's Summary of Deposits |
| Unemployment Rate | The weighted average percentage of the state unemployment rate based on the bank's market area as defined by the FDIC's Summary of Deposits |
| Per-capita income (PCI) | The weighted average per-capita income based on the bank's market area as defined by the FDIC's Summary of Deposits |
| Housing price index | The weighted average state housing price index based on the bank's market area as defined by the FDIC's Summary of Deposits |

Table A.2 – Stage 1 Results for Various Subsample Analyses

This table shows first stage analyses, similar to Table 8, for the various sub-sample tests. Panels A, B, C, and D show first stage results for analyses conducted by year, size, uninsured deposits dependence, and NIBD dependence. We use three categories of size: (i) Small (below median assets in given year), (ii) Large (above median assets in given year), and (iii) Large excluding $10B plus banks. The control variables, lagged at t-1, are included, as before, but not shown. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

## Panel A-First Stage by Year

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | **2009** | | | | **2010** | | | |
| | **Change in Log(NIBD) (t,t-1)** | | **Change in NIBD Ratio (t,t-1)** | | **Change in Log(NIBD) (t,t-1)** | | **Change in NIBD Ratio (t,t-1)** | |
| Market Log NIBD Change (t,t-1) | 0.749*** | | 0.080*** | | 0.792*** | | 0.082*** | |
| | (0.031) | | (0.003) | | (0.031) | | (0.004) | |
| Decline - Market NIBD (t,t-1) | | -0.047*** | | -0.005*** | | -0.054*** | | -0.006*** |
| | | (0.003) | | (0.000) | | (0.003) | | (0.000) |
| Controls | YES | YES | YES | YES | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES | YES | YES |
| N | 31278 | 31278 | 31630 | 31630 | 30238 | 30238 | 30563 | 30563 |
| R^2A | 0.068 | 0.055 | 0.065 | 0.053 | 0.058 | 0.041 | 0.063 | 0.049 |
| rmse | 0.175 | 0.176 | 0.019 | 0.020 | 0.168 | 0.169 | 0.019 | 0.019 |

## Panel B-First Stage by Size

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Small** | | | | **Large** | | | | **Large (Excluding $10B+)** | | | |
| | **Change in Log(NIBD) (t,t-1)** | | **Change in NIBD Ratio (t,t-1)** | | **Change in Log(NIBD) (t,t-1)** | | **Change in NIBD Ratio (t,t-1)** | | **Change in Log(NIBD) (t,t-1)** | | **Change in NIBD Ratio (t,t-1)** | |
| Market Log NIBD Change (t,t-1) | 0.861*** | | 0.093*** | | 0.629*** | | 0.061*** | | 0.643*** | | 0.061*** | |
| | (0.037) | | (0.004) | | (0.033) | | (0.003) | | (0.033) | | (0.003) | |
| Decline-Market NIBD (t,t-1) | | -0.046*** | | -0.005*** | | -0.042*** | | -0.004*** | | -0.043*** | | -0.004*** |
| | | (0.003) | | (0.000) | | (0.003) | | (0.000) | | (0.003) | | (0.000) |
| Controls | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| N | 30580 | 30580 | 31075 | 31075 | 30936 | 30936 | 31118 | 31118 | 30202 | 30202 | 30339 | 30339 |
| R^2A | 0.086 | 0.068 | 0.086 | 0.071 | 0.038 | 0.028 | 0.039 | 0.030 | 0.040 | 0.029 | 0.040 | 0.031 |
| rmse | 0.179 | 0.181 | 0.021 | 0.021 | 0.163 | 0.164 | 0.017 | 0.017 | 0.162 | 0.163 | 0.017 | 0.017 |

**Panel C-First Stage by Prior Four-Quarter Avg Uninsured Deposit Ratio**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Average UnInsured Deposit Ratio (2007q1-2008q3) | | | | | | | |
| | Bottom 75 Percentile | | | | Top 25 Percentile | | | |
| | Change in Log(NIBD) (t,t-1) | | Change in NIBD Ratio (t,t-1) | | Change in Log(NIBD) (t,t-1) | | Change in NIBD Ratio (t,t-1) | |
| Market Log NIBD Change (t,t-1) | 0.838*** | | 0.089*** | | 0.534*** | | 0.052*** | |
| | (0.027) | | (0.003) | | (0.056) | | (0.007) | |
| Decline-Market NIBD (t,t-1) | | -0.050*** | | -0.005*** | | -0.033*** | | -0.003*** |
| | | (0.002) | | (0.000) | | (0.005) | | (0.001) |
| Controls | YES | YES | YES | YES | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES | YES | YES |
| N | 45984 | 45984 | 46588 | 46588 | 15359 | 15359 | 15428 | 15428 |
| R^2A | 0.074 | 0.054 | 0.089 | 0.069 | 0.036 | 0.030 | 0.021 | 0.017 |
| rmse | 0.167 | 0.169 | 0.018 | 0.018 | 0.182 | 0.183 | 0.023 | 0.023 |

**Panel D-First Stage by Average Early-Crisis NIBD Ratio**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Average NIBD Ratio (2007q1-2008q3) | | | | | | | |
| | Bottom 75 Percentile | | | | Top 25 Percentile | | | |
| | Change in Log(NIBD) (t,t-1) | | Change in NIBD Ratio (t,t-1) | | Change in Log(NIBD) (t,t-1) | | Change in NIBD Ratio (t,t-1) | |
| Market Log NIBD Change (t,t-1) | 0.813*** | | 0.081*** | | 0.622*** | | 0.090*** | |
| | (0.027) | | (0.003) | | (0.052) | | (0.008) | |
| Decline - Market Log NIBD (t,t-1) | | -0.051*** | | -0.005*** | | -0.035*** | | -0.005** |
| | | (0.003) | | (0.000) | | (0.004) | | (0.001) |
| Controls | YES | YES | YES | YES | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES | YES | YES |
| N | 45874 | 45874 | 46536 | 46536 | 15469 | 15469 | 15480 | 15480 |
| R^2A | 0.066 | 0.048 | 0.080 | 0.060 | 0.050 | 0.039 | 0.044 | 0.035 |
| rmse | 0.178 | 0.180 | 0.017 | 0.017 | 0.148 | 0.149 | 0.025 | 0.025 |

Table A.3 – First and Second Stage Results using Two-Quarter Observation Window

This table shows results analogous to Tables 8 and 9, but estimates results separately based on two-quarter changes. The control variables, lagged at t-2, are included, as before, but not shown. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

**Panel A-First Stage**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | **Change in Log(NIBD) (t,t-2)** | | | **Change in NIBD Ratio (t,t-2)** | | |
| Market Log NIBD Change (t,t-2) | | 0.789*** | | | 0.085*** | |
| | | (0.026) | | | (0.003) | |
| Decline - Market Log NIBD (t,t-2) | | | -0.071*** | | | -0.008*** |
| | | | (0.003) | | | (0.000) |
| Controls | YES | YES | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES |
| N | 61233 | 61233 | 61233 | 61912 | 61912 | 61912 |
| R^2A | 0.040 | 0.063 | 0.049 | 0.040 | 0.062 | 0.049 |
| rmse | 0.221 | 0.218 | 0.220 | 0.024 | 0.024 | 0.024 |

**Panel B-Second Stage**

| | **OLS** | **OLS** | **OLS** | **IV1** | **IV2** | **IV1** | **IV2** |
|---|---|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** | **(7)** |
| | Opt-Out (t) | | | | | | |
| Change in Log(NIBD) (t,t-2) | | -0.018*** | | 0.088*** | 0.082*** | | |
| | | (0.007) | | (0.019) | (0.028) | | |
| Change in NIBD Ratio (t,t-2) | | | -0.105* | | | 0.820*** | 0.772*** |
| | | | (0.056) | | | (0.176) | (0.265) |
| Controls | YES | YES | YES | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES | YES |
| N | 61912 | 61233 | 61912 | 61233 | 61233 | 61912 | 61912 |
| R^2A | 0.122 | 0.115 | 0.122 | 0.088 | 0.088 | 0.096 | 0.096 |
| rmse | 0.361 | 0.358 | 0.361 | 0.359 | 0.359 | 0.361 | 0.361 |

Table A.4 – First and Second Stage Results using Four-Quarter Observation Window

This table shows results analogous to Tables 8 and 9, but estimates results separately based on four-quarter changes. The control variables, lagged at t-4, are included, as before, but not shown. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

**Panel A-First Stage**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | **Change in Log(NIBD) (t,t-4)** | | | **Change in NIBD Ratio (t,t-4)** | | |
| Market Log NIBD Change (t,t-4) | | 0.028 | | | 0.019*** | |
| | | (0.055) | | | (0.006) | |
| Decline - Market Log NIBD (t,t-4) | | | -0.009 | | | -0.001* |
| | | | (0.007) | | | (0.001) |
| Controls | YES | YES | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES |
| N | 60683 | 60683 | 60683 | 61390 | 61390 | 61390 |
| R^2A | 0.061 | 0.061 | 0.061 | 0.034 | 0.034 | 0.034 |
| rmse | 0.270 | 0.270 | 0.270 | 0.030 | 0.030 | 0.030 |

**Panel B-Second Stage**

| | **OLS (1)** | **OLS (2)** | **OLS (3)** | **IV1 (4)** | **IV2 (5)** | **IV1 (6)** | **IV2 (7)** |
|---|---|---|---|---|---|---|---|
| | Opt-Out (t) | | | | | | |
| Change in Log(NIBD) (t,t-4) | | -0.024*** | | 4.673 | 0.046 | | |
| | | (0.008) | | (9.256) | (0.587) | | |
| Change in NIBD Ratio (t,t-4) | | | -0.114* | | | 6.806** | -0.242 |
| | | | (0.067) | | | (2.760) | (3.890) |
| Controls | YES | YES | YES | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES | YES |
| N | 61390 | 60683 | 61390 | 60683 | 60683 | 61390 | 61390 |
| R^2A | 0.124 | 0.116 | 0.124 | -11.202 | 0.091 | -0.192 | 0.101 |
| rmse | 0.361 | 0.359 | 0.361 | 1.315 | 0.359 | 0.416 | 0.361 |

## Table A.5 – Second Stage Results with Additional Peer Effects

This table shows results analogous to Table 9, but includes an additional control, *Market Opt-Out Rate*. The control variables, lagged at t-1, are included, as before, but not shown. ***, **, and * denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

| | **OLS (1)** | **OLS (2)** | **OLS (3)** | **IV1 (4)** | **IV2 (5)** | **IV1 (6)** | **IV2 7)** |
|---|---|---|---|---|---|---|---|
| | Opt-Out (t) | | | | | | |
| Change in Log(NIBD) (t,t-1) | | -0.018*** | | 0.118*** | 0.278*** | | |
| | | (0.006) | | (0.024) | (0.040) | | |
| Change in NIBD Ratio (t,t-1) | | | -0.097* | | | 1.117*** | 2.648*** |
| | | | (0.050) | | | (0.223) | (0.372) |
| Market Opt-Out Rate | -0.161** | -0.158** | -0.159** | -0.177** | -0.200*** | -0.177** | -0.198*** |
| | (0.073) | (0.073) | (0.073) | (0.073) | (0.074) | (0.073) | (0.073) |
| Controls | YES | YES | YES | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES | YES |
| N | 62193 | 61516 | 62193 | 61516 | 61516 | 62193 | 62193 |
| R^2A | 0.113 | 0.107 | 0.113 | 0.079 | 0.064 | 0.086 | 0.070 |
| rmse | 0.362 | 0.360 | 0.362 | 0.360 | 0.363 | 0.363 | 0.366 |
| idp | | | | 0.000 | 0.000 | 0.000 | 0.000 |
| cdf | | | | 1661.233 | 547.635 | 1493.628 | 494.891 |