Bank Capital, Liquidity Creation and Deposit Insurance[1]

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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 empirically investigate this issue. We use the difference-in-difference approach on a large dataset of all Russian banks. Our findings suggest that the introduction of the deposit insurance scheme has different effects on the relationship between capital and bank liquidity creation across different types of banks. It is those banks characterized by relatively high household deposit ratios that are most affected by the introduction of deposit insurance program. For these banks, deposit insurance reduces the impact of capital on liquidity creation. These findings have important policy implications as they suggest that deposit insurance and capital requirements should not be considered separately by bank regulators.

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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 of US banks. The latter is of great interest, as it offers another perspective concerning potential influence of bank capital requirements, in addition to the conventional focus on the role of bank capital in minimizing the impact of financial risk and losses. In other words, how bank capital impacts liquidity creation should also be taken into account when assessing the contribution of capital to financial stability.

Our aim in this paper is to probe how deposit insurance influences the relationship between bank capital and liquidity creation. The implementation of a deposit insurance scheme can indeed contribute to a change in the influence of bank capital on liquidity creation by affecting the channels of transmission of bank capital.

Two hypotheses frame the current discussion of the relationship between bank capital and liquidity creation. Both of them are influenced by the implementation of deposit insurance.

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). However the implementation of deposit insurance can reduce this liquidity-creating role, as it reduces the incentives for banks being protected from bank runs to own capital to create liquidity.

In contrast, the "financial fragility / crowding out hypothesis" assumes that greater capital hampers liquidity creation. This hypothesis brings together two distinct

[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.

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 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.

However, with deposit insurance, this impact of capital is weakened. Depositors have then no incentive to withdraw money, so deposit contracts do nothing to mitigate the holdup problem. As a result, greater capital does not reduce liquidity creation anymore once a deposit insurance scheme has been implemented.

Thus, we have two competing hypotheses on the impact of capital on liquidity creation, which can be both weakened by the implementation of deposit insurance. This makes the impact of such scheme on the liquidity creation effects of bank capital unpredictable.

Our paper aims at providing the first empirical investigation of the impact of deposit insurance on the relation between bank capital and liquidity creation. To uncover it, we benefit from a natural experiment in Russia. This country implemented a deposit insurance scheme in 2004 which was not expected that soon. The scheme only covers household deposits and all banks with the permission to accept these deposits

have to participate. Even if the original coverage was not big (100,000 rubles, i.e. about 3500 USD), the amount was enough to cover the vast majority of depositors.[3] Chernykh and Cole (2011) and Karas, Pyle and Schoors (2012) also investigate the impact of the implementation of deposit insurance scheme but on other issues.

We use a rich panel dataset on all banks involved in the scheme covering the periods before and after the introduction of the deposit insurance scheme. Our empirical strategy is based on the use of 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 or any other factors that apply to all banks, i.e., both control group and treatment group. We define our control group based on a unique feature that characterizes the Russian financial system: the full implicit deposit insurance of state-controlled banks before the introduction of the deposit insurance scheme, as observed by Chernykh and Cole (2011). We thus assume that state-controlled banks were largely unaffected by the new deposit insurance scheme and therefore can be used as our "control group". More specifically, we compare changes in the relationship between capital and liquidity creation around the time of deposit insurance introduction for banks affected by the scheme (i.e., the "treatment group") against changes for state-controlled banks, which had enjoyed implicit deposit insurance earlier.

As we investigate an issue at their crossroads, our paper makes a key contribution to two major fields of bank regulation: capital requirements, and deposit insurance. The detrimental incentives for moral hazard behavior of 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 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

[3] According to Camara and Montes-Negret (2006), 98.5% of deposit accounts were under 100,000 rubles and thus fully insured at the end of 2005.

either of financial stability through higher bank capital or of liquidity creation with lower bank capital. But it can also empower this dilemma if deposit insurance contributes to enhance this detrimental impact of bank capital.

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. Section 4 presents the results. 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).[4] The original data feature an unbalanced panel containing bank-quarter observations for all Russian banks from the first quarter of 1999 to the fourth quarter of 2009. In our analysis we however rely only on the data that cover different time windows around the introduction of the deposit insurance in 2004. The implementation of the deposit insurance scheme was not finished until the end of 2005 and that is why both year 2004 and year 2005 are considered as the DIS implementation period. The data we use for the period after DIS only start at the beginning of 2006. As we aim to avoid the crisis that hit Russia in the second half of 2008, our full dataset concerns the time period from the first quarter 2003 to the fourth quarter 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 loans-to-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%.[5] 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. Applying these rules and

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

windsorizing the data leaves us the data for over 900 banks in each quarter. Table 1 provides descriptive statistics of our main variables.

In the 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).

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. They introduce four measures of bank liquidity creation that rely on different classification of balance sheet items and inclusion of off-balance sheet data. Following their methodology, we construct two liquidity creation measures for Russian banks which are comparable to their measures; so-called "mat nonfat" and "cat nonfat".

We start by classifying balance sheet items as liquid, semi-liquid, or illiquid. This applies to all itemized terms for assets, liabilities, and capital.[6] The classification is 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 Russia-specific issues, e.g. active trading with certain securities, into account.

Further, we assign weights to all the items. These weights are in line with the theory that states a bank creates liquidity by transforming illiquid assets to liquid liabilities. Thus, positive weights are applied to these two categories of balance sheet items. By the same token, negative weights are used in the case of liquid assets, illiquid liabilities and capital, since bank liquidity creation is destroyed if illiquid liabilities are used to finance liquid assets. Detailed description of balance sheet items used to calculate the liquidity creation measures is provided in the Appendix. After assigning the weights to all balance sheet items we calculate the measures of liquidity creation.

The functional form of measuring bank 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 category and maturity based measures.

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

$$\textit{Liquidity Creation } (LC) = \{\tfrac{1}{2} \times \textit{illiquid assets} + 0 \times \textit{semi-liquid assets} - \tfrac{1}{2} \times \textit{liquid assets}\} + \{\tfrac{1}{2} \times \textit{liquid liabilities} + 0 \times \textit{semi-liquid liabilities} - \tfrac{1}{2} \times \textit{illiquid liabilities}\} - \tfrac{1}{2} \times \textit{capital} \quad (1)$$

We construct two measures of liquidity creation. The first (LC1) is based on category classification of the balance sheet items. The second (LC2) is a liquidity measure based on maturity classification.

The liquid assets category in liquidity creation measure LC1 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 instruments, 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 are considered illiquid liabilities. Bank capital is also considered to be illiquid.

In general, the category-based measure of liquidity creation (LC1) 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 second liquidity creation measure (LC2). On the asset side, the only available data are for 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. All other interbank loans are considered semi-liquid assets.

Classification of liabilities for the LC2 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 LC1, bank capital is treated as illiquid item.

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 Explanatory variables

The most important explanatory variable here is the *capital-assets ratio* (*C*), defined as the ratio of capital to total assets. This variable helps us uncover the relationship between bank capital and bank liquidity creation.

We also include five control variables in the estimations. Berger and Bouwman (2009) use similar control variables when regressing liquidity creation on capital to assets ratio. Our control variables can be divided into two groups. The first contains bank-specific variables, while the second consists of variables describing local market economic environment.

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. It is important to consider this variable in the estimations, as Berger and Bouwman (2009) have shown that liquidity creation can be influenced by size. To control for bank risk, we use *nonperforming loans ratio (NPL)*, defined as the total amount of nonperforming loans divided by total assets, or *volatility of returns (Volatility)*, calculated as the standard deviation of ROA over the last 8 quarters. As argued under the "risk absorption" hypothesis (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).

The second group of control variables takes into account the local economic environment of a bank. We include a *Herfindahl index* based on banking assets to control for local market concentration. 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 measures the concentration of the markets in which the bank operates, using as weights the distribution of its branch networks in the regions. Concentration can have impact on the liquidity creation as it influences the availability of credit, even if the literature describes two different effects. On the one hand, Petersen and Rajan (1995) suggest that greater concentration favors credit supply as banks are more likely to grant credit to clients that are locked in. On the other hand, Beck, Demirgüc-Kunt and Maksimovic (2004) conclude that a higher level of bank concentration is associated with a lower credit demand, as it enhances financing obstacles for companies.

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 take into account the level of economic activity, which can influence liquidity creation as it exerts an impact on the expansion of credit. For instance, economic booms favor loan demand which should be translated in greater liquidity creation. Berger and Bouwman (2009) have similarly included income growth in their investigation.

3. Difference-in-difference estimations

We apply the difference-in-difference approach in our estimations. 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. 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. Difference-in-difference approach enables us to take care of this problem, as it compares the difference between the treatment group and the control group in their changes of before and after the

[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.

implementation of deposit insurance. This approach thus provides results that are robust to the potential bias that the observed impact of the deposit insurance implementation on liquidity creation was contaminated by some other concurrent or temporal policy shift. Moreover, by applying difference-in-difference approach, we are able to benefit from our detailed dataset and some features of the deposit insurance introduction in Russia.

First of all, we need to compare the behavior of banks before and after the introduction of the DIS in 2004. We use three different time windows. For the pre-change period we always use four quarters before the DIS was introduced in 2004. After the introduction of DIS, we consider three alternative windows to check the influence of this policy change taking into account that it might have taken some time before the banks adjusted their balance sheets and operating activities to the deposit insurance. Thus, for the period after the DIS introduction we assume it starts at the beginning of 2006 including alternatively either (1) the first four quarters [+1Q, +4Q] or (2) the third to sixth quarter [+3Q, +6Q] or (3) the fifth to eighth quarter [+5Q, +8Q].[8]

Further, we have to distinguish "treated" banks, i.e. the ones affected by the introduction of DIS, from those that were not influenced by this change. To do so, we exploit a unique feature of the Russian banking system; i.e. even if deposit insurance was intended to cover all deposit-taking banks, state-controlled banks enjoyed an umbrella of implicit deposit insurance already before the deposit insurance was officially implemented as the government explicitly stated it would cover depositor losses only at these banks (Chernykh and Cole, 2011). Therefore, state-controlled banks are considered as the control group in this study. The private banks, both domestic and foreign, thus constitute a treatment group in our estimations. To infer the effect of deposit insurance on the bank-level liquidity creation, we 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).

We estimate the following model:

[8] As we discuss before, the implementation of the DIS was not completed until the end of year 2005.

$$y_{i,t} = \alpha + \beta_1 \times Treatment + \beta_2 \times DIS + \\ \gamma_1 \times C_{i,t} + \gamma_2 \times Treatment \times C_{i,t} + \gamma_3 \times DIS \times C_{i,t} + \gamma_4 \times Treatment \times DIS \times C_{i,t} + \\ \delta_1 \times X_{i,t} + \delta_2 \times Treatment \times X_{i,t} + \delta_3 \times DIS \times X_{i,t} + \delta_4 \times Treatment \times DIS \times X_{i,t} + \varepsilon_{i,t} \quad (2)$$

where $y_{i,t}$ measures the bank-level liquidity creation to total assets (both category and maturity-based liquidity creation measure). The dummy variable *Treatment* equals 1 if the bank enrolled in the deposit insurance scheme in 2004 and 0 if the bank was state-controlled throughout our sample period. *DIS* is a dummy variable that equals one for the quarters after the DIS was introduced and 0 otherwise. We define 2004 as the implementation year and use three alternative time windows described above to calculate the differences between pre- and post-DIS period. $C_{i,t}$ stands for the ratio of capital to assets which is our primary variable in the estimations. The control variables that we consider in our estimations are all included in the vector $X_{i,t}$. In line with the previous literature, we consider both bank-specific and regional control variables as described in section 2.3. As is the case for the ratio of capital to total assets, also other variables enter the equation directly as well as interacted with *Treatment* and *DIS* dummy variables. We account for bank-specific fixed effects and also include seasonal dummy variables. Standard errors are clustered at the bank level.

Our attention is focused on the coefficient γ_4 which concerns the interaction term between capital-assets ratio and dummy variables *Treatment* and *DIS*. This coefficient informs us about the effect of deposit insurance.

4. Results

The results of difference-in-difference estimations with category-based (LC1) and maturity-based (LC2) liquidity creation measures are respectively presented in Tables 2 and 3. In each table, we present three panels pertaining to three different time windows specifications (defined in Section 3) to test whether the results are robust to different time windows. Within each panel of Table 2 and Table 3, we provide a pair of regression results which alternatively use either *NPL* (nonperforming loans to total assets) or *Volatility* (the ex-ante quarterly earnings volatility) as risk measures.

We observe that the introduction of deposit insurance has not changed significantly the relationship between capital and liquidity creation. This finding results from the coefficient γ_4 on the three-way interaction term

$Capital\ ratio \times Treatment \times DIS$, based on the methodology of difference-in-difference estimations. The lack of significance of this coefficient in all regressions in both Tables 2 and 3 support the absence of deposit insurance influence.

To better understand the three-way interaction term γ_4, we present Table 6.1 to map the estimated coefficients concerning capital ratio in the equation (2). Table 6.1 indicates that the coefficient on the relationship between capital and liquidity creation is represented by ($\gamma_1 + \gamma_2$) and (γ_1) respectively for treatment group and control group before deposit insurance is implemented, and the coefficient is changed to ($\gamma_1 + \gamma_2 + \gamma_3 + \gamma_4$) and ($\gamma_1 + \gamma_3$) for these two groups respectively when we examine the post-deposit insurance period. The estimated coefficient γ_4 can thus be rewritten as follows:

γ_4 = changes in 'capital-liquidity relationship' for treatment group
– changes for 'capital-liquidity relationship' for control group

$$= [(\gamma_1 + \gamma_2 + \gamma_3 + \gamma_4) - (\gamma_1 + \gamma_2)] - [(\gamma_1 + \gamma_3) - (\gamma_1)] \quad (3)$$

which confirms that it captures the "real" impact of deposit insurance on 'capital-liquidity creation relationship'.

Following Table 6.1, we present Table 6.2 which is based on the first regression (shown in the first column) in Table 2, to better understand the results in Table 2. Table 6.2 shows that no significance is found among the estimated coefficients for capital ratio for either treatment group or control group estimated before or after deposit insurance. This evidence, combined with insignificant γ_4 coefficients in Table 2 indicates that capital ratio does not affect liquidity creation, and deposit insurance does not change this relationship in a significant way. By the same token, Tables 3 and 6.3 further confirm this finding with the alternative measure of liquidity creation. Thus, the robustness of our result showing that the introduction of deposit insurance does not significantly change the relationship between capital and liquidity creation is confirmed by using two different measures of liquidity creation, three different time windows and two alternative measures of risk.

As outlined above, theoretical literature suggests that the implementation of deposit insurance could weaken the positive impact of capital according to the "risk absorption hypothesis" or reversely predicted by the "financial fragility / crowding out hypothesis". Nevertheless, our findings do not seem to support these propositions. We interpret this result showing lack of influence of deposit insurance in two ways. First, deposit insurance might have no impact on the relationship between capital and

liquidity creation. Under each hypothesis, its impact might be too weak to significantly affect the relationship. Second, deposit insurance can have a strong effect under both hypotheses. However, by strengthening symmetrically these opposing influences, the overall relationship between capital and liquidity creation is not affected as both of these effects compensate. Even if the final result under both explanations is the same for the relationship between capital and liquidity creation, the interpretation is radically different.

To disentangle both views, we take a closer look at the capital-liquidity creation relationship by focusing on the banks that are more influenced by the implementation of deposit insurance. Namely, the introduction of deposit insurance is expected to have stronger effects on the banks with the high ratio of household deposits in their balance sheet. Indeed, we have mentioned above that banks collecting household deposits have to be included in this scheme. Moreover, the greater the share of household deposits the stronger the influence of deposit insurance scheme on the behavior of the bank is expected to be. We thus perform another set of estimations by only considering the banks with a high ratio of household deposits to total assets in the treatment group and the control group. We consider the threshold of 35% of household deposits to total assets to define banks with a high share of household deposits. As a robustness check, we test the threshold of 30% of household deposits to total assets.

The choice of this level is motivated by the distribution of the ratio of household deposits to total assets. The analysis of our sample shows that the 75th percentile is 34.9% for state-controlled banks and 29.9% for other banks. We therefore choose these levels to create the subsamples that include 25% of banks with the highest share of household deposits in their balance sheet. We use them to test the sensitivity of our main findings.

Thus, we now consider only banks which have a ratio of household deposits to total assets greater than the threshold in our sample. We test again the three different time windows, but to save the space we consider only the nonperforming loans ratio as the risk measure[9].

Table 4 describes the results with the threshold of 35% of household deposits to total assets. We note that the interaction term between capital, deposit insurance and treatment variables is now significantly negative in most estimations. This result is

[9] Results are qualitatively similar when using earnings volatility to measure risk.

robust as it is observed with the category-based liquidity creation measure, with all three time windows, and with the maturity-based liquidity creation measure for two time windows.

Table 5 provides the results for the banks that have the ratio of household deposits to total assets higher than 30%. The interaction term between capital, deposit insurance and treatment variables is still negative in all estimations, and significant for four of the six estimations, those for the first and second time windows. Overall, the results presented in Tables 4 and 5 are robust to the choice of liquidity creation measure, threshold for identification of banks with relatively higher proportion of household deposits and also to the different time windows.

These results are supported by those provided in Tables 6.4 and 6.5, which show the coefficients for the relationship between capital and liquidity creation for both groups before and after the implementation of the deposit insurance scheme for the first regression shown in the first column of Tables 4 and 5. We observe that the impact of capital on liquidity creation turns from significantly negative to significantly positive with the implementation of DIS for both groups in both tables (with the exception of a lack of significance for the treatment group in Table 6.5). This change in the relationship between capital and liquidity creation increases the gap between both groups in favor of the control group. For instance, in Table 6.4, the coefficient of the relationship between capital and liquidity creation changes respectively from -0.217 to 0.049 for the treatment group and from -1.605 to 0.676 for the control group. The change was then of 0.266 for the group affected by DIS and 2.281 for the group which was not affected by DIS. We thus observe that the increase of the coefficient was stronger for the group not affected by DIS. This difference is significant as we have shown a significantly negative interaction term between capital, deposit insurance and treatment variables in Table 5.

Therefore, by concentrating on the banks which are supposed to be most affected by the implementation of DIS, we are able to uncover an impact of this introduction on the relationship between capital and liquidity creation. This effect is not observable when considering the sample of all banks, as they are all affected by this change relative to their reliance on household deposits. This result suggests that DIS has contributed to weakening of the positive impact of capital according to the “risk absorption hypothesis”. This hypothesis assumes that capital favors the ability of banks to create liquidity, as capital helps absorbing greater risk associated with liquidity

creation. However, the implementation of DIS makes liquidity creation less risky by reducing potential liquidity demands of customers. The link between capital and liquidity creation is consequently reduced. This does not influence all banks but only those which are the most affected by deposit insurance owing to the relative importance of household deposits in their balance sheet.

The implications of these results are twofold. First, they suggest that by implementing deposit insurance regulators can influence the economic impact of capital requirements. Namely, we show the existence of an impact of capital on liquidity creation which depends on deposit insurance. As a consequence, both fields of bank regulation cannot be considered separately, which is of major importance for bank regulators. Second, the introduction of deposit insurance enhances the liquidity-destroying role of capital. In other words, this implementation strengthens the trade-off for regulators when asking for greater capital levels for banks between the benefits of financial stability, and the costs of diminished liquidity creation.

5. Conclusions

This paper examines how the introduction of deposit insurance affects the relationship between bank capital and liquidity creation. This issue is crucial 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 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 evidence that the post-insurance impact of bank capital on liquidity creation is weaker. Namely, we find no significant role of deposit insurance on this relationship when we consider all banks. However, we observe a significant impact of deposit insurance on the link between bank capital and liquidity creation when we consider only banks which were the most affected by this introduction: those with the higher share of household deposits in their balance sheet. We interpret this result as a

consequence of the fact that deposit insurance enables undercapitalized banks to absorb greater risk and thus it reduces the positive impact of capital on liquidity creation.

Our findings have major policy implications. They suggest that bank regulators cannot consider separately capital requirements and deposit insurance, as the introduction of deposit insurance weakens the impact of bank capital on liquidity creation. Consequently, bank regulators have to take into account this effect before implementing deposit insurance. Our conclusion should however be considered with care, as we provide the first contribution on this issue. Further research is thus needed to confirm these results.

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Table 1
Descriptive statistics

Table 1 presents the descriptive statistics of the variables we use in the empirical analysis for the time windows that we use in our estimations. Besides the number of observations and mean, median (in parentheses) and standard deviation (in brackets) are also presented. We consider year 2003 (4 quarters, i.e., 2003Q1 to 2003Q4) as the time window before the introduction of the deposit insurance scheme (DIS). As for the post-DIS period, we have three alternative time windows: 2006Q1 - 2006Q4, 2006Q3 - 2007Q2 and 2007Q1 - 2007Q4. LC1 is the category-based liquidity creation to total assets ratio, and LC2 is the maturity-based liquidity creation to total assets ratio, and please refer to Appendix for the detailed definitions of LC1 and LC2. Size of the banks is measured by the total assets (in thousand rubles) of the banks. We use two risk measures: NPL is defined as the ratio of total nonperforming loans to total assets, earnings volatility is measured as standard deviation of quarterly earnings (ROA) for the previous eight quarters in the rolling window. Capital ratio is defined as the total capital to total assets. Herfindahl index is calculated as the branch-weighted, region-segmented market concentration at the bank-level. Household income growth is measured as the branch-weighted regional household income per capita. Finally, small business growth is defined as the branch-weighted regional growth in number of total employees working at small and medium-sized enterprises (SMEs).

	Before DIS		After DIS					
	2003Q1 - 2003Q4		2006Q1 - 2006Q4		2006Q3 - 2007Q2		2007Q1 - 2007Q4	
	Obs	Mean (Median) [S.D.]	Obs	Mean (Median) [S.D.]	Obs	Mean (Median) [S.D.]	Obs	Mean (Median) [S.D.]
LC1 (in proportion of assets)	3626	0.284 (0.309) [0.19]	3137	0.31 (0.329) [0.16]	3364	0.306 (0.327) [0.17]	3427	0.305 (0.326) [0.17]
LC2 (in proportion of assets)	3626	0.23 (0.254) [0.20]	3137	0.202 (0.218) [0.16]	3364	0.202 (0.221) [0.17]	3427	0.198 (0.219) [0.17]
Size (total assets in thd.rubles)	3626	4526.9 (493.290) [46,025.87]	3137	13584.6 (1,385.289) [117,258.00]	3364	15795.7 (1,512.953) [139,541.20]	3427	18830.5 (1,753.493) [163,717.60]
Nonperf. loans to total assets ratio (NPL)	3613	0.02 (0.005) [0.05]	3128	0.02 (0.008) [0.04]	3355	0.019 (0.008) [0.04]	3422	0.018 (0.007) [0.04]
Earnings Volatility	3306	0.019 (0.011) [0.02]	2648	0.016 (0.011) [0.02]	2529	0.015 (0.010) [0.02]	2538	0.015 (0.012) [0.02]
Capital ratio (Capital/Assets)	3626	0.266 (0.220) [0.17]	3137	0.192 (0.150) [0.13]	3364	0.194 (0.147) [0.14]	3427	0.192 (0.145) [0.14]
Herfindahl index	3626	0.179 (0.155) [0.16]	3137	0.137 (0.126) [0.11]	3364	0.129 (0.118) [0.11]	3427	0.122 (0.110) [0.11]
Household income growth	3626	135.2 (133.300) [12.79]	3137	119.7 (119.600) [11.70]	3364	118.9 (117.800) [9.76]	3427	120.1 (118.500) [9.48]
Small business growth	3626	0.056 (0.013) [0.35]	3137	0.13 (0.060) [0.18]	3364	0.156 (0.083) [0.22]	3427	0.172 (0.099) [0.24]

Table 2
Difference-in-difference estimations: category-based liquidity creation measure

Table 2 presents the difference-in-difference estimation results for the whole sample, where the dependent variable is the category-based liquidity creation measure normalized by total assets, as defined in the Appendix. *Treatment* is a dummy variable that equals to 1 if the bank is not state-controlled. *DIS* is a dummy variable that equals one for the period after the deposit insurance was introduced. We use three different time windows: we always use 4 quarters before the DIS was introduced (i.e. data for all four quarters in 2003) and after the introduction we consider period starting at the beginning of 2006 including alternatively either (1) the first four quarters [+1Q, +4Q] or (2) the third to sixth quarter [+3Q, +6Q] or (3) the fifth to eighth quarter [+5Q, +8Q]. For each time window two different risk measures are considered: the ratio of nonperforming loans to total loans (*NPL*) and earnings volatility (*Volatility*). All the regressions include the control variables defined in Section 2.3, the interactions between control variables and treatment dummy variable, the interactions between control variables and *DIS*, and the three-way interactions between control variables, *Treatment*, and *DIS*. The coefficients of these control variables and their interaction terms are not reported here for brevity. Seasonal dummy variables are also included but not reported. All estimations include bank- and year-fixed effects, with bank-level clustered standard errors. Absolute values of t-statistics of the coefficients of the independent variables are reported in brackets. *, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Time window	[-4Q, -1Q] vs. [+1Q, +4Q]		[-4Q, -1Q] vs. [+3Q, +6Q]		[-4Q, -1Q] vs. [+5Q, +8Q]	
Constant	0.573**	0.574**	0.633**	0.726***	0.454*	0.433*
	[2.36]	[2.10]	[2.38]	[3.01]	[1.67]	[1.75]
Capital ratio (C)	-0.124	-0.274	-0.247	-0.343*	-0.136	-0.271
	[0.51]	[1.31]	[0.99]	[1.70]	[0.57]	[1.38]
DIS dummy (DIS)	-0.218***	-0.191***	-0.215***	-0.203***	-0.164***	-0.141**
	[3.64]	[2.94]	[3.81]	[3.32]	[2.80]	[2.21]
Treatment	-0.338	-0.386	-0.352	-0.523**	-0.168	-0.238
	[1.38]	[1.43]	[1.32]	[2.19]	[0.62]	[0.98]
Capital ratio × DIS	0.249	0.605*	-0.168	0.121	-0.016	0.031
	[0.91]	[1.76]	[0.57]	[0.25]	[0.06]	[0.08]
Capital ratio × Treatment	-0.166	-0.016	-0.062	0.065	-0.191	-0.003
	[0.68]	[0.07]	[0.25]	[0.32]	[0.80]	[0.01]
Capital ratio × DIS ×	-0.147	-0.475	0.226	-0.035	0.066	0.037
Treatment	[0.53]	[1.36]	[0.76]	[0.07]	[0.23]	[0.09]
Risk measure	*NPL*	*Volatility*	*NPL*	*Volatility*	*NPL*	*Volatility*
Control variables	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Seasonal dummies	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Observations	6552	5954	6783	5835	6963	5844
Number of banks	923	904	926	902	926	905
Adjusted R-squared	0.14	0.13	0.16	0.14	0.16	0.12
F statistic	9.92	11.29	10.66	13.02	12.25	18.17

Table 3
Difference-in-difference estimations: maturity-based liquidity creation measure

Table 3 presents the difference-in-difference estimation results for the whole sample, where the dependent variable is the maturity-based liquidity creation measure normalized by total assets, as defined in the Appendix. *Treatment* is a dummy variable that equals to 1 if the bank is not state-controlled. *DIS* is a dummy variable that equals one for the period after the deposit insurance was introduced. We use three different time windows: we always use 4 quarters before the DIS was introduced (i.e. data for all four quarters in 2003) and after the introduction we consider period starting at the beginning of 2006 including alternatively either (1) the first four quarters [+1Q, +4Q] or (2) the third to sixth quarter [+3Q, +6Q] or (3) the fifth to eighth quarter [+5Q, +8Q]. For each time window two different risk measures are considered: the ratio of nonperforming loans to total loans (*NPL*) and earnings volatility (*Volatility*). All the regressions include the control variables defined in Section 2.3, the interactions between control variables and *Treatment*, the interactions between control variables and *DIS*, and the three-way interactions between control variables, *Treatment*, and *DIS*. The coefficients of these control variables and their interaction terms are not reported here for brevity. Seasonal dummy variables are also included but not reported. All estimations include bank- and year-fixed effects, with bank-level clustered standard errors. Absolute values of t-statistics of the coefficients of the independent variables are reported in brackets. *, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Time window	[-4Q, -1Q] vs [+1Q, +4Q]		[-4Q, -1Q] vs. [+3Q, +6Q]		[-4Q, -1Q] vs. [+5Q, +8Q]	
Constant	0.894***	0.786***	0.849***	0.788***	0.819***	0.788***
	[4.38]	[3.82]	[3.22]	[3.81]	[2.74]	[3.64]
Capital ratio	-0.072	0.075	-0.093	0.154	-0.045	0.085
	[0.36]	[0.38]	[0.35]	[0.70]	[0.15]	[0.34]
DIS	-0.337***	-0.308***	-0.278***	-0.260***	-0.190***	-0.184***
	[4.88]	[4.17]	[4.25]	[3.74]	[2.85]	[2.66]
Treatment	-0.409**	-0.286	-0.318	-0.275	-0.286	-0.284
	[1.99]	[1.40]	[1.21]	[1.34]	[0.96]	[1.35]
Capital ratio × DIS	-0.198	0.007	-0.232	0.163	0.084	0.062
	[0.59]	[0.02]	[0.72]	[0.32]	[0.25]	[0.13]
Capital ratio × Treatment	-0.211	-0.354*	-0.226	-0.436*	-0.290	-0.364
	[1.04]	[1.78]	[0.84]	[1.95]	[0.97]	[1.45]
Capital ratio × DIS ×	0.363	0.158	0.344	-0.070	0.000	0.005
Treatment	[1.07]	[0.52]	[1.05]	[0.14]	[0.00]	[0.01]
Risk proxies	*NPL*	*Volatility*	*NPL*	*Volatility*	*NPL*	*Volatility*
Control variables	*yes*	*Yes*	*yes*	*yes*	*yes*	*yes*
Seasonal dummies	*yes*	*Yes*	*yes*	*yes*	*yes*	*yes*
Observations	6552	5954	6783	5835	6963	5844
Number of banks	923	904	926	902	926	905
Adjusted R-squared	0.12	0.12	0.13	0.11	0.13	0.11
F statistic	13.09	51.87	11.51	38.78	11.43	17.21

Table 4
Difference-in-difference estimations for banks with high share of household deposits (threshold: 35 %)

Table 4 presents the difference-in-difference estimation results for the subsample of banks that have relatively high share of household deposits, where the high share is defined as the ratio of total household deposits to total assets equaling to or higher than 35%. The dependent variable in the estimations is the category-based liquidity creation measure or the maturity-based liquidity creation measure, interchangeably (see Appendix for the definitions of liquidity measures). *Treatment* is a dummy variable that equals to 1 if the bank is not state-controlled. *DIS* is a dummy variable that equals one for the period after the deposit insurance was introduced. We use three different time windows: we always use 4 quarters before the DIS was introduced (i.e. data for all four quarters in 2003) and after the introduction we consider period starting at the beginning of 2006 including alternatively either (1) the first four quarters [+1Q, +4Q] or (2) the third to sixth quarter [+3Q, +6Q] or (3) the fifth to eighth quarter [+5Q, +8Q]. For each time window, we consider the ratio of nonperforming loans to total loans (*NPL*) as the risk measure. All the regressions include the control variables defined in Section 2.3, the interactions between control variables and Treatment, the interactions between control variables and *DIS*, and the three-way interactions between control variables, *Treatment*, and *DIS*. The coefficients of these control variables and their interaction terms are not reported here for brevity. Seasonal dummy variables are also included but not reported. All estimations include bank- and year-fixed effects, with bank-level clustered standard errors. Absolute values of t-statistics of the coefficients of the independent variables are reported in brackets. *, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Time window	[-4Q, -1Q] vs. [+1Q, +4Q]		[-4Q, -1Q] vs. [+3Q, +6Q]		[-4Q, -1Q] vs. [+5Q, +8Q]	
LHS Variable: Liquidity creation measures	category-based	maturity-based	category-based	maturity-based	category-based	maturity-based
Constant	0.374***	0.696***	1.334***	1.727***	-0.216	0.732
	[2.69]	[4.19]	[2.76]	[3.06]	[0.43]	[1.08]
Capital ratio	-1.605***	-2.261***	-1.831***	-2.413***	-0.775*	-1.877***
	[5.33]	[5.30]	[3.61]	[4.28]	[1.87]	[3.96]
DIS	-0.201**	-0.325**	-0.149	-0.286**	-0.148	-0.286**
	[2.10]	[2.47]	[1.35]	[2.08]	[1.22]	[2.05]
Treatment	-	-	-1.005**	-1.059*	0.620	-0.030
			[1.98]	[1.79]	[1.23]	[0.04]
Capital ratio × DIS	2.281***	2.848***	2.410***	2.134***	1.150***	1.335*
	[3.57]	[4.24]	[3.96]	[2.71]	[2.81]	[1.68]
Capital ratio × Treatment	1.388***	2.055***	1.645***	2.214***	0.487	1.518***
	[4.37]	[4.61]	[3.19]	[3.86]	[1.16]	[3.17]
Capital ratio × DIS × Treatment	-2.015***	-2.677***	-2.174***	-2.001**	-1.011**	-1.230
	[3.11]	[3.86]	[3.53]	[2.52]	[2.41]	[1.53]
Risk proxies	*NPL*	*NPL*	*NPL*	*NPL*	*NPL*	*NPL*
Control variables	*yes*	*yes*	*yes*	*yes*	*Yes*	*yes*
Seasonal dummies	*yes*	*yes*	*yes*	*yes*	*Yes*	*yes*
Observations	1500	1500	1561	1561	1610	1610
Number of banks	356	356	378	378	384	384
Adjusted R-squared	0.06	0.29	0.06	0.27	0.07	0.24
F statistic	4334.61	961.29	509.91	1409.86	411.47	1726.64

Table 5
Difference-in-difference estimations for banks with high share of household deposits (threshold: 30%)

Table 5 presents the difference-in-difference estimation results for the subsample of banks that have relatively high share of household deposits, where the high share is defined as the ratio of total household deposits to total assets equaling to or higher than 30%. The dependent variable in the estimations is the category-based liquidity creation measure or the maturity-based liquidity creation measure, interchangeably (see Appendix for the definitions of liquidity measures). *Treatment* is a dummy variable that equals to 1 if the bank is not state-controlled. DIS is a dummy variable that equals one for the period after the deposit insurance was introduced. We use three different time windows: we always use 4 quarters before the DIS was introduced (i.e. data for all four quarters in 2003) and after the introduction we consider period starting at the beginning of 2006 including alternatively either (1) the first four quarters [+1Q, +4Q] or (2) the third to sixth quarter [+3Q, +6Q] or (3) the fifth to eighth quarter [+5Q, +8Q]. For each time window, we consider the ratio of nonperforming loans to total loans (NPL) as the risk measure. All the regressions include the control variables defined in Section 2.3, the interactions between control variables and *Treatment*, the interactions between control variables and *DIS*, and the three-way interactions between control variables, *Treatment*, and *DIS*. The coefficients of these control variables and their interaction terms are not reported here for brevity. Seasonal dummy variables are also included but not reported. All estimations include bank- and year-fixed effects, with bank-level clustered standard errors. Absolute values of t-statistics of the coefficients of the independent variables are reported in brackets. *, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

Time window	[-4Q, -1Q] vs. [+1Q, +4Q]		[-4Q, -1Q] vs. [+3Q, +6Q]		[-4Q, -1Q] vs. [+5Q, +8Q]	
LHS Variable: Liquidity creation measures	category-based	maturity-based	category-based	maturity-based	category-based	maturity-based
Constant	0.313**	0.563***	1.548***	1.609***	-0.098	0.797
	[2.58]	[4.00]	[4.02]	[4.10]	[0.23]	[1.40]
Capital ratio	-1.137***	-1.546***	-1.704***	-1.866***	-0.684*	-1.599***
	[3.15]	[3.04]	[4.13]	[3.70]	[1.68]	[3.67]
DIS	-0.166*	-0.270**	-0.114	-0.199*	-0.094	-0.172
	[1.89]	[2.49]	[1.16]	[1.75]	[0.88]	[1.43]
Treatment	-	-	-1.197***	-0.986**	0.501	-0.156
			[2.94]	[2.34]	[1.18]	[0.27]
Capital ratio × DIS	1.622***	1.600**	1.746***	1.452**	0.917*	1.169*
	[3.11]	[2.27]	[3.15]	[2.03]	[1.70]	[1.66]
Capital ratio × Treatment	0.926**	1.355***	1.441***	1.618***	0.361	1.222***
	[2.50]	[2.61]	[3.40]	[3.15]	[0.87]	[2.78]
Capital ratio × DIS × Treatment	-1.381***	-1.396*	-1.548***	-1.307*	-0.710	-0.959
	[2.61]	[1.96]	[2.75]	[1.81]	[1.29]	[1.35]
Risk proxies	*NPL*	*NPL*	*NPL*	*NPL*	*NPL*	*NPL*
Control variables	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Seasonal dummies	*yes*	*yes*	*yes*	*yes*	*yes*	*yes*
Observations	1963	1963	2062	2062	2131	2131
Number of banks	427	427	443	443	454	454
Adjusted R-squared	0.05	0.26	0.05	0.24	0.05	0.21
F statistic	161.37	624.50	111.13	26.37	175.76	64.91

Table 6: Matrices of summary of coefficients estimations for treatment group vs. control group and before deposit insurance vs. after deposit insurance

Table 6.1. Matrix of coefficients of "capital-liquidity creation relationship" derived from equation (2).

Table 6.1 presents the matrix of capital-related variables' coefficients in the equation (2). Note that γ_4 is the coefficient for the three-way interaction term between DIS, Treatment, and Capital Ratio. In other words, γ_4 shows the net effect of deposit insurance on the linkage between capital ratio and liquidity creation, based on the difference-in-difference method.

	Before DIS (DIS = 0)	After DIS (DIS = 1)	Changes of coefficients [After DIS - Before DIS]
Treatment Group (treat = 1)	$\gamma_1 + \gamma_2$	$\gamma_1 + \gamma_2 + \gamma_3 + \gamma_4$	$\gamma_3 + \gamma_4$
Control Group (treat = 0)	γ_1	$\gamma_1 + \gamma_3$	γ_3
Differences between groups [Treatment - Control Group]	γ_2	$\gamma_2 + \gamma_4$	γ_4

Table 6.2 Matrix of coefficients of "capital-liquidity creation relationship" derived from Table 2, first column.

Table 6.2 presents the matrix of capital-related variables' coefficients based on estimations in the first column regression in Table 2, where the dependent variable is the category-based liquidity creation ratio. Absolute values of t-statistics of the coefficients (or linear combination of relevant coefficients) are derived from post-regression t-test of coefficients (or their linear combinations) and are reported in brackets. *, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

	Before DIS (DIS = 0) [-4Q, -1Q]	After DIS (DIS = 1) [+1Q, +4Q]	Changes of coefficients [After DIS - Before DIS]
Treatment Group (treat = 1)	-0.290***	-0.188***	0.102**
	[6.69]	[3.29]	[2.03]
Control Group (treat = 0)	-0.124	0.125	0.249
	[0.51]	[0.41]	[0.91]
Differences between groups [Treatment - Control Group]	-0.166	-0.313	**-0.147**
	[0.68]	[1.02]	**[0.53]**

Table 6.3 Matrix of coefficients of "capital-liquidity creation relationship" derived from Table 3, first column.

Table 6.3 presents the matrix of capital-related variables' coefficients based on estimations in the first column regression in Table 3, where the dependent variable is the maturity-based liquidity creation ratio. Absolute values of t-statistics of the coefficients (or linear combination of relevant coefficients) are derived from post-regression t-test of coefficients (or their linear combinations) and are reported in brackets. *, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

	Before DIS (DIS = 0) [-4Q, -1Q]	After DIS (DIS = 1) [+1Q, +4Q]	Changes of coefficients [After DIS - Before DIS]
Treatment Group (treat = 1)	-0.283***	-0.118**	0.165***
	[6.26]	[2.01]	[3.12]
Control Group (treat = 0)	-0.072	-0.270	-0.198
	[0.36]	[0.81]	[0.59]
Differences between groups [Treatment - Control Group]	-0.211	0.152	**0.363**
	[1.04]	[0.45]	**[1.07]**

Table 6.4 Matrix of coefficients of "capital-liquidity creation relationship" derived from Table 4, first column (high household deposits sample, i.e., household deposit/assets ratio ≥ 35%)

Table 6.4 presents the matrix of capital-related variables' coefficients based on estimations in the first column regression in Table 4, where the dependent variable is the category-based liquidity creation ratio, and based on the subsample of banks whose household deposits/assets ratio equal to or is above 35%. Absolute values of t-statistics of the coefficients (or linear combination of relevant coefficients) are derived from post-regression t-test of coefficients (or their linear combinations) and are reported in brackets. *, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

	Before DIS (DIS = 0) [-4Q, -1Q]	After DIS (DIS = 1) [+1Q, +4Q]	Changes of coefficients [After DIS - Before DIS]
Treatment Group (treat = 1)	-0.217**	0.048	0.266**
	[1.99]	[0.42]	[2.25]
Control Group (treat = 0)	-1.605***	0.676	2.281***
	[5.33]	[1.06]	[3.57]
Differences between groups [Treatment - Control Group]	1.388***	-0.627	**-2.015*** **
	[4.37]	[0.97]	**[3.11]**

Table 6.5 Matrix of coefficients of "capital-liquidity creation relationship" derived from Table 6, first column (high household deposits sample, i.e., household deposit/assets ratio ≥ 30%)

Table 6.5 presents the matrix of capital-related variables' coefficients based on estimations in the first column regression in Table 5, where the dependent variable is the category-based liquidity creation ratio, and based on the subsample of banks whose household deposits/assets ratio equal to or is above 30%. Absolute values of t-statistics of the coefficients (or linear combination of relevant coefficients) are derived from post-regression t-test of coefficients (or their linear combinations) and are reported in brackets. *, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

	Before DIS (DIS = 0) [-4Q, -1Q]	After DIS (DIS = 1) [+1Q, +4Q]	Changes of coefficients [After DIS - Before DIS]
Treatment Group (treat = 1)	-0.212**	0.029	0.241**
	[2.36]	[0.28]	[2.35]
Control Group (treat = 0)	-1.137***	0.485	1.622***
	[3.15]	[0.96]	[3.11]
Differences between groups [Treatment - Control Group]	0.926**	-0.456	**-1.381*** **
	[2.5]	[0.88]	**[2.61]**

Appendix

Definitions of liquidity creation measures

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 this table in the parentheses. In constructing the category based liquidity creation measure (LC1), we classify the bank activities based on the categories. LC2 is based on the category as well as the maturity classification which is available for interbank loans and all liabilities.

LC1: 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 and capital (-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		
LC2: 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 and capital (-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