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Too Big to Fail Perception by Depositors: an empirical investigation[1]

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Abstract

We examine a run from smaller to the largest banks in Brazil during the international financial turmoil in late 2008. Since Brazilian banks had no exposure to subprime securitized loans, the run is an opportunity to observe depositor reaction to a shock that is exogenous to the domestic banking system. Our empirical strategy allows us to disentangle the too big to fail benefit from the other features continuously related to size. Our unique database allows us to observe the behavior of uninsured deposits and of different types of holders of certificates of deposits, such as individuals, institutional investors and non-financial corporations. Taken together, our results are consistent with the idea that depositors ran from the smaller banks to the largest banks because they believed the largest banks were too big to fail. We also find that institutional investors had an important role in inducing the behavior of other depositors during the crisis: banks that had relatively more deposits of institutional investors *ex-ante* suffered more deposit outflows throughout the crisis.

Key Words: banking system, financial crisis, too big to fail
JEL Classification: G21, G28, F33

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[4] Universidade Presbiteriana Mackenzie and Universidade de São Paulo

> *"In trying to stabilize the financial system, we have led creditors of large financial institutions to expect that the government will protect them from losses, which in turn means they need not monitor risk-taking by these firms."*
>
> Charles Plosse, President of the Federal Reserve Bank of Philadelphia at a policy forum sponsored by the Philadelphia Fed on Dec. 4, 2009[1].

The crisis that started in the U.S. subprime sector in 2007 led to bailouts of large financial institutions in the US and Europe in late 2008 and early 2009. These bailouts brought the too big to fail policy back to the spotlight. Governments usually justify bailing out large financial institutions based on the harmful consequences of the failure of one large institution for the whole financial system. On the other hand, Finance researchers agree that a too big to fail policy is harmful to the long-run financial market stability because it distorts competition in the banking sector and weakens the incentives for creditors to monitor banks, which leads to moral hazard (Kaufman, 1990; Stern and Feldman, 2004; Gropp, Hakenes and Schnabel, 2010; Keister, 2010).

The empirical literature has examined the effect of bail-out policies on the risk-taking of banks (Boyd and Runkle, 1993, Schnabel, 2009), and the response of the capital markets to banks becoming too big to fail (O'Hara and Shaw, 1990; Brewer and Jagtiani, 2009). The empirical literature has not yet examined – to our knowledge – if the perception of a too big to fail policy affects depositor behavior. In other words: do depositors favor banks considered too big to fail regardless of their risk fundamentals?

This paper addresses this question by examining a run from smaller banks to the largest banks in Brazil during the international financial turmoil in late 2008. This flight to size is an opportunity to observe depositor reaction to a shock that is exogenous to the domestic banking system, since Brazilian banks had no exposure to subprime securitized loans. Specifically, we investigate if the depositor behavior may be credited to the perception of an implicit too big to fail policy. Our empirical strategy aims at ruling out the different reasons why depositors may have benefitted from putting their money in larger banks. Previous empirical studies on market discipline have found that

[1] This quote can be seen in Sloan (2009).

depositors favor larger banks, but they did not differentiate between the too big to fail effect and other potential benefits of size (eg. Maechler and McDill, 2006; Imai, 2006).

Our unique bank level information, collected in close consultation with the financial supervisor, enables us to compare the behavior of uninsured depositors versus the total set of depositors. In addition, information on the type of holder of certificates of deposit allows us to identify differences in behavior of institutional investors, individual investors and non financial firms.

Taken together, our results are consistent with the idea that depositors ran from the smaller banks (hereafter, other banks) to the largest banks of Brazil (hereafter, big banks) during the most critical period of the international financial crisis because depositors believed the largest banks were too big to fail. The run was triggered by the bad news from the global banking industry in late 2008 and it was reverted after the turmoil passed. This observation strengthens the interpretation that the run was not based on fundamentals. We observe *no* systematic difference in the change in deposits for big banks in normal times, indicating that the competitive advantage of being too big to fail is most valuable during a crisis. The run is more pronounced for uninsured depositors, rather than for the total set of depositors, as was already expected. Our estimates are both statistically and economically significant. They imply that, after controlling for several sources of bank heterogeneity, including asset size and economic fundamentals, big banks increased uninsured deposits, on average, by approximately 48 percentage points *more* than other banks during the critical stage of the crisis. This expected additional increment amounts to approximately 37 percentage points for total deposits.

Our analysis of changes in certificates of deposit (CDs) by investor type provides interesting results as well. The amount of CDs held by institutional investors in big banks increased 30% in the last 6 months of 2008, while in the other banks there was a decrease of almost 35% in the CDs held by these investors. We also observe a similar movement for CDs of non financial firms: an increase of 55% in big banks and a decrease of 11% in other banks. When we control for bank fundamentals and the degree of dependence on institutional investors, we find that big banks enjoyed a change in the amount of CDs of institutional investors that was 57 percentage points larger than other banks. The effect for the CDs of non-financial firms is lower than for institutional

investors, but still important: a 40 percentage points increase in the amount of certificates of deposits in big banks relative to the other banks.

Our inferences are robust to different specifications of the set of big banks; that is, whether they include only the largest government-owned banks or the largest privately-owned banks.

Our primary contribution to the literature is to show that even an implicit too big to fail policy may be readily perceived by depositors. Our findings also contribute to the financial crisis empirical literature by showing that the presence of institutional investors played an important role in the run in Brazil. We find that each incremental percent point of assets being funded by CDs of institutional investors resulted in an outflow of 2.8% of both uninsured and total deposits during the crisis (we find no such effect for the other periods). Interestingly, the flow in CDs held by non-financial firms was also negatively influenced by the reliance on institutional investors. This result is in line with the evidence from mutual funds outflow found in Chen, Goldstein and Jiang (2010) and with some features of the model for bank runs of Goldstein and Pauzner (2005).

Finally, since the run was reverted after the turmoil and it did not quite reflect depositors' reassessment of bank fundamentals, our findings seem to support the view that a run may occur when depositors learn information from other banking systems, which may serve as a noisy signal on domestic bank-specific information. This result is consistent with some features of the bank runs model of Chen (1999) and Chen and Hassan (2008).

This research contributes to the financial literature for two main reasons: (1) it disentangles the continuous benefits of size from the discontinuous benefit of being perceived as too big to fail; (2) it is, to the best of our knowledge, the first study to document a massive flow of deposits to large banks, that is best explained by depositors anticipating possible bailouts of the large banks rather than by worse fundamentals of the smaller banks.

The remainder of the paper proceeds as follows. Section I lays out the motivation for our study. Section II introduces the empirical strategy. Section III discusses the data and sample selection. Section IV presents the results, Section V describes some robustness checks and Section VI concludes.

I. The Effects of the Global Financial Crisis on Brazil

We begin our analysis by illustrating how the Brazilian financial system was affected by the global financial crisis[2]. The global financial crisis reached a turning point in September 2008, when Lehman's bankruptcy induced losses to several counterparties and forced markets to reassess risks that were previously overlooked. Investors withdrew from the markets and liquidity dried up , affecting the real economy. Allen and Carletti (2010) argue that the most disruptive consequence of Lehman's bankruptcy was the signal it sent to the international markets that credit risk in the banking sector and financial industry was a serious concern. Most banks around the world lost substantial equity value and governments had to infuse capital to prevent failure (Beltratti and Stulz, 2009).

In October 2008, the US and European Governments strengthened deposit guarantee schemes to avoid bank runs. Ireland, Greece, Germany, Denmark, France and others offered blanket guarantees (Willman, 2008; Hall, 2008). In the US, Congress raised the deposit insurance from $100,000 to $250,000 per depositor, per institution, although well-informed depositors know they can have full coverage by putting their money in one institution under separately titled accounts. The UK raised deposit protection from £35,000 to £50,000 (Cumbo, 2008), which was not enough to stop a flight to safety by bank depositors. National Savings & Investments, a state-owned bank that offers 100 per cent government guarantee received record deposit inflows in the last quarter of 2008. (Warwick-Ching, 2009). HSBC, which was perceived as safe, had also record inflows into its UK deposit accounts (Ross, 2008).

The turbulence in the US and Europe in the last quarter of 2008 affected the distribution of deposits across banks in Brazil, although none of the domestic banks (large or small) had exposure to US securitizations of subprime loans. The largest banks experienced a significant inflow of deposits from the smaller banks. Figure 1 provides a snapshot of the flow of funds from the smaller banks into the largest banks of Brazil (big banks) by showing daily data of the market share of certificates of deposit (CDs). From mid-September to December 2008 the big bank's market share of certificates of deposit spiked almost 7 percentage points, reaching 82.5%. It remained in that level until mid-March 2009, when it began to go back to pre-crisis market share.

[2] An overview of the events of the crisis can be seen in Brunnermeier (2009) and Taylor (2009).

[Insert Figure 1 here]

In an attempt to provide liquidity to the smaller banks, the Brazilian Government took several measures, such as the reduction of reserve requirements and the design of a new certificate of deposit with a special guarantee of BRL 20,000,000 (equivalent to around nine million US dollars at the time) in March 2009[3].

Another way to see the run from smaller banks to the big banks is by looking at the market share of the big banks of insured and uninsured deposits. Figure 2 presents semiannual information on the share of total, uninsured and insured deposits of the set of big banks. The results are in line with those presented in Figure 1. There was a significant rise of 5 percentage points in the otherwise relatively stable share of total deposits of the big banks, during the exacerbation of the crisis. Most of this rise is due to a spike of 15 percentage points in the market share of uninsured deposits.

[Insert Figure 2 here]

The exacerbation of the global financial crisis in late 2008 also affected the real economy of Brazil through basically two major channels: (i) an increase in risk aversion tightened external financing conditions and (ii) a significant decline in international investment, followed by lower demand for regional exports and a drop in commodity prices (IMF, 2009a, b).

The constraint in external financing led to a significant devaluation of the Brazilian currency, the Real, in the last quarter of 2008. Despite the devaluation, there was not a process of currency substitution in Brazil: the deposit base grew 24.7% during the third and fourth quarter of 2008, as can be seen in Figure 3.

[Insert Figure 3 here]

II. Testing the Perception of Too Big To Fail

As mentioned before, the flight to the big banks in Brazil during the most critical stage of the global financial crisis is an opportunity to observe depositor reaction to a shock that is exogenous to the domestic banking system, since domestic banks had no subprime securitized loans and insignificant exposure to foreign debt.

[3] The measures to reduce reserve requirements were taken along 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 were taken in October 6, 9, 10 and 16. The creation of a new debt instrument with a special guarantee of BRL 20,000,000 (equivalent to around nine million dollars at the time) was taken in March 26 and 31/2009.

There are two important questions to be asked: (1) why was there a reaction of depositors in Brazil to the international financial turmoil? and (2) why was the reaction a flight from the smaller banks to the big banks? Though the answer to the first question is not formally addressed in this paper, we conjecture that the bad news from the global banking industry in late 2008 made depositors reassess risks in the banking sector. In many aspects, this conjecture is closely related to the models of bank runs presented by Chen (1999) and Chen and Hassan (2008).

There are basically two lines of argument to explain the origins of bank runs. One is based on the classical work of Diamond and Dybvig (1983) where bank runs are self fulfilling prophecies. Given the assumption of first-come, first-served, and costly liquidation of some long-term assets, one possible equilibrium is that depositors should rationally withdraw their funds if they believe that other depositors will withdraw. Another equilibrium occurs when no one believes a banking panic is about to occur, so depositors only withdraw their funds according to their liquidity needs. Which of these two equilibria occurs depends on random shocks or "sunspots".

The second line of argument to explain the origins of banking panics is based on the business-cycle. This view asserts that crises are not random events, or the result of "sunspots", but a natural consequence of the business cycle. If depositors receive information about an upcoming downturn in the cycle, they try to withdraw their funds because they expect a reduction in the value of bank assets and a rise in the probability of bank failures. There are several theoretical models consistent with the business cycle view, such as Jacklin and Bhattacharya (1988), Chari and Jagannathan (1988), Gorton (1988) and Allen and Gale (1998). Calomiris and Kahn (1991) consider bank runs as a result of some depositors gathering information about economic fundamentals that would allow assessing the viability of the bank. If the informed depositors conclude that a bank is in trouble, they will withdraw their money and precipitate a run. The sudden withdrawals will force the bank to liquidate all of its assets.

The models of Chen (1999) and Chen and Hassan (2008) may be understood as being related to both the sunspot view, because of the role of first-come, first-served; and to the business cycle view, more particularly to a strand of the business cycle explanation that emphasizes the role of information asymmetry in triggering runs. Chen (1999) shows that failures of a few banks may serve as a noisy signal to depositors who are not able to value their own bank's assets. These uninformed depositors respond to this

negative signal by withdrawing. Since uninformed depositors will withdraw early, the informed depositors are compelled to do the same, even though it would be otherwise better to wait for more precise bank-specific information. Chen and Hassan (2008) extend Chen (1999) to show that expectations about the quality and amount of bank-specific information that will be revealed can affect depositors' incentives to withdraw. Specifically, panic runs can be triggered not only by bank-specific information, but by depositors running when they expect that more noisy information about banks will be revealed, or when they expect that precise information about banks will not be revealed. In their model, panic runs are more likely to occur when the banking industry is weaker. Therefore, we argue that a possible that a possible explanation for the reaction observed in Brazil is that the noisy signal originating from the international financial turmoil increased the uncertainty and fears about the health of the domestic banking system.

The second question is the core of our paper: to understand why there was a flight of deposits from the smaller banks to the big banks. One possible explanation is that depositors thought the largest banks were too big to fail. This is a plausible interpretation in face of the international context and also of the recent history of Brazil. As mentioned before, Lehman's demise caused turmoil in the global financial system and led to a long list of bailouts with Citibank, Bank of America, AIG, ABN Amro, Royal Bank of Scotland, and others. It would be reasonable to think that the Brazilian Government would act in accordance to US and Europe and bailout the big banks should there be any trouble. Moreover, although Brazil does not have an explicit list of too big to fail banks, the country's recent history implied such policy. After the inflation stabilization in 1994, several banks were not able to adjust to the new environment and became distressed. In order to address the banking system fragility, the Brazilian Government launched three major official bank restructuring programs that included government capital injections to the largest private and federally-owned banks of the country. Small private and state-owned banks were allowed to fail. The perception of a too big to fail policy from depositors may have come from the observation of such policy taking place in the US and Europe and from the Brazilian recent history.

To interpret the run to the largest banks as a result of the perception by depositors of an implicit too big to fail policy may be unwarranted, though. An alternative explanation could be that those big banks were in a better shape than the smaller ones. In this case, the run would be in line with the business-cycle view.

There is wide empirical evidence supporting the business-cycle view, such as Calomiris and Gorton (1991), Gorton (1988), Mishkin (1991) and Calomiris and Mason (2003). In our context, one possible interpretation for deposits flying to the big banks in the midst of the crisis would be that depositors were running from banks with worse fundamentals. We take into account this alternative explanation by using several control variables related to bank fundamentals. The first set of variables includes traditional measures of bank risk: equity ratio, the ratio of low quality loans to assets, and the ratio of liquid assets to total assets. A second set of variables aims to control for the effects of the financial crisis in the Brazilian economy. As mentioned before, the worst period of the crisis tightened external financing conditions, so one could argue that bank's dependence of foreign capital to fund its assets became an important risk factor when the financial crisis reached its peak. Also, we mentioned that the crisis led to a decline in international trade that slowed down the Brazilian economy, so it is plausible that depositors could be concerned with particular types of assets that banks held on their balance sheets. For instance, loans to middle market firms may be perceived as particularly risky if these firms have a higher probability of being financially distressed during the economic downturn. We control for the effects of the financial crisis in several robustness checks detailed in section IV.

Finally, to understand why there was a flight of funds from the smaller banks to the big banks during the crisis, it is necessary to control for the other features of 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 thinking that larger banks have more cutting-edge technology and risk management techniques. We use the continuous variable log of assets to control for these features.

One potential limitation of this strategy comes from the possibility that depositors value the size discontinuity of the big banks for reasons other than being too big to fail. For instance, depositors might think that big banks are safer because they are widely known, better managed, less subject to information asymmetries and perhaps more closely monitored by the Central Bank. If depositors value the size discontinuity for these other subjective reasons, our interpretation of the too big to fail perception would be confounded. However, these hypotheses do not seem very plausible for at least three reasons. First, the subjective perceptions of safety should be less important for

sophisticated institutional investors and our results show that they are precisely the type of depositor who ran more heavily to the big banks. Second, several banks went down despite official supervision from the Fed, FDIC, FSA, etc. Third, as far as monitoring is concerned, Brazilian prudential regulation allows no distinction between the largest banks and other banks.

A. Identification and Empirical Strategy

To analyze if the anecdotal observation of deposit concentration in the hands of big banks during the crisis is consistent with depositors' perception of a too big to fail policy, we estimate five models with changes in deposits on the left hand size: for uninsured deposits, total deposits, certificates of deposits held by institutional investors, non-financial firms and individual investors. This allows us to examine potential differences in behavior by type of depositors.

To disentangle the other potential benefits of size other than government protection calls for a discontinuity approach, applied by using as one right hand side variable the interaction of an indicator of the worst stage of the financial crisis, ($Crisis$) and an indicator that the bank is part of the set of big banks, ($BigBank$) (the selection of these banks is further detailed in section II-B), together with appropriate controls. The test for the perception of a too big to fail policy during the crisis consists of estimating the sensitivity of the change in banks' deposits to this variable. In other words, the perception of a too big to fail policy during the crisis is tested by estimating the coefficient ω of $BigBank \times Crisis$, our main variable of interest.

The baseline specification is:

$$\begin{aligned}\Delta Deposits_{i,t} = {} & \alpha + \phi \Delta Deposits_{i,t-1} \\ & + \lambda \Delta Premium\ Paid\ on\ Deposits_{i,t} \ + \beta' Risk_{i,t-1} \\ & + \delta Regional\ Economic\ Activity_{i,t} + \theta Size_{i,t} + \vartheta Crisis_t \\ & + \gamma BigBank_i + \omega(BigBank_i \times Crisis_t) + \tau'\left(Risk_{i,t-1} \times Crisis_t\right) \\ & + \eta MechChange_{i,t} + \mu_i + d_t + \varepsilon_{i,t}\end{aligned} \quad (1)$$

Where μ_i represents the i-th bank's time invariant unobserved features that might influence the change in deposits, d_t stands for time fixed effects (i.e., the common effect of any shock to $\Delta Deposits$ in time t) and ε is the error term.

On the right hand side we have the lagged dependent variable ($\Delta Deposits$), to account for possible momentum or mean reversion effects in the dynamics of the change in deposits; the change in interest rate premium paid on deposits ($\Delta Premium\ Paid\ on\ Deposits$), to account for possible joint determination with change in deposits and avoid an omitted variable bias; a vector of bank fundamentals traditionally found in the literature ($Risk$), the growth in retail sales, as a a proxy for regional economic activity ($Regional\ Economic\ Activity$); the natural logarithm of the assets of the bank ($Size$), to disentangle the effect of being a big bank from the other features continuously related to size, such as brand equity and convenience; an indicator of the global financial crisis ($Crisis$); along with the necessary interactions. The model specification also deals with a regulatory change of the amount of insured in August, 2006, with a deterministic variable, $MechChange$. All variables used in this study are formally described in the Appendix.

The variables used in the $Risk$ vector are: the equity ratio, to evaluate leverage ($Equity\ ratio$); the ratio of low quality loans to assets, to evaluate the risk of the loan portfolio ($Low\ Quality\ Loans$); and the ratio of liquid assets to total assets, to assess liquidity risk ($Liquidity$).

Table 4 presents the estimation results of this baseline specification for uninsured and total deposits and Table 12 for institutional investors, non-financial firms and individual investors.

The models are estimated using Pooled Ordinary Least Squares (POLS) and the system Generalized Method of Moments (GMM-Sys) procedure described in Blundell and Bond (1998).

The system GMM allows us to explicitly model the bank unobserved fixed effect represented by μ_i and consistently include the lagged dependent variable among the regressors, unlike other panel data estimators, such as the traditional Fixed Effects and Random Effects procedures. In addition, GMM-Sys enables us to deal with the plausible endogenous relationship between bank fundamentals, change in interest rate premium, and change in deposits, by using suitable lagged values of the regressors as instrumental

variables. A similar procedure permits us to tackle the issue of dynamic endogeneity (e.g., see Wintoki, Linck and Netter, 2010) caused by the potential influence of shocks to the change in deposits over bank fundamentals in future periods (e.g., governance or management changes that affect deposits contemporaneously and the bank risk profile in subsequent periods). The plausibility of our identifying assumptions (i.e., the appropriateness of the set of lagged variables that we choose as instruments) is formally tested by the Hansen/Sargan test of overidentifying restrictions and the Arellano-Bond test for error autocorrelation. In all regressions reported in Table 4 we cannot reject the null hypotheses, suggesting that our identifying assumptions are acceptable. Finally, with both POLS and GMM-Sys we control for time fixed effects by using time dummy variables.

As mentioned before, we also estimate other seven specifications to take control for alternative explanations of the run that are detailed in Section IV - Robustness checks. Tables 5 to 11 present the estimation results of these alternative specifications.

B. Big Banks

Systemic risk can be defined as a risk of disruption to financial services caused by a deterioration of all or parts of the financial system that potentially brings a negative impact on the real economy. Institutions that pose a systemic risk are usually referred to as “too big to fail”. The term was first used in a congressional hearing in 1984, right 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 (Mishkin, 2006). At that time, size of assets was the criterion to characterize systemically important financial institutions.

In our model, the identification of the set of banks that could be perceived as too big to fail is based on their importance in the Brazilian market, combining outstanding size, substitutability and interconnectedness. Only domestic banks, including those with foreign control, were considered as candidates. Our definition of big banks is consistent with the concept of systemically important financial institutions. We base our selection procedure on several cluster analyses and multidimensional scaling graphs. For these formal data analyses we use five variables: (i) total assets plus brokerage, (ii) total assets, (iii) total deposits, (iv) number of branches, and (v) number of clients.

Table 1 shows the classification suggested by two clustering algorithms, known as *K-means* and *K-medians* (for details, see Kaufman and Rousseeuw, 2005). In both cases we specify the number of nonoverlapping groups (*k*) to be formed through an iterative process. In other words, we determine the number of groups to be formed and the algorithm chooses how many banks and which banks to assign to each group. Specifically, the *K-means* procedure assigns each bank to the group whose (multivariate) mean is closest, whereas the *K-medians* does the same, but using medians instead of means to represent the group centers. The algorithms begin with *k* randomly chosen seed values, which act as the *k* group means or medians in the first step. Then, based on the initial categorization, new group means/medians are computed. This procedure is repeated until no observations change groups. Table 1 shows that, when $k = 2$, the first cluster is composed by eight banks that are distinctively larger (in terms of the five variables we employ) than the remaining banks. The result is the same with both algorithms.

[Insert Table 1 here]

To visualize these clustering patterns we perform a classical multidimensional scaling analysis, which is a technique that allows us to represent high-dimensional space dissimilarities between observations in a lower-dimensional space. Specifically, we use the Euclidean distance between banks in the two-dimensional space to approximate the actual distances in the five-dimensional space (since we use five variables). The multidimensional scaling configuration graph is shown in Figure 4. Figure 4 reveals that the eight banks selected by the cluster analysis are somewhat distinct from other banks, taking into consideration the five dimensions of systemic importance defined above.

[Insert Figure 4 here]

III. Data and Sample Selection

The Brazilian Financial System has several distinguishing features that have helped shape the industrial organization of that country. First, the banking system is regulated and supervised exclusively at the federal level. The Central Bank of Brazil and the National Monetary Council[4] (CMN, for its acronym in Portuguese) are in charge of regulation and the Central Bank is also in charge of authorizations and supervision.

[4] The National Monetary Council is formed by the President of the Central Bank and two State Secretaries.

Second, the banking industry is formed mostly of universal banks. It has been like that since the end of the 1980s, when there was a regulatory change allowing banks to offer different services such as commercial banking, investment banking, consumer financing and so on.

Third, as mentioned before, banks are allowed to open branches anywhere, by discretion of the Central Bank of Brazil. That is, there are no rules forbidding interstate or international branching, but the Central Bank has to authorize each and every opening.

Fourth, in certain aspects, regulatory restrictions are more stringent than in developed economies. For instance, Brazilian banks are required to have a capital adequacy ratio of at least 11%, larger than the 8% Basle requirement. Furthermore, tier II capital may not exceed tier I capital. Also, the Central Bank operates a real-time gross settlement (RTGS) payment system since April 2002, which avoids the possibility of overdrafts in reserves at any time.

The Brazilian Deposit Insurance Fund, Fundo Garantidor de Crédito (FGC, for its acronym in Portuguese) is mandatory, privately-funded and was founded in 1995, in the aftermath of the restructuring programs mentioned before. The FGC covers the amount held by each person against one financial conglomerate up to BRL 60,000 – around USD 30,000. Initially it covered up to BRL 20,000 but the amount of coverage was extended in June 2006, during a calm period for the Brazilian banking system.

Almost all types of deposits in Brazil are in local currency and eligible for deposit insurance[5]. The distribution of deposits is shown on Panel A of Table 2. Checking account deposits, savings deposits and time deposits accounted for around 93% of the funds deposited in Brazilian banks during the sample period. The remaining 7% include interbank deposits and other deposits, such as those related to litigations. Checking account deposits pay no interest and, on average, accounted for 16% of total deposits over the sample period. Savings deposits pay an interest rate determined by law: a floating interest rate of 6 percentage points over a fraction of a specific inflation index. On average, savings deposits accounted for 28% of total deposits. Checking and savings

[5] Deposits in foreign currency account for less than 2% of total deposits in Brazil and are allowed only to very specific types of investors (non-resident persons 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 litigations; 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.

deposits may be withdrawn on demand by the customer without notice or penalty. Time deposits (mostly certificates of deposits) pay interest, and the rate may be fixed or floating. Around 70% of the time deposits in Brazil allow early withdrawal (eventually with a penalty rate). Throughout the sample period, time deposits accounted for 49% of total deposits on average.

Our primary database consists of semiannual observations of all deposit-taking banks in Brazil in the database of the Central Bank of Brazil between December/2001 and December/2009 (17 periods). We exclude from our sample banks that do not appear among the top 50 in either deposit taking or total assets in any of the 17 periods. We also exclude banks that were under Central Bank intervention. We require that the ratio of deposits over assets be higher than 1% and that all observations have nonmissing data for book assets, while all multivariate analysis implicitly requires nonmissing data for the relevant variables. To mitigate the impact of data errors and outliers on our analysis, we Winsorize all variables at the 5^{th} and 95^{th} percentiles.

Panel B of Table 2 lays out the representativeness of the sample. We have a total of 74 banks in the beginning of the sample period, and end up with 53 banks.(the number decreases over time due to mergers and acquisitions and only one bank failure occurred in 2004). This sample of banks hold from 96.1 to 99.1% of the deposits eligible for deposit insurance in the Brazilian Financial System along the studied period. Panel B also shows a large increase in the amount of deposits holdings by Brazilian banks: in less than 8 years, the amount of deposits has increased fourfold in Brazil. During the same period, the cumulative inflation rate was almost 70%. This rise can be attributed to a series of factors, such as nominal GDP growth of 141% in the sample period, the sharp increase in credit operations, the inclusion of the lower classes of the population into the banking system and the maintenance of high interest rates by the Central Bank in the period.

[Insert Table 2 here]

The data we use in this study has three sources. The first set of data is available to the public, provided by the Central Bank of Brazil. It comprises detailed balance sheet, income and earnings reports, as well as data on the number and location of branches, and selected regulatory indicators, such as the capital adequacy ratio for all Brazilian banking firms.

The second source for our data is private, and comes from the Brazilian Deposit Insurance Fund, (Fundo Garantidor de Crédito – FGC). This is a unique bank level data on the number of depositors and volume of deposits in several different deposit-size brackets for all Brazilian banking firms. This novel data allow us to compute the volume of insured and uninsured deposits of each bank in each period[6].

Third, we use private data provided by the Central Bank of Brazil that comprises daily balances of certificates of deposits in the hands of institutional investors, non-financial firms and individual investors; and semiannual information on the different types of bank loans outstanding.

Fourth, we also use data from the retail sales index provided the Brazilian Institute for Geography and Statistics (IBGE, for its acronym in Portuguese), which provides the growth in retail sales for each state of the federation[7] as well as the resulting national growth in retail sales. This is the most used indicator of regional economic activity in Brazil.

We treat merged banks (or acquisitions in which two different banks start consolidating their balance sheets) as new banking entities. For example, if Bank A acquires Bank B (or even if Bank A and Bank B merge into bank AB), we treat the merged bank as a new bank, Bank C. There were two mergers among the largest banks in Brazil during the exacerbation of the global financial crisis, in the end of 2008. In this case, the change in deposits was calculated based on the sum of deposits of the two merging banks.

A. Summary Statistics

Summary statistics are shown in Table 3 for dates Dec/2001, Jun/2008 and Dec/2009. We split the statistics into big banks and other banks.

[Insert Table 3 here]

Overall, banks have notably increased asset size and equity during the sample period. The other banks rely more on uninsured deposits than the big banks, which is explained by the fact that big banks have more branches and hold deposits of small retail clients, while the other banks rely mostly on middle market, corporate and institutional

[6] The periods range from January 1st to June 30th and July 1st to December 31st.

[7] Brazil has 27 states.

depositors. In addition, big banks have a slightly higher ratio of low quality loans to assets and lower equity ratio on average. In the beginning of the sample period, big banks had slightly higher liquidity than the other banks. In the period immediately before the crisis, we note that both sets of banks had experienced a decrease in liquidity, especially big banks, which ended up less liquid than the other banks. The same pattern remains in the last sample period. The most striking difference between big banks and the other banks is deposit concentration (the portion of a bank's asset being funded by each depositor on average). The ratio of deposit concentration of other banks to big banks is over 9,800 in December/2009.

IV. Results

Our main parameter of interest is the coefficient (ω) of the interaction of the global financial crisis dummy with our big bank dummy ($BigBank \times Crisis$). It captures the expected difference in the percent change in bank deposits between big banks and other banks during the most critical stage of the financial crisis, controlling for fundamentals, change in interest rate paid on deposits, size of assets and macro effects. In other words, a positive and significant ω in the uninsured deposits regression indicates that depositors behave consistently with the perception of a too big to fail policy. In contrast, we expect a lower ω in the total deposits regression.

The results of the estimations of the models of uninsured and total deposits, using Pooled Ordinary Least Squares (POLS) and the System Generalized Method of Moments (GMM-Sys) are shown in Table 4.

[Insert Table 4 here]

We find a positive and statistically significant ω for the deposits regressions under both estimation procedures (in all cases, at the 1% level). These estimates are also economically large, corresponding to a predicted increase of approximately 45 percentage points in uninsured deposits for the big banks group in comparison with other banks during the critical stage of the crisis. In addition, as expected, we find a positive but much lower ω for total deposits regression under all estimation procedures (predicting approximately 36 percentage point additional increase in deposits for big banks during the crisis).

The coefficient of the $Big\ bank$ dummy is not statistically significant, at conventional levels, in any regression. This means that, during normal times, the percentage change

of both uninsured and total deposits is unrelated to whether the bank is in our big bank group or not. Thus, our evidence suggests that investors might perceive a too big to fail policy and that such perception is relevant only in times of crisis.

The coefficient of *Size* is nonsignificant in the uninsured and total deposits models, no matter the estimation procedure. All of the other controls shown in Table 4 (equity ratio, low quality loans and liquidity) and their interactions with the crisis dummy have non-significant coefficient estimates. These widely used proxies for bank fundamentals are not relevant for explaining the behavior of depositors neither in normal times nor during the financial crisis. The results shown in Table 4 also show that interest rates paid on deposits have little or no power to explain the change in deposits, which is consistent with the idea that money markets are risk intolerant. The fact that traditional control variables have little explanatory power is intriguing, because it suggests that depositors are not sensitive to bank fundamentals both in normal times and during the crisis. Since previous empirical research has found evidence supporting runs based on fundamentals, we believe it is very likely that one or more important risk factors related to the characteristics of the crisis may be missing in this specification. We shed some light on the subject in section IV.C below.

Overall, the estimates shown in Table 4 suggest that the positive spike in deposits of big banks during the financial crisis cannot be explained by the heterogeneity in bank fundamentals, by a simple size effect or by a general propensity of such banks to attract more deposits than their competitors.

V. Robustness Checks

A - Isolating the impacts of the Global Financial Crisis on the Brazilian Financial System

A.1. – Types of loans

During the most critical stage of the global financial crisis, the set of big banks may have been considered safer not necessarily because they would be bailed out, but because depositors believe those big banks would be more resilient to the crisis effects. We take a deeper look at bank loans, since it is plausible that depositors could be concerned with particular types of assets that banks were exposed to on their balance sheets. We are especially interested in banks that engage in trade finance loans and middle market operations (loans made to small and medium-sized firms). Trade finance

loans are very collateralized by import/export contracts, have typically very low delinquency rate and loss given default, and are thus expected to be safe during the crisis. On the other hand, middle market loans have typically low collateral and are held to maturity by the lender bank (instead of being securitized and traded in the secondary market) and thus we could expect depositors to percept these loans to be riskier during the financial crisis, since small and medium firms have a higher probability of being financially distressed during the economic downturn.

[Insert Table 5 here]

The results shown in Table 5 show that, although the signs of the coefficients estimates for the interactions of these types of asset exposure with the crisis dummy (*trade finance x crisis* and *middle market x crisis*) are consistent with the above rationale, they are not statistically significant at the usual levels. The other coefficient estimates of interest (especially *big bank x crisis*) are practically unchanged by the inclusion of these variables.

A.2 – Liquidity freeze

[Insert Table 6 here]

As mentioned before, one of the effects of the financial turmoil was tight external financing conditions. After Lehman's bankruptcy the interbank market virtually froze, so banks that depended more heavily on external financing would probably suffer the most and could become distressed. We use the ratio of foreign funds to total assets as a proxy for bank's dependence on external financing on the right hand side of our model. However, we find no evidence that depositors favored banks with lower dependence on foreign funding, as we show on Table 6.

A.3 – Deposit concentration and reliance on institutional depositors

Another indirect measure of exposure on the liabilities side is depositor concentration, measured as the fraction of assets being funded by each depositor on average. Banks that have a narrower depositor base, where few depositors hold a large share of the total deposits, may be in impending distress. For instance, if some of these depositors had to withdraw their funds at the same time due to liquidity reasons related to the global financial crisis, the bank might lose a significant share of its funding. This would be exacerbated under the Goldstein and Pauzner (2005) model, that states that when noisy information is revealed, depositors would tend to run because the bank could be in

trouble if only a few depositors decide to run first. Therefore, in order to control for this feature, we use the natural logarithm of the ratio of the average deposit size to total assets as a right hand side variable that accounts for deposit concentration. We use logs to mitigate the extreme right-tail asymmetry of this variable. Results shown in Table 7 indicate that there is no evidence that depositor concentration affects the growth in deposits.

[Insert Table 7 here]

Under the rationale above, the first-come, first-serve issue is even more exacerbated if depositors assume one (or both) of the two hypotheses: i) that other depositors have superior information; ii) that other depositors are extremely risk-averse and thus will run when noisy information is expected. Institutional investors (such as pension and mutual funds) are the typical case of well informed and, in some cases, risk-averse depositors. As mentioned before, Chen, Goldstein and Jiang (2010) find evidence that the behavior of institutional investors depends on whether they are surrounded by other institutional investors or by retail investors in mutual funds. To account for this factor, we use a measure of reliance on institutional investors for funding, which is the ratio between the amount of certificates of deposit held by institutional investors and total assets. Table 8 shows that, during normal times, the reliance on institutional investors is not important for driving deposits' growth, while there is a very significant (economic and statistical) negative effect of relying on deposits of institutional investors during the financial crisis for both uninsured and total deposits, which is consistent with Chen, Goldstein and Jiang (2010) empirical findings. During the financial crisis, a 1 percentage point increase in the reliance on institutional investors would decrease deposits by over 2.8 percentage points, for both uninsured and total deposits. In addition, when reliance on institutional investors is considered in our regressions, the coefficient of the interaction of liquidity and crisis turns out to show a positive and significant (at the 10% level) effect on deposits. The inclusion of these additional controls slightly changes the magnitude and standard errors of some coefficients but it does not significantly alter our inferences. In particular, the estimates for the *big bank x crisis* interaction lowers to the 38-48 percentage points range for uninsured deposits and 29-38 percentage points range for total deposits. The results in Table 8, however, could simply mean that institutional investors were the ones who ran from deposits, so that the higher the concentration of deposits held by institutional investors in a certain bank, the more it lost deposits (or the

less it gained deposits). We show that this was not the case, when we return to this issue in section C below.

[Insert Table 8 here]

B – Government-owned banks

We then investigate if depositors favor government-owned banks against privately-held banks. 10 banks in our sample are controlled by the government (4 by the Federal Government and 6 by states of the federation), 2 of which are included in our list of big banks. It is plausible to assume that deposits perceive government-owned banks as enjoying some kind of implicit guarantee to depositors, so that these banks could be considered *too-protected-to-fail*. To account for this possibility, we include a dummy variable for non-big banks government-owned banks (i.e. banks that are controlled by the government and do not belong to our list of big banks) and also interact it with the financial crisis dummy. The results shown in Table 9 indicate that these banks do not enjoy higher deposit growth during normal times. The coefficient of the interaction variable (*government-owned bank x crisis*) shows some evidence, although weak, that the increase in both uninsured and total deposits during the financial crisis was higher for government-owned banks.

[Insert Table 9 here]

To further investigate the issue of an implicit protection to government-owned banks, we investigate whether the *big bank x crisis* effect was larger for the 2 government-owned banks of our big bank group than for privately-owned banks in the group. We do that by first excluding big private banks from the sample (results in Table 10) and then excluding big government-owned banks (results in Table 11). The results of Table 10 and 11 show that there is virtually no difference in our estimates of the *big bank x crisis* coefficient for uninsured deposits between private and government-owned banks (either of them enjoy circa 45 percentage points more growth in uninsured deposits compared to the other banks). When we turn our attention to total deposits, the results also show little difference: we observe a coefficient of 34 percentage points for government-owned banks and 38 percentage points for private banks.

[Insert Table 10 here]

[Insert Table 11 here]

C - The behavior of different types of depositors

We then investigate the behavior of different types of depositors. Certificates of deposits may be held by each of the three classes of investors: 1) institutional; 2) non-financial firms and; 3) individuals. It would be reasonable to conjecture that the first are the ones with superior information and higher degree of sophistication among the 3 classes, while individuals would be less informed and less sophisticated. We then run our baseline specification for each of the different classes of investors.

The results of Table 12 show that, during normal times, institutional investors are sensitive to banks' equity ratio. Our estimates imply that a 1 percentage point increase in the equity ratio predicts an increase in the growth rate of certificates of deposit held by institutional investors of around 1.1 percentage points. Institutional investors are sensitive to banks' exposure to trade finance during normal times and during the crisis. In normal times, a greater exposure is mildly penalized by institutional investors: a 1 percentage point increase in exposure predicts a fall in the growth rate of deposits of 0.11 percentage point. However, during the financial crises, the same increase of 1 percentage point in exposure predicts a rise in the growth rate of deposits of 0.74 percentage points. One possible explanation is that, in normal times, a higher diversification of the loan portfolio is preferred, but during the crisis, banks that have higher concentration on the safer types of loans are better off.

Regarding our main variable of interest, we find very large coefficients for institutional investors although with different degrees of statistical significance, depending on the model specification (2 at the 5% level, 1 at the 1% level and 1 at the 10% level). For non-financial firms coefficients are always significant at the 1% level, but smaller in magnitude. In columns (4) and (8), when we control for the presence of other institutional investors, the magnitude of the coefficients of the *big bank x crisis* substantially lowers for both types of investors. These findings suggest that some part of the run could be explained by incentives to withdraw depending on whether depositors fear others will withdraw first. The estimates shown in columns (9) to (12) suggest that individual investors did not favor big banks during the crisis.

D. The post-crisis period

The previous tests have shown that depositors favored big banks, banks that relied less on the funding of institutional investors during the crisis and that these results were

driven by the behavior of both institutional investors and non-financial corporations. We now investigate how deposit growth evolved for different banks in the post-crisis period, which we define as the first and second semesters of 2009 (Jun-09 and Dec-09). Both the OLS and the GMM regressions reported on table 13 show that the change in uninsured deposits during the post-crisis period (*big bank x post crisis*) for other banks was 15 percentage points larger compared to big banks (13% for total deposits), with 10% statistical significance. It is important to note that the coefficient obtained for the post crisis period (by itself, not interacted with big bank) is not significantly different from zero at the usual levels. In addition, the coefficients of *reliance on institutional investors x post crisis* show that banks that had a larger share of their assets funded by CDs of institutional investors experienced larger deposit growth (for both uninsured and total deposits, under OLS and GMM specifications) in the post crisis period.

[Insert Table 13 here]

These results reveal important information on the behavior of depositors. Indeed, there is evidence that the run identified in other banks during the critical stage of the financial crisis is partially reverted for uninsured deposits and almost entirely reverted for total deposits in the post crisis period (note that there are 2 periods considered *post crisis*). This evidence is in some sense consistent with the hypotheses that relate bank runs to noisy information that is revealed (or expected) during crises and the too big to fail hypothesis.

[Insert Table 14 here]

We also look at how different types of depositors (institutional investors, non financial companies and individuals) behaved after the crisis. The results in Table 14 show that the coefficients for *big bank x post crisis* are negative and statistically and economically significant for institutional investors under all specifications, whilst the coefficients of the other variables of interest (including *big bank x crisis*) remain practically unchanged. In fact, the positive change in deposits of institutional investors observed for big banks during the crisis is more than reverted after the crisis[8]. For non financial firms and individuals, we also observe negative coefficients for *big bank x post crisis*, but in only one case it is statistically significant at the 10% level. These results clearly indicate

[8] Again note that our definition of post crisis includes 2 semesters, and the coefficients of *big bank x.post crisis* is more than half the coefficient of *big bank x crisis.*

that institutional investors performed a "flight-to-big-banks" movement during the crisis (and **only** during the crisis).

This reversal in the change in deposits to other banks observed in the post crisis period can also be attributed, at least in part, to the creation of a special CD with guarantee of up to BRL20 million (around USD 9 million) in March 2009 as mentioned before. In fact, there is anecdotal evidence reporting that institutional investors account for a great portion of this special guaranteed CD.

E. Additional controls for bank fundamentals

We implement several other robustness tests to check the stability of our main results. Our baseline specification uses bank fundamentals in level, in accordance to the market discipline literature. However, it is possible that depositors are indeed interested in trends of bank fundamentals. Thus, we substitute $\Delta R_{i,t-1}$ for $R_{i,t-1}$ in equation (1), meaning that we now control for the *change* in bank fundamentals (i.e., capital adequacy, asset quality, management quality, earnings, and liquidity) from $t-2$ to $t-1$. This alternative specification addresses the possibility that clients are mainly sensitive to improvements or deteriorations of bank fundamentals instead of their level when deciding to withdraw or expand their deposits. In these regressions (results not reported), the coefficients estimated for ΔR turn out to be nonsignificant in all cases. However, our coefficient of interest (ω in equation (1)) again remains practically unchanged.

F. Alternative estimators and identifying assumptions

We also check our results employing alternative estimators and/or identifying assumptions. First, we use the GMM fixed effects panel data estimator proposed by Arellano and Bond (1991) with identifying assumptions regarding the endogeneity of some regressors similar to those used in the GMM regressions reported in Table 4, namely, allowing the bank fundamentals contained in vector R, plus $\Delta Deposits$, $\Delta IntRatePremium$, and $Size$ to be only sequentially exogenous (i.e., potentially correlated with the error term ε in some time periods). Specifically, by using suitable lagged values as instruments, we let bank fundamentals and size to be correlated with past shocks, thus allowing for feedback effects running from the change in deposits to those variables. Similarly, we let $\Delta Deposits$ and $\Delta IntRatePremium$ to be correlated with past as well as contemporaneous values of ε, thus accounting for the likely

simultaneous determination of the volume and price of deposits. We also rerun all regressions using the two-step GMM estimator instead of the one-step procedure reported in Table 4. Finally, we employ alternative identifying assumptions, such as allowing the bank fundamentals to be correlated with ε contemporaneously, as well. For the benefit of space, we do not report the results of these exercises. In all cases, our main inferences are not materially affected, though.

VI. Concluding remarks

When a too big to fail policy is in place, either formally or implicitly, there are fewer incentives for debt holders and depositors to discipline financial institutions, leading to an increase in moral hazard.

This study shows that the perception of an implicit too big to fail policy affects depositor behavior. Specifically, we analyze the reaction of Brazilian depositors to the international financial turmoil triggered by Lehman Brother's demise in September 2008. Taken together, our results indicate that depositors moved their funds to the largest banks of the country because depositors thought those banks would not be allowed to fail. The effect for uninsured deposits was larger than for total deposits. Likewise, the effect for certificates of deposits held by institutional investors was larger than for those held by non-financial firms. We find that depositors' response to bank fundamentals was relatively weak, which seem to support the view that a run may occur when depositors learn information from other banking systems, which serves as a noisy signal on domestic bank-specific information. Depositors feared for their funds and decided to run to where they believed was safe: the largest banks of the country, implicitly protected by the Federal Government and the Central Bank. This result is in line with some features of the bank runs model of Chen (1999) and Chen and Hassan (2008).

We also find that the presence of institutional investors seems to have played a role in the run in Brazil. Banks that depended on institutional investors for funding suffered more deposit outflows, not only from institutional investors themselves, but also from non-financial firms. This result indicates that some part of the run can be explained by incentives to withdraw depending on whether depositors fear others will withdraw first, which is in line with the evidence from mutual funds outflow found in Chen, Goldstein and Jiang (2010) and with some features of the model for bank runs of Goldstein and Pauzner (2005).

Taken together, our results indicate that, in the face of uncertainty, depositors considered the largest banks too big to fail and behaved consistently. This calls our attention to possible cross-border spillover effects caused by public policies in developed markets and to the need for improved market discipline. It also makes a strong case to the need of an international approach to bank resolution.

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Figure 1. Market Share of Certificates of Deposits (CDs)

The purple solid line shows the daily evolution of the market share of CDs of the big banks. The green dotted line shows the daily evolution of the market share of CDs of the other banks.

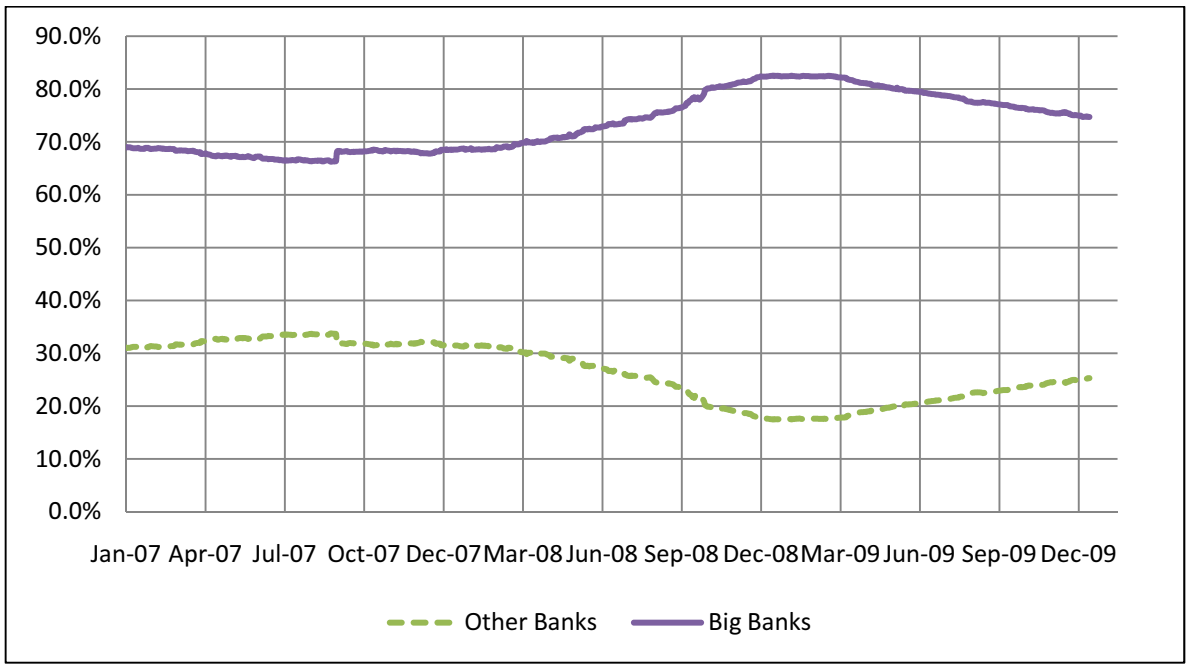
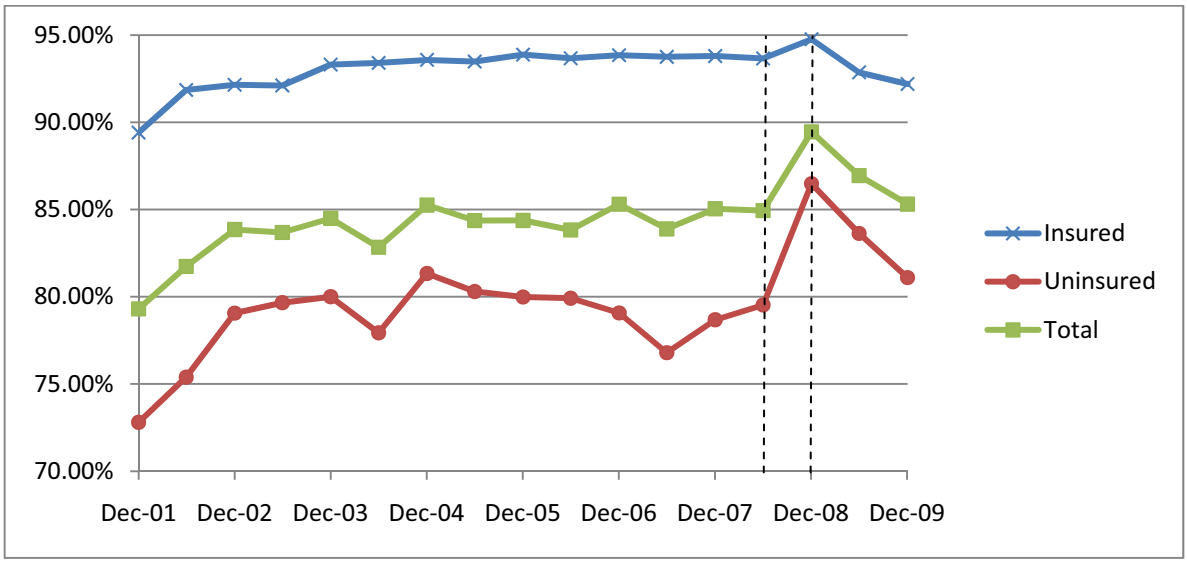


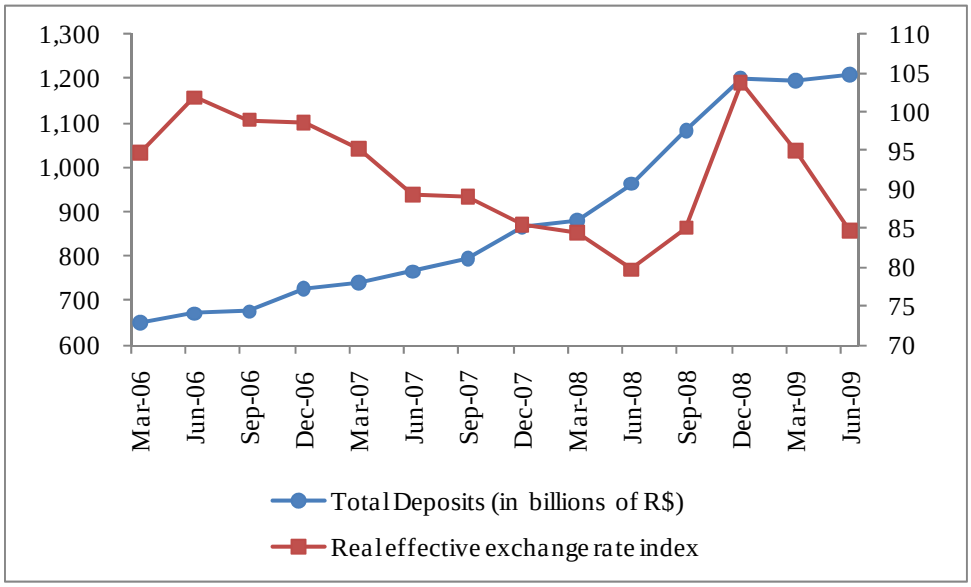
Figure 2. Total deposits market share of the set of Big Banks



Source: Central Bank of Brazil

Figure 3. Total Deposits and Real Effective Exchange Rate Index

The blue line shows the evolution of total deposits (in billions of BRL – left axis) and the real effective exchange rate index.



Source: Central Bank of Brazil

Figure 4. Multidimensional Scaling Configuration Graph

The graph below represents the Euclidian distances between banks in two-dimensional space as an approximation of the original distances computed for the following five variables (in standardized form): (i) total assets plus brokerage, (ii) total assets, (iii) total deposits, (iv) number of branches, and (v) number of clients.

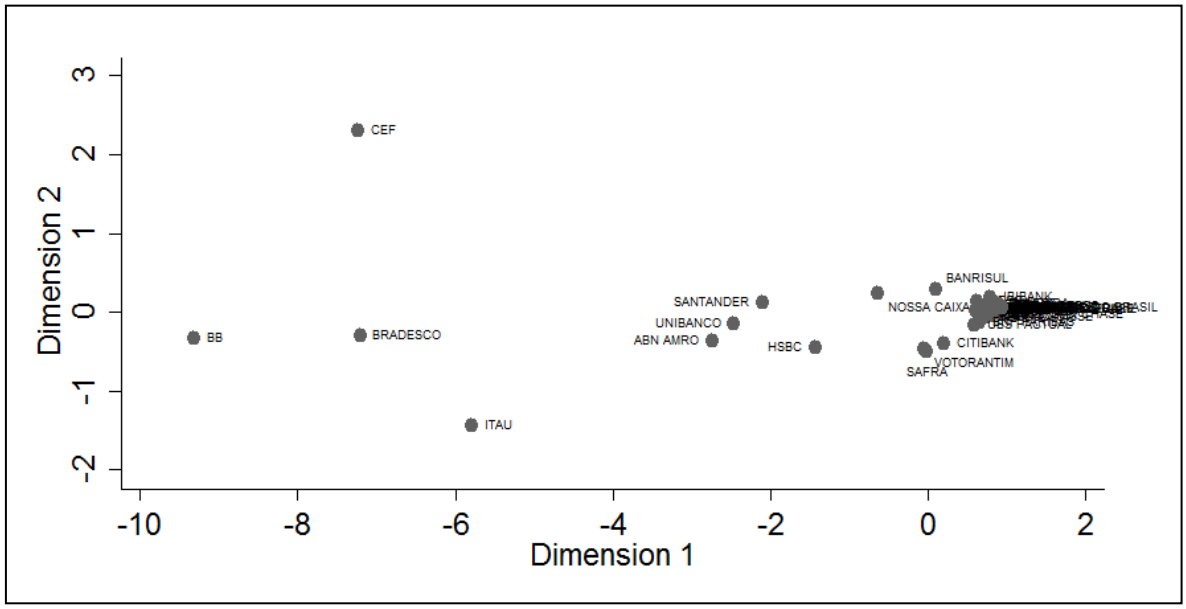


Table 1 – Big banks – Results from the cluster analysis

The groups shown in this table were suggested by the cluster analysis algorithms *K-means* and *K-medians*, setting the number of clusters to $k = 2$. Five variables were used for clustering: (i) total assets plus brokerage, (ii) total assets, (iii) total deposits, (iv) number of branches, and (v) number of clients. 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	Bank
Cluster 1 (Big Banks)	ABN AMRO BB 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 UBS Pactual Votorantim WestLB

Table 2 – Sample

Panel A – Distribution of deposits in the sample

Rows [A] to [E] show the proportion of each type of deposit in relation to total deposits in financial institutions of our sample as of December of each year from 2001 to 2009.

	Dec/ 2001	**Dec/ 2002**	**Dec/ 2003**	**Dec/ 2004**	**Dec / 2005**	**Dec/ 2006**	**Dec/ 2007**	**Dec/ 2008**	**Dec/ 2009**
[A] Checking account deposits	16%	18%	16%	16%	15%	16%	20%	14%	14%
[B] Savings deposits	34%	32%	31%	30%	26%	26%	27%	23%	26%
[C] Time Deposits	45%	46%	46%	48%	51%	50%	46%	56%	55%
[D] Interbank Deposits	2%	2%	3%	3%	3%	3%	3%	4%	3%
[E] Other Deposits	3%	3%	3%	4%	4%	5%	5%	4%	2%
[F] Total Deposits (**[A] + [B] + [C] + [D] +[E])**	100%	100%	100%	100%	100%	100%	100%	100%	100%

Panel B – Representativeness of sample

Row [A] shows the number of deposit-taking financial institutions as of December of each year from 2001 to 2009, while 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, while in row [D] we show the amount of deposits eligible for deposit insurance for the banks in our sample. In row [E], it is shown the proportion of deposits considered in this study relative to the overall deposits of the Brazilian Financial System.

	Dec/ 2001	**Dec/ 2002**	**Dec/ 2003**	**Dec/ 2004**	**Dec / 2005**	**Dec/ 2006**	**Dec/ 2007**	**Dec/ 2008**	**Dec/ 2009**
[A] Number of deposit-taking financial institutions	121	111	110	108	104	104	101	101	100
[B] Number of banks in the sample	74	71	68	65	64	61	60	57	53
[C] Total Deposits (billions of BRL)	313	365	400	470	546	624	740	1,003	1,252
[D] Total Deposits of sample (billions of BRL)	304	357	395	465	535	600	712	986	1,240
[E] Representativeness of sample ([D] / [C])	97.3	97.7	98.9	98.9	97.9	96.1	96.3	98.3	99.1

Table 3 – Summary statistics
Means and standard deviations (in brackets) are reported for Dec/2001, Jun/2008 and Dec/2009. Big banks are defined as in Section II-B.

	Dec/2001		**Jun/2008**		**Dec/2009**	
	Big banks	Other banks	Big banks	Other banks	Big banks	Other banks
Total assets (BRL Millions)	75,488	4,557	271,531	10,985	416,329	11,569
	[45,794]	[6,581]	[132,459]	[15,254]	[208,678]	[16,730]
Total equity (BRL Millions)	6,335	431	21,606	1.158	35,819	1,270
	[3,024]	[537]	[12,659]	[1.304]	[22,210]	[1,468]
# of depositors (thousands)	10,048	192	16,282	245	23,939	138
	[7,279]	[648]	[9,989]	[770]	[12,094]	[336]
Uninsured deposits / total deposits	58.6%	87.8%	62.98%	87.0%	61.8%	80.4%
	[13.8%]	[17.3%]	[15.5%]	[19.7%]	[14.1%]	[21.2%]
Equity ratio	9.7%	14.6%	8.54%	14.56%	9.8%	15.0%
	[4.3%]	[8.3%]	[1.97%]	[8.1%]	[5.6%]	[7.9%]
Low quality loans	2.6%	2.5%	2.3%	1.9%	3.2%	2.3%
	[0.7%]	[3.7%]	[0.3%]	[3.5%]	[0.5%]	[2.1%]
Liquidity	34.5%	32.5%	19.2%	27.0%	19.8%	27.8%
	[9.5%]	[19.2%]	[9.2%]	[16.4%]	[8.1%]	[18.3%]
Exposure to trade finance	-	-	10.4%	11.0%	8.1%	12.4%
			[4.7%]	[17.0%]	[4.5%]	[16.0%]
Exposure to middle market	-	-	34.8%	34.9%	43.9%	42.6%
			[4.7%]	[27.4%]	[4.9%]	[27.5%]
Foreign funding	10.71%	11.79%	4.4%	9.0%	2.5%	8.5%
	[6.1%]	[13.7%]	[2.1%]	[10.3%]	[1.8%]	[8.5%]
Reliance on institutional investors	0.9%	4.7%	3.6%	6.7%	1.6%	8.0%
	[0.9%]	[6.0%]	[3.6%]	[9.0%]	[1.6%]	[10.7%]
Deposit concentration (x1000)	0.00007	1.60	0.00005	0.49	0.00004	0.98
	[0.00005]	[8.10]	[0.00006]	[1.35]	[0.00006]	[3.65]
Observations	8	66	8	51	6	46
Exchange Rate (BRL/USD)	2.32		2.34		1.74	

Table 4 – Change in deposits, financial crisis and big banks

This table shows the results of the estimation of equation (1) for the change in uninsuredand total deposits using the pooled ordinary least squares (POLS) and (one-step) system GMM estimators. In the GMM regressions, we allow all variables 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 dummy; and Big Bank x Crisis*. Coefficient estimates and autocorrelation/heteroskedasticity-robust t-tests are shown in parentheses. Estimates for the time dummies and MechChange (see Appendix) are omitted. D stands for first difference and L stands for first lag. Variables interacted with the crisis dummy are lagged according to the variable that appears without interaction (for example, *equity ratio x crisis* is the interaction of the crisis dummy with the first lag of the equity ratio, since equity ratio, by itself, is also in first lag). *, ** and *** indicate statistical significance at 10%, 5% and 1% respectively.

		Uninsured Deposits		Total Deposits	
		(1)	(2)	(3)	(4)
		OLS	GMM-Sys	OLS	GMM-Sys
Variables of interest					
Crisis dummy		-0.265	-0.266		-0.216
		(-1.545)	(-1.549)		(-1.254)
Size		0.000	0.000	-0.003	-0.003
		(0.041)	(0.042)	(-0.363)	(-0.361)
Big bank dummy		-0.011	-0.010	-0.012	-0.012
		(-0.337)	(-0.325)	(-0.399)	(-0.384)
Big bank x crisis		0.448***	0.447***	0.358***	0.358***
		(3.671)	(3.648)	(3.492)	(3.465)
Control Variables					
Change in uninsured deposits	L	0.038	0.037		
		(0.663)	(0.632)		
Change in total deposits	L			0.048	0.047
				(0.858)	(0.821)
Premium paid on deposits	D	-0.787	-1.100	-0.817	-1.181
		(-0.542)	(-0.784)	(-0.570)	(-0.847)
Equity ratio	L	0.320	0.320	0.284	0.285
		(1.620)	(1.621)	(1.463)	(1.462)
Low quality loans	L	0.099	0.094	-0.236	-0.242
		(0.173)	(0.164)	(-0.423)	(-0.436)
Liquidity	L	0.011	0.011	-0.003	-0.003
		(0.174)	(0.168)	(-0.042)	(-0.050)
Regional economic activity		0.246	0.253	0.050	0.059
		(0.755)	(0.757)	(0.186)	(0.211)
Equity ratio x crisis		-0.675	-0.675	-0.950	-0.950
		(-1.016)	(-1.019)	(-1.457)	(-1.462)
Low quality loans x crisis		-1.702	-1.694	-1.818	-1.809
		(-0.453)	(-0.452)	(-0.497)	(-0.496)
Liquidity x crisis		0.394	0.391	0.381	0.378
		(1.031)	(1.025)	(1.010)	(1.003)
Constant		0.040	0.041	0.154	0.155
		(0.221)	(0.226)	(0.908)	(0.914)
Observations		858	858	858	858
R-squared		0.102		0.085	
F		4.702	4.731	3.494	3.474
F_p		.	5.68e-08	.	1.42e-05
hansen		.	56.63	.	47.00
hansenp		.	1	.	1
# of cross sections			75		75

Table 5 – Exposure to trade finance and middle market loans

This table shows the results of the estimation of equation (1) for the change in uninsured and total deposits using the pooled ordinary least squares (POLS) and (one-step) system GMM estimators. In the GMM regressions, we allow all variables 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 dummy; and Big Bank x Crisis*. Coefficient estimates and autocorrelation/heteroskedasticity-robust t-tests are shown in parentheses. Estimates for the time dummies and MechChange (see Appendix) are omitted. D stands for first difference and L stands for first lag. Variables interacted with the crisis dummy are lagged according to the variable that appears without interaction (for example, *equity ratio x crisis* is the interaction of the crisis dummy with the first lag of the equity ratio, since equity ratio, by itself, is also in first lag). *, ** and *** indicate statistical significance at 10%, 5% and 1% respectively.

		Uninsured Deposits		Total Deposits	
		(1)	(2)	(3)	(4)
		OLS	GMM-Sys	OLS	GMM-Sys
Variables of interest					
Crisis dummy		-0.204	-0.377**	-0.132	-0.296*
		(-1.176)	(-2.137)	(-0.772)	(-1.670)
Size		0.001	0.001	-0.002	-0.002
		(0.110)	(0.110)	(-0.183)	(-0.183)
Big bank dummy		-0.007	-0.007	-0.011	-0.011
		(-0.199)	(-0.190)	(-0.328)	(-0.317)
Big bank x crisis		0.482***	0.482***	0.381***	0.381***
		(3.680)	(3.654)	(3.430)	(3.400)
Control variables					
Exposure to trade finance	L	-0.026	-0.026	-0.038	-0.037
		(-0.966)	(-0.955)	(-1.427)	(-1.415)
Exposure to middle market	L	0.033	0.033	0.023	0.022
		(0.956)	(0.953)	(0.670)	(0.664)
Trade finance x crisis		0.158	0.157	0.132	0.131
		(1.316)	(1.316)	(1.101)	(1.098)
Middle market x crisis		-0.145	-0.145	-0.167	-0.167
		(-1.334)	(-1.339)	(-1.556)	(-1.562)
Change in uninsured deposits	L	0.039	0.039		
		(0.671)	(0.668)		
Change in total deposits	L			0.048	0.049
				(0.860)	(0.855)
Premium paid on deposits	D	-0.732	-1.110	-0.764	-1.219
		(-0.506)	(-0.768)	(-0.537)	(-0.853)
Equity ratio	L	0.295	0.294	0.265	0.264
		(1.538)	(1.531)	(1.424)	(1.415)
Low quality loans	L	-0.018	-0.018	-0.392	-0.392
		(-0.032)	(-0.032)	(-0.708)	(-0.710)
Liquidity	L	0.001	0.000	-0.015	-0.016
		(0.020)	(0.007)	(-0.231)	(-0.247)
Regional economic activity		0.200	0.202	0.028	0.028
		(0.615)	(0.609)	(0.102)	(0.100)
Equity ratio x crisis		-0.296	-0.295	-0.591	-0.590
		(-0.427)	(-0.427)	(-0.864)	(-0.865)
Low quality loans x crisis		-0.808	-0.816	-1.390	-1.400
		(-0.218)	(-0.221)	(-0.380)	(-0.383)
Liquidity x crisis		0.546	0.544	0.503	0.501
		(1.462)	(1.459)	(1.345)	(1.342)
Constant		-0.133	0.041	-0.015	0.150
		(-0.751)	(0.215)	(-0.089)	(0.824)
Observations		858	858	858	858
R-squared		0.108		0.091	
F		4.723	4.700	3.216	3.203
F-p		.	2.53e-08	.	2.54e-05
Hansen		.	44.27	.	42.62
Hansen-p		.	1	.	1
# of cross sections			75		75

Table 6 – Exposure to foreign funding

This table shows the results of the estimation of equation (1) for the change in uninsured and total deposits using the pooled ordinary least squares (POLS) and (one-step) system GMM estimators. In the GMM regressions, we allow all variables 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 dummy; and Big Bank x Crisis*. Coefficient estimates and autocorrelation/heteroskedasticity-robust t-tests are shown in parentheses. Estimates for the time dummies and *mechanical change in deposits* (see Appendix) are omitted. D stands for first difference and L stands for first lag. Variables interacted with the crisis dummy are lagged according to the variable that appears without interaction (for example, *equity ratio x crisis* is the interaction of the crisis dummy with the first lag of the equity ratio, since equity ratio, by itself, is also in first lag). *, ** and *** indicate statistical significance at 10%, 5% and 1% respectively.

		Uninsured Deposits		Total Deposits	
		(1)	(2)	(3)	(4)
		OLS	GMM-Sys	OLS	GMM-Sys
Variables of interest					
Crisis dummy		-0.328*	-0.329*		-0.309*
		(-1.982)	(-1.991)		(-1.949)
Size		0.000	0.000	-0.003	-0.004
		(0.034)	(0.037)	(-0.355)	(-0.388)
Big bank dummy		-0.013	-0.013	-0.014	-0.013
		(-0.383)	(-0.380)	(-0.428)	(-0.402)
Big bank x crisis		0.474***	0.474***	0.380***	0.380***
		(3.861)	(3.842)	(3.684)	(3.653)
Control variables					
Foreign funding	L	-0.081	-0.082	-0.066	-0.063
		(-0.635)	(-0.642)	(-0.513)	(-0.484)
Foreign funding x crisis		0.811	0.807	0.685	0.666
		(1.524)	(1.520)	(1.275)	(1.244)
Change in uninsured deposits	L	0.037	0.037		
		(0.649)	(0.649)		
Change in total deposits	L			0.047	0.039
				(0.840)	(0.740)
Premium paid on deposits	D	-0.777	-1.007	-0.808	-1.199
		(-0.534)	(-0.704)	(-0.563)	(-0.840)
Equity ratio	L	0.318	0.318	0.283	0.277
		(1.580)	(1.575)	(1.433)	(1.404)
Low quality loans	L	0.029	0.026	-0.296	-0.339
		(0.048)	(0.044)	(-0.512)	(-0.588)
Liquidity	L	0.007	0.006	-0.006	-0.010
		(0.105)	(0.092)	(-0.095)	(-0.149)
Regional economic activity		0.171	0.184	-0.013	0.056
		(0.503)	(0.532)	(-0.046)	(0.193)
Equity ratio x crisis		-0.832	-0.830	-1.083*	-1.076*
		(-1.326)	(-1.325)	(-1.739)	(-1.726)
Low quality loans x crisis		-0.789	-0.790	-1.044	-0.992
		(-0.213)	(-0.214)	(-0.292)	(-0.278)
Liquidity x crisis		0.410	0.410	0.395	0.394
		(1.130)	(1.129)	(1.096)	(1.089)
Constant		0.060	0.059	0.171	0.209
		(0.328)	(0.328)	(1.002)	(1.258)
Observations		858	858	858	858
R-squared		0.108		0.091	
F		4.723	4.700	3.216	3.203
F_p		.	2.53e-08	.	2.54e-05
hansen		.	44.27	.	42.62
hansenp		.	1	.	1
# of cross sections			75		75

Table 7 – Deposit concentration

This table shows the results of the estimation of equation (1) for the change in uninsuredand total deposits using the pooled ordinary least squares (POLS) and (one-step) system GMM estimators. In the GMM regressions, we allow all variables 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 dummy; and Big Bank x Crisis*. Coefficient estimates and autocorrelation/heteroskedasticity-robust t-tests are shown in parentheses. Estimates for the time dummies and *mechanical change in deposits* (see Appendix) are omitted. D stands for first difference and L stands for first lag. Variables interacted with the crisis dummy are lagged according to the variable that appears without interaction (for example, *equity ratio x crisis* is the interaction of the crisis dummy with the first lag of the equity ratio, since equity ratio, by itself, is also in first lag). *, ** and *** indicate statistical significance at 10%, 5% and 1% respectively.

		Uninsured Deposits		Total Deposits	
		(1)	(2)	(3)	(4)
		OLS	GMM-Sys	OLS	GMM-Sys
Variables of interest					
Crisis dummy			-0.426		-0.453*
			(-1.627)		(-1.694)
Size		-0.006	-0.006	-0.010	-0.010
		(-0.598)	(-0.618)	(-0.968)	(-0.970)
Big bank dummy		-0.033	-0.033	-0.031	-0.031
		(-0.850)	(-0.841)	(-0.858)	(-0.851)
Big bank x crisis		0.396***	0.393***	0.261**	0.259**
		(2.673)	(2.648)	(2.070)	(2.052)
Control variables					
Deposit concentration	L	-0.007	-0.007	-0.006	-0.006
		(-1.254)	(-1.269)	(-1.234)	(-1.244)
Deposit concentration x crisis		-0.012	-0.013	-0.021	-0.022
		(-0.594)	(-0.625)	(-1.062)	(-1.081)
Change in uninsured deposits	L	0.040	0.038		
		(0.686)	(0.657)		
Change in total deposits	L			0.049	0.050
				(0.866)	(0.866)
Premium paid on deposits	D	-0.832	-1.373	-0.868	-1.358
		(-0.575)	(-0.954)	(-0.608)	(-0.952)
Equity ratio	L	0.352*	0.348*	0.311	0.309
		(1.686)	(1.666)	(1.512)	(1.502)
Low quality loans	L	-0.232	-0.257	-0.546	-0.550
		(-0.373)	(-0.414)	(-0.937)	(-0.945)
Liquidity	L	-0.004	-0.007	-0.018	-0.019
		(-0.062)	(-0.106)	(-0.264)	(-0.288)
Regional economic activity		0.259	0.299	0.087	0.099
		(0.769)	(0.880)	(0.318)	(0.355)
Equity ratio x crisis		-0.413	-0.399	-0.530	-0.523
		(-0.582)	(-0.563)	(-0.749)	(-0.742)
Low quality loans x crisis		-3.019	-3.037	-3.929	-3.947
		(-0.735)	(-0.740)	(-0.983)	(-0.989)
Liquidity x crisis		0.354	0.351	0.314	0.312
		(0.920)	(0.915)	(0.842)	(0.838)
Constant		-0.318	0.100	-0.250	0.200
		(-0.998)	(0.541)	(-0.796)	(1.138)
Observations		858	858	858	858
R-squared		0.105		0.088	
F		5.294	5.475	4.035	3.975
F-p		.	2.35e-09	.	1.07e-06
Hansen		.	47.67	.	55.31
Hansen-p		.	1	.	1
# of cross sections			75		75

Table 8 – Reliance on institutional investors for funding

This table shows the results of the estimation of equation (1) for the change in uninsured and total deposits using the pooled ordinary least squares (POLS) and (one-step) system GMM estimators. In the GMM regressions, we allow all variables 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 dummy; and Big Bank x Crisis*. Coefficient estimates and autocorrelation/heteroskedasticity-robust t-tests are shown in parentheses. Estimates for the time dummies and *mechanical change in deposits* (see Appendix) are omitted. D stands for first difference and L stands for first lag. Variables interacted with the crisis dummy are lagged according to the variable that appears without interaction (for example, *equity ratio x crisis* is the interaction of the crisis dummy with the first lag of the equity ratio, since equity ratio, by itself, is also in first lag). *, ** and *** indicate statistical significance at 10%, 5% and 1% respectively.

		Uninsured Deposits		Total Deposits	
		(1)	(2)	(3)	(4)
		OLS	GMM-Sys	OLS	GMM-Sys
Variables of interest					
Crisis dummy		-0.352**	-0.353**	-0.298**	-0.300**
		(-2.502)	(-2.511)	(-2.141)	(-2.151)
Size		-0.006	-0.006	-0.009	-0.009
		(-0.608)	(-0.607)	(-0.959)	(-0.958)
Big bank dummy		-0.000	0.000	-0.002	-0.002
		(-0.007)	(0.004)	(-0.071)	(-0.059)
Big bank x crisis		0.381***	0.381***	0.292***	0.292***
		(3.594)	(3.560)	(3.361)	(3.325)
Control variables					
Reliance on institutional investors	L	-0.193	-0.196	-0.145	-0.148
		(-1.215)	(-1.229)	(-0.888)	(-0.904)
Reliance on inst. investors x crisis		-2.884***	-2.876***	-2.867***	-2.859***
		(-6.277)	(-6.283)	(-6.252)	(-6.259)
Change in uninsured deposits	L	0.044	0.045		
		(0.764)	(0.768)		
Change in total deposits	L			0.055	0.055
				(0.970)	(0.972)
Premium paid on deposits	D	-0.648	-1.054	-0.676	-1.114
		(-0.447)	(-0.741)	(-0.474)	(-0.792)
Equity ratio	L	0.336	0.335	0.289	0.288
		(1.657)	(1.649)	(1.466)	(1.457)
Low quality loans	L	0.269	0.267	-0.090	-0.093
		(0.469)	(0.466)	(-0.162)	(-0.166)
Liquidity	L	-0.005	-0.006	-0.015	-0.017
		(-0.065)	(-0.083)	(-0.219)	(-0.239)
Regional economic activity		0.392	0.398	0.193	0.202
		(1.286)	(1.278)	(0.769)	(0.785)
Equity ratio x crisis		0.945	0.943	0.648	0.647
		(1.458)	(1.459)	(1.023)	(1.023)
Low quality loans x crisis		0.105	0.105	-0.031	-0.030
		(0.053)	(0.053)	(-0.016)	(-0.015)
Liquidity x crisis		0.467*	0.465*	0.449*	0.448*
		(1.813)	(1.809)	(1.785)	(1.780)
Constant		0.126	0.127	0.230	0.231
		(0.703)	(0.713)	(1.345)	(1.353)
Observations		852	852	852	852
R-squared		0.132		0.115	
F		13.17	13.26	14.35	14.52
F-p		.	0	.	0
Hansen		.	50.42	.	44.62
Hansen-p		.	1	.	1
# of cross sections			73		73

Table 9 – The effect of government-owned banks

This table shows the results of the estimation of equation (1) for the change in uninsured and total deposits using the pooled ordinary least squares (POLS) and (one-step) system GMM estimators. In the GMM regressions, we allow all variables 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 dummy; and Big Bank x Crisis*. Coefficient estimates and autocorrelation/heteroskedasticity-robust t-tests are shown in parentheses. Estimates for the time dummies and MechChange (see Appendix) are omitted. D stands for first difference and L stands for first lag. Variables interacted with the crisis dummy are lagged according to the variable that appears without interaction (for example, *equity ratio x crisis* is the interaction of the crisis dummy with the first lag of the equity ratio, since equity ratio, by itself, is also in first lag). *, ** and *** indicate statistical significance at 10%, 5% and 1% respectively.

		Uninsured Deposits		Total Deposits	
		(1)	(2)	(3)	(4)
		OLS	GMM-Sys	OLS	GMM-Sys
Variables of interest					
Crisis dummy		-0.268	-0.268	-0.217	-0.218
		(-1.588)	(-1.590)	(-1.281)	(-1.284)
Size		0.000	0.000	-0.003	-0.003
		(0.021)	(0.021)	(-0.360)	(-0.358)
Big bank dummy		-0.010	-0.010	-0.011	-0.011
		(-0.322)	(-0.312)	(-0.364)	(-0.351)
Big bank x crisis		0.417***	0.417***	0.328***	0.328***
		(3.581)	(3.568)	(3.236)	(3.223)
Control variables					
Government-ownedbank dummy		0.001	0.001	-0.023	-0.023
		(0.041)	(0.052)	(-1.206)	(-1.193)
Government-owned bank x crisis		0.166	0.165	0.180*	0.180*
		(1.652)	(1.656)	(1.962)	(1.966)
Change in uninsured deposits	L	0.037	0.036		
		(0.637)	(0.612)		
Change in total deposits	L			0.047	0.046
				(0.839)	(0.802)
Premium paid on deposits	D	-0.763	-1.014	-0.768	-1.055
		(-0.528)	(-0.724)	(-0.539)	(-0.757)
Equity ratio	L	0.319	0.319	0.265	0.266
		(1.581)	(1.583)	(1.362)	(1.364)
Low quality loans	L	0.086	0.080	-0.079	-0.086
		(0.139)	(0.129)	(-0.129)	(-0.142)
Liquidity	L	0.010	0.009	0.019	0.019
		(0.131)	(0.124)	(0.263)	(0.256)
Regional economic activity		0.321	0.324	0.161	0.165
		(0.994)	(0.980)	(0.604)	(0.606)
Equity ratio x crisis		-0.460	-0.461	-0.729	-0.730
		(-0.654)	(-0.657)	(-1.055)	(-1.058)
Low quality loans x crisis		-3.148	-3.139	-3.340	-3.328
		(-0.826)	(-0.824)	(-0.898)	(-0.895)
Liquidity x crisis		0.247	0.246	0.221	0.219
		(0.601)	(0.599)	(0.541)	(0.537)
Constant		0.036	0.037	0.139	0.140
		(0.197)	(0.203)	(0.813)	(0.821)
Observations		858	858	858	858
R-squared		0.104		0.087	
F		4.570	4.540	3.617	3.567
F-p		.	7.72e-08	.	6.54e-06
Hansen		.	54.61	.	54.39
Hansen-p		.	1	.	1
# of cross sections			75		75

Table 10 – The effect on big government-owned banks (excluding privately-owned banks from the sample)

This table shows the results of the estimation of equation (1) for the change in uninsured and total deposits using the pooled ordinary least squares (POLS) and (one-step) system GMM estimators. In the GMM regressions, we allow all variables 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 Government-Owned Bank; and Big Government-Owned Bank x Crisis.* Coefficient estimates and autocorrelation/heteroskedasticity-robust t-tests are shown in parentheses. Estimates for the time dummies and MechChange (see Appendix) are omitted. D stands for first difference and L stands for first lag. Variables interacted with the crisis dummy are lagged according to the variable that appears without interaction (for example, *equity ratio x crisis* is the interaction of the crisis dummy with the first lag of the equity ratio, since equity ratio, by itself, is also in first lag). *, ** and *** indicate statistical significance at 10%, 5% and 1% respectively.

		Uninsured Deposits		Total Deposits	
		(1)	(2)	(3)	(4)
		OLS	GMM-Sys	OLS	GMM-Sys
Variables of interest					
Crisis dummy		-0.278	-0.299*	-0.226	-0.226
		(-1.586)	(-1.806)	(-1.281)	(-1.292)
Size		0.001	0.001	-0.003	-0.003
		(0.122)	(0.105)	(-0.290)	(-0.289)
Big government-owned bank dummy		-0.024	-0.023	-0.019	-0.019
		(-0.724)	(-0.713)	(-0.620)	(-0.602)
Big gov. bank x crisis		0.455**	0.457**	0.342**	0.342**
		(2.314)	(2.286)	(2.136)	(2.101)
Control Variables					
Change in uninsured deposits	L	0.045	0.040		
		(0.733)	(0.674)		
Change in total deposits	L			0.056	0.056
				(0.948)	(0.921)
Premium paid on deposits	D	-0.832	-1.352	-0.825	-1.272
		(-0.552)	(-0.913)	(-0.553)	(-0.866)
Equity ratio	L	0.321	0.318	0.285	0.284
		(1.588)	(1.571)	(1.432)	(1.428)
Low quality loans	L	0.076	0.053	-0.252	-0.256
		(0.129)	(0.091)	(-0.442)	(-0.452)
Liquidity	L	0.009	0.007	-0.004	-0.005
		(0.135)	(0.104)	(-0.058)	(-0.073)
Regional economic activity		0.252	0.283	0.049	0.052
		(0.770)	(0.854)	(0.181)	(0.189)
Equity ratio x crisis		-0.699	-0.698	-0.972	-0.975
		(-1.039)	(-1.043)	(-1.474)	(-1.485)
Low quality loans x crisis		-1.701	-1.684	-1.786	-1.782
		(-0.445)	(-0.443)	(-0.480)	(-0.480)
Liquidity x crisis		0.402	0.396	0.394	0.391
		(1.021)	(1.009)	(1.016)	(1.010)
Constant		0.040	0.062	0.153	0.156
		(0.218)	(0.343)	(0.875)	(0.891)
Observations		776	776	776	776
R-squared		0.109		0.095	
F		6.438	5.893	5.506	5.502
F-p		.	2.87e-09	.	1.08e-08
Hansen		.	47.68	.	44.31
Hansen-p		.	1	.	1
# of cross sections			67		67

Table 11 – The effect on big privately-owned banks (excluding government-owned banks from the sample)

This table shows the results of the estimation of equation (1) for the change in uninsured and total deposits using the pooled ordinary least squares (POLS) and (one-step) system GMM estimators. In the GMM regressions, we allow all variables 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 Government-Owned Bank; and Big Government-Owned Bank x Crisis.* Coefficient estimates and autocorrelation/heteroskedasticity-robust t-tests are shown in parentheses. Estimates for the time dummies and MechChange (see Appendix) are omitted. D stands for first difference and L stands for first lag. Variables interacted with the crisis dummy are lagged according to the variable that appears without interaction (for example, *equity ratio x crisis* is the interaction of the crisis dummy with the first lag of the equity ratio, since equity ratio, by itself, is also in first lag). *, ** and *** indicate statistical significance at 10%, 5% and 1% respectively.

		Uninsured Deposits		Total Deposits	
		(1)	(2)	(3)	(4)
		OLS	GMM-Sys	OLS	GMM-Sys
Variables of interest					
Crisis dummy		-0.281	-0.283	-0.230	-0.232
		(-1.592)	(-1.602)	(-1.294)	(-1.305)
Size		0.000	0.000	-0.003	-0.003
		(0.034)	(0.037)	(-0.372)	(-0.368)
Big private bank dummy		-0.007	-0.006	-0.010	-0.010
		(-0.204)	(-0.191)	(-0.308)	(-0.295)
Big private bank x crisis		0.451***	0.450***	0.380***	0.379***
		(3.885)	(3.882)	(3.800)	(3.797)
Control Variables					
Change in uninsured deposits	L	0.039	0.038		
		(0.671)	(0.640)		
Change in total deposits	L			0.051	0.049
				(0.892)	(0.855)
Premium paid on deposits	D	-0.786	-1.193	-0.800	-1.230
		(-0.539)	(-0.841)	(-0.555)	(-0.872)
Equity ratio	L	0.314	0.314	0.281	0.281
		(1.581)	(1.579)	(1.437)	(1.435)
Low quality loans	L	0.111	0.105	-0.232	-0.240
		(0.193)	(0.183)	(-0.414)	(-0.429)
Liquidity	L	0.014	0.013	-0.002	-0.002
		(0.204)	(0.192)	(-0.024)	(-0.036)
Regional economic activity		0.252	0.266	0.053	0.066
		(0.770)	(0.797)	(0.196)	(0.240)
Equity ratio x crisis		-0.687	-0.687	-0.964	-0.963
		(-1.034)	(-1.038)	(-1.478)	(-1.483)
Low quality loans x crisis		-1.602	-1.592	-1.701	-1.691
		(-0.420)	(-0.419)	(-0.459)	(-0.457)
Liquidity x crisis		0.455	0.453	0.436	0.434
		(1.127)	(1.123)	(1.092)	(1.088)
Constant		0.039	0.039	0.154	0.155
		(0.215)	(0.217)	(0.901)	(0.905)
Observations		829	829	829	829
R-squared		0.101		0.086	
F		5.137	5.250	4.230	4.228
F-p		.	1.06e-08	.	7.30e-07
Hansen		.	50.19	.	54.36
Hansen-p		.	1	.	1
# of cross sections			72		72

Table 12 – Institutional investors, corporations and individuals

This table shows the results of the estimation of equation (1) for the change in the amount of certificates of deposits held by institutional investors (specifications 1 to 4), non-financial firms (5 to 8) and individuals (9 to 12) using (one-step) system GMM estimators, in which we allow all variables 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 dummy; and Big Bank x Crisis*. Coefficient estimates and autocorrelation/heteroskedasticity-robust t-tests are shown in parentheses. Estimates for the following variables are omitted: the first lag of the dependent variable, time dummies, premium paid on deposits (lagged difference) and *mechanical change in deposits* (see Appendix) and the intercept. D stands for first difference and L stands for first lag. Variables interacted with the crisis dummy are lagged according to the variable that appears without interaction (for example, *equity ratio x crisis* is the interaction of the crisis dummy with the first lag of the equity ratio, since equity ratio, by itself, is also in first lag). *, ** and *** indicate statistical significance at 10%, 5% and 1% respectively.

		Institutional investors				Non-financial firms				Individuals			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Variables of interest													
Crisis dummy		0.189	-0.518	0.132	-0.001	0.189	-0.134	-0.117	-0.227	0.246*	0.296	0.223	0.242*
		(0.439)	(-1.366)	(0.285)	(-0.003)	(0.439)	(-0.625)	(-0.620)	(-1.444)	(1.734)	(1.546)	(1.599)	(1.703)
Size		-0.008	-0.007	-0.010	-0.019	-0.020	-0.019	-0.020	-0.019	0.001	-0.001	0.001	0.002
		(-0.537)	(-0.442)	(-0.653)	(-1.108)	(-1.594)	(-1.461)	(-1.575)	(-1.449)	(0.080)	(-0.047)	(0.069)	(0.168)
Big bank dummy		0.086	0.091	0.096	0.101*	0.064	0.060	0.066	0.070	0.055	0.061	0.055	0.056
		(1.545)	(1.486)	(1.612)	(1.675)	(1.459)	(1.339)	(1.472)	(1.554)	(1.189)	(1.320)	(1.121)	(1.194)
Big bank x crisis		0.722**	0.978***	0.750**	0.577*	0.451***	0.449***	0.444***	0.403***	0.163	0.116	0.172	0.154
		(2.094)	(2.854)	(2.130)	(1.896)	(3.055)	(2.830)	(2.964)	(2.736)	(1.361)	(0.888)	(1.426)	(1.274)
Control variables													
Equity ratio	L	1.128***	1.084***	1.116***	1.264***	-0.107	-0.099	-0.109	-0.197	-0.010	-0.021	-0.013	-0.057
		(4.082)	(3.819)	(3.985)	(4.076)	(-0.436)	(-0.411)	(-0.441)	(-0.810)	(-0.066)	(-0.128)	(-0.080)	(-0.369)
Low quality loans	L	-0.990	-1.348	-0.885	-0.767	0.274	0.213	0.307	0.138	-0.070	-0.019	-0.089	-0.124
		(-1.066)	(-1.474)	(-0.909)	(-0.761)	(0.429)	(0.336)	(0.471)	(0.215)	(-0.173)	(-0.048)	(-0.224)	(-0.325)
Liquidity	L	0.018	-0.005	0.026	-0.031	0.108	0.107	0.110	0.126	0.018	0.021	0.016	0.030
		(0.140)	(-0.037)	(0.203)	(-0.231)	(1.354)	(1.313)	(1.441)	(1.469)	(0.357)	(0.410)	(0.318)	(0.577)
Regional economic activity		-0.499	-0.688	-0.553	-0.120	0.420	0.411	0.432	0.557*	0.204	0.158	0.180	0.236
		(-0.712)	(-0.952)	(-0.770)	(-0.175)	(1.407)	(1.281)	(1.409)	(1.888)	(1.069)	(0.793)	(0.949)	(1.233)
Equity ratio x crisis		-2.190	-0.939	-2.398	1.097	-0.643	-0.588	-0.603	0.408	-0.953	-0.620	-1.006	-0.770
		(-1.419)	(-0.616)	(-1.629)	(0.674)	(-0.836)	(-0.718)	(-0.793)	(0.603)	(-1.449)	(-0.992)	(-1.482)	(-1.295)
Low quality loans x crisis		-5.408	2.345	-4.386	-1.650	0.055	-0.130	-0.191	1.318	-1.023	-2.342	-0.696	-0.821
		(-0.630)	(0.294)	(-0.489)	(-0.333)	(0.020)	(-0.046)	(-0.069)	(0.465)	(-0.548)	(-0.848)	(-0.359)	(-0.413)
Liquidity x crisis		-0.790	0.033	-0.779	-0.625	0.208	0.221	0.202	0.220	0.012	0.024	0.017	0.005
		(-0.852)	(0.043)	(-0.843)	(-0.795)	(0.557)	(0.555)	(0.549)	(0.683)	(0.061)	(0.089)	(0.087)	(0.025)
Other variables													
Exposure to trade finance			-0.110**				-0.021				0.014		
			(-2.195)				(-0.606)				(0.528)		
Exposure to middle			0.013				-0.023				0.010		

market												
		(0.205)				(-0.603)				(0.427)		
Trade finance x crisis		0.854***				0.016				-0.018		
		(3.199)				(0.144)				(-0.176)		
Middle market x crisis		-0.197				-0.046				-0.239***		
		(-0.818)				(-0.452)				(-2.802)		
Foreign funding			0.098				0.035				-0.020	
			(0.491)				(0.208)				(-0.151)	
Foreign Funding x crisis			0.856				-0.218				0.287	
			(0.798)				(-0.434)				(0.781)	
Reliance on instit. investors				-0.660*				0.278				0.163
				(-1.885)				(1.076)				(1.140)
Instit. Investors x crisis				-5.743***				-2.059***				-0.401
				(-5.554)				(-3.966)				(-0.750)
Observations	949	949	949	949	949	949	949	949	949	949	949	949
F	4.491	5.986	3.971	11.15	7.697	8.134	8.361	9.256	9.267	10.87	8.773	8.857
F-p	1.66e-07	1.76e-10	9.72e-07	0	0	0	0	0	0	0	0	0
Hansen	40.96	47.95	41.37	43.70	52.27	47.99	50.36	50.22	42.12	38.78	38.95	44.19
hansenp	1	1	1	1	1	1	1	1	1	1	1	1
# of cross sections	74	74	74	74	74	74	74	74	74	74	74	74

Table 13 – Change in deposits, post-financial crisis and big banks

This table shows the results of the estimation of equation (1) for the change in uninsured and total deposits using the pooled ordinary least squares (POLS) and (one-step) system GMM estimators. In the GMM regressions, we allow all variables 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 dummy; Big Bank x Crisis and Big Bank x Post-Crisis*. Coefficient estimates and autocorrelation/heteroskedasticity-robust t-tests are shown in parentheses. Estimates for the time dummies and *mechanical change in deposits* (see Appendix) are omitted. D stands for first difference and L stands for first lag. Variables interacted with the crisis dummy and the post-crisis dummy are lagged according to the variable that appears without interaction (for example, *equity ratio x crisis* is the interaction of the crisis dummy with the first lag of the equity ratio, since equity ratio, by itself, is also in first lag). *, ** and *** indicate statistical significance at 10%, 5% and 1% respectively.

		Uninsured Deposits		Total Deposits	
		(1)	(2)	(3)	(4)
		OLS	GMM-Sys	OLS	GMM-Sys
Variables of interest					
Crisis dummy		-0.191	-0.398***	-0.142	-0.324**
		(-1.438)	(-2.989)	(-1.086)	(-2.429)
Post-Crisis dummy		0.119	-0.088	0.054	-0.128
		(1.071)	(-0.878)	(0.509)	(-1.398)
Size		-0.009	-0.009	-0.012	-0.012
		(-1.016)	(-1.014)	(-1.366)	(-1.364)
Big bank dummy		0.024	0.024	0.019	0.019
		(0.729)	(0.735)	(0.570)	(0.577)
Big bank x crisis		0.366***	0.366***	0.280***	0.281***
		(3.485)	(3.454)	(3.236)	(3.203)
Big bank x post-crisis		-0.150*	-0.149*	-0.134**	-0.133*
		(-1.876)	(-1.859)	(-1.994)	(-1.971)
Control variables					
Rel.on institutional investors	L	-0.276	-0.279*	-0.282*	-0.285*
		(-1.657)	(-1.673)	(-1.743)	(-1.761)
Rel. on inst. investors x crisis		-2.811***	-2.802***	-2.736***	-2.728***
		(-5.990)	(-5.993)	(-5.854)	(-5.856)
Rel. on inst. investors x post-crisis	L	0.976**	0.981**	1.474***	1.479***
		(2.526)	(2.540)	(3.506)	(3.522)
Premium paid on deposits	D	-0.646	-1.052	-0.702	-1.142
		(-0.442)	(-0.734)	(-0.488)	(-0.806)
Equity ratio	L	0.247	0.246	0.185	0.183
		(1.163)	(1.154)	(0.922)	(0.912)
Low quality loans	L	-0.087	-0.091	-0.470	-0.474
		(-0.151)	(-0.157)	(-0.832)	(-0.839)
Liquidity	L	0.011	0.010	-0.016	-0.018
		(0.159)	(0.136)	(-0.241)	(-0.267)
Regional economic activity		0.376	0.382	0.162	0.172
		(1.319)	(1.314)	(0.688)	(0.711)
Liquidity x crisis		0.451*	0.450*	0.449*	0.448*
		(1.702)	(1.699)	(1.719)	(1.715)
Constant		0.026	0.234	0.136	0.318*
		(0.163)	(1.310)	(0.892)	(1.918)
Lagged dependent variable	L	Yes	Yes	Yes	Yes
Other interactions controls x crisis		Yes	Yes	Yes	Yes
Other interactions controls x post-crisis		Yes	Yes	Yes	Yes
Observations		852	852	852	852
R-squared		0.148		0.137	
F		13.10	13.17	14.14	14.20
F-p		.	0	.	0
Hansen		.	47.94	.	41.68

Hansen-p	.	1	.	1
# of cross sections		73		73

Table 14 – Institutional investors, corporations and individuals – post-crisis

This table shows the results of the estimation of equation (1) for the change in the amount of certificates of deposits held by institutional investors (specifications 1 to 4), non-financial firms (5 to 8) and individuals (9 to 12) using (one-step) system GMM estimators, in which we allow all variables 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 dummy; Big Bank x Crisis and Big Bank x Post-Crisis.* Coefficient estimates and autocorrelation/heteroskedasticity-robust t-tests are shown in parentheses. Estimates for the following variables are omitted: the first lag of the dependent variable, time dummies, premium paid on deposits (lagged difference) and *mechanical change in deposits* (see Appendix) and the intercept. D stands for first difference and L stands for first lag. Variables interacted with the crisis dummy are lagged according to the variable that appears without interaction (for example, *equity ratio x crisis* is the interaction of the crisis dummy with the first lag of the equity ratio, since equity ratio, by itself, is also in first lag). *, ** and *** indicate statistical significance at 10%, 5% and 1% respectively.

		Institutional investors				Non-financial firms				Individuals			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Variables of interest													
Crisis dummy		0.119	-0.594	0.044	-0.062	-0.329*	-0.327	-0.309	-0.362**	-0.015	0.033	-0.041	-0.020
		(0.288)	(-1.633)	(0.098)	(-0.170)	(-1.774)	(-1.553)	(-1.641)	(-2.190)	(-0.095)	(0.162)	(-0.274)	(-0.131)
Post-Crisis dummy		-0.108	-0.073	-0.142	-0.128	-0.319**	-0.288**	-0.270**	-0.229*	-0.157**	-0.131	-0.180**	-0.032
		(-0.352)	(-0.238)	(-0.478)	(-0.423)	(-2.491)	(-2.003)	(-2.072)	(-1.871)	(-2.095)	(-1.441)	(-2.076)	(-0.385)
Size		-0.013	-0.013	-0.014	-0.024	-0.023*	-0.022*	-0.023*	-0.022	-0.000	-0.001	-0.000	0.001
		(-0.912)	(-0.835)	(-0.917)	(-1.430)	(-1.801)	(-1.685)	(-1.783)	(-1.644)	(-0.025)	(-0.089)	(-0.004)	(0.054)
Big bank dummy		0.144**	0.159**	0.147**	0.156**	0.085*	0.082*	0.086*	0.090*	0.070	0.073	0.069	0.070
		(2.456)	(2.519)	(2.370)	(2.526)	(1.786)	(1.722)	(1.817)	(1.863)	(1.477)	(1.511)	(1.369)	(1.452)
Big bank x crisis		0.680*	0.939***	0.711*	0.536*	0.438***	0.433***	0.431***	0.390***	0.151	0.105	0.161	0.144
		(1.937)	(2.736)	(1.984)	(1.729)	(3.024)	(2.766)	(2.921)	(2.698)	(1.243)	(0.793)	(1.311)	(1.167)
Big bank x post-crisis		-0.428*	-0.491**	-0.400*	-0.412*	-0.126	-0.149	-0.164	-0.132	-0.128	-0.137*	-0.112	-0.128
		(-1.937)	(-2.065)	(-1.704)	(-1.873)	(-1.104)	(-1.225)	(-1.430)	(-1.141)	(-1.651)	(-1.669)	(-1.394)	(-1.649)
Control variables													
Equity ratio	L	0.934***	0.900**	0.928***	1.070***	-0.241	-0.232	-0.243	-0.324	0.048	0.039	0.045	0.018
		(2.834)	(2.626)	(2.789)	(2.950)	(-0.927)	(-0.897)	(-0.933)	(-1.263)	(0.284)	(0.228)	(0.263)	(0.106)
Low quality loans	L	-1.329	-1.693*	-1.323	-1.127	-0.036	-0.064	0.015	-0.136	-0.156	-0.119	-0.216	-0.211
		(-1.442)	(-1.854)	(-1.326)	(-1.106)	(-0.058)	(-0.104)	(0.023)	(-0.214)	(-0.360)	(-0.287)	(-0.498)	(-0.512)
Liquidity	L	0.049	0.030	0.051	-0.007	0.112	0.114	0.114	0.133	0.037	0.037	0.033	0.041
		(0.365)	(0.220)	(0.376)	(-0.054)	(1.280)	(1.278)	(1.378)	(1.349)	(0.651)	(0.672)	(0.575)	(0.698)
Regional econ. act.		-0.519	-0.756	-0.634	-0.148	0.430	0.418	0.525*	0.564*	0.208	0.189	0.148	0.361*
		(-0.745)	(-1.072)	(-0.875)	(-0.217)	(1.419)	(1.316)	(1.716)	(1.891)	(1.081)	(0.935)	(0.747)	(1.835)
Int. controls x crisis		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Int. controls x post-crisis		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other variables													
Exp. trade finance			-0.131***				-0.015				0.015		
			(-2.742)				(-0.354)				(0.505)		
Exp. middle market			0.022				-0.022				0.011		
			(0.327)				(-0.533)				(0.438)		
Trade finance x crisis			0.878***				0.013				-0.019		

		(3.340)				(0.112)				(-0.190)		
Middle market x crisis		-0.207				-0.048				-0.239***		
		(-0.868)				(-0.464)				(-2.879)		
Foreign funding			-0.009				0.058				-0.056	
			(-0.042)				(0.276)				(-0.387)	
Foreign Fund x crisis			0.988				-0.251				0.331	
			(0.914)				(-0.494)				(0.931)	
Rel. on instit. invest.				-0.677*				0.261				0.099
				(-1.889)				(0.892)				(0.649)
Instit. Invest. x crisis				-5.740***				-2.052***				-0.353
				(-5.531)				(-3.811)				(-0.679)
Int. other variables x post-crisis	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	949	949	949	949	949	949	949	949	949	949	949	949
F												
F-p	6.132	8.329	6.160	18.92	7.838	8.973	7.581	8.297	9.601	10.56	9.030	8.385
Hansen	1.03e-10	0	0	0	0	0	0	0	0	0	0	0
hansenp	42.70	30.77	40.16	42.89	45.73	41.61	40.67	47.20	33.74	33.94	39.79	42.31
# of cross sections	1	1	1	1	1	1	1	1	1	1	1	1

APPENDIX

Operational Definitions of Variables Used in the Tests

1 – Independent Variables

$\Delta Deposits_{i,t}$ is the change in deposits of bank i in period t, measured by the first difference of the log of deposits.

The database from the FGC provides the amount of insured and uninsured deposits.

2 – Dependent Variables

Our right-hand-side variables are defined as below. Some are used in levels (contemporaneous and/or lagged) and others are used in first differences, as explained in section I.

2.1 Risk

The bank-specific risk indicators chosen are commonly used in the literature. The operational definition of all the variables is described below.

Equity: we measure the ratio of equity to total assets to examine capital adequacy.

Low quality loans: the assessment of the quality of assets can be made using several indicators. To a great extent, empirical studies use the ratio of nonperforming loans and total assets. We prefer a more forward looking metric: the ratio of low quality loans to total assets. Brazilian banks must rate their credit operations in an ascending order of risk, on levels 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 into one of the ratings E to H. Resolution 2.682 from the Brazilian National Monetary Council states that loans due for more than 90 days should be rated E or worse.

Liquidity: We use as a proxy for liquidity *(cash + tradable securities) / assets.*

2.2 Control Variables

Size: we measure size as the *natural log of assets*. We include this variable as a fundamental in order to disentangle the pure effect of size on deposits from the special characteristics that may cause a bank to be too big to fail.

Regional economic activity: although bank legislation allows banks to open branches and have operations throughout all Brazilian states, many banks focus on specific states to do business. Deposits may thus be influenced by the economic activity of individual states. We use data from the retail sales survey done by the Brazilian Institute for Geography and Statistics (IBGE, for its acronym in Portuguese), which provides the growth in retail sales for each state of the federation as well as the resulting national growth in retail sales[1]. This is the most used indicator of regional economic activity in Brazil. To assign a state to each bank, we use the following procedure: if a bank has branches in more than 10 states[2] and no single state accounts for more than 50% of its

[1] The index is released on a monthly basis. We use the 12-month compound growth in retail sales (which does not need to be adjusted for seasonality) for June and December to match with the rest of our data.
[2] Brazil has 27 states.

branches, we consider it a nationwide bank, and use the national index. Otherwise we use the index for the state where the bank has more branches. Thus: $Regional\ Economic\ Activity_{i,t}$ is the change in retail sales index of the state in which the bank has more branches (considers heterogeneous macro-effects over depositors-base).

Exposure on Loans: loans are classified into 8 different categories: 1) trade finance (import and export); 2) short-term (less than 12 months) loans to non-financial companies; 3) agricultural; 4) real estate; 5) consumer goods (including auto vehicles); 6) infrastructure; 7) personal (loans made to individuals without specifying a particular purpose); 8) others. Exposure to each of these classes of loans is measured as the ratio between the amount of loans in that class and total assets. For example, exposure to trade finance is measured as the amount of loans qualified as trade finance and total assets. We are especially interested in classes 1 (trade finance) and 2 (working capital). Trade finance loans are very collateralized by import/export contracts, have typically very low delinquency rate and loss given default and are thus expected to be very safe during the crisis. On the other hand, working capital loans have typically low collateral and are mostly issued by small and middle firms (since in Brazil these firms have little access to long term debt markets) and held to maturity by the lender bank (instead of being securitized and traded in the secondary market) and thus we can expect these loans to be riskier during the financial crisis.

Deposit concentration: a bank with a larger depositor base is naturally more diversified than another that relies on few depositors to fund its assets. In addition, deposit concentration may create incentives for depositors to "run first" during periods in which informational asymmetry is higher. Deposit concentration is measured as the portion of a bank's asset being funded by each depositor on average, i.e., *total deposits / (total assets * number of depositors)* in each semester.

Reliance on institutional investors: Chen, Goldstein and Jiang (2010) find evidence that the behavior of institutional investors depends on whether they are surrounded by other institutional investors or by retail investors. We use the ratio between the amount of certificates of deposit held by institutional investors and total assets to account for the reliance on institutional investors.

Reliance on foreign funds: banks that rely on foreign funds may be more likely to struggle to obtain funding during episodes that reduce the amount of foreign capital to emerging markets in general or to Brazil in particular. We define the reliance on foreign funds as the proportion of assets being funded by sources obtained abroad, i.e. *total foreign funds / total assets.*

Mechanical Change in deposits: We also compute for each bank the change occurred in insured and uninsured deposits due to the change in the amount insured in September 2006 ($MechChange$). This computation is based on an unique bank level data on the number of depositors and volume of deposits in several different deposit-size brackets for all Brazilian banking firms. Since the change took place in September 2006, we compute, based on the data of Jun/2006 the amount of uninsured deposits that became insured due to the simple fact that the amount insured was increased. Had we neglected this change, we would end up with a measurement error in our left-hand-side variables (*change in insured deposits* and *change in uninsured deposits*) in the period Dec/2006, since these are not changes derived from depositors moving their resources from one bank to another, which is ultimately what we want to measure. It is also important that, since the change in the amount insured affects each bank differently (because they have

different depositor profiles) it is not simply a change in level that could be captured by time fixed effects. As such, in order to correct this measurement error, we create a variable that assumes the value of the change in uninsured deposits due to the increase in the amount insured in Dec/2006 and 0 in all other periods[3]. We create an analogous variable for insured deposits.

2.3 Identification variables

We use two different variables that allow us to perform our identification strategy.

Big Bank: This is a dummy that assumes 1 for the banks that could be perceived as too big to fail and 0 otherwise. As explained above, these are the eight largest banks up to Jun/2008. In Dec/2008 there are six banks, because there were two mergers between banks belonging to this group in the second semester of 2008. The reasons for choosing these eight banks are described in section I.

Crisis: This is a Crisis dummy that assumes 1 for period ending in Dec/2008 and 0 in all other periods.

Post-Crisis: This is an indicator of the period that followed the crisis. It assumes 1 for periods ending in Jun/2009 and Dec/2009 and 0 in all other periods.

[3] As expected, the coefficient of this variable is equal to 1 in our regressions, with significance of less than 1%.

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