Deposit Insurance, Banking Crises and Market Discipline:

Evidence from a Natural Experiment on Deposit Flows and Rates

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Abstract: Using evidence from Russia, we carry out what we believe to be the literature's cleanest test of the direct impact of deposit insurance on market discipline and study the combined effect of a banking crisis and deposit insurance on market discipline. We employ a difference-in-difference estimator to isolate the change in the behavior of a newly insured group (i.e., households) relative to an uninsured "control" group (i.e., firms). The sensitivity of households to bank capitalization diminishes markedly after the introduction of deposit insurance. The traditional wake-up call effect of a crisis is muted by this numbing effect of deposit insurance.

Keywords: deposit insurance, market discipline

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1. Introduction

A particular challenge facing the architects of modern financial safety nets lies in the possibility that measures taken to mitigate bank failures might also weaken other forces contributing to banking sector stability (Calomiris, 1999). The introduction of explicit deposit insurance presents just such a dilemma. Its potential for stabilizing economies by limiting bank runs helps explain its ubiquity across OECD countries and its spread in recent years to remote corners of the developing world (Demirgüç-Kunt and Kane, 2002).[1] But if insurance numbs depositors to the consequences of institutional failure, the disincentives of their banks to engage in excessive risk-taking may weaken. The downside of deposit insurance, that is, may lie in the consequences of decreased market discipline.

Understanding the nature of this tradeoff holds particular importance for periods of instability in the banking sector for it is precisely during such times when deposit insurance is most likely to be extended (Demirgüç-Kunt *et al.*, 2008). What is more, there is reason to believe that the numbing effect of deposit insurance is sensitive to the macro-economic environment into which it is introduced. Periods of financial crisis or panic may make depositors naturally more vigilant, providing them with a "wake-up call" that strengthens market discipline (Martinez-Peria and Schmukler, 2001). The literature, however, is silent as to how this potential crisis-induced wake-up call might interact with the numbing effect brought on by the extension of deposit insurance.

[1] The United States introduced the first national system of deposit insurance in 1934. Recent years have witnessed a particularly rapid expansion in its use. In 1995, 49 countries offered explicit deposit insurance; by 2003, this number had grown to 87 (Demirgüç-Kunt *et al*., 2008).

The degree to which depositors actually engage in market discipline, the extent to which such behavior is curtailed by explicit deposit insurance and the manner in which any such numbing effect might be sensitive to the macro-economic environment are questions that must be resolved empirically. The data available to previous studies, however, have made it difficult for researchers to cleanly identify the effect of deposit insurance. Most published studies rely upon comparisons of uninsured and insured depositors and attribute behavioral differences to the impact of insurance. But their approach is open to the criticism that other characteristics, which may vary across depositor groups, explain the observed differences in behavior. A smaller number of studies infer the impact of deposit insurance on market discipline by comparing the behavior of a well-defined group before and after the introduction of deposit insurance. This approach, however, cannot dismiss the possibility that results are driven by time-specific factors other than the introduction of insurance.

We are fortunate to have at our disposal data from what effectively amounts to a natural experiment. In a manner unique to the literature, we can thus explore whether and how the introduction of explicit deposit insurance affects deposit flows and rates of banks of varying risk levels. In 2004, a comprehensive deposit insurance scheme was introduced to cover all household deposits in Russian banks. Deposits of firms, however, were left uncovered. Since our bank-level data report these two categories separately and cover the periods preceding and following the scheme's introduction, we can apply a difference-in-difference estimator to identify the effect of the policy on households. Using firms as a benchmark, that is, we filter out from any post-deposit-insurance change in household

behavior the effect of any time-specific factors that would influence the behavior of all depositors in a similar manner. Our results demonstrate a noteworthy reduction in the relative and, in some specifications, absolute disciplining behavior of households, a finding consistent with deposit insurance having had a numbing effect on market discipline.

We then engage the question as to whether that finding might be explained in part or in whole by a time-specific factor that could have had a differential impact on the two depositor groups. In 2004, at roughly the same time that deposit insurance was introduced, Russia was hit by a small banking crisis. And, as noted, prior research suggests that crises may have a direct effect on market discipline by providing a wake-up call to depositors, alerting them anew to the potential for bank insolvency (Martinez-Peria and Schmukler, 2001). In the interest of cleanly identifying the effect of deposit insurance, we compare the relative market disciplining behavior of firms and households in the aftermath of both this crisis and one in 1998. After the 1998 crisis, both households and firms demonstrate comparable increases in market discipline, evidence consistent with the wake-up-call effect. After the 2004 crisis, however, their behavior diverges, with the uninsured firms increasing their market discipline in a manner that the newly insured households do not. The difference in relative disciplining behaviors across crises, we argue, arises from the direct numbing effect of deposit insurance on households after 2004. Our evidence, in other words, points to the wake-up-call effect of the crisis being greatly muted by the numbing effect of deposit insurance.

Our findings thus make two noteworthy contributions to the literature on market discipline and deposit insurance. First, the data allow us to carry out what we believe to be

the cleanest test heretofore of the direct impact of deposit insurance on market discipline. Second, we introduce to the empirical literature the first study on the combined effect of banking crises and deposit insurance on market discipline through a comparison of the behaviors of insured and uninsured depositors. Since, as has been the case with the recent global downturn, explicit deposit insurance programs are often introduced or expanded during periods of financial crisis (Demirgüç-Kunt *et al.*, 2008), understanding the combined effect of crises and deposit insurance on subsequent market disciplining behavior can be of particular value to those designing financial market institutions.

Our article is organized as follows. Section 2 reviews prior research on the relationship between deposit insurance and deposit-market discipline. Section 3 reviews the relevant histories of deposit markets and deposit insurance in Russia. Section 4 introduces our data. Sections 5 focuses on identifying the effect of deposit insurance on market discipline. Section 6 then expands the time-period of analysis in order to compare the effects of the 1998 and 2004 crises so as both to solidify our case for having identified a causal relationship and to understand more fully the combined effect of banking crises and deposit insurance on market discipline. Section 7 offers concluding thoughts.

2. Deposit Insurance, Market Discipline and Bank Risk

Market discipline requires that depositors both have access to information on bank risk and anticipate bearing a cost in the event of bank insolvency. Researchers first began looking for evidence of market discipline where these conditions appeared to be most

clearly met – in uninsured niches of markets with a well-developed informational infrastructure. Investigating partially uninsured large deposits in the United States, Park and Peristiani (1998) demonstrated a negative relationship between thrifts' predicted probability of failure and the subsequent growth of their large uninsured deposits. Others turned up links between U.S. institutions' cost of funds in one period and their prior-period measures of depositor risk: low capital-assets ratios; high variability of return on assets; higher percentages of bad loans and, generally, lower return on assets; and greater exposure to junk bonds (Brewer and Mondschean, 1994; Hannan and Hanweck, 1988; Park and Peristiani, 1998).

Among this first generation of articles, the one by Park and Peristiani (1998) stands out for comparing the propensity of uninsured and insured depositors in providing market discipline.[2] Given the latter's potential interest in monitoring the behavior of their banks as well, this comparison provides a better sense – than an exclusive focus on the uninsured – of how the introduction of explicit insurance affects disciplining behavior. Indeed, these authors find that measures of risk have an adverse effect on the growth and pricing of smaller deposits that were insured, although to a lesser extent than on the deposits that were larger and thus partially uninsured. The difference in disciplining behavior is attributed implicitly to the introduction of deposit insurance.

[2] Insured depositors may feel compelled to monitor their banks if the insurer's guarantee is not ironclad or if they face a cost to recovering funds from a failed institution. Cook and Spellman (1994) show that deposits at institutions insured by the Federal Savings and Loan Insurance Corporation were sensitive to risk measures, such as the leverage ratio, during a period when the guarantor had been declared insolvent.

Analyzing the behavior of smaller insured and larger uninsured deposits in Argentina and Chile, Martinez-Peria and Schmukler (2001) explicitly present the comparison as a test of deposit insurance's effect on market discipline. They find that both types of deposits are sensitive to bank risk. But unlike Park and Peristiani (1998), they uncover little discernible difference between the two depositor types' disciplining behaviors. Explicit deposit insurance, that is, seems to have had little to no effect in these Latin American countries. The protection schemes, the researchers conjecture, were not viewed as credible.

As a test of the effect of explicit deposit insurance on market disciplining behavior, however, the approach adopted by Park and Peristiani (1998) and Martinez-Peria and Schmukler (2001) presents problems. Notably, small insured depositors may be different from the large un-insured depositors in ways that cannot be observed but that are conceivably related to market discipline. Larger depositors, for instance, may be more risk averse or more informed about bank fundamentals than small depositors. As a result, the comparison of these groups' contemporaneous behavior may not inform us as to how the introduction of an explicit insurance scheme is likely to affect the propensity of a given group of depositors to engage in market discipline.

Another approach that has been taken to infer the effect of deposit insurance on market discipline exploits comprehensive bank-level data and a recently compiled cross-country dataset of deposit insurance policies. Controlling for the presence of explicit insurance in a sample of thirty OECD and developing countries from 1990-1997, Demirgüç-Kunt and Huizinga (2004) uncover a negative relationship between the implicit cost of bank

funds and prior period measures of bank capitalization, profitability and liquidity. Moreover, they demonstrate that explicit deposit insurance significantly reduces interest rate sensitivity to these measures of bank risk. In deposit growth regressions on a larger group of countries, better capitalized banks are found to be more successful in attracting deposits. But in the presence of explicit deposit insurance, this relationship is muted, a result consistent with weaker market discipline. As with within-country comparisons of insured and uninsured depositors (Park and Peristiani, 1998; Martinez-Peria and Schmukler, 2001), this cross-country approach – which covers a period in which only two of the countries in the sample introduced explicit deposit insurance – relies on inferring the market-disciplining effect of explicit deposit insurance from a potentially diverse group of depositors. Depositors in countries that already have explicit deposit insurance may be fundamentally different on average from those in countries in which it has not been introduced. It is even possible that a country's policy with respect to deposit insurance is endogenous to the behavioral predispositions of its depositors.

To avoid drawing conclusions from a comparison of fundamentally different depositor groups, a test for the effect of deposit insurance on market discipline should be based on a before-and-after perspective. For a given group of depositors, that is, we would like to compare their behavior both prior to and after an explicit insurance scheme's introduction. An un-published study by Ioannidou and de Dreu (2006), using Bolivian data from 1998-2003, finds that the magnitude of the coefficients designed to proxy for market discipline shrink notably after the introduction of explicit deposit insurance in 2001. By providing a before-and-after comparison for a specific group of depositors, their approach

provides more direct evidence of deposit insurance's effect on market discipline than prior studies. However, they cannot fully control for time-varying, macro-level factors that may have an influence on market discipline.[3] Their study thus cannot rule out the possibility that the apparent post-deposit-insurance reduction in market discipline is at least partly (if not wholly) the result of some unobserved macro-level factor confined either to the pre- or post-insurance period.

This type of identification problem is not unusual in the literature. Indeed, Peresetsky (2008), like us, has undertaken a study of deposit market discipline and the introduction of deposit insurance in Russia. Using monthly observations on deposit interest rates at one hundred banks between 2004 and 2006, he finds evidence consistent with decreased discipline. But unlike our study here, he does not exploit the natural experiment potential of comparing household and enterprise deposits with each other before and after the introduction of deposit insurance. Instead, he relies upon comparing household deposits before and after the introduction of insurance.

Our difference-in-difference approach makes the identification problem less of a concern than in these earlier studies. A simple before-and-after comparison on a single group of depositors (*e.g.*, just households) could not allow us to disentangle the effect of deposit insurance from the banking panic of 2004, which hit the Russian market at roughly the same time as deposit insurance's introduction. But by using (uninsured) firms as a comparison group, we can control for macro-level factors that affect all depositors (firms

[3] Ioanninidou and de Dreu (2006) also present results that are consistent with the proposition that larger depositors are more likely than small to impose market discipline.

and households) in a similar fashion. The only way in which the banking crisis can confound our results is if it affects the behavior of households differently than it affects the behavior of firms. Investigating this possibility leads us to analyze an earlier crisis period when both groups were uninsured.

In pursuing an answer to the question as to whether households and firms respond differently to crises, all else equal, we confront an important question that the literature, because of an absence of settings in which to explore it, has heretofore not been able to engage. That is, how do the coincidence of crises and the extension of deposit insurance affect market disciplining behavior?[4] Using a dataset of 180 countries covering 1960 to 2003, Demirgüç-Kunt *et al*. (2008) demonstrate that deposit insurance can be endogenous to prior crises.[5] But the potential combined effect of deposit insurance and crisis on market discipline has not been well studied. To address this matter, we return to the 1998 crisis in Russia. Though the data going back to this period are less comprehensive, we are able to show that households and firms responded similarly to the crisis. That is, they both behave consistent with having received a wake-up call (Martinez-Peria and Schmukler, 2001). After

[4] Recognizing a potential causal chain from the introduction of deposit insurance to the reduction of market discipline to an increase in bank moral hazard to an increase in banking sector instability, a related literature effectively assumes the first link and looks for evidence of the expected relationships between other links. Nier and Baumann (2006) demonstrate that banks more prone to be disciplined – because they might rely more on uninsured liabilities or because they face greater disclosure requirements – carry larger capital buffers and are thus inherently more stable. Ioannidou and Penas (2010) show that Bolivian banks were more likely to initiate riskier loans after the introduction of deposit insurance. And in a cross-country study similar in spirit to Demirgüç-Kunt and Huizinga (2004), Demirgüç-Kunt and Detragiache (2002), find that generous insurance schemes are related to a greater likelihood of banking crises, particularly in weak rule of law environments.

[5] In the midst of the Great Depression, recall, the U.S. Congress enacted the first national deposit insurance system.

the 2004 crisis, however, only the uninsured firms woke up. The insured households did not. For them, we can show that the numbing effect of deposit insurance canceled out the wake-up call of the crisis.

3. Deposit Markets and Deposit Insurance in Russia

Dating back less than two decades, the experience with liberalized deposit markets in Russia has been relatively brief.[6] Indeed, this relatively short period in which to develop institutions that facilitate depositor monitoring probably explains why Barth *et al*. (2004, 2006) ranked Russia in the bottom quintile of over one hundred countries on a "private sector monitoring" (PSM) index, a measure meant to capture the quality of institutions that facilitate deposit market discipline.[7] Although the ranking raises questions about Russian depositors' ability to monitor and discipline banks, it does not provide any sense of their interest in doing so. However, a review of Russia's post-communist financial sector development suggests that the intensity of this interest should not be under-estimated.

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[6] The first part of this section draws on a similar discussion in Karas *et al.* (2010).

[7] The following considerations are factored positively into a country's score on the PSM index: (1) whether a certified external audit of the bank's financial statement is required; (2) whether all of the ten biggest banks are rated by international rating agencies; (3) whether income statements include accrued or unpaid interest or principal on non-performing loans and whether banks are required to produce consolidated financial statements; (4) whether off-balance sheet items are disclosed to the public; (5) whether banks must disclose risk management procedures to the public; and (6) whether subordinated debt is allowable as a part of regulatory capital. The version of the PSM index presented in Barth *et al*. (2006) is slightly modified to include the percentage of the ten biggest banks rated by domestic rating agencies; since there is no entry for Russia in this sub-category, its PSM index is not reported. The authors' measures of bank transparency paint a similar picture. With respect to both the quality of its bank audit regime and its pace in adopting best practice accounting standards, Russia is ranked in the bottom third of countries surveyed.

When financial markets were first permitted in the early 1990s, bank deposits, particularly those of households, were held almost exclusively by *Sberbank*, the state-owned savings bank. But lax entry policies in the early post-communist period contributed to the quick development of a relatively competitive market for deposits. By 1994, private banks had captured over half of the household deposit market. The mix of liberalized deposit rates, naïve depositors and over-burdened regulators proved volatile. System-wide crises, including a particularly large one in 1998, led to the insolvency of many of the largest banks on the retail market during the first decade of post-communist reform. Obligations to tens of thousands of depositors went unmet (Perotti, 2003; Radaev, 2000; Schoors, 2001; Spicer and Pyle, 2002). These experiences quickly heightened Russians' awareness of the private costs of bank failure and thus the value of carefully monitoring their financial institutions.

Karas *et al*. (2010) provide evidence for the existence of market discipline in Russia in the half decade after the 1998 crisis, but before the introduction of explicit deposit insurance. Flows of household and firm deposits during this period were consistent with quantity-based sanctioning of weaker banks; more poorly capitalized banks, that is, were less successful in attracting the deposits of households and firms. Evidence for the standard form of price discipline (*i.e.*, depositors requiring a deposit rate premium from less stable banks) was mixed.[8,9]

[8] Ungan *et al*. (2008) presented similar findings from a slightly later period.

[9] This combination of findings was argued to be consistent with households and firms interpreting the deposit rate as a complementary proxy of otherwise unobserved bank-level risk. Testing this hypothesis, Karas *et al*. (2010) estimated the deposit supply function and showed that, particularly for poorly capitalized banks, deposit rate increases exhibited diminishing, and

Russia's Deposit Insurance Agency (DIA) was created as an independent agency in January 2004 and given responsibility for administering the national deposit insurance fund. The DIA was charged with determining bank premiums, making any necessary payouts to depositors and overseeing the liquidation of insolvent banks.[10] The Russian government provided initial seed capital but premiums – payable quarterly and assessed on the daily averages of a bank's insured deposits – quickly became the fund's primary source of financing. The deposits of households, but not firms, were to be covered. And all private banks that accepted household deposits were required to participate. All deposits up to 100,000 rubles were fully insured from when banks were first admitted into the system in September 2004 until August 2006.[11] From then until March 2007, up to 190,000 rubles per deposit were insured, with amounts above 100,000 insured at a 90% rate (Camara and Montes-Negret, 2006). After March 2007, the 190,000 ruble ceiling was increased to 400,000 rubles.

By January 1, 2005, several month's into the system's operation, 829 banks and a bit more than 330 million deposit accounts, with an average deposit size of seven thousand rubles (roughly $252), were insured by the system. Of these accounts, 98.5% were under 100,000 rubles and thus fully insured. Three years later, 934 banks and roughly 383 million deposit accounts, with an average deposit size of thirteen thousand rubles (roughly $529),

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eventually negative, returns in terms of deposit attraction. At very high deposit rates, in other words, the deposit supply curve became backward bending.

[10] The DIA's board includes seven government-appointed representatives in addition to five representatives from the Central Bank of Russia.

[11] Ruble equivalents in dollar deposits were also covered.

were covered by the program. Of these, 99.6% held deposits under 400,000 rubles and thus were insured at a rate of at least 92.5%.[12] Generally, it has been the case that since the introduction of deposit insurance, we have observed particularly rapid growth in personal deposits, much of which has been accounted for by term deposits with maturities between half a year and three years. *Sberbank's* market share, moreover, declined after household deposits became insured. There has also been a decline in the combined market share of the thirty largest banks, suggesting that the insurance scheme has contributed to greater competition within the retail banking market (Camara and Montes-Negret, 2006; Chernykh and Cole, 2008).

Russia was struck by a small banking crisis during the spring and summer of 2004.[13] In response, Russia's State Duma swiftly modified the arrangements governing deposit insurance (Tompson, 2004). Household deposits with failed institutions that were outside the deposit insurance system would be temporarily covered for sums of up to 100,000 rubles. In other words, from the middle of July 2004, all household deposits were covered

[12] These data, and updates, can be accessed at www.asv.org.ru, the website of the Deposit Insurance Agency.

[13] In May 2004, after the licenses of a couple of small banks were withdrawn on charges of money laundering and failure to comply with prudential regulations, rumors began to circulate of a CBR blacklist of weak banks, which was reported to include large institutions. These led to a rush of deposit withdrawals and growing liquidity problems at a number of banks. In July, one of Russia's largest retail banks collapsed, fueling rumors that Alfa Bank, the largest private retail bank, would be next. Panicked depositors withdrew $160 million in deposits (12% of total) from Alfa Bank in a three day period. Rapid policy responses of the CBR and the State Duma prevented a further deterioration of the situation and the panic abated (Camara and Montes-Negret, 2006).

by temporary insurance (Federal Law No. 96-FZ).[14] This emergency coverage was subsequently replaced by that from the general deposit insurance program for those banks that were admitted. Banks not admitted to the general program lost the rights to attract new household deposits and renew existing deposit contracts, thus leading to a progressive deterioration in their household deposit base.

4. Data

All Russian banks are required to disclose their financial statements to the Central Bank of Russia (CBR). This information is then made available to the public through several channels. Since 1999 an increasing number of banks granted the CBR permission to disclose their detailed balance sheets and income statements online via the CBR's website (http://www.cbr.ru/credit/transparent.asp). Less detailed bank balances, but for *all* Russian banks, are provided since 1998 by a private information agency, Banksrate.ru, at www.banks-rate.ru. Further, banks publish their balances in the financial press such as the monthly financial periodical *Den'gi i Kredit*. Finally, the most detailed information on all Russian banks can be purchased from private information agencies.

The data used in the analysis in sections 5 and 6 were made available to the authors by two respected private financial information agencies, Interfax and Mobile, and consist of quarterly bank balances and income statements of all Russian banks from 1995q4 through

[14] Such a policy of blanket deposit guarantees has become common in the midst of systemic banking problems around the world (Demirgüç-Kunt, Kane and Laeven, 2008) as demonstrated most recently in the responses of many countries to the global financial crisis of 2008-09.

2007q4.[15] The panel of banks is unbalanced because some banks fail, some merge, and some are founded during the sample period. If a bank acquired or merged with another bank, we treat the resulting larger bank as "new" from the standpoint of our sample.

The bank-specific variables used in this paper include deposits and interest rates as well as measures of risk, performance and balance sheet structure. The average quarterly interest rate that a bank offers on its deposits has been calculated by dividing interest expenses in a particular quarter by the corresponding level of deposits (Martinez-Peria and Schmukler, 2001).[16] Since our dataset disaggregates both interest expenses and deposits by the legal status of the depositor, the variables measuring deposit flows and interest rates can be constructed separately for firms and households.

Our primary measure of a bank's risk level is its capital-assets ratio. Models of bank behavior have long treated this measure of leverage as directly related to default risk (Merton, 1977). More practically, in the wake of the 1988 Basel Accord and the 1996 Market Risk Amendment, banks have increasingly relied upon capital adjustments as the channel through which to manage the threat of insolvency (Nier and Baumann, 2006). Further, more than any other measure, it has been used to proxy for risk exposure in prior studies of deposit-market discipline (Cook and Spellman, 1994; Hannan and Hanweck, 1988; Park and Peristiani, 1998; Martinez-Peria and Schmukler, 2001; Demirgüç-Kunt and Huizinga, 2004;

[15] For more information on these firms, see their respective websites at www.interfax.ru and www.mobile.ru. Karas and Schoors (2005) provide a detailed description of the datasets and confirm the consistency of different data sources.

[16] Taking into account the imperfect nature of such a measure we have to drop unreasonable values (outliers) to prevent them from driving our regression results. We use the Tukey box-plot to detect outliers: for each interest rate we drop observations lying beyond the range defined by the first and third quartile minus/plus 1.5 times the inter-quartile range.

Karas *et al*., 2010). Since depositors are hypothesized to react to observable data, this simple measure of bank-level stability has the appealing characteristic that it can be easily calculated from publicly available information.[17]

Our analysis is limited to private banks participating in the deposit insurance program. We exclude all state-owned banks, many of which have consistently enjoyed advantages over their private competitors: privileged access to state funds, *de facto* exemption from some regulations and explicit backing for their retail deposits during the entirety of the period covered by our data (Tompson, 2004; Civil Code of Russia, article 840).[18] Banks not admitted to the deposit insurance program are excluded from our analysis since they were ultimately banned from attracting new household deposits and forbidden from renewing existing contracts. Analysis in section 5 starts from the first quarter of 1999 and concludes with the fourth quarter of 2007.[19] We use the fourth quarter of 2004 as the first post-deposit-insurance observation.

Corresponding with a period of rapid economic expansion in Russia, the summary statistics from our sample banks in Table 1 reveal robust quarterly deposit growth rates

[17] As an alternative measure of bank stability, we use a bank's current liquidity ratio – *i.e.*, the sum of its liquid assets divided by the sum of its liabilities on demand accounts and accounts up to 30 days. In general, one might expect it to have the same effect as capitalization with respect to market discipline. Highly liquid banks, that is, may be better able to accommodate unexpected deposit withdrawals (Martinez-Peria and Schmukler, 2001; Demirgüç-Kunt and Huizinga, 2004).

[18] The list of state-owned banks was compiled from Kulakova (2000), Matovnikov (2002), Mamontov (2005), Vernikov (2007) and Vernikov (2009), and includes banks owned by the CBR as well as banks owned by other government entities or by sub-federal governments (for details see Karas and Schoors, 2010).

[19] Russia, as noted, experienced a severe financial crisis in 1998 that led to the failure of many banks, making 1999 an appropriate year to begin our analysis.

both before and after the introduction of deposit insurance. In the earlier period household deposits on average grow twice faster compared to firm deposits. As a result the ratio of household deposits to total assets increases over time from 0.15 to 0.25, while that of firm deposits remains stable at around 0.35. As deposits become a more important source of banks' funding, alternative sources, such as capital, become less important. In particular, Table 1 reports average capital-assets ratio falling from 0.28 in the period before deposit insurance to 0.21 in the period after. Consistent with their longer average maturity household deposits pay substantially higher interest rates.

[Table 1]

5. Market discipline and deposit insurance: a difference-in-difference approach

We apply a difference-in-difference estimator to identify the effect of deposit insurance on market disciplining behavior. To our knowledge, this approach has not been previously used to capture the impact of a financial safety net policy on market discipline. Several beneficial features of our data allow us to conduct what is in effect a natural experiment. Explicit deposit insurance was introduced in the middle of the period covered by our data. When introduced, it covered households but not firms. And the deposit holdings of these two groups are reported separately. We thus can observe the behavior of the "treated" group both before and after "treatment." And we can distinguish depositors who receive the "treatment" – *i.e.*, explicit deposit insurance – from those that do not.

Exploiting these features of the data, a difference-in-difference specification allows us to compare the change in market discipline – before and after explicit deposit insurance – among household depositors to the corresponding change among firm depositors. Comparing changes, or differencing differences, allows us to control for both time-invariant factors that affect households and firms differently and for time-varying factors that affect them in a similar fashion.[20] The change in the disciplining behavior of firms after the introduction of deposit insurance on household deposits is an estimate of the unobserved counterfactual – *i.e.*, what would have happened to the disciplining behavior of households if there had been no policy of explicit insurance introduced.

As with most similar studies, we look for market discipline through quantities (*i.e.*, depositors withdrawing funds from risky banks) and prices (*i.e.*, depositors demanding an interest rate premium from risky banks). Having both allows us to better identify disciplining behavior. By itself, an outflow of deposits could be caused by a drop in a bank's demand for deposits. However, an outflow of deposits and an increase in deposit rates would be consistent with a shift in the supply of deposits – *i.e.*, market discipline.

Our difference-in-difference models can be specified in regression form as

$$\Delta \ln(D_{i,j,t}) = b_1 X_{i,t-1} + b_2 X_{i,t-1} H + b_3 X_{i,t-1} I + b_4 X_{i,t-1} HI + Z + e_{i,j,t} \qquad \text{(1a), and}$$

$$r_{i,j,t} = \beta_1 X_{i,t-1} + \beta_2 X_{i,t-1} H + \beta_3 X_{i,t-1} I + \beta_4 X_{i,t-1} HI + Z + \varepsilon_{i,j,t} \qquad \text{(1b),}$$

[20] We are sensitive to the possibility that, independent of deposit insurance, the two may differ in their willingness and/or ability to discipline deposit-taking institutions (Karas *et al.*, 2010). Enterprise managers, for instance, might have better access to, or more appreciation for, the financial information released by banks. Or they might face a different set of costs in moving their deposits between banks.

with the dependent variable in (1a) being the first difference of the log of deposits of type *j* (firm or household) for bank *i* during period *t*, and the dependent variable in (1b) being the implicit interest rate paid out on deposits of type *j* by bank *i* during period *t*.

$X_{i,t-1}$ represents a vector of bank-level controls that varies over time and across banks. These include capitalization, our primary measure of bank-level risk, bank liquidity and a host of other characteristics[21]: change in loan quality, return on assets, excess reserves as a share of total assets, loans to non-banks as a share of total assets, loans to households as a share of loans to non-banks, term deposits as a share of total deposits and personnel expenses over total assets. Each of these controls is entered directly as well as with three separate interaction terms per the difference-in-difference estimation.

The dummy variables, *H* and *I*, take on the value of one if, respectively, the observation is for household deposits (as opposed to those of firms) and/or is recorded after the introduction of explicit deposit insurance in the third quarter of 2004.

The coefficients b_4 and β_4 represent the difference-in-difference estimates of the effect of explicit deposit insurance. If newly insured depositors respond as hypothesized, becoming in comparison to the un-insured "control" group less sensitive to bank risk, we would expect the coefficients on capitalization to have the following signs: $b_4<0$ and $\beta_4>0$.

The vector of controls *Z* includes two sets of time dummies, λ_{tj}, one per depositor type (*j=household or firm*), that control for changes to the macroeconomic environment that may have a different effect on the two types of depositors. Z also includes two sets of bank-

[21] See Karas *et al*. (2010) for the motivation of these variables.

specific fixed effects, μ_{ij}, again one per depositor type (*j=household or firm*); these control for unobserved heterogeneity at the bank-depositor-type level.

The results from the difference-in-difference estimations are laid out in Table 2. We only report the coefficients for capital (C) and liquidity (L), but full results are available on request.[22] Specifications (1-4) estimate equation (1a); specifications (5-8) estimate equation (1b).[23] To test the short run effects of deposit insurance, we set a window of one quarter around deposit insurance in specifications (1) and (5), and a window of two quarters around deposit insurance in specifications (2) and (6). To verify whether the moral hazard effect of deposit insurance is maintained in the longer run, we repeat these estimations for a window of fifteen quarters before and thirteen quarters after deposit insurance in specifications (3) and (7), and finally for a window of twenty-two quarters before and thirteen quarters after deposit insurance in specifications (4) and (8). We limit the analysis to thirteen quarters after deposit insurance's introduction (*i.e.*, through the last quarter of 2007) because 2008 is a crisis year in banking. Fifteen quarters before deposit insurance (*i.e.*, the first quarter of 2001) corresponds to the effective start of the Putin era[24], and a twenty-two quarter window preceding deposit insurance (*i.e.*, beginning in the second quarter of 1999) allows us to still steer clear from the effects of the August 1998 crisis.

[22] None of the difference-in-difference coefficients on other plausible measures of risk came out significant. For instance, with respect to loan quality, while its (unreported) baseline coefficient in Table 2 deposit growth regressions was often significant with an intuitive negative sign, the t-statistic on its difference-in-difference coefficient was insignificant ranging from 0.05 to 1.25.

[23] Results without bank fixed effects are available upon request. The coefficient estimates are quite similar.

[24] We indeed observe that the sensitivities of household deposit rates to capital estimated for the earlier seven quarters (1999q2-2000q4) are markedly different.

[Table 2]

We observe that prior to the introduction of deposit insurance, firms were sensitive to bank capitalization in the manner predicted by the market discipline hypothesis: b_1 is positive and statistically significant in all quantity (deposit) regressions (row 1, columns 1-4) while β_1 is negative and statistically significant in all price (interest rate) regressions (row 1, columns 5-8). As to whether households were more or less sensitive to bank capitalization than firms prior to the introduction of deposit insurance, the evidence in row 2 is mixed. The price regressions suggest relatively greater sensitivity (*i.e.*, β_2, like β_1, is negative and is consistently significant). But the deposit regressions suggest relatively weaker sensitivity (*i.e.*, b_2, unlike b_1, is negative and is consistently significant).[25] The deposit regressions, nevertheless, provide evidence that households were sensitive to bank capitalization in the manner predicted by the market discipline hypothesis (*i.e.*, $b_1 + b_2 > 0$).

Of greatest note, given our focus, we observe in row 4 that the difference-in-difference coefficient, b_4, is negative and statistically significant across all quantity discipline specifications (columns 1-4). We also see that β_4, the difference-in-difference coefficient for the price discipline specifications (columns 5-8) is positive and statistically significant across all four specifications. These findings are consistent with the sensitivity of households to

[25] A possible interpretation for this finding is that bank demand for household deposits is less elastic compared to firm deposits; that is, for an identical capital-induced deposit supply shift, the price (quantity) reaction will be higher (lower) for households. Firm deposits have shorter maturities and, thus, lower deposit rates (see Table 1). Banks can easily absorb those deposits in any quantity and invest them in liquid low-risk-low-return instruments earning a positive return. Thus, demand for firm deposits is fairly flat. This is not the case with household deposits that have longer maturities, higher rates and, thus, need to be invested in high-return projects to secure a positive margin. To the extent high-return projects are scarce banks will only be willing to take extra household deposits at substantially reduced rates. That is, bank demand for household deposits will be relatively steep (inelastic).

bank capitalization, relative to that of firms, having diminished after the introduction of deposit insurance.[26] This result is robust to excluding liquidity and other bank-specific characteristics.[27]

As to whether the values of b_4 and β_4 from equations (1a) and (1b) represent a decline in the sensitivity of households to capitalization in an absolute (as well as a relative) sense, the evidence from the deposit regressions is mixed, whereas that from the interest rate regressions points more consistently to an absolute change. The value of b_3 shown in the third row of Table 2 demonstrates the relationship between bank capitalization and deposit flows for households (partly, in conjunction with b_4) and firms (wholly) after the introduction of deposit insurance. Alternatively, we might describe b_3 as capturing the effect of a commonly felt macro-economic shock – *i.e.*, the banking crisis – on depositor vigilance, whereas b_4 (the difference-in-difference coefficient) captures the differential effect of deposit insurance on insured depositors' vigilance.

The significantly positive value of b_3 across three of the specifications in columns 1-4 suggests that firms became more sensitive to bank risk after the third quarter of 2004, a result consistent with the wake-up call effect that depositors may experience in the aftermath of a banking crisis (Martinez-Peria and Schmukler, 2001). Looking at the short term specifications (columns 1-2), b_4 is negative, statistically significant and greater (in

[26] We only report regressions run on banks reporting a positive level of capitalization in a particular time period. Excluding those that report negative capital, which represent less than half of one percent of all observations, does not alter in any substantive manner our results of interest.

[27] Available on request from authors.

absolute value terms) than b_3. This suggests that households became less sensitive to bank capitalization in an absolute sense, and not just relative to firms, after the third quarter of 2004. In the immediate aftermath of the crisis, that is, the numbing effect of deposit insurance dominates the wake-up call effect for insured depositors. The longer run quantity specifications, however, suggest that the decrease in household sensitivity is only relative. Indeed the absolute values of b_4 and b_3 (columns 3-4) are very close to identical and their difference is never significant, suggesting that while firms got a wake-up call, households remained equally sensitive to risk. That is, for them, the evidence suggests that, while the numbing effect of deposit insurance dominates the wake-up call effect of crisis in the short run, these two effects tend to cancel each other out in the longer run.

The evidence from the price discipline regressions (columns 5-8) points more consistently to an absolute change in household sensitivity to bank risk. As noted above, prior to the introduction of deposit insurance, our results are consistent with both types of depositors requiring higher interest rates from riskier institutions. After the introduction of insurance, however, the premium that households "demand" from lesser capitalized banks declines markedly, but there is no evidence of a similar decline in the premium "demanded" by firms. That is, we observe in row 4 (columns 5-8) that β_4 is consistently positive and statistically significant, whereas β_3 is never statistically different from zero. In other words, after the introduction of deposit insurance, household sensitivity to bank capitalization declined both relative to that of firms and in an absolute sense.

6. Crises, Deposit Insurance and Market Discipline

Any conclusion to the effect that we have identified the effect of deposit insurance on market discipline rests on an assumption that during the period covered by our analysis there are no time-specific factors – with the exception of the insurance scheme's introduction – that had a differential impact on the two types of depositors. The occurrence of a banking crisis in Russia, roughly concurrent to the introduction of deposit insurance, thus gives us pause. As we have noted, Martinez-Peria and Schmukler (2001), for one, present evidence that crisis periods increase market discipline by providing a wake-up call to depositors.[28] If the effect of the 2004 crisis differs across depositor types, then the difference-in-difference estimation that we have laid out above cannot disentangle the impacts of deposit insurance and the crisis on market discipline. This is a non-trivial matter for reasons that transcend our identification strategy. The introduction or expansion of deposit insurance often occur concurrent, and indeed in response, to banking crises (Demirgüç-Kunt *et al.*, 2008). Better understanding their interaction thus carries potential value for policy makers as they evaluate the costs and benefits of financial safety net expansion during periods of systemic instability.

Since we cannot rule out *a priori* the possibility that household depositors may react differently than firms to periods of banking crisis, we return to the Russian data and expand the temporal scope of our analysis so as to include the time period before the 1998

[28] Using a large cross-country panel data set with banks from 32 countries, covering the period 1993-2000, Nier and Baumann (2006) show that the effect of variables associated with market disciplining behavior is greater in countries that experienced a crisis. This, they explain, may be due to bank franchise values in crisis countries being lower and risk taking incentives (in the absence of market discipline) being stronger.

crisis. The data offer us, in a sense, another natural experiment. In 1998, Russian depositors were subjected to a severe banking panic but the government did not introduce deposit insurance. In 2004, as we have discussed, depositors again suffered through a banking panic, but this time a comprehensive deposit insurance scheme was introduced to cover households alone. The disciplining behavior of households and firms in the aftermath of 1998 serves as benchmark against which to compare their behavior in the wake of the 2004 events. The noteworthy difference in the two episodes, of course, is the introduction of deposit insurance.[29]

Both the absolute change of the disciplining behavior of households after the 1998 crisis and its relationship to the change in the behavior of firms serve as an estimate of the unobserved counterfactual – *i.e.*, what would have happened to the disciplining behavior of households in a relative and absolute sense if there had been no deposit insurance introduced at roughly the same time as the banking panic of 2004. Evidence that firms responded similarly to the two panics but that households responded differently would be consistent with deposit insurance having affected the behavior of households.

We estimate the sensitivity of deposit flows to bank capitalization, allowing for different sensitivities across the two depositor types and three distinct periods: before the 1998 crisis, between the 1998 and the 2004 crises, and after the 2004 crisis. We cannot

[29] It is important to note here that the two crises differed greatly in magnitude. But even though the number of bank failures was minimal in 2004 in comparison to 1998, the fear in 2004 of failures on the order of those in 1998 was present in the market at the time. In this context, the introduction of deposit insurance in 2004 may have been the policy that altered the ultimate outcome.

estimate an equivalent price equation because deposit rate data are not available before 1998. Specifically, we estimate:

$$\Delta \ln(D_{ijt}) = f_0 C_{i,t-1} F^0 + f_1 C_{i,t-1} F^1 + f_2 C_{i,t-1} F^2 + h_0 C_{i,t-1} H^0 + h_1 C_{i,t-1} H^1 + h_2 C_{i,t-1} H^2 + Z + \varepsilon_{ijt} \quad (2)$$

As in equation (1a), the dependent variable is the first difference of the log of deposits of type *j* (firm or household) for bank *i* during period *t*. The right-hand-side variables include a lagged measure of bank-level capitalization, $C_{i,t-1}$, that varies over time and across banks and dummies for both firm and household deposits for three specific time periods: F^0=1 and H^0=1 for firm and household deposits, respectively, before 1998q4; F^1=1 and H^1=1 for firm and household deposits, respectively, for the period between 1998q4 - 2004q3; and F^2=1 and H^2=1 for firm and household deposits, respectively, after 2004q3.

As before, $Z=\lambda_{tj}+\mu_{ij}$, where λ_{tj} represents two sets of time dummies – one per depositor type (*j=household or firm*) to control for changes to the macroeconomic environment that may have a different effect on the two types of depositors – and μ_{ij} represents two sets of bank-specific fixed effects, again one per depositor type (*j=household or firm*) that control for unobserved heterogeneity at the bank-depositor-type level. Other bank-level controls are similar to specifications (1a) and (1b) with the exclusion of term deposits as a share of total deposits and personnel expenses over total assets, which are not available prior to 1999q1.

[Table 3]

Panel A of Table 3 reports the estimation results. The results are most closely comparable to those of specification (4) in Table 2. In Panel B, coefficient tests present comparisons of market discipline across time and depositor types.

We observe from rows 1-3 of Panel A that firms were sensitive to bank risk across sub-periods; almost all coefficient estimates are positive and statistically significant. And in line with the wake-up call hypothesis, the degree of this sensitivity increased in the period after each crisis: f_1 is greater than f_0 (Panel B, row 1) and f_2 is greater than f_1 (Panel B, row 4). We do not observe a statistically significant difference in the changes in firms' disciplining behavior in the wake of the two crises (Panel B, row 6).

Unlike firms, we find little evidence that households were sensitive to bank risk prior to the 1998 crisis (Panel A, row 4) but, like firms, they displayed such sensitivity in its aftermath (Panel A, row 5). In row 3 of Panel B, we test the hypothesis that the change in disciplining behavior was the same for households and firms after the 1998 crisis. The results show that we cannot dismiss this possibility. The evidence, in other words, is consistent with the first crisis having served as a wake-up call for both depositor types.

After the 2004 crisis, household sensitivity to bank capitalization did not change (Panel B, row 5). And whereas the behavior of firms in the aftermath of the two crises was not dissimilar (Panel B, row 6), the reaction of households demonstrably was (Panel B, row 7). And perhaps most clearly, we can reject the hypothesis that the sensitivity of households and firms to bank capitalization changed in a similar fashion after 2004 (Panel B, row 8).

In sum, our results point to the change in the relative disciplining behaviors of firms and households after 2004 being due not to their responding differently to periods of banking crisis. Indeed, we found the sensitivity of household and firm deposit flows to bank capitalization rose in a similar manner after the 1998 crisis. The wake- up call affected both. After the 2004 crisis, the sensitivity of uninsured firm deposit flows to bank capitalization rose again markedly and in a manner not dissimilar to the change after the 1998 crisis. The sensitivity of insured household deposit flows to bank capitalization however remained unchanged, or even decreased in absolute terms as shown in the previous section. The early crisis had a similar effect on the two groups; the latter crisis did not. We interpret this evidence as confirming that when deposit insurance is introduced in the presence of financial crisis, the wake-call effect of the latter is substantially muted by the numbing effect of deposit insurance.

To visualize the temporal pattern of the difference-in-difference coefficients above, we allow the sensitivity of firms' and households' deposits to bank capitalization to be different in each time period by estimating:

$$\Delta \ln(D_{i,j,t}) = b_1 C_{i,t-1} \lambda_t F + b_2 C_{i,t-1} \lambda_t H + Z + e_{i,j,t} \quad \text{(3a), and}$$

$$\Delta \ln(D_{i,j,t}) = \beta_1 C_{i,t-1} \lambda_t + \beta_2 C_{i,t-1} \lambda_t H + Z + e_{i,j,t} \quad \text{(3b),}$$

with controls similar to those in Table 3. Figure 1 shows how the values of b_1 rise while those of b_2 stay put after the introduction of deposit insurance in the third quarter of 2004

(vertical line).[30] The dynamics suggest, that is, that households' sensitivity to capital remained effectively constant, while that of firms increased substantially. In other words, firms got a wake-up call but households did not; the numbing effect and wake-up call completely cancel one another out. What is more, the visual representation demonstrates that our findings for b_4 in equation (1a) are not driven exclusively by observations in the periods immediately preceding and/or following the introduction of deposit insurance, but remain valid in the longer run.

Figure 2 shows the estimated values of β_2 (which is equivalent to $b_2 - b_1$). It is clear that β_2 shifts down after the introduction of deposit insurance in the third quarter of 2004 (vertical line), as would be suspected given our prior rejection of the hypothesis that the sensitivity of households and firms to bank capitalization changed in a similar fashion after 2004 (Table 2, Panel B, row 8).

[Figure 1]

[Figure 2]

8. Conclusion

[30] Some households may have anticipated the introduction of deposit insurance and adjusted their behavior before the policy's formal introduction. But if some households did indeed anticipate the policy, the fact that Figure 2 demonstrates a drop in the difference between b_1 and b_2 after the formal introduction of deposit insurance is even more impressive.

By using data from what amounts to two natural experiments in Russia, we contribute to the literature the first test of financial crisis and deposit insurance's combined effect on market discipline and the cleanest test heretofore of deposit insurance's effect on market discipline. We employ a difference-in-difference methodology to identify the differential effect of deposit insurance on the behavior of insured households and uninsured firms and find evidence consistent with insurance diminishing the insured depositors' sensitivity to bank risk, even in the presence of a financial crisis. Indeed, comparing the relationship of risk sensitivity across depositor types and multiple banking crises, we feel confident in dismissing the possibility that our results might be explained by a different reaction of households and firms to a banking crisis that hit at roughly the same time as the insurance scheme was introduced. When deposit insurance is introduced in the presence of a financial crisis, the wake-up call effect of the latter on household depositors is substantially muted by the numbing effect of deposit insurance.

Importantly, our findings speak to the combined effect of deposit insurance and crises on market discipline. Uninsured depositors respond to a crisis by increasing market discipline, thereby providing a potentially valuable check to banks contemplating the assumption of even more risk during a period of systemic instability. While we do not claim that newly insured depositors will be entirely numb to bank risk in the aftermath of a crisis, the market discipline they impose will clearly be less vigorous than that of uninsured groups. Given the connection established in the literature between weaker market discipline and systemic instability (Demirgüç-Kunt and Detragiache, 2002; Nier and Baumann, 2006), our results thus might be interpreted to suggest that policy makers should

exercise caution with respect to any permanent crisis-related expansion of deposit insurance, lest risk-taking incentives for already weak banks become distorted.

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Table 1. Summary statistics

	2001q1-2004q3			2004q4-2007q4		
Variables	N	mean	sd	N	mean	sd
Log-difference of firm deposits	13622	0.07	0.49	10100	0.11	0.41
Log-difference of household deposits	13054	0.14	0.45	9900	0.11	0.34
Firm deposits / Total assets	13675	0.35	0.19	10120	0.36	0.17
Household deposits / Total assets	13675	0.15	0.13	10120	0.25	0.18
Interest rate on firm deposits (in %)	12544	0.39	0.43	9543	0.38	0.39
Interest rate on household deposits (in %)	12678	1.89	1.13	9701	1.74	0.74
Capital / Total assets	13675	0.28	0.17	10120	0.21	0.14
Liquid assets / Demand liabilities	13675	0.67	0.6	10120	0.57	0.49
Bad loans / Total loans	13675	0.02	0.06	10120	0.02	0.04
Net income / Total assets	13675	0.01	0.02	10120	0.01	0.01
Excess reserves / Total assets	13675	0.12	0.13	10120	0.13	0.13
Loans to non-banks / Total assets	13675	0.51	0.19	10120	0.57	0.19
Loans to households / Loans to non-banks	13675	0.13	0.18	10120	0.21	0.21
Term deposits / Total deposits	13675	0.39	0.24	10120	0.51	0.24
Personnel expenses / Total assets	13675	0.01	0.01	10120	0.01	0.01

Notes: The table reports summary statistics of bank-specific variables with each observation representing a measure for a single bank in a specific quarter. Only observations used in at least one of the regressions are included. All variables are in nominal terms.

Table 2. Tests for market discipline

	Deposit growth (equation 1a)				Deposit rate (equation 1b)			
	$Z=\lambda_{tj}+\mu_{ij}$				$Z=\lambda_{tj}+\mu_{ij}$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	-1/+1q	-2/+2q	-15/+13q	-22/+13q	-1/+1q	-2/+2q	-15/+13q	-22/+13q
C	3.10***	2.06***	0.59***	0.52***	-0.45**	-0.22**	-0.35***	-0.36***
	(0.74)	(0.27)	(0.05)	(0.04)	(0.20)	(0.09)	(0.04)	(0.04)
C*H	-1.59*	-1.02***	-0.45***	-0.44***	-1.10**	-0.82**	-0.58***	-1.91***
	(0.84)	(0.38)	(0.08)	(0.06)	(0.54)	(0.33)	(0.15)	(0.49)
C*I	0.38**	0.17	0.32***	0.32***	-0.08	-0.05	-0.03	-0.02
	(0.18)	(0.13)	(0.06)	(0.06)	(0.06)	(0.06)	(0.05)	(0.05)
C*H*I	**-0.68*** **	**-0.42** **	**-0.34*** **	**-0.32*** **	**0.41***	**0.38** **	**0.29***	**1.64*** **
	(0.26)	(0.18)	(0.09)	(0.08)	(0.24)	(0.18)	(0.17)	(0.46)
L	0.18**	-0.01	0.06***	0.05***	-0.05	-0.04	0.00	0.00
	(0.08)	(0.07)	(0.01)	(0.01)	(0.04)	(0.02)	(0.01)	(0.01)
L*H	-0.11	0.03	-0.01	-0.01	0.08	0.00	-0.06*	-0.18**
	(0.11)	(0.08)	(0.02)	(0.02)	(0.09)	(0.05)	(0.03)	(0.09)
L*I	-0.16***	0.01	-0.04	-0.04	0.02	0.03*	0.02	0.02*
	(0.06)	(0.06)	(0.03)	(0.03)	(0.03)	(0.02)	(0.01)	(0.01)
L*H*I	0.20**	0.00	0.04	0.03	-0.06	-0.04	-0.01	0.03
	(0.08)	(0.07)	(0.04)	(0.04)	(0.08)	(0.06)	(0.05)	(0.11)
Obs	3594	7188	46676	59097	3452	6922	44466	55449
R^2	0.317	0.190	0.092	0.080	0.113	0.062	0.084	0.377

Notes: C and L are measures of bank capitalization and liquidity as described in the text. I is the dummy for post deposit insurance. H is the dummy for household deposits. All equations include change in loan quality, return on assets, excess reserves as a share of total assets, loans to non-banks as a share of total assets, loans to households as a share of loans to non-banks, term deposits as a share of total deposits and personnel expenses over total assets as control variables with different coefficients for firms and households and for the pre- and post-deposit-insurance period. Specifications (1-4) estimate equation 1a, specifications (5-8) estimate 1b. All regressions include fixed effects. We test for window of 1 quarter around deposit insurance in specifications (1) and (5), a window of 2 quarters around deposit insurance in specifications (2) and (6), a window of 15 quarters before and 13 quarters after deposit insurance in specifications (3) and (7), and finally a window of 22 quarters before and 13 quarters after deposit insurance in specifications (4) and (8). We take not more than 13 quarters after because 2008 is a crisis year in banking (the 13th quarter after deposit insurance is 2007q4). We limit ourselves first to 15 quarters before (2001q1) because the sensitivities of household deposit rates to capital estimated for the earlier 7 quarters (1999q2-2000q4) are markedly different, possibly because 2001q1 marks the start of the Putin era. We then limit ourselves to 22 quarters before (1999q2) to steer clear from the effects of the August 1998 crisis. Clustered standard errors reported in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Table 3. Crises and the sensitivity of deposits to bank capitalization

Panel A. Estimation results		
Firm deposit flows	Coefficient	$Z=\lambda_{ij}+\mu_{ij}$
(1) 1995q4 – 1998q3	$C_{i,t-1}F^0$	0.19***
		(0.06)
(2) 1998q4 – 2004q3	$C_{i,t-1}F^1$	0.52***
		(0.03)
(3) 2004q4 – 2007q4	$C_{i,t-1}F^2$	0.79***
		(0.05)
Household deposit flows		
(4) 1995q4 – 1998q3	$C_{i,t-1}H^0$	-0.07
		(0.06)
(5) 1998q4 – 2004q3	$C_{i,t-1}H^1$	0.18***
		(0.04)
(6) 2004q4 – 2007q4	$C_{i,t-1}H^2$	0.22***
		(0.05)
Observations		77800
R-squared		0.062
Notes: robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1		

Panel B. Hypothesis tests on coefficients	
(1) Sensitivity of firm deposits to capitalization pre- and post-first crisis: $f_1 - f_0 = 0$.	0.33
	(0.00)
(2) Sensitivity of household deposits to capitalization pre- and post-first crisis: $h_1 - h_0 = 0$	0.25
	(0.00)
(3) Relative sensitivity of household and firm deposits to first crisis: $(h_1 - h_0) - (f_1 - f_0) = 0$	-0.08
	(0.34)
(4) Sensitivity of firm deposits to capitalization pre- and post-second crisis: $f_2 - f_1 = 0$	0.27
	(0.00)
(5) Sensitivity of household deposits to capitalization pre- and post-second crisis: $h_2 - h_1 = 0$	0.04
	(0.46)
(6) Relative sensitivity of firm deposits to first and second crisis: $(f_2 - f_1) - (f_1 - f_0) = 0$	-0.06
	(0.46)
(7) Relative sensitivity of household deposits to first and second crisis: $(h_2 - h_1) - (h_1 - h_0) = 0$	-0.21
	(0.02)
(8) Relative sensitivity of household and firm deposits to second crisis: $(h_2 - h_1) - (f_2 - f_1) = 0$	-0.23
	(0.00)

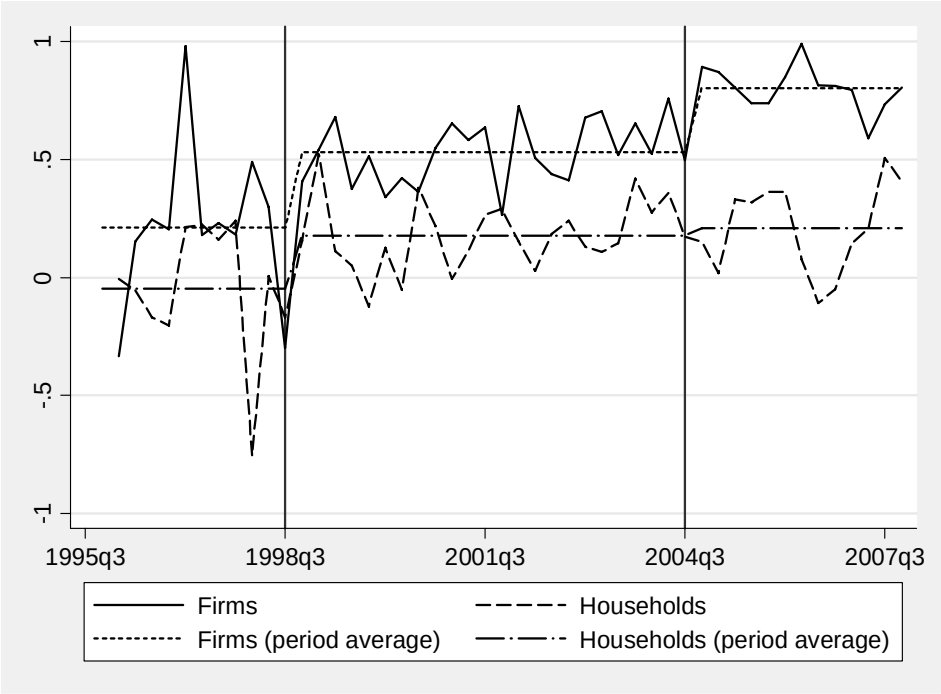

Figure 1. Deposit flow sensitivity to capital over time (b_1 and b_2 in equation 3a)

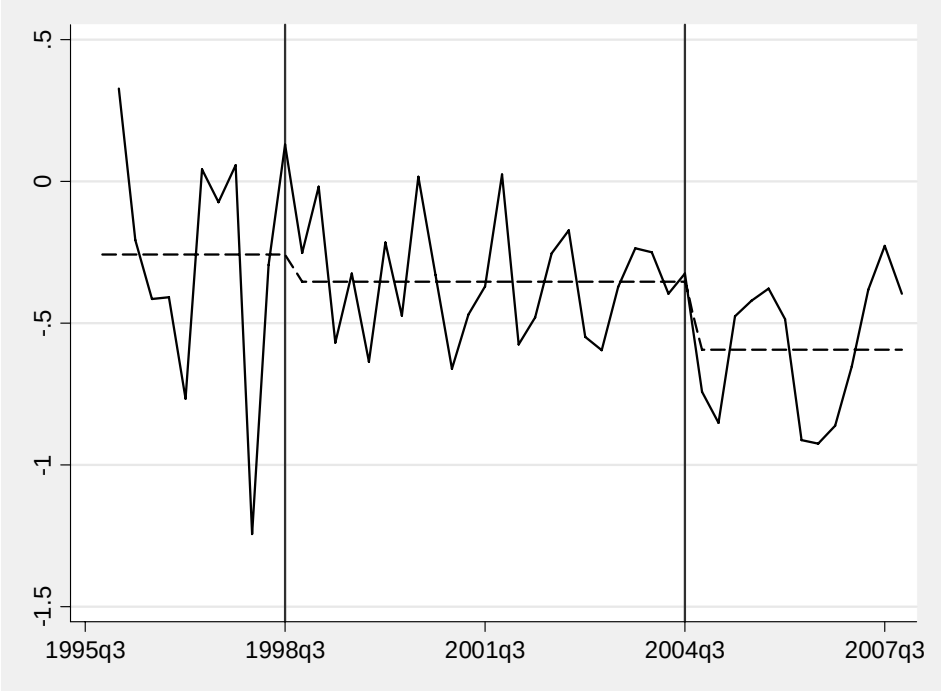

Figure 2. Sensitivity of household deposits to capital minus sensitivity of firm deposits to capital over time (β_2 in equation 3b, which equals $b_1 - b_2$ of equation 3a)