Depositors' Perception of "Too-Big-to-Fail"

Abstract

We examine if depositors respond to the perception of a too-big-to-fail policy by exploiting the exogenous shock to the Brazilian banking system caused by the international turmoil of 2008. We find evidence that a run to systemically important banks is better explained by the perception of a too-big-to-fail policy than by bank fundamentals. Among depositors, institutional investors are more prone to run, and their presence in the deposit base affects the decision to run by nonfinancial firms. Our evidence indicates that the extra inflow of deposits that systemically important banks receive during a crisis gives them an important competitive advantage.

Key Words: banking system, financial crisis, too-big-to-fail

JEL Classification: G21, G28, F650

1. Introduction

The policy of bailing out systemically important financial institutions, usually called "too-big-to-fail,"[1] is considered harmful to long-term financial market stability because it distorts competition and weakens the incentives for creditors to monitor banks, leading to increased moral hazard. The usual justification for this type of policy is that the failure of a systemically important financial institution may harm the entire financial system and possibly lead to a serious economic downturn.

The empirical literature on the effects of bailout policies focuses on two issues: the risk-taking behavior of banks (e.g., Gropp et al., 2011; Fischer et al., 2011, Dam and Koetter, 2012) and their capital markets' valuation (e.g., O'Hara and Shaw, 1990; Penas and Unal, 2004; Veronesi and Zingales, 2010; Brewer and Jagtiani, 2011; Kelly et al., 2011). These studies indicate that systemically important banks have a competitive advantage of lower funding costs and an incentive to take more risks. Despite its importance, little is known about the depositor response to bailout policies.

The goal of this paper is to investigate how the perception of a too-big-to-fail policy affects depositor behavior. The paper builds on the literature of bank runs (e.g., Diamond and Dybvig, 1983; Chari and Jagannathan, 1988; Calomiris and Gorton, 1991; Allen and Gale, 1998; Levy-Yeyati et al., 2010;

[1] The term "too big to fail" was first used to characterize institutions that pose systemic risk during a US congressional hearing in 1984, after the bailout of Continental Illinois, when the regulator of US national banks testified that 11 of the largest banks would receive a similar treatment if necessary (O'Hara and Shaw, 1990). Today, as Rajan (2009) points out, it is better to address these institutions as "too systemic to fail", because there are factors other than size that may cause an institution to become systemically important, such as its interconnectedness, centrality to a market and complexity. We use the term "too big to fail," although it should be understood in the broader meaning of systemic importance.

Iyer and Puri, 2012) and market discipline (e.g., Martinez Peria and Schmukler, 2001; Maechler and McDill, 2006; Imai, 2006) and examines whether depositor behavior is better explained by bank fundamentals or by the perception of an implicit governmental guarantee for systemically important banks in times of turmoil.

To address this question, we examine the depositor run in Brazil during the crisis of 2008. Starting around the first days of October, small and medium banks lost deposits week after week, until around the end of December. By the end of three months, these banks had lost approximately 20% of their certificates of deposits (CDs), whereas the big banks increased CDs by around 16%. Interest rate differentials cannot explain this preference shift. On the contrary, the small and medium banks already paid a higher mean interest rate on certificates of deposit than the big banks before the crisis, and this difference increased during the crisis.

The origins of the run in Brazil can be traced back to the international turmoil that followed the failure of Lehman Brothers on September 15, 2008. Lehman's failure induced losses to several counterparties and forced markets to reassess risk previously overlooked. It also led to a long list of bailouts of systemically important financial institutions in the US and Europe, including AIG (on the following day), and several others from October onwards, such as Citibank, Bank of America, ABN Amro, Royal Bank of Scotland, Commerzbank, Hypo Real Estate, UBS. On the other hand, many small banks were allowed to fail. Actually, Ueda and Mauro (2012) note that governments have proven their willingness to extended large-scale support to avoid the failure of sufficiently large or complex institutions during the crisis of 2008.

The run in Brazil is an ideal setting for assessing the causality of the relationship between the perception of a too-big-to-fail policy and depositors' response because the international turmoil offers an exogenous variation in the perception of systemic uncertainty. We chose to focus on that country for two main reasons. First, we argue that, among the countries where the financial sector was not exposed to subprime related assets, Brazil has a unique blend of market and institutional features that are useful for the identification of a too-big-to-fail effect, such as financial sector diversification in terms of ownership structure and size, and the availability of detailed information on bank and depositor behavior. Second, along the lines of Ayar (2012), Gormley (2010), and Calomiris and Mason (1997), by focusing in one country, instead of cross-country comparisons, we are able to control for the effects of the macroeconomic environment, the type of the deposit insurance scheme, the currency in which deposits can be made, and other unobservable microeconomic sources of heterogeneity, which might otherwise confound our analysis.

Our analysis uses a unique and comprehensive dataset, collected in close consultation with the financial supervisor of Brazil. This dataset allows us to compare changes of uninsured, insured and total deposits. Additionally, the dataset includes information on the type of holder of CDs, which can be institutional investors[2], individual investors and nonfinancial firms. To the best of our knowledge, this is the first paper that employs such disaggregated data that allows the investigation of differences in behavior by type of depositor. The dataset also allows us to extract the interest rates paid on

[2] Institutional investors are investment funds, investment companies, pension funds, and insurance companies.

freshly issued CDs. These marginal rates capture the dynamic interaction of deposit interest rates and deposit quantities better than implicit interest rates, computed in previous papers as the ratio of interest expenses to the level of deposits (e.g., Martinez Peria and Schmukler, 2001; Maechler and McDill, 2006; Acharya and Mora, 2012).

To identify the systemically important banks (big banks, for short), we apply a cluster analysis based on the institutional characteristics that Adrian and Brunnermeier (2011) find to predict their systemic risk indicator (ΔCoVaR). Alternatively, we run cluster analyses using variables that capture different aspects of bank size and find virtually identical results. Our inferences are also robust to including the subsidiaries of global powerhouse banks that are not locally systemically important.

Overall, the estimates suggest that the run to the big banks during the international turmoil is better explained by the depositors' perception of an implicit too-big-to-fail policy than by several sources of bank heterogeneity, including asset size, economic fundamentals, and ratings. Over half of the deposits that fled to the big banks during the crisis returned to the other banks in the year that followed the crisis, which strengthens this interpretation. We observe no systematic preference for big banks during the pre- and post-crisis periods. The results from our multiple regression analysis indicate a predicted increase of approximately 38 (28) percentage points (pp) in uninsured (total) deposits for the big banks in comparison with the other banks during the crisis.

Our inferences are robust to the inclusion of bank-specific risk factors that capture the effects of the international crisis on the Brazilian real economy, such as the decrease in economic activity and tighter external financing conditions. Unlike the study by Levy-Yeyati et al. (2010) of bank runs in Argentina and Uruguay, we do not find that withdrawals during a crisis are explained by the banks' exposure to any specific macroeconomic factor.

When we analyze the behavior of each type of depositor separately, we find that nonfinancial firms' decision to run has greater economic importance, but institutional investors run more heavily to the big banks during the crisis. This evidence is similar to the findings of Schmidt et al. (2012), who analyze the US money market fund crisis in September 2008 and find that institutional investors moved their money more quickly than retail investors. Our findings are also related to those of Iyer and Puri (2012), who examine the micro-depositor-level data for a bank run in India and find that depositors who have loans with a bank are less likely to run from that bank. Because institutional investors rarely (if ever) take any loans from banks, they should have a higher propensity to run.

We also find that the behavior of nonfinancial firms is influenced by the presence of institutional investors. Banks that have a higher share of deposits held by institutional investors before the crisis suffer more deposit outflows by nonfinancial firms throughout the crisis. This finding may indicate the presence of strategic complementarity, i.e., nonfinancial firms fear that massive outflows from institutional investors can harm the bank's health and decide to withdraw.

Our paper contributes to the literature on the effects of too-big-to-fail government guarantees by showing that depositors favor systemically important banks in turbulent times even in the absence of an explicit governmental bailout policy. In this sense, our study provides evidence of the effects of the time-inconsistency problem faced by central banks, as discussed by Chari and Kehoe (2010). The time-inconsistency problem arises because, *ex ante,* the central bank may commit to closing insolvent banks and helping illiquid banks; however, *ex post*, the high cost of liquidation makes the central bank more likely to choose the bailout approach.

Our paper also speaks to the literature on international transmission mechanisms. Studies by Popov and Udell (2012), Schnabl (2012), and Cetorelli and Goldberg (2012) find a negative effect of international crises on domestic lending. We add evidence that an international crisis impacts the depositors' allocation decision in the domestic banking system.

Our paper also adds to the literature on liquidity production and liquidity-risk management. Some studies (e.g. Kashyap, Rajan and Stein, 2002, Gatev and Strahan, 2006, Gatev et al., 2009, and Cornett et al., 2011) argue that banks can be liquidity providers even in times when market liquidity tightens, because investors pull money out of the capital markets and purchase bank deposits that provide funding for loan demand shocks that follow declines in market liquidity. On the other hand, Acharya and Mora (2012) argue that in the recent crisis US banks had to offer higher deposit rates to attract deposits, weakening the safe haven theory of deposits, and the role of the banking system as a stabilizing liquidity insurer. Our evidence adds a nuance to both strands of the literature. We find that investors shift their resources to systemically important banks, leaving the other banks heavily liquidity constrained. We also find that the big banks did not actively seek deposits by raising rates. Therefore, systemically important banks have a competitive advantage in the form of extra access to market liquidity from depositors. Such evidence adds another layer to the discussions of bank competition and financial stability (e.g., Carletti, 2010).

The remainder of the paper proceeds as follows. Section 2 describes the motivation for our study and the theoretical foundation. Section 3 introduces the empirical strategy. Section 4 provides the institutional details and describes the data and sample selection. Section 5 presents the results. Section 6 provides some robustness checks, and Section 7 concludes.

2. Testing the Too-big-to-fail Effect

To ascertain the causality of the relationship between the perception of an implicit too-big-to-fail policy and depositors' response, we look for an exogenous variation in perceived systemic risk that is strong enough to motivate an unexpected and abrupt shift in depositor behavior. The international crisis of the last quarter of 2008 provides such exogenous variation of perceived systemic risk in Brazil.

Covering countries whose banking systems were exposed to US subprime related assets or to market risk from trading activity would harm the assessment of causality. Brazil provides an interesting setting for our analysis because its banks had been performing well, did not have any exposure to toxic assets, and had very low exposure to foreign capital markets. The economy had been showing record high growth, and the housing market was not a concern[3].

Additionally, Brazil has a unique blend of market and institutional features that are useful for the identification of a too-big-to-fail effect. First,

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[3] In fact, the mortgage-to-GDP ratio in December 2008 was very low, at approximately 2.1%.

residents in Brazil may choose to make deposits in banks that are privately held or state-owned; domestic or foreign subsidiaries; large, medium, or small. This wide range of options allows for greater potential variation in depositor reaction to the crisis than in countries with a less diversified financial sector, such as China, where most banks are state-owned.

Second, although deposit insurance is mandatory, it covers only a limited amount per depositor per financial conglomerate (60 thousand BRL, approximately 30 thousand USD at the time). Unlike other countries, for example, Australia, Singapore, New Zealand, and Malaysia, Brazilian authorities did not adopt blanket guarantees during the financial turmoil.

Third, Brazil does not allow residents to hold deposits in foreign currency, unlike many other countries, such as Hong Kong, Singapore, Canada, and Israel. Distinguishing a too-big-to-fail effect is harder in these countries because shifts in deposits may be motivated by currency substitution rather than by the fear of bank failure.

Finally, the Central Bank of Brazil provided a unique dataset including actual interest rates paid on freshly issued CDs and detailed bank-level information disaggregated by deposit-size categories and type of depositor, allowing for a finer understanding of the determinants of depositor behavior.

2.1. THE GLOBAL CRISIS AND THE RUN

Allen and Carletti (2010) argue that the most disruptive consequence of Lehman's failure was the signal it sent to the international markets, raising concerns about the solvency and liquidity of financial institutions.

In an attempt to prevent bank runs, several countries throughout the globe raised deposit insurance and/or extended guarantees to non-deposit liabilities of banks[4]. As Acharya and Mora (2012) point out, in October 2008 the US government provided explicit support to the financial system, including the recapitalization of large banks and the increase in the deposit insurance limit from 100 thousand USD to 250 thousand USD per depositor.

In Brazil, the government did not increase the deposit insurance, nor did it inject capital into any bank. However, there was a significant outflow of funds from the other banks, as can be seen in Figure 1, which shows daily data of the CDs. The Central Bank of Brazil took several measures to provide liquidity to these banks, such as the reduction of reserve requirements[5].

Two pieces of evidence indicate that this reduction in deposits of the other banks is mainly driven by a deposit supply effect, and not by a decrease in credit demand, or a decision to shrink the loan portfolio: (i) total loans extended by these banks increase by 1.4% during the second half of 2008; and (ii) the difference between the average interest rate paid on freshly issued CDs by the other banks and the big banks widens.

[Figure 1]

Figure 2 presents anecdotal evidence of the abrupt shift in the behavior of institutional investors. It shows the evolution of the total amount of assets under the management of three different fixed-income mutual funds and the ratio of CDs of the big banks and the other banks to total assets. The total amount of assets under management is not affected by the crisis, but there is a

[4] Laeven and Valencia (2010) provide a detailed view of the policy responses by country for the 2007-2009 crisis.

[5] The measures to reduce reserve requirements occurred on the following dates in 2008: September 24; October 2, 8, 13, 14, 15, 24 and 31; November 13 and 25; and December 19. Measures to change the discount window occurred on October 6, 9, 10 and 16. In March 26, 2009, banks were authorized to issue a new type of bank liability, with a special guarantee of 20 million BRL (equivalent to approximately 9 million USD at the time), as long as they complied with a specific set of rules. These special-type liabilities are not included in our database.

sharp decline in the weight of the CDs of the other banks compared with an increase in the weight of the CDs of the big banks in the last quarter of 2008.

[Figure 2]

Bank runs are usually explained by two sets of theories.[6] One is based on the classical work of Diamond and Dybvig (1983), in which bank runs are self-fulfilling prophecies that occur when depositors withdraw their funds if they fear that other depositors will also withdraw. The second set of theories is based on the business-cycle view. This view asserts that bank runs are triggered by depositors who withdraw funds in anticipation of an upcoming downturn in the cycle (Jacklyn and Bhattacharya, 1988; Chari and Jagannathan, 1988; Allen and Gale, 1998).

One possible reason why the run in Brazil was limited to the other banks, whereas the big banks received a substantial inflow of deposits, is because depositors perceived the big banks as having stronger fundamentals.

Alternatively, depositors may have reacted to the news from US and Europe of many small and medium-sized banks failing, whereas the systemically important financial institutions were being bailed out, and decided to run to the big banks as a result of the perception of an implicit too-big-to-fail policy taking place in Brazil.

In fact, the adoption of a too-big-to-fail policy may be inferred from the country's recent history. After inflation stabilized in 1994, several banks were not able to adjust to the new environment and became distressed. To address the fragility of the banking system, the Brazilian government launched three major official bank restructuring programs, including government capital

[6] The literature on bank runs is vast. Allen et al. (2009) and Laeven (2011) provide excellent surveys.

injections to the largest private and state-owned banks in the country. In contrast, small private and state-owned banks were allowed to fail.

3. Identification and Empirical Strategy

To examine the extent to which depositor behavior is affected by bank fundamentals or the perception of a too-big-to-fail policy, we exploit the exogenous variation in the perception of systemic uncertainty caused by the international financial turmoil by applying a discontinuity approach.

We estimate the following model:

$$\begin{aligned}\Delta Deposits_{i,t} = {} & \alpha + \omega(Big\ Bank_i \times Crisis_t) + \vartheta Crisis_t + \gamma Big\ Bank_i \\ & + \beta' Fundamentals_{i,t-1} + \tau'\left(Fundamentals_{i,t-1} \times Crisis_t\right) \\ & + \theta Size_{i,t} + \lambda \Delta Interest\ Rate\ Margin_{i,t} + \phi \Delta Deposits_{i,t-1} \\ & + \delta \Delta Regional\ Economic\ Activity_{i,t} + \mu_i + d_t + \varepsilon_{i,t}\end{aligned} \tag{1}$$

The dependent variable is the semiannual change in deposits of bank i in period t, defined as the first difference of the log of deposits between $t-1$ and t.

The effect of the perception of a too-big-to-fail policy on depositor behavior is captured by the coefficient ω of the interaction of *crisis*, an indicator for the observation being during the international turmoil, and *big bank*, an indicator that equals one for banks considered systemically important. The definition of systemic importance is detailed in Section 3.1.

We include a vector of bank fundamentals traditionally found in the literature (*fundamentals*) to account for the business-cycle view of bank runs and depositor discipline. This vector includes the variables *equity ratio*, defined as the ratio of equity to total assets, to measure capital adequacy; *low* *quality loans*, defined as the ratio of low quality loans to total assets[7], to measure the risk of the loan portfolio; and *asset liquidity*, defined as the ratio of liquid assets (cash, tradable securities and net interbank) to total assets, to measure liquidity risk. We also add their interactions with the *crisis* indicator.

The variable *size*, defined as the natural logarithm of assets, controls for the other features continuously related to bank size that may be seen as beneficial to depositors. For instance, larger banks are usually more diversified, either by having a large customer base or offering a wide array of financial services and products. There may be other features, such as depositors' perception that larger banks have more cutting-edge technology and risk-management techniques.

Building on Maechler and McDill (2006) and Acharya and Mora (2012), we include in the model the variable Δ*interest rate margin*, defined as the semiannual change in the difference between the interest rate paid on CDs issued by each bank in each period and the Brazilian reference rate Selic (Brazilian equivalent to the US Federal Funds rate).

The lagged dependent variable $\Delta deposits_{i,t-1}$ accounts for possible momentum or mean reversion effects in the dynamics of the change in deposits. We also include a set of time dummies, represented by d_t, to account for time-fixed effects, enabling us to control for the common effect of any shock to $\Delta deposits_{i,t}$ during time t. In addition, we include a proxy for regional economic activity (*regional economic activity*), defined as the change in the

[7] Brazilian banks must rate their credit operations by risk category, namely, AA, A, B, C, D, E, F, G and H, and report the volume of credit in each of these ratings in their financial statements. Low-quality loans are those that fall within ratings E to H. Resolution 2682 from the Brazilian National Monetary Council states that loans due for more than 90 days should be rated E or worse.

retail sales index of the state in which the bank has more branches, to control for heterogeneous macro-effects over the depositor base. Bank unobserved fixed effects are represented by μ_i and ε is the error term[8].

The models are estimated using pooled ordinary least squares (OLS) and the system generalized method of moments (GMM-Sys), described by Blundell and Bond (1998).

The GMM-Sys allows us to estimate dynamic panel models that account for the presence of bank fixed effects and control for any time-invariant unobserved features that might influence the change in deposits. In addition, GMM-Sys enables us to mitigate concerns over the plausibly endogenous relationship between the change in deposits and some of the regressors by using suitable lagged values of the regressors as instrumental variables. For example, because deposit interest rates and deposit quantities are jointly determined, we allow Δ*interest rate margin* to be correlated with contemporaneous values (as well as with past values) of the error term ε, but not with future values of ε. Under this identifying assumption, we can use appropriate lags of Δ*interest rate margin* as instruments. Analogously, we

[8] The model specification also includes a deterministic regressor to take into account a regulatory change of the deposit insurance scheme. When the deposit insurance was implemented, in 1995, it covered up to 20 thousand BRL (approximately 20 thousand USD at the time). The amount of coverage was extended to 60 thousand BRL (approximately 27 thousand USD at the time) in August 2006, during a calm period for the Brazilian banking system. The variable assumes the value of the change in uninsured (insured) deposits resulting from the extension of coverage for the period December 2006 in the model with uninsured (insured) deposits on the left-hand side and zero otherwise. This computation is based on the number of depositors and the volume of deposits in several different deposit-size categories. Based on data from June 2006, we compute the uninsured deposits that became insured as a result of the increase in deposit insurance. Neglecting this issue would result in measurement error because part of the changes in uninsured and insured deposits in December 2006 is not derived from depositors moving their resources from one bank to another. This error could not be captured by time-fixed effects because the change in coverage affects each bank differently depending on its depositor profile.

allow bank fundamentals and *size* to be correlated with past shocks to account for feedback effects running from the change in deposits to those variables.

To understand whether depositors behave differently depending on whether their funds are insured or not, we estimate model (1) with changes in the uninsured and insured deposits on the left-hand side. Deposit insurance is mandatory and provided by the Brazilian Deposit Insurance Fund (Fundo Garantidor de Crédito – FGC, in Portuguese). The Fund is financed by flat insurance premiums paid by every deposit-taking institution[9]. The insurance covers deposits up to a specific amount per depositor per financial conglomerate. Therefore, it is reasonable to expect that uninsured deposits are more likely to be withdrawn. Because total deposits are the sum of uninsured and insured deposits, we omit the estimation of the model with insured deposits on the left-hand side to save space.

We also examine potential differences in behavior by type of depositors by estimating model (1) with changes in certificates of deposit held by institutional investors, nonfinancial firms and individual investors on the left-hand side. Institutional investors are considered more sophisticated than individual investors and nonfinancial firms and Calvet et al. (2009) show that sophistication accelerates the reaction to information. Also, Ben-David et al. (2012) argue that institutional investors are more reactive to bad news than individual investors because they have internal risk-management systems or

[9] Over 98% of deposits in Brazil are denominated in Brazilian Real, the local currency. Deposits in foreign currency are not eligible for insurance and are allowed only for very specific types of investors (non-resident individuals and companies). Some other types of deposits are not eligible for deposit insurance, such as i) deposits, loans or any other type of funding raised abroad; ii) deposits related to litigation; iii) time deposits authorized to compose Tier-2 of the regulatory capital. These ineligible-for-insurance deposits account for less than 10% of the overall amount of deposits in the Brazilian financial system.

funding requirements that may force a periodic revision of their asset allocation. Accordingly, the model by Huang and Ratnovski (2011) suggests that short-term wholesale financiers react to negative public signals by withdrawing. Finally, institutional investors are customers of the bank only on the liabilities side, unlike individuals and nonfinancial firms, which usually take loans from banks. This feature gives institutional investors a higher degree of freedom to move their resources from one bank to another.

We also estimate other model specifications that account for alternative explanations of the run, detailed in Section 6.

Our empirical strategy could be questioned if depositors considered big banks a safe haven during the crisis for reasons other than the perception of an implicit governmental guarantee or better fundamentals. For example, big banks could be considered safer because depositors believe they are better managed (especially during a crisis) or more closely monitored by the Central Bank or just because big banks are more familiar to depositors. If any of these subjective reasons hold, then our interpretation of the too-big-to-fail perception may be confounded. However, these hypotheses do not seem plausible for at least four reasons.

First, our results show that institutional investors run more heavily to the big banks. Because they are the most sophisticated type of depositor, the hypothesis that big banks were favored because of their well-known brands or other subjective perceptions of safety is weak.

Second, the big banks have the highest level of complexity in the Brazilian banking system; aside from traditional credit operations, they are involved in securities dealing, market making, brokerage, and proprietary trading. Stiroh (2004) analyzes potential diversification benefits in the U.S. banking industry and finds that even a low exposure to non-traditional banking activities increases risk. Thus, the big banks' high complexity weakens the hypothesis that they are safer than the other banks.

Third, the better management hypothesis is not appealing because the crisis stemmed from globally large and complex financial institutions, and poor management was regarded as one of the main reasons for the crisis.

Fourth, the idea that large and complex financial institutions are safer because they are closely monitored by the supervisory agencies is at odds with the fact that large and complex financial institutions supervised by the Federal Reserve, FDIC, Financial Services Authority (FSA) and other supervisory agencies were so risky that some failed and had to be bailed out.

3.1. BIG BANKS

Quantitative models that aim to estimate the individual banks' contributions to systemic risk, such as those of Adrian and Brunnermeier (2011) and Acharya et al. (2010), are usually based on stock market data. Because only 20 banks in Brazil are publicly traded, and half of them had their Initial Public Offerings in 2007, we resort to the banks' characteristics to identify those that are systemically important. Adrian and Brunnermeier (2011) develop a systemic risk indicator based on market data named ΔCoVaR and search for the financial institutions' characteristics that predict their future ΔCoVaR. They find that financial institutions with higher leverage, a greater maturity mismatch, and a larger size tend to be associated with larger systemic risk contributions between one quarter and two years later.

We use the same variables suggested by Adrian and Brunnermeier (2011) in several cluster analyses to differentiate the two sets of banks: the systemically important banks and the others. We use data from the beginning of the sample period until the period prior to the global financial crisis to make such differentiation. The variables are: (i) leverage, defined as total assets/total equity (in book values); (ii) size, defined as the book value of total assets because of the lack of market data; (iii) loan-loss reserves/total book assets; (iv) trading assets/total book assets; and (v) non-interest-bearing deposits.

Table 1 – Panel A shows the two-cluster classification suggested by two clustering algorithms, *K-means* and *K-medians* (see Kaufman and Rousseeuw, 2005). The first cluster is composed of eight banks that are remarkably different (in terms of the five variables we employ) from the remaining banks. The result is the same using both algorithms.

[Table 1]

We check the robustness of our categorization using bank size as the main driver of systemic importance, similar to the studies by Brewer and Jagtiani (2011), Demirgüç-Kunt and Huizinga (2011), Houston et al. (2010), and Laeven and Levine (2009). Bank size is easily observed by the market and has historically been the only feature used to distinguish institutions that pose systemic risk. Our approach is to run additional cluster analyses using variables that capture different aspects of the bank's size: (i) total book assets plus brokerage, (ii) total book assets, (iii) total deposits, (iv) number of branches, and (v) number of clients. We find that the set of systemically important banks shown in Table 1 remains unchanged.

We also test whether the subsidiaries of global systemically important institutions that do not fit the aforementioned big bank criteria are also perceived as too big to fail by depositors. This set of banks, shown in Table 1 – Panel B, is based on a list published by the *Financial Times* (Jenkins and Davies, 2009) and includes nine banks. The hypothesis behind this test is that depositors in Brazil could favor these global powerhouse banks not because they would be eligible for a bailout by the Brazilian government but because they would be bailed out (and most of them actually were) by the governments of their home countries.

4. Data, Summary Statistics, and Mean Comparison Tests

Our primary database consists of observations of deposit-taking banks in Brazil from December 2001 to December 2009. In cases where banks belong to a common holding company, we use information from the holding-company-level balance sheets, following Gatev and Strahan (2006).

There are just over 100 banks in Brazil, and they are of 3 different types, according to the ownership structure: domestic privately-owned banks, foreign subsidiaries, state-owned banks (owned either by the federal Government or the states government). All the banks are regulated and supervised exclusively at the federal level by the Central Bank of Brazil. Panel A of Table 2 shows that, in the period immediately before the crisis, domestic private banks and foreign banks' subsidiaries hold approximately 57% of the total deposits of the system, whereas state-owned banks hold the remaining 43%. The banks' funding structure is mostly deposit based, and the average loan-deposit ratio in the pre-crisis period is approximately 0.9.

[Table 2]

Our data come from four different sources. The first set of data is available to the public on the Central Bank of Brazil website. This dataset is composed of detailed balance sheets, income and earnings reports, as well as data on the number and location of branches and regulatory indicators.

The second source for our data is private and from the Brazilian Deposit Insurance Fund. These data allow us to compute the volume of insured and uninsured deposits of each bank in each period. This dataset is available only on a semiannual basis, which binds our definition of the crisis period to the entire second half of 2008. According to Aït-Sahalia et al (2012), the end of the crisis is marked by the G20 Leaders' Summit on Financial Markets and the World Economy held in April 2, 2009, so we treat the periods ending in June 30 and December 31 of 2009 as the post-crisis period. We call all other periods “normal times”.

Third, we use private data provided by the Central Bank of Brazil. This novel dataset includes the daily balances of certificates of deposit held by institutional investors, nonfinancial firms and individual investors as well as the interest rates paid on issues of fresh CDs; the data also include semiannual information on the different types of outstanding bank loans.

Fourth, we use data from the retail sales index provided by the Brazilian Institute of Geography and Statistics (IBGE, for its acronym in Portuguese), which provides the growth in retail sales for each of the 27 states of the federation as well as the resulting national growth in retail sales[10]. This index is the most commonly used indicator of regional economic activity.

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[10] Although interstate branching is allowed, many banks concentrate activities in specific states. If a bank has branches in more than 10 states and no single state accounts for more than 50% of its branches, we consider it a

In order to analyze only banks that take deposits on a regular basis, we exclude from our sample banks whose ratio of deposits to assets is lower than 1%. We also exclude banks that were under Central Bank intervention and banks that were not among the top 50 in either deposit taking or total assets in any of the 17 periods. The banks in our sample hold almost 98% of the deposits in the Brazilian banking system. We require that all observations have non-missing data for book assets, and all multivariate analyses implicitly require non-missing data for the relevant variables. To mitigate the impact of data errors and outliers on our analysis, we Winsorize all variables at the 5th and 95th percentiles. We treat merged banks (or acquisitions in which two different banks consolidated their balance sheets) as new banking entities[11]. Panel B of Table 2 describes the representativeness of the sample. At the beginning of the sample period, the sample has 73 banks, which hold 97.1% of the total deposits in the Brazilian financial system. At the end of the sample period, we have 52 banks, which hold 99.0% of the total amount of deposits. The decreasing number of banks is the result of mergers and acquisitions throughout the sample period and of one bank failure, which occurred in 2004. The final sample has 1,056 bank-period observations.

Table 3 presents the summary statistics for December 2001, June 2008, December 2008, and December 2009.

[Table 3]

nationwide bank and use the national index. Otherwise, we use the index for the state where the bank has more branches.

[11] For example, if Bank A acquires, or merges with Bank B, we treat the merged Bank C as a new bank. In this case, the change in deposits was calculated based on the sum of the deposits of the two merged banks.

During the international turmoil in the second half of 2008, the other banks experience a negative change in both uninsured and total deposits, whereas the big banks experience a positive change. Throughout 2009, there appears to be a reversal, with the other banks receiving more deposits (both total and uninsured) than the big banks.

The difference between the interest rate paid on freshly issued CDs by the other banks and the big banks increases by 162 basis points (bps) during the turmoil (from 110 to 272 bps), returning to pre-crisis levels, 134 bps, in December/2009. As mentioned before, these numbers are consistent with the idea of the big banks passively receiving deposits during the crisis, while the other banks actively search for deposits.

Overall, both the big banks and the other banks notably increased their asset size and equity during the sample period. Because the big banks have larger branch networks than the other banks, they have a larger number of depositors and, thus, a smaller ratio of uninsured to total deposits. On average, the big banks have a slightly lower equity ratio and a higher ratio of low-quality loans to assets. At the beginning of the sample period, the big banks have slightly higher asset liquidity than the other banks, but in the period immediately prior to the crisis, during the turmoil, and after it, the other banks have higher asset liquidity than the big banks.

Table 4 shows the results of OLS regressions without control variables and intercepts. It indicates that the negative change in both uninsured and total deposits of the other banks during the crisis is statistically significant at conventional levels. It also presents evidence that the institutional investors were the major runners. In contrast, the big banks experienced a highly significant positive change in deposits, with substantial inflows from all types of depositors. The estimates also show a partial reversal in the post-crisis period, corresponding to the year of 2009. Throughout the post-crisis year, the other banks experienced statistically significant and much larger inflows than the big banks, from each type of depositor.

[Table 4]

5. Results

5.1. UNINSURED AND TOTAL DEPOSITS

Table 5 – Panels A, B and C shows the regression results for uninsured and total deposits using OLS and GMM-Sys estimators.

Table 5 – Panel A shows the baseline model (1) in which the set of big banks is defined according to the procedure described in Section 3.1. We find a positive and statistically significant ω for the uninsured deposits regressions under both estimation procedures (at the 1% level). These estimates are also economically large, corresponding to a predicted increase of approximately 38 pp in uninsured deposits for the big banks relative to the other banks during the crisis. As expected, we find a positive but lower ω for the total deposits regressions in all cases, predicting an increase of approximately 28 pp in deposits for the big banks relative to the other banks during the crisis.

The coefficient of the *big bank* dummy variable is not statistically significant at conventional levels in any regression. This result suggests that the growth rate of deposits is similar for the big banks and the other banks during normal times.

The controls for bank fundamentals and their interactions with the *crisis* dummy have non-significant coefficient estimates. Because previous empirical research found evidence supporting runs based on fundamentals, we look at bank ratings and investigate other risk factors specifically related to the international financial crisis in Section 6.

[Table 5]

Table 5 – Panel B uses a broader definition of systemically important banks, including the subsidiaries of global powerhouse banks. We call this group *big + powerhouse banks*. The estimates shown in Panel B indicate that adding global powerhouse banks to the set of big banks slightly increases ω and substantially increases the negative coefficient of the crisis dummy. To better understand the role played by these banks, in Table 5 – Panel C we estimate the same models after excluding the big banks from the sample and find similar estimates. Taken together, these results show that depositors favored both Brazil's systemically important banks (big banks) and the subsidiaries of banks that have systemic importance on a global level (global powerhouse banks) during the financial crisis. This evidence is consistent with a too-big-to-fail effect, since global banks received implicit (and, in many cases, explicit) governmental guarantees during the crisis.

Next, we investigate whether depositors favor big government-owned banks compared with big private banks. We test this possibility by first excluding big private banks from the sample (specifications 1 to 4 of Table 6) and then excluding big government-owned banks (5 to 8 of Table 6).

[Table 6]

Table 6 shows that there is almost no difference between the estimates of the coefficient ω after excluding the big private banks and after excluding the big government-owned banks. For uninsured deposits, both types of big banks experience approximately 39 pp more expected growth than the other banks during the crisis. For total deposits, the results also show 27 pp for the big government-owned banks and 31 pp for big private banks.

Overall, the estimates shown in Tables 5 and 6 suggest that the positive spike in the deposits of the big banks during the financial crisis is better explained by their systemic importance (thus being perceived as enjoying an implicit governmental guarantee) than by the heterogeneity in traditionally used bank fundamentals, by a continuous size effect or by a general propensity of such banks to attract more deposits than their competitors.

5.2. CERTIFICATES OF DEPOSIT HELD BY DIFFERENT TYPES OF INVESTORS

In this section, we investigate the behavior of different types of holders of certificates of deposit[12] according to their degree of sophistication: (i) institutional investors, (ii) nonfinancial firms, and (iii) individuals.

Unfortunately, the data do not enable us to identify the proportion of CDs covered by deposit insurance. Nonetheless, it is reasonable to assume that the fraction of uninsured CDs is larger for institutional investors, followed by nonfinancial firms and individuals.

The results for the institutional investors are shown in columns 1 and 2 of Table 7. During the crisis, there is an expected increase of approximately 68

[12] We restrict our analysis to CDs because of the unavailability of data on the type of holder of checking and savings deposits.

pp in the growth rate of CDs issued by big banks to institutional investors relative to those issued by other banks (significant at the 5% level). Institutional investors are sensitive to the equity ratio. Our estimates also imply that a 1 pp increase in the equity ratio predicts an increase in the growth rate of certificates of deposit held by institutional investors of approximately .97 pp. This result indicates that institutional investors respond to changes in bank risk, which supports the existence of market discipline.

Results in columns 3 and 4 of Table 7 show that the expected increment for big banks relative to other banks in the growth rate of CDs held by nonfinancial firms during the crisis is approximately 43 pp (significant at 1%). The results for individuals are in columns 5 and 6 of Table 7 and ω is also positive but not statistically significant at the usual levels. It is reasonable to expect that a large part of the CDs held by individuals are insured, and therefore, they are less likely to run.

The more pronounced run observed for institutional investors is consistent with the findings of Schmidt et al. (2012), who show that, immediately after Lehman's failure, institutional investors in the US moved their money from money market funds without "deep pocket backing" (i.e., implicit guarantees from the management company) to other money market funds that held mainly Treasury bonds more quickly than retail investors did.

[Table 7]

6. Robustness Checks

The most important assumption for the determination of a causal relationship between the perception of a too-big-to-fail policy and depositors' reaction is that there would be no other reason for the big banks to receive more deposits than the other banks during the crisis.

In this section, we test alternative explanations for the run to big banks observed during the financial crisis[13]. Namely, we: (a) test if depositors fled to high-rated banks; (b) test for risk factors specifically related to the international financial crisis; (c) investigate how deposit growth evolves for different banks in the post-crisis period; and (d) investigate whether the share of institutional investors in the deposit base affects the decision to run. Additionally, we: (e) investigate whether the depositors favor other (non-big) government-owned banks over privately held banks during the crisis; (f) investigate whether banks with publicly traded shares (which are assumed to have a lower level of information asymmetry) are favored over privately held banks; (g) include the interaction of the crisis dummy with other variables, such as size and the interest rate paid on CDs, to check if any of those may affect depositors decisions during the crisis; and (h) use alternative estimators and/or identifying assumptions to verify the stability of our results.

6.1. BANK RATINGS

Previous research suggests that most runs are based on bank fundamentals (e.g., Calomiris and Gorton, 1991; Gorton, 1988; and Calomiris and Mason, 2003). Our results show a weak response of depositors to the fundamentals that are traditionally found in the literature. However, it is plausible that our indicators of asset quality, liquidity and leverage do not fully capture bank fundamentals. We then investigate whether bank ratings are able to explain

[13] To save space, we hereafter report only GMM-Sys estimations in our robustness tests. Our main inferences are maintained using POLS estimations.

changes in deposits. We use a dummy variable that is equal to 1 if a certain bank has received an investment grade rating, and 0 for banks rated below investment grade or without any rating[14]. Table 8 shows the results of our estimations adding this variable and its interaction with the crisis dummy to our baseline specification.

[Table 8]

The results in Table 8 show that the point estimates for the *investment grade x crisis* variable are positive, but statistically insignificant, which indicates that depositors do not flee to investment-grade banks during the crisis. In fact, the average change in deposits for investment-grade banks that are not systemically important (i.e., banks that do not belong to the big banks group) during the crisis is approximately -9.3%, which is not very different from the average for below investment grade and unrated banks (-10.5%). For example, investment-grade bank Votorantim lost 37% of its deposits during the crisis, whereas below-investment-grade bank Brascan and unrated bank BGN increased their deposits by 8% and 5% respectively.

More importantly, our inference about the importance of being too-big-to-fail in driving depositors' behavior during the financial crisis is unchanged. The estimates for ω are statistically and economically very significant, except for the CDs held by individual investors. Big banks enjoy an approximately 32 pp increase in the expected rate of growth of uninsured deposits relative to

[14] About half of the banks in our sample are not rated by any of the major rating agencies. Implicit to the rationale of this dummy variable is the very plausible assumption that, had unrated banks been issued any rating, it would be below investment grade. We use deposits ratings attributed by Fitch Ratings, which is the agency covering the highest number of banks in our sample. This particular choice is not an issue, since ratings do not vary materially across different rating agencies.

other banks (24 pp for total deposits) during the crisis. The results reported in columns 3 and 4 of Table 8 show that the expected growth rate in the CDs of big banks held by institutional investors and nonfinancial firms increases by 56 and 38 pp, respectively, relative to other banks.

We also perform a series of other (unreported) robustness tests using information on bank ratings, such as: (i) using several thresholds other than investment versus speculative grade for the rating dummy; (ii) using the ratings issued under the domestic ratings scale instead of the global rating scale; (iii) attributing the ratings issued to parent banks to the subsidiaries of foreign banks. In all cases, our inferences are unchanged.

6.2. RISK FACTORS RELATED TO THE GLOBAL CRISIS

Our results so far show little importance of bank fundamentals, or even bank ratings, in driving depositors' decisions. However, a potential concern is that depositors respond to other risk factors that are directly related to the effects of the crisis on the Brazilian economy. In this section, we investigate whether these risk factors explain why the big banks received more deposits than the other banks during the crisis.

The exacerbation of the global financial crisis affected the real economy of Brazil through two major channels: (i) the liquidity freeze in international markets, which tightened external financing conditions, and (ii) a significant decline in international investment followed by a lower demand for regional exports and a drop in commodity prices (IMF, 2009). The crisis led to a 45% depreciation of the Brazilian Real relative to the US dollar in the second half of 2008. Despite the depreciation, there was no process of currency substitution in Brazil; the deposit base grew by approximately 30% during the second half of 2008, as shown in Figure 3[15].

6.2.a. The Market Liquidity Freeze

The liquidity freeze after Lehman's failure tightened the external financing conditions; therefore, one could argue that the banks' dependence on foreign capital to fund assets became an important risk factor. We use the variable *exposure to foreign funding*, defined as the ratio of foreign funds to total assets as a proxy for a bank's dependence on external financing on the right-hand side of our model.

Table 9 shows the estimation of the model with the added control *exposure to foreign funding*. We find no evidence that the depositors favor the banks with a lower ratio of foreign funds to total assets, either during the crisis or during normal times. More importantly, ω remains practically unchanged in all specifications.

[Table 9]

6.2.b. Types of Loans

The crisis caused a slowdown in the Brazilian economy, so it is plausible that depositors can be concerned with particular types of bank loans. We are especially interested in banks that engage in trade finance loans and

[15] The amount of deposits increased more than threefold in 8 years. This increase in deposits is related to the fourfold increase in the amount of outstanding credit, which increased from 336 billion BRL in December 2001 (25.8% of GDP, approximately) to 1,414 billion BRL in December 2009 (44.9% of GDP). The increase in the ratio of credit to GDP was not followed by an increase in delinquency rates, mostly because of a reduction in the federal funds interest rate as a result of the on-going process of economic stabilization (Central Bank of Brazil, 2010). The cumulative inflation rate was almost 70%, and the nominal GDP growth was 145% in the sample period.

middle market operations (loans made to small and medium-sized firms). Trade finance loans are very collateralized by import/export contracts and typically have a very low delinquency rate and loss given default and are therefore expected to be safe during a crisis. In contrast, middle-market loans typically have low collateral and are held to maturity by the lender bank (instead of being securitized and traded in the secondary market). Therefore one could expect depositors to perceive these loans to be riskier during a crisis because small and medium-sized firms have a higher probability of being financially distressed during an economic downturn.

We define the variable *exposure to trade finance* as the ratio between the amount of trade finance loans and total assets. The variable *exposure to middle-market* is defined analogously.

[Table 10]

The results in columns 1 and 2 of Table 10 are consistent with the above rationale. The negative coefficient for the *exposure to middle-market x crisis* interaction indicates that banks exposed to loans to middle-market firms on their balance sheets during the crisis are penalized by depositors. A 1 pp increase in the exposure to middle-market loans during the crisis causes a .26 pp decrease in the expected change in uninsured deposits and a .27 pp decrease for total deposits (both significant at 5%). For the *exposure to trade finance x crisis* interaction, the coefficient is positive, but not statistically significant. Most importantly, the other coefficients (particularly *big bank x crisis*) are practically unchanged by the addition of these variables to our baseline specification. We find no statistical significance for these variables during normal times.

Next, we examine the different types of CD holders (specifications 3, 4 and 5 in Table 10), and observe that institutional investors mildly penalize banks that carry trade finance loans during normal times, whereas these banks receive substantially more deposits during the financial crisis, as expected. In contrast, the estimates for the *exposure to middle-market x crisis* interaction are negative for all types of CD holders, as expected, but the coefficient is statistically significant only for individuals.

6.3. THE POST-CRISIS PERIOD

Another potential concern with interpreting a positive and significant coefficient of the interaction *crisis x big bank* as a causal relationship between the perception of an implicit governmental guarantee to big banks and a change in deposits is that the big banks and the other banks may have different pre-existing time trends in deposit growth. We are able to address this concern by investigating how the change in deposits evolved for the big banks and other banks during the post-crisis period. To do so, we add the indicator *post crisis* and the interaction *big bank x post crisis* to the model. This indicator variable is equal to 1 for periods ending in June 2009 and December 2009 and 0 otherwise.

We also examine how institutional investors, nonfinancial firms and individuals behave after the crisis. The results in columns 3, 4 and 5 of Table 11 show that the coefficients for *big bank x post-crisis* are negative and economically significant for all types of depositors, although they are statistically significant at the usual levels only for institutional and individual investors. The coefficients of the other variables of interest (including *big bank x crisis*) remain unchanged.

[Table 11]

In fact, the results in column (3) of Table 11, indicate that the 64 pp expected positive change in the CDs of institutional investors observed for the big banks during the crisis is more than reverted by a 43 pp negative change in each of the two post-crisis periods, on average. We make a similar inference for the CDs held by individuals. The estimates for nonfinancial firms also suggest a reversion of the run in the post-crisis period, although we lack statistical significance at conventional levels.

The regression results in columns 1 and 2 of Table 11 show a similar effect for uninsured and total deposits, but the coefficients for *big bank x post-crisis* are smaller than the ones observed for the CDs, and are not statistically significant.

The combined results of all specifications in Table 11 reinforce the interpretation that the run was not based on fundamentals.

6.4. SHARE OF INSTITUTIONAL DEPOSITORS

The composition of the depositor base may also affect the decision to run. The study by Iyer and Puri (2012) shows that the decision to run may be related to information obtained from other depositors through social networks. We previously showed that institutional investors are the most active in moving funds from other banks to big banks during the financial crisis, in line with most of the recent literature. If depositors consider that banks that rely on institutional investors for funding may be threatened by large outflows during a crisis, they may run in anticipation of eventual market liquidity problems.

To assess whether the presence of institutional investors affects the decision to run, we follow Ben-David et al. (2012) and include in the model an interaction of the variable *crisis* with the variable *share of institutional investors*, which is defined as the ratio of the amount of CDs held by institutional investors to total assets. The results in columns 1 and 2 of Table 12 show that relying on institutional investors has a negative effect on deposit growth during the crisis (statistically significant at 1% for both uninsured and total deposits). This is consistent with the empirical findings of the study by Ben-David et al. (2012), which shows that hedge funds with a higher share of institutional investors experience stronger redemptions during a crisis. Specifically, we find that during the financial crisis, a 1 pp increase in the proportion of assets being funded by the CDs of institutional investors results in a decrease of uninsured and total deposits by circa 3 pp. During normal times, we find much lower negative coefficients for the *share of institutional investors*. More importantly, the estimates for the *big bank x crisis* interaction remain almost unaffected.

[Table 12]

The results in columns 1 and 2 of Table 12 could be driven by institutional investors. However, we see that this was not the whole story when we analyze the results by different types of depositors.

The results presented in columns 3 and 4 of Table 12 show that the higher the share of assets funded by the CDs of institutional investors in a certain bank during the crisis, the more the bank loses deposits (or the less it gains deposits) not only from institutional investors but also from nonfinancial firms. A 1 pp increase in the proportion of assets funded by the CDs of institutional investors decreases the amount of CDs held by nonfinancial firms by over 2 pp, whereas the effect on the CDs of institutional investors is 5.8 pp during the crisis and 0.9 pp during normal times. This finding may be an indication that both nonfinancial firms and institutional investors fear that massive outflows from institutional investors can harm the bank's financial condition. Most importantly, although the magnitude of the coefficients of the *big bank x crisis* decreases slightly for institutional investors and nonfinancial firms in Table 12, our main inferences remain robust when we control for the share of institutional investors.

6.5. OTHER ROBUSTNESS CHECKS

We implement several other robustness tests to verify the stability of our main results. First, we check whether our inferences are robust to the inclusion of an indicator that the bank has publicly traded shares. The rationale for this test is that traded banks may be seen to have less opaque assets as a result of market scrutiny (e.g., analyst coverage) or to enjoy better corporate governance. Second, we investigate whether depositors favor other (non-big) government-owned banks[16]. Third, we include interactions of the variables *size* and Δ*interest rate margin* with the *crisis* dummy, to check if any of these variables may affect depositors' decisions differently during the crisis. Fourth, we repeat all robustness tests reported above after adding the post-crisis dummy and the interactions of our robustness variables (non-big governmental bank dummy, *share of institutional investors*, *exposure to trade finance, exposure to middle market* and *exposure to foreign funding*) with the *post-crisis* dummy. All of our inferences remain unchanged[17].

[16] In our sample, 12 banks are controlled by the government (4 by the federal government and 8 by states of the federation), 10 of which are not classified as big banks.

[17] We do not report these tests to save space, but they are available upon request.

Finally, we estimate Equation (1) controlling for changes in bank fundamentals to test if depositors are mainly sensitive to improvements or deteriorations of bank fundamentals rather than to their levels. In these regressions (not reported), the coefficients estimated for $\Delta risk$ are non-significant in all cases and our inferences on the coefficient ω are unchanged.

6.6. ALTERNATIVE ESTIMATORS AND IDENTIFYING ASSUMPTIONS

We also check our results by using alternative estimators and/or identifying assumptions. For example, we run all regressions using the first-difference GMM estimator proposed by Arellano and Bond (1991) or the two-step GMM-Sys estimator instead of the one-step procedure reported in Table 5. In addition, we employ alternative identifying assumptions, for example allowing the vector *fundamentals* to be contemporaneously correlated with ε. We check the statistical plausibility of our exogeneity assumptions by running diagnostic tests of error autocorrelation and the Hansen/Sargan test of overidentifying restrictions. For the benefit of space, we do not report these results. In all cases, our main inferences are not materially affected.

7. Concluding remarks

This paper investigates whether depositor behavior is affected by the perception of a too-big-to-fail policy. We focus on Brazil during the crisis of 2008 because it allows us to mitigate the concern of endogeneity bias present in cross-country comparisons while at the same time taking advantage of a detailed proprietary database and of market and institutional features that are useful for the identification of a too-big-to-fail effect.

Specifically, the best explanation for the run from the smaller banks of Brazil to the systemically important banks during the international turmoil of late 2008 is that depositors thought the systemically important banks enjoyed an implicit governmental guarantee and would not be allowed to fail. The depositors' response to bank fundamentals and ratings was weak. Our inferences are robust with regard to several different specifications.

Our results show that banks that relied more on institutional investors for funding suffered more deposit outflows, not only from institutional investors themselves but also from nonfinancial firms.

Our findings suggest that depositor behavior gave systemically important banks a unique competitive advantage in the form of extra access to market liquidity from depositors while harming the other banks. If history is a good guide, it is likely that depositors will put their money in systemically important banks during the next major crisis; this will occur not only in Brazil but even more so in Europe and the US, where most of the bailouts occurred. We believe this competitive advantage of systemically important banks adds another layer to the too-big-to-fail problem. The current proposals to address this problem are focused on how being perceived as too-big-to-fail results in a lower cost of capital and an increased moral hazard[18]. However, we believe these solutions do not address the advantage of easy access to market liquidity through funds originally deposited in non-systemically important banks.

[18] The proposals include higher capital requirements for systemically important banks, contingent capital arrangements and living wills. For a discussion of these and other proposals, we refer the reader to Allen and Carletti (2010), and Chari and Kehoe (2010).

References

Acharya,V. , Mora, N., 2012. Are banks passive liquidity backstops? Deposit rates and flows during the 2007-2009 crisis. NBER Working Paper 17838.

Acharya,V., Pedersen, L., Philippon, T., Richardson, M., 2010. Measuring systemic risk. Working Paper, NYU Stern School of Business.

Adrian, T., Brunnermeier, M., 2011. CoVaR. NBER Working Paper 17454.

Aït-Sahalia, Y., Andritzky, J., Jobst, A., Nowak, S., Tamirisa, N., 2012. Market response to policy initiatives during the global financial crisis. Journal of International Economics, 87, 1, 162-177.

Allen, F., Babus, A., Carletti, E., 2009. Financial crises: theory and evidence Annual Review of Financial Economics 1, 97–116.

Allen, F., Gale, D., 1998. Optimal Financial Crises. Journal of Finance 53. 1245-1284.

Allen, F., Carletti, E., 2010. An overview of the crisis: causes, consequences, and solutions. International Review of Finance, 10, 1, 1-26.

Arellano, M., Bond, S , 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Review of Economic Studies. 58, 277-297.

Ayar, S., 2012. From financial crisis to great recession: the role of globalized banks. American Economic Review: Papers & Proceedings 102 (3), 225-230.

Ben-David, I., Franzoni, F., Moussawi, R., 2012. Hedge fund stock trading in the financial crisis of 2007-2009. Review of Financial Studies 25, 1, 1-54.

Blundell, R. Bond, S. R., 1998. Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics. 87, 115-143.

Brewer III, E., Jagtiani, J., 2011. How much did banks pay to become too-big-to-fail and to become systemically important? Journal of Financial Services Research, v. 40, 1-35.

Calomiris, C., Gorton, G., 1991. The origins of banking panics, models, facts, and bank regulation. In: Hubbard, R. G. (Ed.), Financial Markets and Financial Crises, Chicago, IL: Univ. of Chicago Press, Chicago, pp. 109-173.

Calomiris C., Mason, J., 2003. Fundamentals, panics, and bank distress during the depression. American Economic Review 93, 1615–47.

Calvet, L., Campbell, J., Sodini, P., 2009. Fight or flight? Portfolio rebalancing by individual investors. Quarterly Journal of Economics 124, 1, 301-348.

Carletti, E., 2010. Competition, Concentration and Stability in the Banking Sector. OECD Competition Committee Roundtable, Available at: http://www.oecd.org/dataoecd/52/46/46040053.pdf.

Central Bank of Brazil, 2010. Financial Stability Report – April. Available at: http://www.bcb.gov.br/?FSR201004.

Cetorelli, N., Goldberg, L., 2012. Banking globalization and monetary transmission. Journal of Finance 67, 5.

Chari, V., Jagannathan, R., 1988. Banking panics, information, and rational expectations equilibrium. Journal of Finance 43, 3, 749-761.

Chari, V., Kehoe, P., 2010. Bailouts, time inconsistency and optimal regulation. Federal Reserve Bank of Minneapolis Staff Report, February.

Cornett, M., McNutt, J., Strahan, P., Tehranian, H., 2011. Liquidity risk management and credit supply in the financial crisis, Journal of Financial Economics, 101, 2, 297-312.

Dam, L., Koetter, M., 2012. Bank bailouts and moral hazard: empirical evidence from Germany. Review of Financial Studies 25 (8).

Demirgüç-Kunt, A., Huizinga, H., 2011. Do we need big banks? Evidence on performance, strategy and market discipline. CEPR Discussion Paper 8276.

Diamond, D., Dybvig, P., 1983. Bank runs, deposit insurance, and liquidity. Journal of Political Economy 91, 401–19.

Fischer, M., Heinz, C., Rocholl, J., Steffen, S., 2011. Government guarantees and bank risk taking incentives. Available at: http://ssrn.com/abstract=1786923

Gatev, E., Schuermann, T., Strahan, P., 2009. Managing bank liquidity risk: how deposit–loan synergies vary with market conditions. Review of Financial Studies 22, 995–1020.

Gatev, E., Strahan, P., 2006. Banks’ advantage in hedging liquidity risk: theory and evidence from the commercial paper market. Journal of Finance 61, 2, 867-892.

Gorton, G., 1988. Banking Panics and Business Cycles. Oxford Economic Papers 40, 751-781.

Gropp, R., Hakenes, H., Schnabel, I., 2011. Competition, Risk-Shifting, and Public Bail-out Policies. Review of Financial Studies 24, 6, 2084-2120.

Houston, J., Lin, C., Lin, P., Ma, Y., 2010. Creditor rights, information sharing, and bank risk taking. Journal of Financial Economics 96, 485-512.

Huang, R., Ratnovski, L., 2011. The dark side of bank wholesale funding, Journal of Financial Intermediation 20, 248-263.

Imai, M., 2006. Market discipline and deposit reform insurance in Japan, Journal of Banking and Finance 30, 3433-52.

International Monetary Fund (IMF), 2009. Regional Economic Outlook, Western Hemisphere: Stronger Fundamentals Pay Off. May, 2009.

Iyer, R., Puri, M., 2012. Understanding bank runs: the importance of depositor-bank relationships and networks. American Economic Review 102, 4, 1414-45.

Jenkins, P., Davies, P. J., 2009. Thirty financial groups on systemic risk list, Financial Times, November 29. Retrieved from: http://www.ft.com.

Kashyap, A., Rajan, R., Stein, J., 2002. Banks as liquidity providers: an explanation for the coexistence of lending and deposit-taking. Journal of Finance 57, 1, 33-73.

Kaufman, L., Rousseeuw, P. J., 2005. Finding groups in data: an introduction to cluster analysis. Wiley, New York.

Kelly, B., Lustig, H., Van Nieuwerburgh, S., 2011. Too-systemic-to-fail: what option markets imply about sector-wide government guarantees. NBER Working Paper 17149.

Laeven, L., 2011. Banking Crises: A Review. Annual Review of Financial Economics 3, 4.1-4.24.

Laeven, L., Levine, R., 2009. Bank governance, regulation and risk taking. Journal of Financial Economics 93, 259–275.

Laeven, L., Valencia, F., 2010. Resolution of Banking Crises: The Good, the Bad, and the Ugly, IMF Working Paper WP/10/146.

Levy-Yeyati, E., Martínez Péria, M., Schmukler, S., 2010. Depositor behavior under macroeconomic risk: evidence from bank runs in emerging economies. Journal of Money, Credit and Banking 42, 4, 585-614.

Maechler, A., McDill, K., 2006. Dynamic depositor discipline in US banks. Journal of Banking and Finance 30, 1871-1898.

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

Penas, M., Unal, H., 2004. Gains in Bank Mergers: Evidence from the Bond Markets. Journal of Financial Economics 74, 1, 149–79.

Martinez Peria, M., Schmukler, S., 2001. Do depositors punish banks for band behavior? Market discipline, deposit insurance and banking crises. Journal of Finance 54, 3, 1029-1051.

Popov, A., Udell, G., 2012. Cross-Border Banking, Credit Access and the Financial Crisis. Journal of International Economics 87, 1, 147-161.

Rajan, R., 2009. Too Systemic to fail: consequences, causes, and potential remedies. Written statement at the University of Chicago's Booth School of Business to the Senate Banking Committee Hearings on May 6th 2009.

Schmidt, L., Timmermann, A.,Wermers, R., 2012. Runs on money market mutual funds. Available at: http://ssrn.com/abstract=1784445.

Schnabl, P., 2012. The international transmission of bank liquidity shocks: evidence from an emerging market. Journal of Finance 67, 3, 897-932.

Stiroh, K., 2004. Diversification in banking: is noninterest income the answer? Journal of Money, Credit, and Banking 36, 5, 853-82.

Veronesi, P., Zingales, L., 2010., Paulson's gift. Journal of Financial Economics 97, 3, 339–368.

Figure 1. Certificates of Deposit issued by the Other Banks

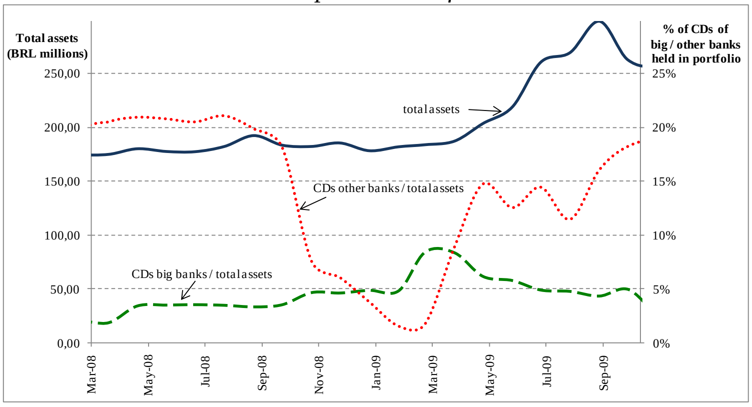
The solid line shows the daily evolution of the amount of CDs issued by banks that are not considered systemically important in Brazil.

Source: Central Bank of Brazil

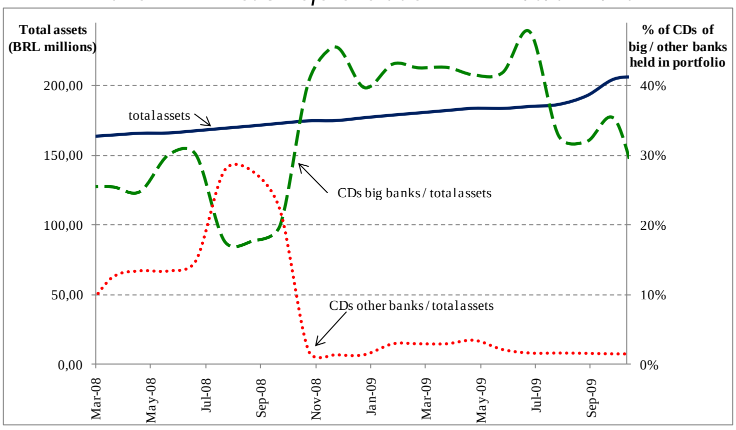
Figure 2. Portfolios of Mutual Funds

Panels A, B, and C of Figure 2 show the portfolios of three different mutual funds. The solid line is the total amount of assets under management in millions of BRL, shown on the left axis. The dotted line is the percentage of CDs of the other banks in the total portfolio of assets, and the dashed line is the percentage of CDs of the big banks in the total portfolio of assets, shown on the right axis.

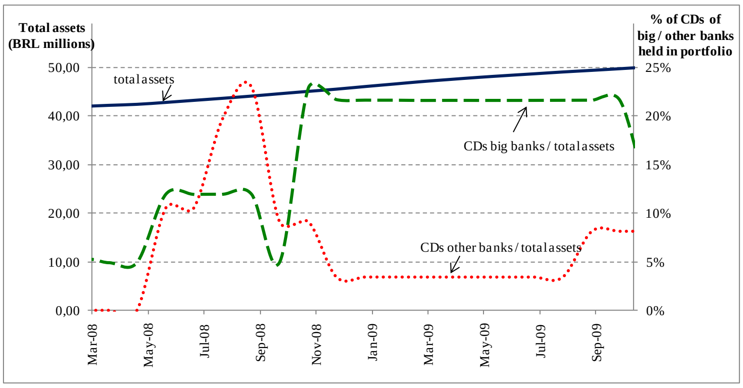
Panel A – Banco do Nordeste Especial FI Referenciado DI LP Mutual Fund



Panel B – Arietis Referenciado DI FI Mutual Fund



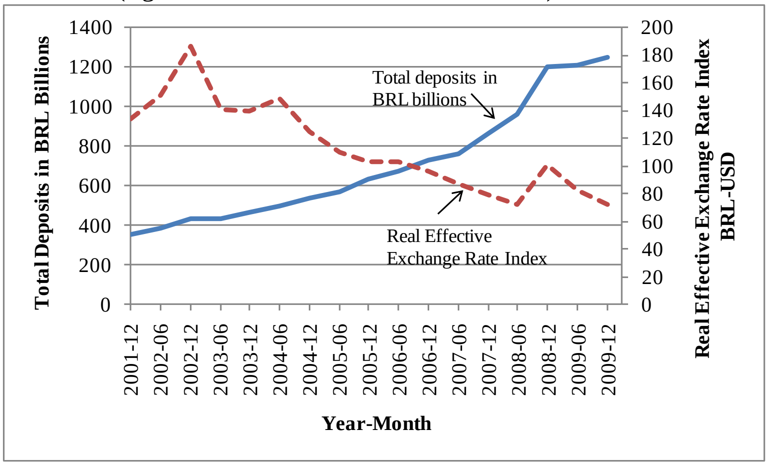
Panel C – Santander Truck FI Renda Fixa Mutual Fund



Source: Securities and Exchange Comission of Brazil (Comissão de Valores Mobiliários – CVM)

Figure 3. Deposit Base and the Real Effective Exchange Rate Index

The solid line shows the semiannual evolution of the deposit base (in billions of BRL – left axis). The dashed line shows the semiannual evolution of real effective exchange rate index of BRL against the USD (right axis; basis set to 100 in June 1994).



Source: Central Bank of Brazil

Table 1 – Systemically Important Banks

Panel A shows the results of the cluster analysis algorithms *K-means* and *K-medians*, setting the number of clusters to $k = 2$. Five variables were used for the clustering: (i) leverage, (ii) total assets, (iii) loan-loss reserves/total assets, (iv) trading assets/total assets, and (v) non-interest bearing deposits. The algorithms search iteratively for the best partition using the squared Euclidean distance as the dissimilarity measure. We use only pre-crisis data from December 2001 through June 2008. Cluster 1 includes banks that may be considered systemically important in Brazil, whereas cluster 2 includes all the other banks in the sample. Panel B shows an alternative specification, which includes in the set of systemically important banks the subsidiaries of global systemically important banks (global powerhouse banks), based on a list published by the Financial Times (Jenkins and Davies, 2009).

Panel A – Baseline specification: big banks (results from the cluster analysis)

Cluster	Bank
Cluster 1 (Big Banks)	ABN AMRO, Banco do Brasil, Bradesco, CEF, HSBC, Itau, Santander, Unibanco.
Cluster 2 (Other Banks)	ABC-Brasil, Alfa, Bancoob, Banese, Banestes, Banif, Banpara, Banrisul, Bansicredi, Basa, BBM, Besc, BGN, BIC, BMG, BNB, BNP Paribas, Bonsucesso, Brascan, BRB, BTMUB, BVA, Citibank, Credit Suisse, Cruzeiro do Sul, Daycoval, DBB BM, Deutsche, Fibra, Ibibank, Industrial do Brasil, Indusval, ING, J. Malucelli, John Deere, JP Morgan Chase, Mercantil do Brasil, Nossa Caixa, SS, Pine, Prosper, Rabobank, Rural, Safra, Schahin, SMBC, Societe Generale, Sofisa, Pactual, Votorantim, WestLB.

Panel B – Alternative specification: big banks + global powerhouse banks

Cluster	Bank
Big Banks	ABN AMRO, Banco do Brasil, Bradesco, CEF, HSBC, Itau, Santander, Unibanco.
Global Powerhouse Banks that were not clustered as Big Banks	BNP Paribas, BTMUB (Tokyo-Mitsubishi), Citibank, Credit Suisse, Deutsche, ING, JP Morgan Chase, SMBC (Sumitomo Mitsui), Societe Generale.

Table 2 – Overview of the Brazilian Banking System

Panel A provides an overview of the composition of deposits in the Brazilian Banking System by ownership structure. The information represents the status as of June 2008. Panel B shows the representativeness of sample. Row [A] shows the number of deposit-taking financial institutions as of December 31 of each year from 2001 to 2009, and row [B] shows the number of banks considered in our sample in the same period. In row [C], we show the total amount of deposits eligible to receive deposit insurance in the Brazilian financial system, and in row [D], we show the amount of deposits eligible for deposit insurance for the banks in our sample. Row [E] shows the proportion of deposits considered in this study relative to the overall deposits of the Brazilian financial system.

Panel A – The composition of deposits by banks' ownership structure as of June 2008

	# of banks	Total Deposits (billions of BRL)	% of deposits
State-Owned banks	12	411	43%
Privately owned banks	55	348	36%
Foreign bank subsidiaries	34	204	21%
Total	101	963	100%

Panel B – The representativeness of the sample

	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
[A] Number of deposit-taking financial institutions	121	111	110	108	104	104	101	101	100
[B] Number of banks in the sample	73	70	67	64	64	61	60	57	52
[C] Total Deposits (billions of BRL)	313	365	400	470	546	624	740	1,003	1,241
[D] Total Deposits of sample (billions of BRL)	304	356	395	465	535	600	712	986	1,229
[E] Representativeness of sample ([D] / [C])	97.1	97.5	98.8	98.9	98.0	96.2	96.2	98.3	99.0

Table 3– Summary Statistics

This table reports means and standard deviations (in brackets) of key variables for December 2001, June 2008, December 2008, and December 2009. The big banks and the other banks are defined in Table 1. Δ*total(uninsured) deposits* is defined as the first difference of the log of total (uninsured) deposits; Δ*CDs held by each type of depositor* is defined as the first difference of the log of CDs held by each type of depositor (institutional investors, nonfinancial firms or individuals); *interest rate paid on CDs* is the annualized interest rate paid on CDs issued by each bank in each period; *equity ratio* is the ratio of equity to total assets; *low quality loans* is the ratio of low quality loans to total assets; *asset liquidity* is the ratio of liquid assets (cash, tradable securities and net interbank) to total assets; *exposure to trade finance* is the ratio of the amount of trade finance loans to total assets, and *exposure to middle market* is the ratio of the amount of loans to middle market firms to total assets; *exposure to foreign funding* is the ratio of foreign funds to total assets; and *share of institutional investors* is the ratio of the amount of CDs held by institutional investors to total assets.

	December 2001		June 2008		December 2008		December 2009	
	big banks	other banks	big banks	other banks	big banks	other banks	big banks	other banks
Total assets (BRL Millions)	75,488 [45,795]	4,493 [6,611]	239,313 [115,058]	10,985 [15,254]	381,453 [178,750]	11,293 [15,914]	416,329 [208,678]	11,569 [16,730]
# of depositors (thousands)	10,049 [7,279]	195 [653]	15,507 [11,109]	246 [771]	21,548 [11,395]	236 [793]	23,939 [12,094]	139 [337]
Uninsured deposits/ total deposits	59.3% [12.9%]	87.9% [16.7%]	63.7% [14.7%]	88.1% [16.3%]	65,5% [12.7%]	88.2% [15.7%]	62.8% [12.3%]	78.9% [20.1%]
Δtotal deposits	-	-	14.2% [8.6%]	16.4% [28.7%]	23.8% [15.5%]	-10.7% [34.9%]	2.4% [6.3%]	13.0% [28.8%]
Δuninsured deposits	-	-	20.4% [11.5%]	17.7% [30.2%]	30.5% [22.9%]	-12.7% [35.3%]	-0.7% [9.9%]	12.4% [30.2%]
ΔCDs held by instit. investors	-	-	84.4% [63.2%]	9.7% [61.0%]	40.8% [65.8%]	-26.0% [75.2%]	-35.8% [21.8%]	30.5% [75.5%]
ΔCDs held by nonfinancial firms	-	-	38.6% [19.8%]	28.6% [31.9%]	38.1% [34.9%]	-8.5% [32.4%]	-6.3% [19.0%]	9.1% [27.1%]
ΔCDs held by individuals	-	-	40.5% [17.4%]	22.3% [26.3%]	41.4% [23.7%]	7.6% [27.6%]	-10.1% [4.0%]	-4.6% [16.5%]
Interest rate paid on CDs (% per annum)	13.29 [3.77]	16.55 [2.86]	10.21 [1.81]	11.31 [1.46]	11.40 [2.22]	14.12 [1.62]	8.28 [1.28]	9.62 [1.58]
Equity ratio	9.8% [4.1%]	14.3% [7.1%]	8.3% [2.1%]	14.4% [7.1%]	8.3% [3.6%]	14.1% [7.0%]	9.8% [5.5%]	14.8% [7.0%]
Low quality loans	2.6% [0.7%]	2.1% [2.2%]	2.3% [0.3%]	1.5% [1.8%]	2.4% [0.2%]	2.0% [1.9%]	3.2% [0.5%]	2.2% [1.7%]
Asset Liquidity	34.5% [9.5%]	31.9% [18.5%]	19.9% [10.2%]	26.9% [15.7%]	20.8% [10.3%]	27.6% [14.2%]	19.8% [8.1%]	27.7% [17.5%]
Exposure to trade finance	-	-	7.0% [4.0%]	7.6% [10.0%]	7.9% [4.8%]	8.7% [10.4%]	5.3% [3.1%]	9.1% [10.2%]
Exposure to middle market	-	-	25.2% [8.0%]	32.8% [23.8%]	27.0% [6.9%]	35.5% [25.0%]	29.2% [7.2%]	38.4% [26.4%]
Exposure to foreign funding	10.71% [6.1%]	11.0% [12.1%]	4.1% [2.3%]	8.7% [9.2%]	4.0% [2.6%]	12.8% [11.6%]	2.5% [1.8%]	8.4% [8.1%]
Share of instit. investors	0.97% [0.9%]	4,6% [5.8%]	3.3% [3.6%]	6.3% [7.9%]	2.6% [2.3%]	3.7% [5.1%]	1.6% [1.6%]	3.7% [4.8%]
Observations	8	65	8	51	6	50	6	46
Exchange Rate (BRL/USD)	2.32		1.59		2.34		1.74	

Table 4 – Mean change in deposits during the financial crisis and during the post-crisis period
This table shows regressions without control variables and excluding the intercept, estimated with ordinary least squares (OLS). All regressors are dummy variables, defined as follows: *crisis* is equal to 1 during the international turmoil (the second half of 2008); *big bank* is equal to one if the bank is considered systemically important by the cluster analysis presented in Table 1; *post-crisis* is equal to 1 during the year of 2009. Autocorrelation/ heteroskedasticity-robust t-statistics are shown in parentheses. A set of semiannual time dummies is also included, but their estimates are omitted. *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

Dependent Variable	ΔUninsured Deposits	ΔTotal Deposits	ΔCDs held by		
			Institutional Investors	Nonfinancial firms	Individuals
	(1)	(2)	(3)	(4)	(5)
Crisis	-0.127**	-0.107**	-0.260**	-0.085*	0.076*
	(-2.522)	(-2.168)	(-2.435)	(-1.851)	(1.936)
Big bank	-0.007	-0.015	0.058	0.005	0.056**
	(-0.341)	(-0.905)	(1.171)	(0.197)	(2.394)
Big bank x crisis	0.438***	0.361***	0.611**	0.462***	0.282***
	(4.248)	(4.408)	(2.219)	(3.318)	(2.737)
Post-crisis	0.045	0.045	0.247**	0.171***	0.088**
	(0.995)	(1.081)	(2.102)	(4.020)	(2.576)
Big bank x post-crisis	-0.078	-0.060	-0.297*	-0.165*	-0.074**
	(-1.550)	(-1.579)	(-1.731)	(-1.876)	(-2.177)
Time dummies	Yes	Yes	Yes	Yes	Yes
Observations	965	965	1,038	1,051	1,051
R-squared	0.145	0.140	0.058	0.139	0.255
F	14.13	17.00	3.093	14.17	17.76
F (p-value)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
# of banks	76	76	75	75	75

Table 5 – Change in Deposits, Financial Crisis and Systemically Important Banks

Panels A, B and C show the results of the estimation of Equation (1). In columns 1 and 3, the estimation uses the OLS, and in columns 2 and 4, (one-step) GMM-Sys estimators. The regressors are as follows: *crisis* is a dummy variable for the observation being during the international turmoil; *size* is the natural logarithm of the assets; *big bank* and *big + powerhouse bank* are dummy variables equal to one if the bank is clustered as such in Table 1; *regional economic activity* is the change in the retail sales index of the state in which the bank has more branches. The remaining variables are defined in Table 3. Additional controls are the i-th bank's time invariant unobserved features (in the GMM regressions); and time fixed effects (in all regressions). In the GMM regressions, we allow regressors to be only sequentially exogenous, employing suitable lagged values as their instruments, except for the following regressors, which are assumed to be strictly exogenous: time dummies, *regional economic activity*, *big bank,* and *big bank x crisis*. Autocorrelation/ heteroskedasticity-robust t-statistics are shown in parentheses. The estimates for the time dummies are omitted. D represents the first difference, and L represents the first lag. The variables that interact with the *crisis* are lagged according to the variable that appears without interaction (for example, *equity ratio x crisis* is the interaction of the *crisis* with the first lag of the equity ratio). *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

Panel A – Baseline specification: big banks

Dependent Variable		ΔUninsured Deposits		ΔTotal Deposits	
		(1)	(2)	(3)	(4)
		OLS	GMM-Sys	OLS	GMM-Sys
Variables of interest					
Crisis		-0.100	-0.249	-0.047	-0.192
		(-0.669)	(-1.460)	(-0.316)	(-1.142)
Big bank		-0.002	-0.002	-0.002	-0.001
		(-0.070)	(-0.057)	(-0.056)	(-0.042)
Big bank x crisis		0.382***	0.383***	0.284**	0.285**
		(3.031)	(3.039)	(2.548)	(2.555)
Control Variables					
Size	L	-0.002	-0.002	-0.004	-0.004
		(-0.233)	(-0.267)	(-0.465)	(-0.497)
Δuninsured deposits	L	0.024	0.024		
		(0.405)	(0.406)		
Δ total deposits	L			0.037	0.036
				(0.604)	(0.604)
Δinterest rate margin	D	1.212	0.628	1.431	0.942
		(0.653)	(0.336)	(0.826)	(0.535)
Equity ratio	L	0.276	0.273	0.206	0.204
		(1.514)	(1.502)	(1.197)	(1.186)
Low quality loans	L	-0.055	-0.048	-0.321	-0.314
		(-0.097)	(-0.084)	(-0.592)	(-0.578)
Asset liquidity	L	0.014	0.014	-0.001	-0.001
		(0.227)	(0.231)	(-0.014)	(-0.011)
Regional economic activity		0.206	0.193	0.020	0.012
		(0.623)	(0.564)	(0.071)	(0.041)
Equity ratio x crisis		-0.807	-0.802	-1.043	-1.039
		(-1.157)	(-1.147)	(-1.542)	(-1.532)
Low quality loans x crisis		1.630	1.570	1.493	1.443
		(0.339)	(0.327)	(0.316)	(0.306)
Asset liquidity x crisis		0.365	0.365	0.355	0.354
		(0.963)	(0.960)	(0.955)	(0.952)
Constant		-0.065	0.086	0.016	0.163
		(-0.447)	(0.526)	(0.119)	(1.071)
Time dummies		Yes	Yes	Yes	Yes
Observations		847	847	847	847
R-squared		0.090	-	0.072	-
F		5.570	5.528	3.939	3.997
F (p-value)		< 0.001	< 0.001	< 0.001	< 0.001
Hansen		.	57.55	.	52.12
Hansen (p-value)		.	> .999	.	> .999
# of banks		71	71	71	71

Panel B – Alternative specification - big + powerhouse banks

Dependent Variable		ΔUninsured Deposits		ΔTotal Deposits	
		(1)	(2)	(3)	(4)
		OLS	GMM-Sys	OLS	GMM-Sys
Variables of interest					
Crisis		-0.311**	-0.400**	-0.196	-0.294*
		(-2.080)	(-2.578)	(-1.350)	(-1.940)
Big + powerhouse bank		-0.042	-0.042	-0.046*	-0.045*
		(-1.572)	(-1.564)	(-1.783)	(-1.744)
(Big + powerhouse bank) x crisis		0.408***	0.409***	0.360***	0.362***
		(3.478)	(3.474)	(3.106)	(3.117)
Control Variables					
Size	L	0.004	0.004	0.003	0.002
		(0.561)	(0.524)	(0.403)	(0.348)
Δ uninsured deposits	L	0.020	0.020		
		(0.346)	(0.348)		
Δ total deposits	L			0.032	0.036
				(0.543)	(0.622)
Δinterest rate margin	D	1.169	0.548	1.385	0.186
		(0.613)	(0.285)	(0.778)	(0.118)
Equity ratio	L	0.305	0.303	0.237	0.235
		(1.643)	(1.631)	(1.365)	(1.354)
Low quality loans	L	-0.284	-0.276	-0.574	-0.510
		(-0.541)	(-0.525)	(-1.160)	(-1.044)
Asset liquidity	L	0.000	0.000	-0.017	-0.013
		(0.002)	(0.002)	(-0.298)	(-0.246)
Regional economic activity		0.100	0.093	-0.071	-0.147
		(0.304)	(0.274)	(-0.255)	(-0.532)
Equity ratio x crisis		-0.801	-0.797	-0.986	-0.976
		(-1.333)	(-1.321)	(-1.633)	(-1.616)
Low quality loans x crisis		4.576	4.524	3.956	3.775
		(1.048)	(1.040)	(0.926)	(0.907)
Asset liquidity x crisis		0.531	0.531	0.500	0.498
		(1.602)	(1.601)	(1.520)	(1.518)
Constant		-0.073	0.017	-0.054	0.052
		(-0.514)	(0.117)	(-0.438)	(0.427)
Time dummies		Yes	Yes	Yes	Yes
Observations		847	847	847	847
R-squared		0.101		0.084	
F		5.751	5.736	4.351	4.580
F (p-value)		< 0.001	< 0.001	< 0.001	< 0.001
Hansen		.	53.37	.	52.33
Hansen (p-value)		.	> .999	.	> .999
# of banks		71	71	71	71

Panel C – Specification that excludes big banks from the sample

Dependent Variable		ΔUninsured Deposits		ΔTotal Deposits	
		(1)	(2)	(3)	(4)
		OLS	GMM-Sys	OLS	GMM-Sys
Variables of interest					
Crisis		-0.426***	-0.428***	-0.355**	-0.357**
		(-2.675)	(-2.685)	(-2.187)	(-2.199)
Powerhouse bank		-0.055	-0.055	-0.061	-0.061
		(-1.412)	(-1.410)	(-1.624)	(-1.622)
Powerhouse bank x crisis		0.405**	0.405**	0.386**	0.387**
		(2.531)	(2.531)	(2.392)	(2.394)
Control Variables					
Size	L	0.000	-0.000	-0.001	-0.002
		(0.008)	(-0.022)	(-0.164)	(-0.203)
Δ uninsured deposits	L	0.023	0.023		
		(0.376)	(0.380)		
Δ total deposits	L			0.037	0.037
				(0.582)	(0.585)
Δinterest rate margin	D	1.542	1.050	2.054	1.438
		(0.687)	(0.466)	(0.960)	(0.665)
Equity ratio	L	0.307	0.305	0.239	0.236
		(1.594)	(1.587)	(1.338)	(1.327)
Low quality loans	L	-0.416	-0.410	-0.700	-0.692
		(-0.788)	(-0.777)	(-1.411)	(-1.392)
Asset liquidity	L	0.004	0.004	-0.010	-0.010
		(0.069)	(0.069)	(-0.166)	(-0.163)
Regional economic activity		0.134	0.129	-0.056	-0.069
		(0.401)	(0.378)	(-0.202)	(-0.243)
Equity ratio x crisis		-0.833	-0.830	-1.066*	-1.061*
		(-1.395)	(-1.387)	(-1.804)	(-1.793)
Low quality loans x crisis		4.697	4.654	4.417	4.361
		(1.008)	(1.003)	(0.962)	(0.955)
Asset liquidity x crisis		0.593*	0.593*	0.562	0.562
		(1.710)	(1.709)	(1.637)	(1.636)
Constant		0.086	0.089	0.157	0.161
		(0.507)	(0.530)	(1.003)	(1.040)
Time dummies		Yes	Yes	Yes	Yes
Observations		736	736	736	736
R-squared		0.108		0.096	
F		6.677	6.543	6.405	6.356
F (p-value)		< 0.001	< 0.001	< 0.001	< 0.001
Hansen		.	28.82	.	40.26
Hansen (p-value)		.	> .999	.	> .999
# of banks		60	60	60	60

Table 6 – The separate effect on big government-owned banks and big privately owned banks

Columns 1 to 4 show the results of the estimation of Equation (1) when we exclude from the sample the privately owned banks included in the set big banks, defined in Table 1. Columns 5 to 8 show the results of the estimation of Equation (1) when we exclude from the sample the government-owned banks from the set big banks, defined in Table 1. In columns 1, 3, 5, and 7, Equation (1) is estimated using the OLS, whereas in columns 2, 4, 6, and 8, we use the (one-step) GMM-Sys estimator. The variable *big gov.-owned bank* is a dummy variable equal to one for the sub-set of big banks that are government-owned; the variable *big private bank* is a dummy variable equal to one for the sub-set of big banks that are privately owned. The other variables are defined in Tables 3 and 5. In the GMM regressions, we allow regressors to be only sequentially exogenous, employing suitable lagged values as their instruments, except for the following regressors, which are assumed to be strictly exogenous: time dummies, *regional economic activity*, *big gov.-owned bank*, *big private bank*, *big gov.-owned bank x crisis*, and *big private bank x crisis*. Autocorrelation/ heteroskedasticity-robust t-statistics are shown in parentheses. The estimates for the time dummies are omitted. D represents the first difference, and L represents the first lag. The variables that interact with the *crisis* are lagged according to the variable that appears without interaction. *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

		Big government-owned banks				**Big private banks**			
Dependent Variable		ΔUnins.	Deposits	ΔTotal	Deposits	ΔUnins.	Deposits	ΔTotal	Deposits
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		OLS	GMM-Sys	OLS	GMM-Sys	OLS	GMM-Sys	OLS	GMM-Sys
Variables of interest									
Crisis		-0.070	-0.129	-0.094	-0.201	-0.262	-0.265	-0.204	-0.206
		(-0.462)	(-0.710)	(-0.597)	(-1.166)	(-1.499)	(-1.516)	(-1.180)	(-1.195)
Big gov.-owned bank		-0.026	-0.023	-0.016	-0.015				
		(-0.840)	(-0.722)	(-0.542)	(-0.525)				
Big gov. bank x crisis		0.393**	0.379**	0.267	0.268*				
		(2.059)	(2.024)	(1.669)	(1.672)				
Big private bank						0.004	0.004	0.002	0.003
						(0.118)	(0.131)	(0.069)	(0.083)
Big priv. bank x crisis						0.389***	0.391***	0.309***	0.311***
						(3.171)	(3.183)	(2.830)	(2.842)
Control Variables									
Size		-0.001	-0.002	-0.003	-0.003	-0.002	-0.002	-0.004	-0.004
		(-0.112)	(-0.174)	(-0.347)	(-0.376)	(-0.241)	(-0.281)	(-0.458)	(-0.495)
Δuninsured deposits	L	0.028	0.021			0.024	0.025		
		(0.444)	(0.326)			(0.406)	(0.408)		
Δtotal deposits	L			0.041	0.041			0.038	0.038
				(0.648)	(0.651)			(0.627)	(0.628)
Δinterest rate margin	D	1.538	1.562	1.992	1.516	1.275	0.617	1.532	0.959
		(0.718)	(0.751)	(0.983)	(0.748)	(0.681)	(0.327)	(0.871)	(0.537)
Equity ratio	L	0.279	0.294	0.209	0.207	0.269	0.266	0.202	0.199
		(1.485)	(1.552)	(1.176)	(1.167)	(1.461)	(1.447)	(1.159)	(1.146)
Low quality loans	L	-0.090	-0.132	-0.346	-0.338	-0.060	-0.053	-0.319	-0.312
		(-0.155)	(-0.223)	(-0.622)	(-0.608)	(-0.106)	(-0.093)	(-0.586)	(-0.571)
Asset liquidity	L	0.013	0.036	-0.001	-0.001	0.016	0.016	0.001	0.001
		(0.203)	(0.638)	(-0.014)	(-0.010)	(0.264)	(0.264)	(0.014)	(0.014)
Regional economic activity		0.222	0.153	0.030	0.014	0.212	0.212	0.024	0.024
		(0.666)	(0.402)	(0.107)	(0.048)	(0.636)	(0.621)	(0.087)	(0.085)
Equity ratio x crisis		-0.834	-1.132	-1.069	-1.065	-0.819	-0.814	-1.056	-1.051
		(-1.182)	(-1.290)	(-1.563)	(-1.554)	(-1.175)	(-1.165)	(-1.561)	(-1.551)
Low quality loans x crisis		1.685	3.074	1.591	1.538	1.776	1.717	1.633	1.581
		(0.344)	(0.464)	(0.331)	(0.321)	(0.365)	(0.353)	(0.342)	(0.332)
Asset liquidity x crisis		0.373	0.000	0.368	0.367	0.423	0.423	0.405	0.405
		(0.955)	(.000)	(0.961)	(0.958)	(1.053)	(1.052)	(1.030)	(1.029)
Constant		0.082	0.086	0.159	0.162	0.082	0.086	0.159	0.162
		(0.491)	(0.515)	(1.021)	(1.048)	(0.491)	(0.515)	(1.021)	(1.048)
Time dummies		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations		765	765	765	765	818	818	818	818
R-squared		0.096		0.081		0.089		0.074	
F		7.784	10.44	5.906	5.926	6.377	6.319	4.891	4.969
F (p-value)		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Hansen		.	36.95	.	38.42	.	52.29	.	47.70
Hansen (p-value)		.	> .999	.	> .999	.	> .999	.	> .999
# of banks		63	63	63	63	68	68	68	68

Table 7 – Institutional investors, corporations and individuals

This table shows the results of the estimation of Equation (1) using the change in CDs, defined as the first difference of the log of CDs as the dependent variable. In columns 1, 3, and 5, Equation (1) is estimated using the OLS, whereas in columns 2, 4, and 6, we use (one-step) GMM-Sys estimators. Variables are defined in Tables 3 and 5. In the GMM regressions, we allow regressors to be only sequentially exogenous, employing suitable lagged values as their instruments, except for the following regressors, which are assumed to be strictly exogenous: time dummies, *regional economic activity*, *big bank*, and *big bank x crisis*. Autocorrelation/ heteroskedasticity-robust t-statistics are shown in parentheses. The estimates for the time dummies are omitted. D represents the first difference, and L represents the first lag. The variables that interact with the *crisis* are lagged according to the variable that appears without interaction. *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

Dependent Variable		ΔCDs held by Institutional investors		ΔCDs held by Nonfinancial firms		ΔCDs held by Individuals	
		(1)	(2)	(3)	(4)	(5)	(6)
Variables of interest		OLS	GMM-Sys	OLS	GMM-Sys	OLS	GMM-Sys
Crisis		0.422	0.084	-0.167	0.000	0.254*	0.194
		(1.051)	(0.199)	(-0.916)	(.000)	(1.787)	(1.282)
Size		-0.008	-0.007	-0.024*	-0.025*	0.003	0.003
		(-0.547)	(-0.526)	(-1.993)	(-1.955)	(0.257)	(0.287)
Big bank		0.082	0.082	0.079*	0.081*	0.046	0.045
		(1.539)	(1.526)	(1.877)	(1.831)	(1.027)	(0.999)
Big bank x crisis		0.683**	0.682**	0.443***	0.431***	0.168	0.167
		(2.081)	(2.076)	(3.037)	(2.996)	(1.384)	(1.376)
Control variables							
Δinterest rate margin	D	-1.582	-0.896	-0.639	2.396	-0.242	1.241
		(-0.566)	(-0.299)	(-0.289)	(0.519)	(-0.162)	(0.962)
Equity ratio	L	0.962***	0.965***	-0.087	-0.143	-0.000	-0.000
		(3.490)	(3.490)	(-0.363)	(-0.642)	(-0.001)	(-0.002)
Low quality loans	L	-1.208	-1.209	0.075	0.165	-0.078	-0.145
		(-1.349)	(-1.342)	(0.128)	(0.298)	(-0.207)	(-0.385)
Asset liquidity	L	0.006	0.007	0.127	0.172**	0.032	0.028
		(0.048)	(0.057)	(1.616)	(2.152)	(0.642)	(0.570)
Regional economic		-0.383	-0.477	0.426	0.498	0.228	0.313
activity		(-0.578)	(-0.699)	(1.465)	(1.589)	(1.209)	(1.541)
Equity ratio x crisis		-2.064	-2.065	-0.706	0.000	-0.927	-0.938
		(-1.330)	(-1.329)	(-0.926)	(.)	(-1.449)	(-1.467)
Low quality loans x		-4.286	-4.274	0.441	-6.885*	-1.006	-0.780
crisis		(-0.526)	(-0.525)	(0.180)	(-1.811)	(-0.606)	(-0.464)
Asset liquidity x		-0.750	-0.754	0.187	-0.959	-0.002	0.005
crisis		(-0.807)	(-0.811)	(0.510)	(-1.469)	(-0.010)	(0.025)
Lagged dep. variable		Yes	Yes	Yes	Yes	Yes	Yes
Time dummies		Yes	Yes	Yes	Yes	Yes	Yes
Observations		929	929	942	942	942	942
R-squared		0.069		0.105		0.115	
F		3.802	3.775	7.853	6.599	10.49	8.065
F (p-value)		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Hansen		.	45.98	.	54.49	.	45.04
Hansen (p-value)		.	> .999	.	> .999	.	> .999
# of banks		72	72	72	72	72	72

Table 8 – Bank ratings

This table shows the results of estimations of Equation (1) using (one-step) system GMM. The variables are defined in Tables 3 and 5. In the GMM regressions, we allow regressors to be only sequentially exogenous, employing suitable lagged values as their instruments, except for the following regressors, which are assumed to be strictly exogenous: time dummies, *regional economic activity*, *big bank*, and *big bank x crisis*. Autocorrelation/ heteroskedasticity-robust t-statistics are shown in parentheses. The estimates for the time dummies are omitted. The variables that interact with the *crisis* are lagged according to the variable that appears without interaction *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

Dependent Variable	ΔUninsured Deposits	ΔTotal Deposits	ΔCDs held by		
			Institutional Investors	Nonfinancial firms	Individuals
	(1)	(2)	(3)	(4)	(5)
Variables of interest					
Crisis	-0.221	-0.158	0.060	-0.133	0.236*
	(-1.417)	(-1.012)	(0.140)	(-0.743)	(1.735)
Big bank	0.003	0.002	0.073	0.051	0.058
	(0.082)	(0.064)	(1.578)	(1.248)	(0.921)
Big bank x crisis	0.324**	0.243*	0.557**	0.380**	0.053
	(2.182)	(1.700)	(2.145)	(2.261)	(0.377)
Control variables					
Banks rated w/ investment grade	-0.005	-0.003	0.042	0.087*	-0.019
	(-0.120)	(-0.087)	(0.983)	(1.945)	(-0.284)
Investment grade x crisis	0.127	0.090	0.290	0.177	0.239
	(0.696)	(0.511)	(1.407)	(0.857)	(1.182)

Other control variables: Size, Bank fundamentals (Equity ratio, Low quality loans, Asset liquidity), bank fundamentals x crisis dummy, Δinterest rate margin, Regional economic activity, lagged dependent variables, time dummies.

Observations	847	847	929	942	942
F	5.696	4.143	4.126	9.649	10.96
F (p-value)	< .001	< .001	< .001	< .001	< .001
Hansen	56.56	53.00	43.86	47.90	46.25
Hansen (p-value)	> .999	> .999	> .999	> .999	> .999
# of banks	71	71	72	72	72

Table 9 – Exposure to foreign funding

This table shows the results of estimations of Equation (1) using (one-step) system GMM. The variables are defined in Tables 3 and 5. In the GMM regressions, we allow regressors to be only sequentially exogenous, employing suitable lagged values as their instruments, except for the following regressors, which are assumed to be strictly exogenous: time dummies, *regional economic activity*, *big bank*, and *big bank x crisis*. Autocorrelation/ heteroskedasticity-robust t-statistics are shown in parentheses. The estimates for the time dummies are omitted. D represents the first difference, and L represents the first lag. The variables that interact with the *crisis* are lagged according to the variable that appears without interaction *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

Dependent Variable		ΔUninsured Deposits	ΔTotal Deposits	ΔCDs held by		
				Institutional Investors	Nonfinancial firms	Individuals
		(1)	(2)	(3)	(4)	(5)
Variables of interest						
Crisis		-0.257	-0.247	0.020	-0.107	0.329*
		(-0.715)	(-1.499)	(0.044)	(-0.564)	(1.817)
Big bank		-0.005	-0.005	0.088	0.079*	0.052
		(-0.147)	(-0.146)	(1.573)	(1.822)	(1.084)
Big bank x crisis		0.424***	0.306***	0.710**	0.440***	0.036
		(2.890)	(2.694)	(2.113)	(2.971)	(0.197)
Control variables						
Exposure to foreign funding	L	-0.107	-0.103	0.051	-0.006	0.020
		(-0.864)	(-0.887)	(0.252)	(-0.033)	(0.147)
Exposure to foreign funding x crisis		0.776	0.682	0.925	-0.154	-0.036
		(1.225)	(1.240)	(0.852)	(-0.308)	(-0.064)

Other control variables: Size, Bank fundamentals (Equity ratio, Low quality loans, Asset liquidity), bank fundamentals x crisis dummy, Δinterest rate margin, Regional economic activity, lagged dependent variables, time dummies

	(1)	(2)	(3)	(4)	(5)
Observations	847	847	929	942	942
F	5.854	3.609	3.465	7.485	10.24
F (p-value)	< .001	< .001	< .001	< .001	< .001
Hansen	47.64	49.31	41.55	40.21	43.42
Hansen (p-value)	> .999	> .999	> .999	> .999	> .999
# of banks	71	71	72	72	72

Table 10 – Exposure to trade finance and middle-market loans

This table shows the results of estimations of Equation (1) using (one-step) GMM-Sys. The variables are defined in Table 5. We allow regressors to be only sequentially exogenous, employing suitable lagged values as their instruments, except for the following regressors, which are assumed to be strictly exogenous: time dummies, *regional economic activity*, *big bank*, and *big bank x crisis*. Autocorrelation/ heteroskedasticity-robust t-statistics are shown in parentheses. The estimates for the time dummies are omitted. D represents the first difference, and L represents the first lag. The variables that interact with the *crisis* are lagged according to the variable that appears without interaction *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

Dependent Variable		ΔUninsured Deposits	ΔTotal Deposits	ΔCDs held by		
				Institutional Investors	Nonfinancial firms	Individuals
		(1)	(2)	(3)	(4)	(5)
Variables of interest						
Crisis		-0.271	-0.195	-0.433	-0.264	0.294*
		(-1.513)	(-1.121)	(-1.181)	(-0.837)	(1.704)
Big bank		-0.002	-0.003	0.073	0.071	0.048
		(-0.054)	(-0.098)	(1.174)	(1.579)	(1.069)
Big bank x crisis		0.357***	0.257**	0.658*	0.521**	0.141
		(2.990)	(2.461)	(1.669)	(2.427)	(1.168)
Control variables						
Exposure to trade finance	L	-0.039	-0.046	-0.109**	-0.035	0.009
		(-1.265)	(-1.538)	(-2.229)	(-0.982)	(0.388)
Exposure to middle market	L	0.043	0.036	0.020	0.016	-0.013
		(1.539)	(1.351)	(0.340)	(0.423)	(-0.632)
Exposure trade finance x crisis		0.115	0.092	0.817***	0.093	-0.011
		(1.047)	(0.850)	(3.332)	(0.656)	(-0.133)
Exposure to middle market x crisis		-0.259**	-0.271**	-0.254	-0.144	-0.227***
		(-2.377)	(-2.563)	(-0.956)	(-0.977)	(-2.885)
Other control variables: Size, Bank fundamentals (Equity ratio, Low quality loans, Asset liquidity), bank fundamentals x crisis dummy, Δinterest rate margin, Regional economic activity, lagged dependent variables, time dummies						
Observations		847	847	929	942	942
F		5.951	4.287	4.692	4.845	9.873
F (p-value)		< .001	< .001	< .001	< .001	< .001
Hansen		46.73	42.43	40.72	45.25	36.16
Hansen (p-value)		> .999	> .999	> .999	> .999	> .999
# of banks		71	70	72	72	72

Table 11 – Change in deposits, post-financial crisis and big banks

This table shows the results of estimations of Equation (1) using (one-step) GMM-Sys. The variable *post-crisis* is a dummy variable for the observation being during the periods after the international turmoil. The other variables are defined in Table 5. We allow regressors to be only sequentially exogenous, employing suitable lagged values as their instruments, except for the following regressors, which are assumed to be strictly exogenous: time dummies, *regional economic activity*, *big bank*, and *big bank x crisis*. Autocorrelation/ heteroskedasticity-robust t-statistics are shown in parentheses. The estimates for the time dummies are omitted. D represents the first difference, and L represents the first lag. The variables that interact with the *crisis* are lagged according to the variable that appears without interaction *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

Dependent Variable	ΔUninsured Deposits	ΔTotal Deposits	ΔCDs held by		
			Institutional Investors	Nonfinancial firms	Individuals
	(1)	(2)	(3)	(4)	(5)
Variables of interest					
Crisis	-0.303*	-0.223	0.104	-0.332*	-0.074
	(-1.852)	(-1.378)	(0.252)	(-1.730)	(-0.463)
Post-crisis	0.023	0.032	0.330	-0.252**	-0.143**
	(0.230)	(0.360)	(1.131)	(-2.009)	(-2.230)
Big bank	0.016	0.014	0.129**	0.102**	0.066
	(0.492)	(0.462)	(2.377)	(2.280)	(1.417)
Big bank x crisis	0.373***	0.276**	0.643*	0.429***	0.152
	(2.977)	(2.481)	(1.936)	(2.992)	(1.308)
Big bank x post-crisis	-0.096	-0.080	-0.431*	-0.167	-0.173***
	(-1.269)	(-1.370)	(-1.987)	(-1.515)	(-4.070)
Control variables: Size, Bank fundamentals (Equity ratio, Low quality loans, Asset liquidity), Bank fundamentals x crisis dummy, bank fundamentals x post-crisis dummy, Δinterest rate margin, Regional economic activity, lagged dependent variables, time dummies					
Observations	847	847	929	942	942
F	5.715	4.419	3.844	7.139	10.54
F (p-value)	< .001	< .001	< .001	< .001	< .001
Hansen	45.78	45.15	35.18	41.70	37.31
Hansen (p-value)	> .999	> .999	> .999	> .999	> .999
# of banks	71	71	72	72	72

Table 12 – Share of institutional investors

This table shows the results of estimations of Equation (1) using (one-step) system GMM. The variables are defined in Table 5. We allow regressors to be only sequentially exogenous, employing suitable lagged values as their instruments, except for the following regressors, which are assumed to be strictly exogenous: time dummies, *regional economic activity, big bank*, and *big bank x crisis*. Autocorrelation/ heteroskedasticity-robust t-statistics are shown in parentheses. The estimates for the time dummies are omitted. D represents the first difference, and L represents the first lag. The variables that interact with the *crisis* are lagged according to the variable that appears without interaction *, ** and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

Dependent Variable		ΔUninsured Deposits	ΔTotal Deposits	ΔCDs held by		
				Institutional Investors	Nonfinancial firms	Individuals
		(1)	(2)	(3)	(4)	(5)
Variables of interest						
Crisis		-0.340**	-0.142*	-0.105	-0.164	0.250*
		(-2.409)	(-1.700)	(-0.285)	(-1.000)	(1.750)
Big bank		0.007	0.010	0.094	0.084*	0.047
		(0.238)	(0.332)	(1.629)	(1.991)	(1.027)
Big bank x crisis		0.329***	0.190*	0.571*	0.409***	0.162
		(3.033)	(1.837)	(1.971)	(2.811)	(1.328)
Control variables						
Share of institutional investors	L	-0.268	-0.271*	-0.945**	0.177	0.049
		(-1.568)	(-1.686)	(-2.527)	(0.654)	(0.331)
Share of inst. investors x crisis		-3.163***	-2.909***	-5.793***	-2.039***	-0.305
		(-5.875)	(-4.281)	(-5.065)	(-3.788)	(-0.609)
Other control variables: Size, Bank fundamentals (Equity ratio, Low quality loans, Asset liquidity), bank fundamentals x crisis dummy, Δinterest rate margin, Regional economic activity, lagged dependent variables, time dummies						
Observations		847	847	929	942	942
F		11.44	12.03	8.523	10.19	10.24
F (p-value)		< .001	< .001	< .001	< .001	< .001
Hansen		45.11	49.59	35.24	48.80	42.20
Hansen (p-value)		> .999	> .999	> .999	> .999	> .999
# of banks		71	71	72	72	72