BOFIT Discussion Papers
17 • 2010

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Bank capital, liquidity creation and deposit insurance

EUROJÄRJESTELMÄ
EUROSYSTEMET

Bank of Finland, BOFIT
Institute for Economies in Transition

BOFIT Discussion Papers
Editor-in-Chief Aaron Mehrotra

BOFIT Discussion Papers 17/2010
29.9.2010

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ISBN 978-952- 462-692-7
ISSN 1456-5889
(online)

Suomen Pankki
Helsinki 2010

Contents

All opinions expressed are those of the authors and do not necessarily reflect the views of the Bank of Finland.

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Abstract

This paper examines how the introduction of deposit insurance influences the relationship between bank capital and liquidity creation. As discussed by Berger and Bouwman (2009), there are two competing hypotheses on this relationship which can be influenced by the presence of deposit insurance. The introduction of a deposit insurance scheme in an emerging market, Russia, provides a natural experiment to investigate this issue. We study three alternative measures of bank liquidity creation and perform estimations on a large set of Russian banks. Our findings suggest that the introduction of the deposit insurance scheme exerts a limited impact on the relationship between bank capital and liquidity creation and does not change the negative sign of the relationship. The implication is that better capitalized banks tend to create less liquidity, which supports the "financial fragility/crowding-out" hypothesis. This conclusion has important policy implications for emerging countries as it suggests that bank capital requirements implemented to support financial stability may harm liquidity creation.

JEL classification: G21; G28; G38; P30; P50
Keywords: Bank capital, liquidity creation, deposit insurance, Russia

[1] We are grateful to Veronika Belousova and Alexei Karas for their valuable comments and suggestions.
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Tiivistelmä

Tässä tutkimuksessa analysoidaan, kuinka talletusvakuutuksen käyttöönotto vaikuttaa pankin pääoman ja likviditeetin luomisen väliseen suhteeseen. Kuten Berger ja Bouwman (2009) ovat maininneet, muuttujien suhteesta on kaksi kilpailevaa hypoteesia, joihin talletusvakuutuksen olemassaolo saattaa vaikuttaa. Talletusvakuutuksen käyttöönotto Venäjän kehittyvässä taloudessa tarjoaa luonnollisen koetilanteen tutkittaessa tätä kysymystä. Pankin likviditeetin luomista tarkastellaan tutkimuksessa kolmella eri mittarilla ja estimoinnit tehdään venäläisistä pankeista koostuvan suuren aineiston avulla. Tutkimustulosten mukaan talletusvakuutuksen käyttöönotolla on rajallinen vaikutus pankin pääoman ja likviditeetin luomisen väliseen suhteeseen, eikä talletusvakuutus muuta näiden negatiivista suhdetta. Pankit, joilla on enemmän pääomaa, luovat tulosten mukaan vähemmän likviditeettiä. Tämä tukee taloudellisen epävakauden/syrjäyttämisen (financial fragility/crowding-out) hypoteesia. Johtopäätöksellä on merkittävää politiikka-arvoa kehittyvien talouksien kannalta, koska tulosten mukaan rahoitusmarkkinoiden vakautta tukevat pääomavaatimukset saattavat haitata likviditeetin luomista.

Avainsanat: pankin pääoma, likviditeetin luonti, talletusvakuutus, Venäjä

1 Introduction

The recent financial crisis provides a stark reminder of the substantial role banks play in liquidity creation. Yet, while the literature deals extensively with banks as risk transformers, their function in liquidity creation has largely been neglected.[2] A recent paper by Berger and Bouwman (2009) attempts to correct this situation by offering a new method for measuring liquidity created by banks and investigating the role of bank capital in liquidity creation for US banks. This issue is of great interest, particularly with respect to policy in setting of bank capital requirements. The role of capital in minimizing the impact of losses has received considerable attention. However, how bank capital impacts liquidity creation should also be taken into account when assessing the role of capital on financial stability.

Berger and Bouwman (2009) observe that two hypotheses largely frame the current discussion of the relationship between bank capital and liquidity creation. The "risk absorption" hypothesis predicts that higher capital enhances the ability of banks to create liquidity. This hypothesis comes out of two strands of literature dealing with the role of banks as risk transformers. Liquidity creation increases the bank's exposure to risk as its losses increase with the level of illiquid assets to satisfy the liquidity demands of customers (e.g. Allen and Gale, 2004), while bank capital allows the bank to absorb greater risk (e.g. Repullo, 2004).

In contrast, the "financial fragility/crowding-out" hypothesis predicts that greater capital hampers liquidity creation. This hypothesis brings together two distinct effects: a higher capital ratio crowds out deposits, thereby reducing liquidity creation, while financial fragility, characterized by lower capital, tends to favor liquidity creation (Diamond and Rajan, 2000, 2001).

Roughly described, the financial fragility effect is the outcome of a following process. The bank collects funds from depositors and lends them to borrowers. Once the loan is issued, the bank's job is to monitor the borrower and collect loan payments. This helps the bank obtain private information on its borrowers that gives it an advantage in assessing the profitability of its borrowers. This informational advantage, however, creates an agency problem, whereby the bank may be tempted to extort rents from its depositors by demanding a greater share of the loan income. If depositors refuse to pay the higher costs, the bank threatens to curtail its monitoring or loan collecting

[2] According to standard liquidity creation theory, a bank creates liquidity by transforming illiquid assets into liquid liabilities. Diamond and Rajan (2000) however point out that liquidity is also created by simply changing banks' funding mix on their liability side. Berger and Bouwman (2009) consider changes in the mixes on both sides of banks' balance sheets and also off-balance sheet activities.

efforts. As depositors know that the bank may abuse their trust, they become leery about depositing their money with the bank. The bank is thus forced to demonstrate its commitment to depositors by adopting a fragile financial structure with a large share of liquid deposits. The consequence of this fragile financial structure is that the bank runs the risk of losing funding if it attempts to withhold depositors. As such, the threat of bank runs mitigates the holdup problem which arises after depositors have put their funds to the bank. Consequently, by allowing the bank to receive more deposits and finance more loans, financial fragility favors liquidity creation. As greater capital reduces financial fragility, it enhances the bargaining power of the bank and hampers the credibility of its commitment to the depositors. Thus, greater capital works to diminish liquidity creation.

A key issue here is how a deposit insurance scheme might influence this relationship. With deposit insurance, depositors have no incentive to withdraw their money, so deposit contracts do nothing to mitigate the holdup problem. As a result, greater capital does not reduce liquidity creation.

Our aim is to probe the relationship between bank capital and liquidity creation by analyzing how introduction of a deposit insurance scheme influences this linkage. We examine the case of Russia as it provides a unique natural experiment to investigate this issue. Russia implemented its deposit insurance scheme in 2004.

This study contributes to research investigating how bank capital influences financial stability and also sheds light on some of the neglected effects of deposit insurance schemes. The detrimental incentives for moral hazard behavior for banks promoted through deposit insurance schemes are well understood (e.g. Demirgüc-Kunt and Detragiache, 2002), but we only vaguely grasp how implementation of a deposit insurance scheme might contribute to the reduction of the negative link between bank capital and liquidity creation in ways that promote the benefits of bank capital for the economy. Of course, bank regulators frequently look to see how well banks are meeting their capital requirements as it is received dictum that bank capital contributes to financial stability. What they may ignore is the fact that capital requirements might also be detrimental for liquidity creation as the negative effects of bank capital on liquidity creation can overwhelm the benefits in some instances. The introduction of deposit insurance scheme may reduce the negative effects, solving the dilemma for policymakers in favor either of financial stability through higher bank capital or of liquidity creation with lower bank capital.

This analysis also contributes to the literature on liquidity creation by banks. We provide the first investigation of the role bank capital plays in liquidity creation in emerging markets, which contributes to a better understanding of financial stability in emerging countries and the implica-

tions of bank capital requirements there. We also consider whether the relationship between bank capital and liquidity creation differs depending on the form of bank ownership. Berger and Bouwman (2009) show that this relationship may vary depending on the size of the bank as the underlying arguments may play different roles depending on the type of bank. In the same vein, we ask whether private or foreign ownership influences this relationship. As major debates about the banking industry in emerging economies focus on the benefits of privatization and the presence of foreign investors, we examine how ownership interacts with bank capital and liquidity creation in Russia. Russia's banking sector is characterized by the coexistence of three types of banks (state-controlled banks, domestic private banks, and foreign-owned banks), which provides a broad spectrum of ownership arrangements to investigate.

We use a rich panel dataset on banks in Russia covering the periods before and after the introduction of the deposit insurance scheme. Following Berger and Bouwman (2009), we measure liquidity created by Russian banks by classifying all bank assets and liabilities as liquid, semi-liquid or illiquid. We then assign weights to these categories and compute the amount of liquidity created by each bank.

Our empirical strategy is based on two complementary methodologies. First, we adopt the difference-in-difference approach to analyze the impact of the deposit insurance scheme on the relationship between bank capital and liquidity creation. This approach controls for the changing economic conditions. We apply it by using a unique feature of deposit insurance in Russia: the implicit deposit insurance of state-controlled banks during the entire observation period. We thus assume that state-controlled banks were unaffected by the deposit insurance scheme and compare changes in liquidity creation around the time of deposit insurance introduction for banks affected by the scheme against changes for state-controlled banks, which had essentially enjoyed implied deposit insurance earlier. Second, we test whether the nature of the relationship between bank capital and liquidity creation changes with the implementation of the deposit insurance scheme. Regressing liquidity creation measures on bank capital before and after its implementation allows us to check whether the introduction of the deposit insurance scheme contributed to change in the sign of this relationship. We report the sign of this relationship for all banks in Russia, accounting in terms of both bank ownership and size.

The remainder of the paper is structured as follows. In section 2, we present data and liquidity creation measures. Section 3 describes the difference-in-difference approach and section 4

presents the separate regressions before and after the implementation of the deposit insurance scheme. We conclude in section 5.

2 Data and measures

2.1 Data

Our main dataset consists of the quarterly balance sheet and income statement information of Russian banks provided by the financial information agency Interfax, which collects and organizes this data from the Central Bank of Russia (CBR).[3] The original data feature an unbalanced panel containing over 41,000 bank-quarter observations for 1,593 credit institutions from the first quarter of 1999 to the first quarter of 2007. To make sure our tests are based on deposit-taking banking institutions only, we drop observations that fulfill at least one of the following criteria. First, we exclude observations where the average total-loans-to-total-assets ratio is less than or equal to 5%. Second, we drop those observations where the sum of deposits equals zero. Third, the capital-to-assets ratio should not be larger than 100%. To avoid the potential distortion of the results by deeply financial troubled banks or banks that have had their licenses pulled by Russian regulators, we further drop the observations that show a capital-to-assets ratio less than or equal to 2%.[4] Finally, since banks that were not admitted to the deposit insurance scheme are prohibited from collecting household deposits, we only consider banks participating in the scheme in our analysis.

In our estimations, we use information on bank branches by regions collected from the CBR website. Regional data come from the Russian Federal State Statistics Service (Rosstat). Table 1 provides descriptive statistics for all the variables used.

Foreign-owned banks are defined based on the CBR data as those with foreign ownership shares in excess of 50%. State-controlled banks are identified using the classification by Vernikov (2009). These include banks owned by the government or central bank, as well as banks owned by state-controlled companies. In addition to ownership type, we also classify banks by size. Large, or systemic, banks are those ranked 1−50 in terms of total assets. Following the CBR, banks ranked 51−200 in terms of total assets are classed as medium-sized banks. The remaining small banks on average accounted for about 10% of banking sector assets during our observation period.

[3] For a more detailed description of the dataset, see Karas and Schoors (2005).
[4] Russian regulations require withdrawal of a bank's license if its capital ratio falls below 2%.

2.2 Measures of bank liquidity creation

Berger and Bouwman (2009) provide a detailed description of measuring bank liquidity creation based on the US bank financial statement data. Following their methodology, we construct the liquidity creation measures for Russian banks with the necessary customization based on Russian financial data.

We start by classifying balance sheet items as liquid, semi-liquid, or illiquid. This applies to all itemized terms for assets, liabilities, and equity.[5] We then assign weights to all the items, and calculate the measures of liquidity creation. Below we give our three measures of liquidity creation and describe in detail how we classify financial items based on liquidity.

The functional form of measuring liquidity creation (eq. 1) remains the same throughout the paper while the definitions of each of the right-hand-side terms in the equation change for different measures.

Liquidity Creation (*LC*)

$$= \{ \tfrac{1}{2} \times \textit{illiquid assets} + 0 \times \textit{semi-liquid assets} - \tfrac{1}{2} \times \textit{liquid assets} \} +$$

$$+ \{ \tfrac{1}{2} \times \textit{liquid liabilities} + 0 \times \textit{semi-liquid liabilities} - \tfrac{1}{2} \times \textit{illiquid liabilities} \} \quad (1)$$

We construct three measures of liquidity creation. The first is a gross measure meant to provide an overall picture of liquidity creation. The second is based on category classification of balance sheet items. The last is a liquidity measure based on maturity (see Appendix for detailed description of items used here to calculate the liquidity creation measures).

The first liquidity creation measure (LC1), a gross indicator in line with Deep and Schaefer (2004), has the advantage of less strict assumptions than our other two indicators. We do not use detailed category or maturity classification of different balance sheet items here. The underlying assumption in LC1 calculation is that we account for the most important categories of assets and liabilities that might be classed liquid or illiquid. Total deposits are regarded as liquid liabilities and equity as illiquid liabilities. On the asset side, we assume total loans are illiquid assets and current account and securities investment are liquid assets.

As noted, the risk of not imposing a sufficient number of assumptions in specification of each balance sheet item in LC1 is that we might lose our chance at creating a clear picture of how banks in our sample create liquidity across time or cross-sectionally if the structure within each

[5] We do not consider off-balance sheet activities; they were not significant for most of the investigated period.

gross term makes a difference. To capture such differences and achieve better precision, we closely inspect different items within broad categories in terms of their liquidity assumptions. From this, we construct our second measure of liquidity creation (LC2), which is based on category classification of balance sheet items. In defining different categories of liquid, semi-liquid, and illiquid assets and liabilities we follow the classification of Berger and Bouwman (2009) based on the ease, cost, and time necessary for banks to turn their obligations into liquid funds, and the ease, cost, and time customers need to withdraw liquid funds from their bank. We also take country-specific issues into account.

The liquid assets category in liquidity creation measure LC2 consists of (a) correspondent account with other banks (i.e. central bank, domestic, and foreign banks) (b) investments in government securities, and (c) investments in promissory notes. Investments in non-government securities are not included as their values were quite low for most of the observation period. The selection of such instruments was rather limited and Russia's capital markets were still not liquid. Moreover, banks had little incentive to hold these securities as, unlike government securities, it was not possible to use them as collateral when borrowing from the CBR.

In classification of loans, we follow the literature and classify corporate loans as illiquid assets as banks generally lack the option of selling them to meet their liquidity needs. The other categories of loans that include consumer loans, loans to government and interbank loans are classified as semi-liquid assets. Due to the fact that mortgage loans started to emerge in Russia only in recent years, the majority of consumer loans are short-term loans used to buy consumer goods. Thus, even though securitization of loans is still rare in Russia, we can classify consumer loans as semi-liquid by applying the rule that items with shorter maturity tend to be more liquid than longer term items.

Finally, we calculate other assets by subtracting all loans and liquid assets from the total assets. Other assets include fixed assets, which we classify as illiquid.

On the liability side, we distinguish between two types of claims of the non-banking sector. The first category includes the settlement accounts of different clients: domestic and foreign firms, government and households. These are classified as liquid as they can be quickly withdrawn by customers without penalty. The same holds true for the claims of banks, so they also fall into the liquid liabilities category. The second category of claims of non-banking sector contains term deposits. Since their withdrawal is in general more difficult and costly, we consider them to be semi-liquid.

Debt securities issued by banks include promissory notes, deposit and saving certificates, and bonds. Russia has liquid markets for promissory notes, the most significant of these instru-

ments, so we classify promissory notes as liquid liabilities. Deposit and saving certificates and bonds have gained importance only in the recent years. During our sample period, their issuance was not significant and the markets for these instruments were just emerging. For this reason, these securities are categorized as semi-liquid liabilities.

Following the same logic as on the side of assets, we calculate other liabilities by subtracting all of the above mentioned claims of banks and non-banking sector and the amount of debt securities issued by a bank from total liabilities. Other liabilities such as bank capital are considered illiquid liabilities.

In general, the category-based measure of liquidity creation (LC2) can be expected to be reasonably accurate under the assumption that the categories of assets and liabilities outlined above are good indicators of the liquidity of bank activities. Based on a careful examination of the balance sheet information of all the Russian banks in the sample, however, we find a more detailed breakdown reporting based on maturity for some items. Such maturity-based information provides us with important additional information to define the liquidity creation in a more precise manner. Furthermore, Berger and Bouwman (2009) conclude that maturity-based liquidity creation measures are better.

We use the maturity information to construct our third liquidity creation measure (LC3). On the asset side, we only have available the data on maturity of interbank loans. Thus, the classification of assets is similar to the one we employ for the second liquidity creation measure. However, all interbank loans are not included in the semi-liquid category anymore. Part of them, that has maturity lower than one week, is considered in the category of liquid assets. Interbank loans with maturity higher than one year together with nonperforming interbank loans are classified as illiquid. The rest of interbank loans belong to semi-liquid assets.

Classification of liabilities for the LC3 calculation is solely based on maturity. We apply the general principle, whereby items that have shorter maturity are more liquid as they self-liquidate sooner. Term deposits and debt securities that have maturities shorter than 90 days are classified as liquid liabilities. We consider current and correspondent accounts to be liquid liabilities as well. Liabilities with maturity between 90 days and one year belong to the semi-liquid category. Finally, liabilities that have maturities over one year, overdue liabilities, and liabilities with uncertain terms to maturity are classified as illiquid. Again, similar to the category liquidity creation measure LC2, bank capital is treated as illiquid.

We consider liquidity creation measures normalized to total assets to make them comparable across banks and to avoid giving excessive weight to large banks.

2.3 Other variables

Explanatory variables that we use in the estimations can be divided into two groups. The first contains bank-specific variables, while the second consists of variables describing local market economic environment. The most important explanatory variable here is the *capital-assets ratio* (*CAP*), defined as the ratio of capital to total assets. This variable helps us uncover the relationship between bank capital and bank liquidity creation.

At the bank's level, we control for bank size and bank risk. Size is taken into account by using the variable logarithm of total assets. We also split the sample into three subsamples based on the size (large, medium, and small banks) to examine differences in the relationship of bank liquidity creation and bank capital.

We use nonperforming loans ratio, defined as the total amount of nonperforming loans divided by total assets, to control for bank risk. As argued under the "risk absorption" hypothesis (e.g. Bhattacharya and Thakor 1993, Repullo 2004, Von Thadden 2004, Coval and Thakor 2005), it is important to appropriately control for bank risk as the main reason for banks to hold capital is to be able to absorb risk. Further, Berger and Bouwman (2009) suggest that inclusion of risk measures in the analysis could help isolate the role of capital in the liquidity creation function from its role in supporting risk transformation functions of banks. We follow the standard practice in the literature of entering one risk measure at a time in the regressions (see e.g. Acharya, Bharath and Srinivasan, 2007).[6]

The second group of control variables takes into account the local economic environment of a bank. We include a Herfindahl index (HFDL) based on banking assets to control for local market competition. The local market is defined as the region where bank headquarters and/or branches are located. Given that we do not have information regarding the assets or loans or deposits associated with each branch of the banks, we assume that a bank's assets are equally distributed across its branches (we thus treat the headquarters as a branch). We use distribution of branch offices as a proxy for banking output by region when calculating the Herfindahl index for a given region. The Herfindahl index for a bank here measures the concentration of the markets in which the bank oper-

[6] In addition to the non-performing loans ratio, we also use loan loss provisions, volatility of returns and Z-score to account for risk.

ates, using as weights the distribution of its branch networks in the regions. Concentration can influence liquidity creation as it notably influences the availability of credit (Beck, Demirgüc-Kunt and Maksimovic, 2004). We also control for other aspects of the local market by including the Household income growth and Small business growth in our estimations.[7] Both variables account for trends in the macroeconomic environment.

3 Difference-in-difference estimations

3.1 Methodology

We apply the difference-in-difference approach to control for the changing economic conditions that might coincide with the implementation of deposit insurance. This approach enables us to exploit a unique feature of deposit insurance in Russia; i.e. even if deposit insurance was intended to cover all deposit-taking banks, state-controlled banks enjoyed an umbrella of implicit deposit insurance throughout the whole observation period. Therefore, state-controlled banks can be considered as the control group in this study. To infer the effect of deposit insurance on the bank-level liquidity creation, we simply compare changes in liquidity creation around the time of deposit insurance introduction for banks affected by the scheme (treatment group) to changes for banks unaffected by the scheme (control group). The difference-in-difference approach, of course, does not provide information about the change in the sign of the relationship between bank capital and liquidity creation, which is key to answering our main research question. What it does provide is information about the change in the magnitude of this relationship.

The fixed effects panel-data estimators allow for heterogeneity across panel units, and produce consistent and efficient estimators as long as the unobserved time-invariant individual effects are not strictly orthogonal to the regressors in the regression. However, if the observed association between the treatment dummy variable (deposit insurance) and the dependent variable (liquidity creation) is driven by other incidents occurring at the time of treatment, they could lead to biased results. To control for this potential problem, we use a difference-in-difference approach which

[7] Household income is defined as regional household income per capita and small enterprise business variable is calculated as number of small and medium-sized enterprises (SMEs) in a given region multiplied by the average number of employees SMEs have in that region. Both household income growth and small business growth variables are calculated as weighted averages of regions in which a bank has its operations. We use weights based on the distribution of branch offices in regions.

compares the difference between the treatment group and the control group in their changes of before and after the implementation of deposit insurance. This provides results that are robust to the potential bias that the observed effect of the deposit insurance implementation on liquidity creation was contaminated by some other concurrent or temporal policy shift.

For a simple illustration of our methodology, consider two banks in Russia. One belongs to the treatment group (i.e. enrolled in the deposit insurance in 2004), and the other belongs to the control group (i.e. covered by implicit deposit insurance during the entire period). Implementation of the deposit insurance scheme in 2004 enables us to compare the changes in the outcomes for these two banks. Since both the treatment group and control group banks are chartered in Russia, they are affected by roughly similar economic, regulatory and political shocks, but only banks in the treatment group are affected by the change in the deposit insurance implementation. Hence, we can control for any economic, business, or regulatory factors that may have coincided with or led to the initiatives of deposit insurance scheme.

We estimate the following model:

$$\Delta y_{i,t} = \alpha + \beta \times treatment_i + \gamma \times \Delta capital_{i,t} + \delta \times \Delta size_{i,t} + \phi \times treatment_i \times \Delta capital_{i,t}$$
$$+ \varphi \times treatment_i \times \Delta size_{i,t} + \lambda \times z_{i,t} + \varepsilon_{i,t} \quad (2)$$

where $\Delta y_{i,t}$ measures the changes in the bank-level liquidity creation to assets (LC/assets) after the deposit insurance was implemented from its level prior to the implementation. We define 2004 as the implementation year. The last quarter before 2004 is denoted as Q_{-1}, and the first quarter after year 2004 is denoted as Q_{+1}, and so on. Given that it might have taken some time before the banks adjusted their balance sheet and operating activities to the deposit insurance, we omit 2004 and the three quarters around 2004 in the estimation and extend the event window to eight quarters before and after 2004.[8] *Treatment* is a dummy variable that equals 1 if the bank was enrolled in the deposit insurance scheme in 2004, and 0 if the bank was state-controlled throughout our sample period. $\Delta capital_{i,t}$ and $\Delta size_{i,t}$ are defined as the changes in the capital-to-assets ratio, and the changes in bank size after the deposit insurance from its level before the deposit insurance was implemented, respectively. All control variables are defined as the changes over the same period.

In equation (2), β captures the differences in the mean levels of increases (or decreases) of liquidity creation after deposit insurance from its previous level between the treatment group and

[8] Therefore, we include Q_{-8}, Q_{-7}, Q_{-6}, Q_{-5}, Q_{-4}, Q_{+4}, Q_{+5}, Q_{+6}, Q_{+7}, Q_{+8}. Our robustness tests that are based on alternative windows show qualitatively similar results. The results are available upon request.

the control group. γ measures the average differences in changes of the effects of capital ratio (δ for bank size) on the liquidity creation for all the banks after the deposit insurance was implemented.

Two interaction terms are included, namely, interactions between treatment dummy variable and changes in capital ratio, and treatment dummy variable and changes in bank size. ϕ calibrates the mean differences in changes of the effects of capital ratio on the liquidity creation for the banks after the deposit insurance between the treatment group and the control group. If the estimations of equation (2) yield positive ϕ it suggests that the effects of capital ratio (bank size) on liquidity creation increase more (or decrease less) after the deposit insurance was implemented, compared to the banks that do not receive the treatment of deposit insurance, and vice versa. Similarly, φ informs on the mean differences in changes of the effects of bank size.

We are also curious whether the impact of deposit insurance treatment on the effects of the capital ratio on liquidity creation depends on bank size. To answer this, we test the following model:

$$\begin{aligned}\Delta y_{i,t} = {} & \alpha + \beta \times treatment_i + \gamma \times \Delta capital_{i,t} + \delta \times \Delta size_{i,t} + \phi \times treatment_i \times \Delta capital_{i,t} \\ & + \varphi \times treatment_i \times \Delta size_{i,t} + \eta \times treatment_i \times \Delta capital_{i,t} \times \Delta size_{i,t} + \lambda \times z_{i,t} + \varepsilon_{i,t} \qquad (3)\end{aligned}$$

In equation (3), η is the coefficient of three-way interaction terms between treatment dummy variable, changes in capital ratio, and changes in bank size. A positive η would indicate that with the increase of bank size, on average, the effects of capital ratio on liquidity creation of treatment group banks increased after the deposit insurance was implemented relative to the control group banks.

3.2 Results

The results of difference-in-difference estimations are presented in Table 2. Within each measure of liquidity creation, two models are used based on equations (2) and (3). We note that the coefficients on the interactions between treatment dummy and difference in capital ratio are positive in all estimations, as well as significant for the LC2/assets measure. These findings provide limited evidence that the impact of capital ratio on liquidity creation is less negative for banks participating in the deposit insurance program after it was implemented relative to banks in our control group.

Furthermore, the coefficients on the three-way interaction term between treatment dummy variable, difference in capital ratio, and difference in bank size are positive and significant, except

when LC1/assets is used. After taking out the effects of other contemporary variables on liquidity creation, we are left with an implication that changes in the effects of capital ratio on liquidity creation after the deposit insurance implementation are positively and linearly associated with bank size.

Thus, we find limited evidence confirming that the impact of capital ratio on liquidity creation grows stronger with the implementation of the deposit insurance scheme. Nevertheless, the difference-in-difference approach does not uncover whether the sign of the relationship between bank capital and liquidity creation changes after the introduction of deposit insurance scheme. This information is necessary to analyze the implications of deposit insurance implementation in terms of financial stability.

4 Separate estimations

4.1 Methodology

The difference-in-difference approach provides evidence on the impact of the introduction of the deposit insurance scheme on the relationship between bank capital and liquidity creation. We are however interested in the sign of this relationship and whether it changes after the introduction of deposit insurance. We also want to see how this sign varies with ownership and size. Indeed, key banking policy questions in emerging countries concern foreign bank entry and the privatization of banks, as well as the consolidation of the banking industry through mergers and acquisitions. Therefore, it is reasonable to ask whether such policies influence the impact bank capital has on liquidity creation.

To answer these questions, we perform regressions of the ratio of liquidity creation to assets on a set of variables including the capital-assets ratio and the set of control variables. We estimate separate regressions before and after the introduction of DIS in 2004, considering the periods from the first quarter of 2001 to the fourth quarter of 2003 and from the first quarter of 2005 to the first quarter of 2007. Regressions are estimated with robust standard errors clustered by bank.

Following Berger and Bouwman (2009), we use lagged values of all explanatory variables to mitigate the potential endogeneity problem. Furthermore, we can reasonably consider that bank capital influences liquidity creation with a lag. As we have a limited number of quarters for each sub-period of our analysis, we consider a lag of one quarter to limit the reduction of the number of observations for each sub-sample. We consider alternatively three liquidity creation measures.

4.2 General results

We present the results observed for each sample before and after the implementation of the DIS. Table 3 reports the results for each sub-period. The major finding is the negative coefficient of the bank capital variable, which is significant at the 1% level in all regressions before and after the implementation of the DIS. This result suggests that in the case of Russian banks the "financial fragility/crowding out" hypothesis is stronger than the "risk absorption" hypothesis. The general implication of such a finding is that policies aimed at increasing bank capital in emerging countries may hamper liquidity creation.

However, for our investigation, the main implication of this result is the fact that the implementation of the DIS does not change the relationship between bank capital and liquidity creation. Indeed, as the "financial fragility/crowding out" hypothesis is more prominent in the absence of deposit insurance scheme, we should expect that the introduction of such scheme would diminish the influence of this channel. Yet we observe no such thing, indicating that the introduction of deposit insurance does not influence the relationship between bank capital and liquidity creation. All conclusions are very robust in the sense that they are observed with the three different liquidity creation measures. The results do not change if we use different variables to assess risk (loan loss provisions, volatility of earnings, or Z-score).[9]

We briefly turn to the analysis of control variables. We observe non-significant coefficients in the majority of cases. Similarly, Berger and Bouwman (2009) report many non-significant control variables in their estimations. In our case, a notable exception is the significantly positive coefficient for size at least for two liquidity creation measures, which suggests that greater banks may create more liquidity. Risk measures are significantly negative in several cases, suggesting that greater risk hampers liquidity creation.

The difference-in-difference estimations on the impact of the implementation of the deposit insurance scheme described above are thus complemented by these results. The limited effect of deposit insurance introduction on the relationship between bank capital and liquidity creation was not strong enough to influence the sign of this relationship, which remains negative throughout the observation period.

The implications of these results are twofold. First, they suggest that by imposing capital requirements on banks for safety reasons regulators may hamper liquidity creation, and thereby

[9] These results are available upon request.

cause economic harm. In other words, a trade-off would exist between the benefits of financial stability and the costs of diminished liquidity creation. Second, the introduction of deposit insurance scheme does not provide a solution to this dilemma. Indeed, the relationship between bank capital and liquidity creation is still negative after the implementation of the DIS.

We next ask whether our main findings might differ among size classes and types of ownership. Indeed, Berger and Bouwman (2009) find different relationship between bank capital and liquidity creation for US banks depending on the size of the bank. If the results differ with size and with ownership, then the role of bank capital on liquidity creation can be modified through policies promoting changes of size (policies favoring mergers) or privatization and foreign bank entry. We therefore continue our analysis with the estimations by size and by ownership.

4.3 Results by size

Berger and Bouwman (2009) argue that the relationship between bank capital and liquidity creation can vary with bank size, as hypotheses on this link are not similarly applicable for all banks. They claim the "risk absorption" hypothesis, which expects a positive impact of bank capital, is most applicable to large banks. This hypothesis posits that as liquidity creation enhances the likelihood of losses for banks, bank capital becomes more important in absorbing losses. Large banks are in this respect more concerned as they are more exposed to regulatory scrutiny and market discipline from uninsured providers of funds. They also mention that the "financial fragility/crowding out" hypothesis suggests a negative relationship more applicable to small banks. Small banks tend to raise more funds locally than large banks. Consequently, there is larger overlap between those who invest in equity and those who provide deposits, resulting in greater crowding-out of deposits by equity. In their study on US banks, Berger and Bouwman (2009) find empirical support for these expectations, as the relationship between bank capital and liquidity creation is significantly positive for large banks, significantly negative for small banks, and not significant for medium-sized banks.

Here, we aim to check whether similar findings are applicable for an emerging country like Russia. Indeed, emerging markets may have different characteristics that modify the relationship observed on the US market. The Russian banking industry is characterized by an impressive number of banks and there are pressures to implement a consolidation process to reduce their number. Thus, if we find that the relationship between bank capital and liquidity creation is significantly positive for large banks as it is the case for US banks, this would provide an additional argument to favor consolidation in the Russian banking industry. Indeed, it would then contribute to reduction of

the detrimental effects of bank capital requirements on liquidity creation. Moreover, as the introduction of the deposit insurance may have exerted a different impact on different banks, we want to check whether our finding regarding the absence of impact of this introduction on the relationship between bank capital and liquidity creation is valid for all size categories.

To examine the relationship between bank capital and liquidity creation by size, we separate Russian banks into three samples based on size: large banks (top 50), medium-sized banks (top 51-200), and small banks. Tables 4 and 5 display the results for each category of banks before and after the introduction of the DIS, respectively.

The results can be summarized as follows. Before the introduction of the DIS, the relationship between bank capital and liquidity creation is significantly negative for small and medium banks and all liquidity creation measures. After the introduction of the DIS, the relationship is significantly negative for small banks, and not significant for big banks with all liquidity creation measures. For medium-sized banks, the relationship is significantly negative with LC1/assets and LC2/assets, but not significant with LC3/assets.

All in all, these results suggest two major conclusions. First, the comparison of size classes shows some differences in the link between bank capital and liquidity creation across these subgroups. In other words, the relationship is significantly negative for small and medium-sized banks, but not significant for large banks. To some extent, these results are in line with those from Berger and Bouwman (2009). Similarly, we find that the "risk absorption" hypothesis according to which the relationship would be positive is more applicable to large banks as it offsets the negative effect from the "financial fragility-crowding out" hypothesis. We do not observe a significantly positive relationship for large banks like in the case for US banks. This finding supports a policy aiming to increase the size of Russian banks. Greater bank size might reduce the negative impact of bank capital on liquidity creation, and could consequently diminish the detrimental effects of bank capital requirements applied to promote financial stability.

Second, our main finding for all banks that the introduction of the deposit insurance scheme does not change the relationship of bank capital and liquidity creation is now corroborated in the estimations by bank size. Indeed, in most cases, the sign and significance of the coefficient for bank capital remains the same before and after DIS. The only exceptions are medium banks with LC3/assets for which the negative sign loses its significance after the DIS. Thus, even for small banks for which the "financial fragility/crowding out" effect plays a stronger role, the introduction

of the deposit insurance scheme which is expected to reduce the dominance of this effect does not have a significant impact.

4.4 Results by ownership

We now turn to estimations by ownership − a major issue in many emerging markets, including Russia. Three types of banks coexist in Russia: state-controlled banks, foreign-owned banks, and domestic private banks. This coexistence leads to major debates with notably the relevance of foreign bank entry and privatization. While the effects of foreign and private ownership on efficiency and competition in emerging markets have been widely investigated,[10] we are unaware of investigations dealing with the role ownership plays in the relationship of bank capital and liquidity creation. In Russia's case, one must therefore ask whether the relationship, which is negative at the general level, differs by ownership format. If we find a non-negative relationship for a specific group, it would suggest promoting the importance of such group in the banking industry to diminish the negative impact of bank capital requirements.

We estimate regressions by considering separately state-controlled, foreign and private domestic banks. Results for before and after the introduction of the DIS are presented in Tables 6 and 7. Two findings clearly emerge. First, the relationship between bank capital and liquidity creation is significantly negative for private domestic banks, whereas it is not significant for state-controlled and foreign banks. Second, this relationship was not influenced by the introduction of the DIS in any group. This is in line with our former results.

Significance of our results for different ownership groups is not surprising since banks that are mostly affected by deposit insurance are private domestic banks. On the other hand, state-controlled banks have benefited from the implicit deposit insurance even before the introduction of the official DIS (Karas, Pyle and Schoors, 2009), and foreign banks can be perceived as less sensitive to bank runs owing to the presence of a foreign shareholder. Therefore, if DIS influences the relationship between bank capital and liquidity creation, one would particularly anticipate these changes for private domestic banks.

Our first finding that the relationship between bank capital and liquidity creation is not significant for state-controlled and foreign banks could be interpreted as evidence of a cancelling out of both main effects even if the "financial fragility/crowding out" effect seems to dominate for pri-

[10] For Russian banks, see Karas, Schoors and Weill (2010) for the role of ownership on efficiency and Fungáčová, Solanko and Weill (2010) for the link between ownership and competition. For a more global view of the impact of private ownership on performance, see Estrin et al. (2009).

vate domestic banks. In other words, the "risk absorption" effect plays a stronger role for foreign banks and state-controlled banks. In the case of foreign banks, the greater scrutiny of foreign shareholders might ascribe a higher importance of bank capital in absorbing potential losses associated with greater liquidity creation. This finding suggests that authorities should consider promoting foreign bank entry or preserving state ownership if they wish to limit the detrimental effects of the bank capital requirements on liquidity creation.

5 Conclusions

This paper examines how the introduction of deposit insurance affects the relationship between bank capital and liquidity creation. Following Berger and Bouwman (2009), this issue appears to have value in addressing the normative implications of bank capital requirements. Indeed, financial authorities today encourage banks to increase their bank capital in the name of financial stability, while neglecting the role of banks in liquidity creation (which, as the relevant literature suggests, can be influenced by bank capital).

Introduction of the deposit insurance scheme in Russia in 2004 serves as a natural experiment that permits testing the relationship between bank capital and liquidity creation. It also allows investigating this relationship in the context of a major emerging economy.

We find limited evidence that the post-insurance impact of bank capital on liquidity creation is less negative. Nonetheless, the introduction of a deposit insurance scheme did not change the sign of this impact, which is negative both before and after implementation. This negative relationship between bank capital and liquidity creation has important policy implications as it suggests that bank capital requirements implemented for safety reasons may actually harm liquidity creation, and thereby harm performance of the economy. There appears to be a trade-off between the benefits of financial stability and the costs of lower liquidity creation for greater bank capital.

Additional estimations confirm that relationship between bank capital and liquidity creation varies with size and type of ownership. This relationship is not significant for large banks, foreign banks, and state-controlled banks, but is significantly negative for small and medium-sized banks, as well as for private domestic banks. These findings point to a number of ways policymakers might mitigate the detrimental effects of greater bank capital for liquidity creation. Most notably, policies that promote consolidation of Russian banks to boost their size and the opening up of

the banking sector to foreign banks appear to have diminished the negative impacts of bank capital on liquidity creation.

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Appendix

Definitions of liquidity creation measures (LC1, LC2, and LC3)

The following are definitions of the balance sheet items in terms of their liquidity, which is the basis for calculation of the liquidity creation measures. The general functional form to calculate liquidity creation is given by Equation (1) and the weights of different items are reported in the parentheses. LC1 is a gross measure of liquidity creation, based on the rough liquidity characteristics of broad categories of financial terms. In constructing the second liquidity creation measure (LC2), we classify the bank activities based on the categories. LC3 is based on the category as well as the maturity that is nested in some of the categories of the financial terms.

LC1: GROSS MEASURE	**Illiquid assets (1/2)**		**Liquid assets (-1/2)**
	Total loans		Correspondent accounts with other banks
			Securities investments
	Liquid liabilities (1/2)		**Illiquid liabilities (-1/2)**
	Total deposits		Capital
LC2: CATEGORY MEASURE	**Illiquid assets (1/2)**	**Semi-liquid assets (0)**	**Liquid assets (-1/2)**
	Loans to firms	Interbank loans	Correspondent accounts with other banks
	Other assets	Loans to government	Government securities (incl. securities issued by regions and municipalities)
		Loans to individuals	Investments to promissory notes
	Liquid liabilities (1/2)	**Semi-liquid liabilities (0)**	**Illiquid liabilities (-1/2)**
	Debt securities issued (promissory notes)	Debt securities issued (deposit and saving certificates, bonds)	Other liabilities
	Claims of non-bank sector : settlement accounts (firms, households, government)	Claims of non-bank sector : term deposits accounts (firms, households, government)	Capital
	Claims of banks		
LC3: MATURITY MEASURE	**Illiquid assets (1/2)**	**Semi-liquid assets (0)**	**Liquid assets (-1/2)**
	Interbank loans (maturity more than 1 year, nonperforming interbank loans)	Interbank loans (maturity more than a week and less than 1 year)	Interbank loans (maturity less than a week)
	Loans to firms	Loans to government	Correspondent accounts with other banks
	Other assets	Loans to individuals	Government securities (incl. securities issued by regions and municipalities)
			Investments into prom. notes
	Liquid liabilities (1/2)	**Semi-liquid liabilities (0)**	**Illiquid liabilities (-1/2)**
	Liabilities with maturity lower than 90 days	Liabilities (term deposits and debt securities) with maturity less than 1 year	Liabilities (term deposits, debt securities) with maturity more than 1 year and overdue liabilities and liabilities with uncertain term to maturity
	Current and corresponding accounts		Capital

Table 1

Descriptive statistics for the main variables

This table provides the descriptive statistics of the main variables for the period before the introduction of the deposit insurance scheme (DIS) from 2001 to 2003 and after its introduction from 2005 to 2007.

	Before DIS			After DIS		
	Obs.	Mean	Std. deviation	Obs.	Mean	Std. deviation
LC1 (in proportion of assets)	10542	0.32	0.20	7541	0.47	0.19
LC2 (in proportion of assets)	10542	0.27	0.18	7541	0.30	0.16
LC3 (in proportion of assets)	10542	0.22	0.18	7541	0.20	0.16
Size (ln of assets)	10542	5.86	1.83	7541	7.10	1.80
Nonperf. loans ratio	10542	0.01	0.02	7541	0.01	0.02
Capital-asset ratio	10542	0.29	0.18	7541	0.21	0.15
Herfindahl index	10542	0.18	0.17	7541	0.14	0.12
Household income growth	10542	33.27	11.39	7541	22.39	10.23
Small business growth	10542	0.07	0.46	7541	0.18	0.83

Table 2

Difference-in-difference estimations

This table presents the results based on the difference-in-difference approach. Dependent variables are the three liquidity creation (LC1, LC2, and LC3 normalized by total assets), respectively. Treatment is a dummy variable that equals to 1 if the bank was enrolled in the deposit insurance scheme around 2004, and 0 otherwise (i.e. state-controlled banks). All variables are defined as the changes between corresponding quarters before and after 2004, a year in which deposit insurance was implemented. Absolute values of t-statistics are reported in brackets. *, **, *** denote an estimate significantly different from 0 at the 10%, 5%, or 1% level, respectively.

Liquidity creation measure (% of assets)	LC1 (difference)		LC2 (difference)		LC3 (difference)	
Constant	-0.182***	-0.182***	-0.100**	-0.100**	-0.067	-0.068
	[7.91]	[7.90]	[2.11]	[2.12]	[1.22]	[1.24]
Treatment dummy variable	0.129***	0.131***	0.129***	0.125***	0.107*	0.100*
	[5.23]	[5.29]	[2.68]	[2.59]	[1.91]	[1.81]
Capital asset ratio (difference)	-0.621***	-0.621***	-1.288***	-1.290***	-0.433	-0.435*
	[6.65]	[6.64]	[4.02]	[4.03]	[1.64]	[1.65]
Size (difference)	-0.044***	-0.044***	-0.115***	-0.115***	-0.096**	-0.097**
	[3.01]	[2.99]	[2.77]	[2.79]	[2.45]	[2.48]
Treatment × capital assets ratio (difference)	0.036	0.002	0.829**	0.894***	0.008	0.105
	[0.36]	[0.02]	[2.58]	[2.77]	[0.03]	[0.39]
Treatment × size (difference)	0.076***	0.079***	0.126***	0.121***	0.081**	0.073*
	[4.84]	[4.95]	[3.00]	[2.89]	[2.02]	[1.84]
Treatment × capital assets ratio difference × size (difference)		-0.022		0.042**		0.063***
		[1.12]		[2.47]		[2.93]
Nonperf. loans (difference)	0.394	0.400	-0.082	-0.094	-0.556*	-0.574**
	[1.39]	[1.42]	[0.30]	[0.35]	[1.94]	[2.02]
Herfindahl index (difference)	-0.130**	-0.126**	0.137***	0.131**	0.281***	0.271***
	[2.40]	[2.32]	[2.63]	[2.51]	[5.05]	[4.89]
Household income growth (difference)	0.001	0.001	-0.001**	-0.001**	-0.001***	-0.001***
	[0.26]	[0.33]	[2.30]	[2.18]	[3.24]	[3.10]
Small business growth (difference)	-0.002	-0.002	-0.006	-0.005	-0.011*	-0.010*
	[0.72]	[0.80]	[1.12]	[1.04]	[1.92]	[1.83]
Observations	19011	19011	19011	19011	19011	19011
F-statistics	73.87	67.77	42.55	43.74	27.13	28.00
R-squared	0.34	0.34	0.22	0.22	0.13	0.14

Table 3

Main estimations for the period before and after introduction of deposit insurance scheme (DIS)

Fixed effect estimations for the period before the deposit insurance scheme was implemented (2001−2003) and after its implementation (2005–2007). Dependent variables are liquidity creation measures as indicated in the second row. Explanatory variables are one period lagged. Regressions are estimated with robust standard errors clustered by banks. T-statistics are reported in brackets below estimated coefficients. *, **, *** denote an estimate significantly different from 0 at the 10%, 5%, or 1% level, respectively. Dummy variables for quarters and years are included in the regressions, but not reported.

	Before DIS			After DIS		
Liquidity measure (% of assets)	LC1	LC2	LC3	LC1	LC2	LC3
Constant	0.231***	0.194***	0.262***	0.206**	0.087	0.142
	[5.40]	[5.20]	[6.51]	[2.57]	[0.98]	[1.53]
Capital-asset ratio	-0.293***	-0.258***	-0.266***	-0.310***	-0.221***	-0.197***
	[11.68]	[11.47]	[11.44]	[8.42]	[5.36]	[4.77]
Size	0.023***	0.021***	0.005	0.044***	0.035***	0.009
	[3.18]	[3.49]	[0.79]	[4.30]	[2.97]	[0.71]
Nonperforming loans	-0.549***	-0.285	-0.351*	-0.102	-0.091	-0.223
	[2.92]	[1.56]	[1.70]	[0.45]	[0.38]	[0.84]
Herfindahl index	0.045	0.117**	0.049	0.097	0.172**	0.319***
	[0.77]	[2.35]	[0.95]	[1.15]	[2.26]	[3.49]
Household income growth	-0.001*	-0.001	-0.001	0.001	-0.001	-0.001***
	[1.84]	[0.40]	[0.92]	[1.08]	[0.96]	[3.60]
Small business growth	-0.001	-0.002	-0.002	-0.001	0.001	0.002
	[0.58]	[1.17]	[1.54]	[0.33]	[0.41]	[0.68]
Observations	10324	10324	10324	7323	7323	7323
No. of banks	916	916	916	916	916	916
R-squared	0.38	0.24	0.2	0.37	0.24	0.09

Table 4

Estimations for different size groups before introduction of deposit insurance scheme

Fixed effect estimations for the period before the deposit insurance scheme was implemented (2001−2003). Dependent variables are liquidity creation measures as indicated in the second row. Explanatory variables are one period lagged. Regressions are estimated with robust standard errors clustered by banks. T-statistics are reported in brackets below estimated coefficients. *, **, *** denote an estimate significantly different from 0 at the 10%, 5%, or 1% level, respectively. Dummy variables for quarters and years are included in the regressions, but not reported.

Sample	Small banks			Medium banks			Large banks		
Liquidity measure (% of assets)	LC1	LC2	LC3	LC1	LC2	LC3	LC1	LC2	LC3
Constant	0.210***	0.203***	0.271***	0.362**	0.159	0.22	0.530*	0.388	0.279
	[4.82]	[5.37]	[6.81]	[2.29]	[1.26]	[1.28]	[1.80]	[1.38]	[0.94]
Capital-asset ratio	-0.294***	-0.262***	-0.265***	-0.172*	-0.162**	-0.227***	-0.239	-0.055	-0.169
	[11.02]	[11.08]	[10.93]	[1.77]	[2.13]	[2.74]	[1.51]	[0.35]	[0.90]
Size	0.025***	0.021***	0.005	0.004	0.022	0.004	-0.019	-0.013	-0.005
	[3.16]	[3.16]	[0.73]	[0.20]	[1.42]	[0.18]	[0.60]	[0.42]	[0.15]
Nonperform. loans	-0.493**	-0.337*	-0.396*	-0.209	0.508	0.223	-1.331*	-0.038	0.202
	[2.43]	[1.75]	[1.88]	[0.50]	[1.05]	[0.29]	[1.75]	[0.03]	[0.17]
Herfindahl index	0.059	0.106**	0.031	-0.055	0.047	0.191	0.843**	0.422	0.285
	[0.97]	[2.03]	[0.60]	[0.32]	[0.34]	[0.94]	[2.09]	[1.06]	[0.55]
Household income growth	-0.001*	0.001	0.001	0.001	0.001	0.001	0.001	0.001	-0.001
	[1.91]	[0.38]	[0.52]	[0.23]	[0.13]	[0.59]	[0.07]	[0.30]	[1.33]
Small business growth	-0.001	-0.002	-0.002	-0.008	0.001	-0.005	0.005	-0.018	-0.034
	[0.46]	[1.10]	[1.36]	[0.43]	[0.03]	[0.33]	[0.18]	[0.73]	[0.93]
Observations	8483	8483	8483	1337	1337	1337	504	504	504
No. of banks	792	792	792	175	175	175	56	56	56
R-squared	0.36	0.25	0.22	0.17	0.11	0.13	0.06	0.08	0.1

Table 5

Estimations for different size groups after introduction of deposit insurance scheme

Fixed effect estimations for the period after the deposit insurance scheme was implemented (2005−2007). Dependent variables are liquidity creation measures as indicated in the second row. Explanatory variables are one period lagged. Regressions are estimated with robust standard errors clustered by banks. T-statistics are reported in brackets below estimated coefficients. *, **, *** denote an estimate significantly different from 0 at the 10%, 5%, or 1% level, respectively. Dummy variables for quarters and years are included in the regressions, but not reported.

Sample	Small banks			Medium banks			Large banks		
Liquidity measure (% of assets)	LC1	LC2	LC3	LC1	LC2	LC3	LC1	LC2	LC3
Constant	0.172**	0.057	0.098	0.705***	0.505**	0.485	0.369	0.380	0.564
	[1.97]	[0.61]	[0.99]	[3.49]	[2.09]	[1.43]	[1.40]	[1.42]	[1.51]
Capital-asset ratio	-0.304***	-0.218***	-0.205***	-0.253**	-0.245**	-0.125	-0.186	0.074	0.181
	[7.57]	[4.80]	[4.52]	[2.11]	[2.11]	[1.01]	[1.02]	[0.52]	[1.27]
Size	0.050***	0.040***	0.017	-0.016	-0.014	-0.032	0.025	-0.001	-0.040
	[4.27]	[3.08]	[1.21]	[0.76]	[0.54]	[0.85]	[1.06]	[0.06]	[1.10]
Nonperform. loans	0.053	0.120	0.028	-0.737	-0.936	-1.600**	-0.562	-2.436**	-0.586
	[0.21]	[0.46]	[0.10]	[1.43]	[1.49]	[2.23]	[0.50]	[2.38]	[0.38]
Herfindahl index	0.125	0.167*	0.310***	0.016	0.203	0.320**	-0.231	0.384	0.266
	[1.23]	[1.88]	[2.92]	[0.08]	[1.11]	[2.01]	[1.43]	[1.61]	[0.86]
Household income growth	0.001	0.001	-0.001***	0.001**	0.001	0.001	0.001	0.001	0.001
	[0.33]	[1.43]	[4.12]	[2.52]	[1.44]	[0.53]	[0.75]	[0.49]	[0.67]
Small business growth	-0.001	0.001	0.002	-0.039*	-0.008	0.018	-0.008	-0.034	-0.027
	[0.35]	[0.34]	[0.55]	[1.81]	[0.38]	[0.65]	[0.19]	[0.79]	[0.41]
Observations	5734	5734	5734	1159	1159	1159	430	430	430
No. of banks	760	760	760	180	180	180	58	58	58
R-squared	0.38	0.22	0.12	0.18	0.01	0.02	0.14	0.19	0.04

Table 6

Estimations for different ownership groups before introduction of deposit insurance scheme

Fixed effect estimations for the period before the deposit insurance scheme was implemented (2001−2003). Dependent variables are liquidity creation measures as indicated in the second row. Explanatory variables are one period lagged. Regressions are estimated with robust standard errors clustered by banks. T-statistics are reported in brackets below estimated coefficients. *, **, *** denote an estimate significantly different from 0 at the 10%, 5%, or 1% level, respectively. Dummy variables for quarters and years are included in the regressions, but not reported.

Sample	Private domestic banks			State-controlled banks			Foreign-owned banks		
Liquidity measure (% of assets)	LC1	LC2	LC3	LC1	LC2	LC3	LC1	LC2	LC3
Constant	0.223***	0.183***	0.252***	-0.004	0.076	0.287	-0.506	0.080	0.701
	[5.19]	[4.86]	[6.26]	[0.01]	[0.20]	[0.99]	[0.76]	[0.26]	[1.54]
Capital-asset ratio	-0.291***	-0.252***	-0.260***	-0.290	-0.304	-0.501**	-0.001	-0.12	-0.077
	[11.35]	[10.93]	[10.92]	[1.27]	[1.44]	[2.35]	[0.00]	[0.77]	[0.25]
Size	0.024***	0.024***	0.008	0.043	0.032	0.007	0.113	0.018	-0.077
	[3.26]	[3.78]	[1.17]	[0.79]	[0.68]	[0.18]	[1.47]	[0.48]	[1.52]
Nonperf. loans	-0.621***	-0.395**	-0.458**	2.037	2.362	1.702	1.043	1.942***	1.997**
	[3.22]	[2.13]	[2.19]	[1.67]	[1.49]	[1.13]	[1.09]	[4.34]	[2.20]
Herfindahl index	0.043	0.117**	0.037	0.166	0.081	0.139	0.049	0.134	0.425
	[0.71]	[2.25]	[0.72]	[1.04]	[0.50]	[0.63]	[0.02]	[0.07]	[0.22]
Household income growth	0.001	0.001	0.001	0.001	-0.001	-0.001	0.001	0.001	-0.001
	[1.57]	[0.16]	[0.65]	[0.18]	[1.05]	[0.81]	[0.32]	[0.08]	[1.11]
Small business growth	-0.001	-0.002	-0.002	-0.003	-0.008	-0.018	-0.024	0.030	-0.051
	[0.71]	[1.24]	[1.55]	[0.05]	[0.20]	[0.56]	[0.30]	[0.68]	[0.95]
Observations	9817	9817	9817	231	231	231	276	276	276
No. of banks	871	871	871	20	20	20	33	33	33
R-squared	0.37	0.26	0.21	0.07	0.01	0.04	0.19	0.18	0.06

Table 7

Estimations for different ownership groups after introduction of deposit insurance scheme

Fixed effect estimations for the period after the deposit insurance scheme was implemented (2005−2007). Dependent variables are liquidity creation measures as indicated in the second row. Explanatory variables are one period lagged. Regressions are estimated with robust standard errors clustered by banks. T-statistics are reported in brackets below estimated coefficients. *, **, *** denote an estimate significantly different from 0 at the 10%, 5%, or 1% level, respectively. Dummy variables for quarters and years are included in the regressions, but not reported.

Sample	Private domestic banks			State-controlled banks			Foreign-owned banks		
Liquidity measure (% of assets)	LC1	LC2	LC3	LC1	LC2	LC3	LC1	LC2	LC3
Constant	0.252***	0.128	0.132	0.214	0.173	1.190***	-0.198	-0.299	0.292
	[3.63]	[1.61]	[1.37]	[0.45]	[0.43]	[3.27]	[0.41]	[0.60]	[0.68]
Capital-asset ratio	-0.325***	-0.224***	-0.201***	-0.251	0.171	0.128	-0.103	-0.139	-0.095
	[9.74]	[6.05]	[4.73]	[0.66]	[0.65]	[0.32]	[0.65]	[0.68]	[0.68]
Size	0.038***	0.030***	0.010	0.036	0.010	-0.098**	0.085	0.074	-0.012
	[4.37]	[2.82]	[0.81]	[0.75]	[0.24]	[2.71]	[1.57]	[1.42]	[0.24]
Nonperf. loans	-0.143	-0.213	-0.172	1.113	0.800	-0.988	0.880	1.468	-0.710
	[0.60]	[0.85]	[0.62]	[0.73]	[0.84]	[0.91]	[0.56]	[0.93]	[0.74]
Herfindahl index	0.083	0.152*	0.337***	-0.036	0.109	-0.258	0.235	0.061	-0.817
	[0.92]	[1.88]	[3.45]	[0.26]	[0.55]	[1.03]	[0.41]	[0.08]	[1.20]
Household income growth	0.001	0.001	-0.001***	0.001*	0.001**	0.001	0.001	0.001	0.001
	[0.79]	[1.26]	[4.03]	[1.79]	[2.55]	[0.43]	[0.91]	[0.62]	[1.07]
Small business growth	-0.001	0.001	0.002	-0.060	-0.090	-0.130*	-0.170*	-0.160	-0.144**
	[0.27]	[0.48]	[0.71]	[1.04]	[1.67]	[1.91]	[1.75]	[1.55]	[2.19]
Observations	6849	6849	6849	173	173	173	301	301	301
No. of banks	866	866	866	20	20	20	49	49	49
R-squared	0.39	0.27	0.09	0.14	0.15	0.18	0.32	0.06	0.05

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