Bank Regulation, Supervision and Liquidity Creation

George Kladakis[1], The Business School, Edinburgh Napier University, Edinburgh, UK

Lei Chen, Loughborough University, Loughborough, UK

Sotirios K. Bellos, South East European Research Centre (SEERC); CITY College, University of York Europe Campus, Thessaloniki, Greece

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Abstract

The exposures of the banking system during the global financial crisis of 2007-2009 alerted regulators who strengthened their regulation and supervision of banks to prevent future problems. Yet, banks need to perform one of their main functions in the economy, which is creating liquidity. This raises the question: does greater regulation and supervision of banks enhance or impede bank liquidity creation? We use the 2019 Bank Regulation and Supervision Survey published by the World Bank to update the respective indexes and examine the relationship of regulation and supervision with liquidity creation. We find that banks create more liquidity in countries with stronger supervision policies such as supervisory power and mitigation of moral hazard, while they create less liquidity in countries with tighter regulatory regimes such as activity restrictions and capital regulations.

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[1] Corresponding author. Email: g.kladakis@napier.ac.uk Address: 219 Colinton Rd, Edinburgh EH14 1DJ, United Kingdom

1. Introduction

The lack of effective regulation and supervision of banks received much of the blame for the global financial crisis of 2007-2009. This has led to increasing calls for regulation reforms in the banking sector. New regulatory requirements, such as greater capital adequacy, restrictions on bank activities and increased transparency have been gradually implemented in different countries. However, empirical evidence on the effectiveness of bank regulation and supervision on bank performance and risk-taking appears to be ambiguous, showing that tighter regulations are not always beneficial as policymakers expected (e.g. Barth et al., 2013; Li et al., 2019). It is therefore crucial to assess which policy reforms can promote the functions of banks and which may harm them (Barth et al., 2013).

The purpose of this paper is to investigate the effects of the national level regulation and supervision on bank liquidity creation, which is one of the main functions of banks (Bryant, 1980; Diamond and Dybvig, 1983). Differing from some previous empirical studies that consider banking regulation and supervision indiscriminatingly (e.g. Barth et al., 2013; Li et al., 2019; Chen et al., 2021), we make a distinction between regulation and supervision as their effects on bank functioning could be different. Bank regulation by its nature is rigid and inflexible, with strict rules that all banks in the same jurisdiction need to follow. On the other hand, bank supervision tends to be relatively flexible, allowing the authorities to intervene whenever they foresee a problematic situation to prevent its wider escalation. Using the recent world-wide survey data on bank regulation and supervision, our study provides novel evidence on whether bank regulatory and supervisory requirements enhance or impede the ability of banks to create liquidity and has important policy implications for regulators regarding the efficiency of the post-2007-2009 crisis regulations.

Banks create liquidity by funding illiquid assets with liquid liabilities. With their strong intermediation skills, banks provide liquidity to depositors who can withdraw their money and to borrowers who receive loans to finance investment opportunities. Earlier literature has identified the beneficial effect of liquidity creation on real economic output, particularly in bank-dependent industries (Berger and Sedunov, 2017). However, liquidity creation is inherently associated with liquidity risk which can have adverse effects on the economy[2] (Acharya and Naqvi, 2012), since funding illiquid loans with liquid deposits increases the vulnerability of banks to runs (Diamond and Dybvig, 1983; Leiva and Mendizábal, 2019).

Liquidity creation has attracted great attention in empirical research mainly after the seminal work by Berger and Bouwman (2009) who introduced a method to measure bank liquidity creation by assigning weights to balance sheet items based on whether they contribute to or reduce the creation of liquidity in the economy. So far, the literature on the impact of regulations on liquidity creation has been particularly concerned with the capital adequacy requirements at the bank-level, and has generally concluded that there is a negative relationship between capital ratios and liquidity creation due to the financial fragility effect (Distinguin et al., 2013; Horvath et al., 2014; Fungacova et al., 2017; Casu et al., 2019), except for a few researchers (Berger and Bouwman, 2009; Tran et al., 2016) who find a positive relationship.

However, the effects of country-level regulation and supervision on bank liquidity creation have been largely neglected. Although the new regulatory frameworks are internationally agreed upon and centralized bank supervision is gradually emerging (e.g. Avignone et al., 2021), more cross-country evidence is needed to assess whether the bank regulatory regimes work well to promote a well-functioning banking system (Barth et al., 2013). So far, the studies examining

[2] For example, high levels of liquidity creation can lead to increased cost of capital (Freixas and Rochet, 2008), or even to bank and market failures (Imbierowicz and Rauch, 2014; Berger and Bouwman, 2017).

national regulations have paid very limited attention to liquidity creation.[3] Our study is the first attempt to investigate the effects of country-level regulatory and supervisory policies on bank liquidity creation and has important implications for policy makers. Compared to a few studies that investigate the effects of regulatory interventions (Berger et al., 2016), regulatory-induced competition (Jiang et al., 2019) and government guarantees (Berger et al., 2020) on liquidity creation, our study contributes to the literature by providing empirical evidence on the relationship between national-level policies and liquidity creation for multiple countries based on the latest information about their levels of bank regulation and supervision.

The empirical investigation of the effects of regulation and supervision on banks is of significant importance to informing policy decisions, since it is difficult to draw clear conclusions based on theory alone. There are conflicting predictions for whether tight regulation or enhanced supervision helps or hinders the banking system in fulfilling its functions (Barth et al., 2006). On the one hand, the *public interest view* suggests that governments and authorities act in the interest of the public by introducing rules or intervening to enhance the efficiency of the banking system by preventing market failures. A more efficient and safer bank is likely to perform better its functions, such as creating more liquidity through attracting more deposits and/or issuing more loans. On the other hand, the *private interest view* suggests that tighter rules or strengthened supervision are employed to facilitate the interests of the few and not of the public, thereby impeding the efficient operation of the banking system. For instance, when supervisory authorities have the power to control the distribution of lending, this may encourage corruption and political

[3] The studies of national regulations in the literature have mostly focused on the impact on bank risk-taking and stability (Laeven and Levine, 2009; Agoraki et al., 2011; Ongena et al., 2013; Bermpei et al., 2018; Danisman and Demirel, 2019; Shaddady and Moore, 2019), international bank flows (Houston et al., 2012), financial/banking crises (Angkinand, 2009; Kim et al., 2013), systemic risk (Hoque et al., 2015; Chen et al., 2021), lending (Deli and Hasan, 2017) and bank efficiency (Barth et al., 2013; Chortareas et al., 2013).

interests to shape the allocation of bank credit (Beck et al., 2006). Because of these contradictory expectations, we discuss the theoretical predictions based on both contrasting views on the possible effects of regulation and supervision on liquidity creation.

We use the database developed by Barth et al. (2013) and update it with information from the recently published survey by the World Bank, which covers the period of 2011-2016 and contains the most recent regulation and supervision data across many jurisdictions. Our sample contains a diverse group of 721 banks from 65 countries which enables a broad cross-country analysis. To examine the implications of supervision and regulation separately, we construct a bank supervision index by combining the official supervisory power and actions taken to curtail moral hazard indexes, and a bank regulation index that takes into consideration the activity restrictions and capital regulations indexes. We mitigate potential endogeneity concerns by employing additional estimators, including the Hausman-Taylor, System GMM and 2SLS instrumental variables estimators.

The study contributes to the growing literature on the regulatory and supervisory implications on liquidity creation. We find that banks operating in countries with greater supervision tend to create more liquidity, while banks in countries with tighter regulations create less liquidity. Our findings highlight the importance of flexible supervision in enabling liquidity creation and emphasize the caution with which multiple restricting policies should be introduced should regulators aim to promote a well-functioning banking system.

The remainder of the paper is structured as follows: Section 2 discusses the theoretical framework and hypotheses development; Section 3 describes our data and key variables; Section 4 outlines our empirical methodology; Section 5 presents and discusses our empirical results;

Section 6 presents our robustness tests; and Section 7 concludes and discusses the policy implications of our findings.

2. Theoretical Framework

This section discusses the theoretical predictions for the effects of regulation and supervision on bank liquidity creation. More specifically, we consider two types of bank regulations, namely activity restrictions and capital regulations, and two dimensions of supervision, that is, official supervisory power and actions taken to mitigate moral hazard. We take into account the public and private interest views to discuss the contrasting theoretical predictions for these types of bank regulation and supervision.

2.1 Bank Regulation and Liquidity Creation

After the global financial crisis in 2008, policy makers in different counties introduced more prudential regulations, which were mainly concerned with two aspects of banks' operations: their capital level and non-banking activities. The effects of more stringent regulations on banks' operations, however, appear to be inconclusive. For instance, recent research has reported conflicting evidence on the effects of activity restrictions on bank stability. Some argue that activity restrictions promote bank stability (e.g. Agoraki et al., 2011; Bermpei et al., 2018), while others suggest that they undermine it (e.g. Laeven and Levine, 2009; Ongena et al., 2013; Shaddady and Moore, 2019; Danisman and Demirel, 2019). It is also not easy to draw clear conclusions on the effect of bank regulation on liquidity creation, as there appear to be conflicting predictions based on the extant empirical and theoretical literature for both capital regulation and activity restrictions.

2.1.1 The Positive Impact of Bank Regulation on Liquidity Creation

Literature suggests that the level of regulation stringency may affect positively banks' capability of liquidity creation as a tighter regulatory environment is likely to reduce banks' exposure to excessive risk. When banks create liquidity in the market, they are exposed to liquidity risk (Bouwman, 2019). Banks with higher levels of risk-bearing capacity are therefore able to create more liquidity.

The risk absorption hypothesis suggests that a higher capital ratio can help banks absorb the risk that is associated with liquidity creation (Berger and Bouwman, 2009). Banks with a stronger capital structure have a higher level of risk-bearing capacity, which enables banks to expand their lending and avoid liquidating illiquid assets to meet depositors' liquidity demand. Restrictions on bank activities can also limit banks' exposure to excessively risky ventures. Preventing banks from engaging in complex and irrelevant to their core business activities, such as insurance and securities underwriting or real estate investments, may reduce their exposure to the inappropriate risk of these activities (Boyd et al., 1998; Allen and Carletti, 2006). Therefore, we can expect that higher levels of capital requirements and/or more restrictions on bank activities are likely to have a positive impact on liquidity creation.

Moreover, activity restrictions can encourage banks to create more liquidity by extending their lending and increasing their interest margin. Ongena et al. (2013) find that to offset the negative effect of activity restrictions on profitability, banks loosen their lending standards and take on more risk. In addition, Jiang et al. (2019) show that activity restrictions may control the level of competition and therefore prevent the negative effect of competition on bank liquidity creation.[4]

[4] Jiang et al. (2019) show that regulatory-induced competition (measured by deregulated interstate banking with at least one other state) has a negative effect on liquidity creation.

2.1.2 The Negative Impact of Bank Regulation on Liquidity Creation

Although a positive relationship between bank regulation and liquidity creation is predictable from the public interest view, activity restrictions may be designed so that regulators have more discretion and increase their bargaining power for rent-seeking (Djankov et al., 2002) disregarding the public interest. Activity restrictions could limit the extent to which banks can diversify their portfolios, which is essential for risk management (Claessens and Klingebiel, 2001; Barth et al., 2004), and prevent banks from taking advantage of synergies associated with complimentary activities (Barth et al., 2006). As a result, lack of access to more activities does not allow banks to exploit all available opportunities in alternative asset classes to diversify their operations. This may reduce banks' capacity to create liquidity in an economy by limiting both potential funding sources and loan opportunities. Also, restrictions on bank activities can negatively affect the economies of scope and scale in collecting and processing information about firms that banks can exploit (Barth et al., 2013), and in turn limit banks' capability to expand their lending. The literature shows that non-traditional bank activities, such as securities and insurance underwriting, brokerage and mutual fund services, can produce information that enables loan decisions (Laeven and Levine, 2007). Therefore, restrictions on activities are likely to reduce banks' capacity to create liquidity through contractions in lending.

We could also expect a negative impact of capital regulations on banks' capacity to create more liquidity. The risk absorption hypothesis on capital regulations discussed before ignores possible regulatory costs associated with demanding more capital, which may reduce bank liquidity creation. The negative impact that capital may have on bank liquidity creation can reflect on both sides of the balance sheet. First, a more fragile capital structure encourages banks to monitor their borrowers better and therefore create more loans (i.e. financial fragility effect) (Berger and

Bouwman, 2009). While a stronger level of capital makes banks' structure less fragile, it is likely to discourage banks from committing to monitoring their borrowers and therefore it affects negatively their lending capacity (e.g. Diamond and Rajan, 2001).[5] Second, more capital may substitute the role of deposits on the balance sheet (i.e. crowding-out effect) and reduce bank liquidity creation on the liability side.

The contrasting expectations on the relationship between bank regulation and liquidity creation reflect not only on the theoretical literature, but also on empirical studies. For example, the financial fragility/crowding-out effect is well-documented empirically (Distinguin et al., 2013; Horvath et al., 2014; Fungacova et al., 2017; Casu et al., 2019), while there are also a few empirical studies supporting the risk absorption effect discussed in section 2.1.1 (Berger and Bouwman, 2009; Tran et al., 2016). However, these empirical studies examine the impact of bank-specific capital rather than the cross-country variation of capital regulations. Our study sheds light on the investigation of how the national-level regulatory stringency affects bank liquidity creation.

2.2 Bank Supervision and Liquidity Creation

Compared with the rigid regulatory rules discussed in section 2.1, bank supervision is more flexible by its nature. In many countries, supervisory authorities have the power to intervene and prevent bank failures or address other issues, such as fraud or moral hazard problems.

Most countries have adopted some form of a deposit insurance scheme. For instance, under EU legislation, deposit guarantee schemes (DGS) are designed to compensate depositors in case of bank failure for deposits up to €100,000, while the equivalent insured amount for depositors in China is ¥500,000. Deposit insurance schemes have also been developed to further protect

[5] Diamond and Rajan (2001) argue that lenders (banks) cannot threaten to withdraw their special collection skills (to generate a greater return) because this would trigger a run by depositors. Due to the illiquidity associated with liquidity creation, banks will not demand a higher premium and they will avoid liquidating borrowers during a liquidity shock. Thus, under greater market discipline by depositors, banks may create more liquidity.

depositors and financial stability after the 2007-2009 financial crisis. However, the literature suggests that deposit insurance schemes are usually associated with moral hazard problems. Depositors may lose their disciplinary value as they have fewer incentives to run on the bank when their deposits are insured. The greater the deposit insurance scheme, the less market discipline is imposed on banks and the fewer incentives banks have to monitor their borrowers and honour their commitment towards depositors (Diamond and Rajan, 2001). To mitigate the moral hazard problems of deposit insurance, authorities often take actions such as partially insuring deposits, charging insurance fees to banks based on a risk assessment or asking from banks to contribute to the reserves held for the event of the failure of a member bank. For example, DGSs are fully funded by banks instead of taxpayer money.

The extent to which supervisory authorities have the power or take actions to intervene varies in different countries, and thus it is important to understand the effectiveness of bank supervision. However, similar with the inconclusive evidence on the impact of regulation on banks' operation, there is large heterogeneity in the existing theoretical and empirical studies of bank supervision. We review mainly literature on two aspects of bank supervision: official supervisory power that refers to the extent to which supervisory authorities have the power to intervene and prevent problems; and the degree to which authorities take actions to mitigate moral hazard problems associated with deposit insurance.

2.2.1 The Positive Impact of Bank Supervision on Liquidity Creation

Beck et al. (2006) argue that bank supervisors have the knowledge and the incentive to alleviate information asymmetries. As imperfect information can be an important contributor to bank runs, powerful supervision can be beneficial for liquidity creation (Hoque et al., 2015). An inherent issue of liquidity creation is that it makes banks vulnerable to runs, since large withdrawals of

deposits can force banks to liquidate a big portion of their assets at losses (Diamond and Dybvig, 1983). Powerful supervision, from the perspective of public interest, can help protect the provision of credit, prevent bank runs and stabilize the banking system (Fratzscher et al., 2016). Thus, in countries where supervisory authorities have more power to access banks' information and take action to prevent failures or fraud, banks can create more liquidity through greater risk absorption and/or less withdrawal of deposits led by customers' confidence with the banking system.

Moreover, actions to curtail moral hazard taken by national authorities can partly incentivise banks to commit to monitoring their borrowers and help banks create more liquidity. Although the public interest view proponents would advocate a stronger deposit insurance scheme for the purpose of preventing bank runs, adherents of the private interest view may argue that deposit insurance can be used to unduly increase banks' risk-taking and thus prevent banks from creating more liquidity. Indeed, Berger et al. (2020) find that government guarantees such as deposit insurance have a negative effect on total bank liquidity creation. The actions taken by supervisory authorities to mitigate the moral hazard issues, therefore, may help to reduce the negative impact of deposit insurance and encourage banks to create more liquidity.

2.2.2 The Negative Impact of Bank Supervision on Liquidity Creation

The extent to which supervisory authorities have the power to intervene or take actions to prevent problems is not always beneficial for banks as bank supervisors may use their power to favour their own personal interests rather than the public interest. Beck et al. (2006) argue that when authorities have more power to discipline noncompliant banks, bank supervisors might take advantage of their position to directly or indirectly manipulate the allocation of bank credit to benefit their private or political interests. Hence, with more corruption due to greater supervisory power, liquidity creation might not be efficiently allocated and instead unduly be limited. Also, if

the public is to be aware that the powerful supervisory authorities behave in their own interests rather than in the public interest, depositors' confidence is likely to be diminished. This could result in less liquidity being created on the liability side of the balance sheet.

Actions such as partially insuring deposits may make banks more vulnerable to bank runs (Diamond and Dybvig, 1983). Successively, this may hinder the capacity of banks to absorb the risk associated with liquidity creation and thus lead to the contraction of liquidity creation. Therefore, we may expect that a higher level of official supervisory power and/or more actions to mitigate moral hazard discourages banks to create liquidity.

3. Data, Key Variables and Descriptive Statistics

3.1 Data and Sample

Our sample consists of a global panel of 721 banks from 65 countries for the period of 2005-2019. However, as the liquidity creation measures require the availability of 13 balance sheet items per measure, most of the available observations included in the regressions are concentrated in the period of 2008-2017. We collect bank-level data from the S&P Global Market Intelligence database and country-level data from the International Monetary Fund (IMF), while the country-level regulation indexes are collected from the last three Bank Regulation and Supervision Surveys by the World Bank and are constructed as described in subsection 3.2. Table 1 summarizes the definitions and sources for all variables used in our analysis and Table 2 provides the descriptive statistics of the variables. Table 3 presents the distribution of liquidity creation observations across the 65 countries in our sample. The table shows that our sample is dominated by European and Asian banks with the top countries being France, China, Italy and Germany.

<Insert Tables 1, 2 and 3 Here>

3.2 Regulation Indexes

The Bank Regulation and Supervision Survey developed by Barth et al. (2013) under the World Bank auspices provides a comprehensive country-level dataset on how banks are regulated and supervised in 160 jurisdictions. The dataset has been widely used in prior literature to unearth the effects of country-level regulations on different aspects of banking. The last survey was published in late 2019 by the World Bank and covers the period of 2011-2016. We use this survey to update five regulatory indexes by matching the questions of the 2019 survey with the ones of the 2011 survey. As our sample covers the period of 2005-2019, we assign the 2007 survey to the years 2005-2007, the 2011 survey to the years 2008-2010 and the 2019 survey to the years 2011-2019. The large period of 6 years that the 2019 survey covers is a major difference to the previous surveys that cover only 2-3 years. The large dependence of the sample on the last survey and the lack of differences in regulation and supervision indexes between the last two surveys for many of the countries make the regulation and supervision variables almost time-invariant. Considering the nature of the data, we first transform the variables into entirely time-invariant by taking the weighted average for each country from 2005 to 2019.

The following subsections provide the definitions of the regulation and supervision indexes. Since the underlying sub-indexes are constructed on the same method (i.e. each regulatory action increases the index by 1), we calculate the sum of the relevant sub-indexes to construct the overall regulation or supervision indexes for our baseline analysis. Additionally, we use two alternative methods to combine the sub-indexes and test the robustness of our results in Section 6. Each sub-index is constructed with a quantitative transformation of the responses in the questionnaire of the Bank Regulation and Supervision Survey.

3.2.1 Bank Regulation Index

The regulation index is constructed by calculating the sum of the activity restrictions and capital regulations indexes. It ranges from 3 to 22 and higher values indicate stricter bank regulation.

More specifically, the activity restrictions index measures the degree to which authorities restrict banks' engagement in activities involving securities (such as underwriting, brokerage, and dealing), insurance (referring to underwriting and selling insurance) and real estate (including real estate investment, development, and management). The activity restrictions index ranges from 3 to 12 and higher values indicate greater restrictions. The capital regulations index measures how much capital banks are required to hold and the stringency of regulatory capital requirements. The index takes into account the level of flexibility in minimum capital adequacy ratios and the sources of funds that can be used to increase the capital ratio. The index ranges from 0 to 10 and higher values indicate more stringent capital regulation.

3.2.2 Bank Supervision Index

The supervision index is constructed by calculating the sum of the official supervisory power and mitigation of moral hazard indexes. It ranges from 0 to 17 and higher values indicate greater levels of bank supervision.

The official supervisory power index measures the degree to which a country's supervisory authorities have the power to intervene and prevent problems. In particular, it takes into account the power of authorities to access banks' information and take action to prevent failures or address other issues (e.g. fraud). The index ranges from 0 to 14 and higher values indicate greater supervisory power. The mitigation of moral hazard index measures the degree to which authorities have taken actions to mitigate moral hazard issues related with deposit insurance. These actions

include whether banks participate in funding the deposit insurance scheme, whether the deposit insurance premiums are charged to banks based on some risk assessment and whether depositors are insured for less than 100% of their deposits. The index ranges from 0 to 3 and higher values indicate greater mitigation of moral hazard.

3.3 Liquidity Creation Measures

We measure bank liquidity creation by following the methodology of Berger and Bouwman (2009). Table 4 presents the classification and the weight of each balance sheet item.

<Insert Table 4 Here>

The Berger-Bouwman method can be outlined in three steps. First, all balance sheet items are classified into three groups: liquid, semi-liquid and illiquid. Second, illiquid assets and liquid liabilities are assigned a positive weight of 0.5, while liquid assets, illiquid liabilities and equity are assigned a negative weight of -0.5. The remaining semi-liquid balance sheet items are assigned a weight of 0 and thus, they are not incorporated in the measurement of liquidity creation. Finally, we construct our liquidity creation measure by adding up all the weighted balance sheet items. Our main liquidity creation measure (LC1) includes long-term loans (i.e. loans with maturity of greater than one year) as illiquid loans, and transactional and savings deposits as liquid deposits. In Sections 3.4 and 6.2, we use an alternative liquidity creation measure (LC2) which replaces transactional and savings deposits with short-term deposits as in Berger and Bouwman (2009). We normalize the final calculation of liquidity creation by total assets.

3.4 Mean Difference Tests

Table 5 presents some preliminary evidence on how liquidity creation is associated with the regulation and supervision indexes. More specifically, we conduct mean difference tests for the liquidity creation measures between two groups after splitting the sample above and below each index's median. The table shows that, on average, banks create less liquidity in countries with higher levels of activity restrictions, capital regulations and the combined regulation index, while they create more liquidity in countries with greater official supervisory power, mitigation of moral hazard and the combined supervision index. All mean differences are significant at the 1% level.

<Insert Table 5 Here>

4. Empirical Methodology

Since our data has a panel structure, a fixed-effects/within estimator would remedy the problem of correlation between the independent variables and the unobserved individual effects. However, since this is accomplished by mean-differencing all variables in the regression, the model would drop any time-invariant variables, which is the case of our regulation and supervision variables. To tackle this issue, we use estimators that allow the inclusion of time-invariant variables throughout the paper.

We begin our baseline regressions using OLS to assure that our results are not dependent on the methodology, focusing more on random-effects (henceforth RE) to better take into account all dimensions of our data. Therefore, we construct the following model:

$$Liquidity\ Creation_{i,t} = \alpha_0 + \beta_1 Supervision_c + \beta_2 Regulation_c + \sum_{j=1}^{4} \beta_j\ Bank\ Control_{i,t} + \sum_{j=1}^{3} \beta_j\ Country\ Control_{c,t} + \lambda_t + \varepsilon_{i,t} \quad (1)$$

where i, c and t denote bank, country and year, respectively, while $Liquidity\ Creation_{i,t}$ is our measure of liquidity creation constructed as described in subsection 3.3. $Supervision_c$ and $Regulation_c$ are the main time-invariant country-level supervision and regulation indexes as

constructed in subsection 3.2. We control for four bank-specific factors (i.e. the natural logarithm total assets, the return on average assets, the cost-to-income ratio and the share of loan loss reserves) and three country-specific variables (i.e. private monitoring, real GDP growth and the rate of unemployment in the bank's home country) that are often used in liquidity creation literature. λ_t are the time fixed effects, while $\varepsilon_{i,t}$ is the error term. Following the literature on bank regulation and supervision, we use heteroskedasticity robust standards errors clustered at the bank level to allow for residuals to be correlated across times within banks (e.g. Beck et al., 2006; Barth et al., 2013; Avignone et al., 2021).[6]

5. Results and Discussion

Table 6 presents the OLS and RE baseline results. We begin our estimations by including each of the main independent variables alone and then gradually introduce the control variables in the regressions. The signs and significance of the coefficients of the supervision and regulation indexes provide interesting insights to how government-imposed rules may affect banks' capacity to create liquidity in the economy. More specifically, the coefficient of SUPERVISION is positive and the coefficient of REGULATION is negative, while both are significant at the 1% level regardless of the specification and method used.

<Insert Table 6 Here>

We observe that banks in countries with greater bank supervision appear to create more liquidity, supporting the view that bank liquidity creation is enabled by powerful supervision. With the proper intervention of supervisory authorities, information asymmetries can be alleviated, while additional assistance is available when banks face difficult situations that may lead to their failure. At the same time, mitigating the moral hazard problems associated with deposit insurance

[6] Detailed descriptions of how all variables are constructed can be found in Table 1.

can further incentivise banks to commit to monitoring their borrowers, with the presence of a deposit insurance scheme protecting depositors' interests to an adequate level.[7] Overall, based on our results these flexible supervisory arrangements seem to be beneficial for banks.

On the other hand, banks appear to create less liquidity in countries with tighter regulation, consistent with the expectations that regulation restricts banks' operations because it is rigid and inflexible. First, strict restrictions on activities can limit banks' freedom to diversify their assets and exploit synergies that might help them in risk management and balance sheet expansion. This is however contrasting with the finding by Jiang et al. (2019) that regulatory-induced competition (reducing activity restrictions) has a negative effect on liquidity creation.[8] Also, creating less liquidity under more stringent capital regimes would be consistent with the financial fragility effect argued by Berger and Bouwman (2009), which suggests that banks create more liquidity when their capital structure is fragile as greater fragility motivates banks to monitor their borrowers and commit to creating loans and thus liquidity.

In columns (7) and (8) of Table 6, we also introduce the ratio of SUPERVISION to REGULATION. This allows us to further test the simultaneous existence of the two main independent variables. The coefficient of the ratio is positive and statistically and economically significant. More specifically, a one standard deviation increase in the ratio of SUPERVISION to REGULATION can increase liquidity creation by 7.8 percentage points, while the respective figures for the individual coefficients of the two variables from column (6) are much smaller (4.7 percentage points for SUPERVISION and 5.4 percentage points for REGULATION). This

[7] These results are complementary to those of Berger et al. (2020) who find that government guarantees (e.g. deposit insurance) decrease bank liquidity creation. They suggest that deposit insurance reduces the incentives of depositors to run on the bank. This impedes the effectiveness of financial fragility and deteriorates banks' ability to create liquidity.

[8] Jiang et al. (2019) study the effects of deregulated interstate banking, so our results are not directly comparable but rather closely related.

highlights the importance of flexibility relative to rigidness in bank regulation and supervision, suggesting that regulators may want to rely more on bank supervision to enable them to create more liquidity.

The signs of the significant coefficients of the control variables are mostly as expected, although with some inconsistencies between OLS and RE estimates. LC1 appears to be associated negatively with LNTA and LLR, and positively with PM. The association between LC1 and GDPG is negative in the OLS regressions and positive in the RE regressions. RE models allow controlling for unobserved heterogeneity when it is constant over time and uncorrelated with independent variables, as is the case for our supervision and regulation indexes. Moreover, since liquidity creation is expected to be positively associated with economic growth (e.g. Berger and Sedunov, 2017), we use the positive GDPG coefficient as an additional indication that the RE estimates are more trustworthy and use RE for most of the rest of our regressions.

6. Robustness Tests

We conduct several tests to check the robustness of our findings. These are presented in Tables 7 to 11 and are discussed in the subsections that follow.

6.1 Endogeneity Issues

There might be concerns of potential endogeneity with our baseline results reported in Table 6, due to issues such as reverse causality. For example, in countries where few large banks dominate the banking sector, the level of liquidity created by these banks may influence the extent of bank regulation and supervision. In other words, the regulatory and supervisory frameworks may be endogenous to the structure of each country's banking system (Barth et al., 2013). To address this concern, we employ three additional estimators that allow the inclusion of time-

invariant independent variables but also mitigate endogeneity issues by using either internally constructed or external instruments. These results are presented in Table 7.

<Insert Table 7 Here>

First, we use the Hausman-Taylor (HT) estimator (shown in Columns (1) and (2)) which is based upon instrumental variables and assumes that some of the independent variables are correlated with the individual random effects but none of the independent variables is correlated with the error term (Hausman and Taylor, 1981). Therefore, the estimator can deal with possible endogeneity in our regressions induced by variations at the bank- and country-level (Alraheb et al., 2019).

Second, we use the two-step system generalised method of moments (S-GMM) developed by Arellano and Bover (1995) and Blundell and Bond (1998) (reported in Columns (3) and (4)). The estimator controls for the sluggish adjustment of liquidity creation and for possible endogeneity issues by using the lags of the endogenous variables as instruments. Since the two-step S-GMM estimation might produce downward biased standard errors, we use the finite-sample correction by Windmeijer (2005). We also use three diagnostic tests. First, the Arellano and Bond (1991) test for second order autocorrelation suggests that the null hypothesis of no second-order serial correlation cannot be rejected. Second, the Hansen J test indicates that the null hypothesis that the instruments are valid cannot be rejected. Finally, based on the difference-in-Hansen test results we cannot reject the null hypothesis that the group of instruments used in the system GMM estimates are exogenous. In the HT and S-GMM regressions, we treat all variables as endogenous except for the country-level control variables (PM, GDPG and UNEMP) (e.g. Distinguin et al., 2013).

Finally, we employ the Instrumental Variable (IV) Two Stage Least Squares (2SLS) approach (reported in Columns (5) and (6)). Following the literature on bank regulation and supervision (e.g.

Beck et al., 2006; Barth et al., 2013), we use instruments based on the legal and geographical characteristics of the host country since they can explain financial institutional development. More specifically, in the regression reported in column (5) we use legal origin, latitude, ethnic fractionalization, religions and the percentage of years that the host country has been independent since 1776 as instrumental variables. In column (6), we only include latitude as the instrumental variable considering potential overidentification concerns. Yet, the results hold regardless of using one instrument or the set of instruments.

Overall, the results confirm our baseline findings as the coefficients generally hold their signs and significance (except for the coefficient of SUPERVISION in column (5)). The HT results should be approached with caution since the Sargan-Hansen null hypothesis is rejected, while for the rest of the regressions we can be somewhat confident for the selection of the instruments based on the diagnostic tests.

6.2 Alternative Measurement of Regulation, Supervision and Liquidity Creation

We also use alternative measures of regulation, supervision and liquidity creation to test the robustness of our baseline results. One might have concerns about the way we constructed the regulation and supervision indexes by simply adding them.[9] Although this is reasonably based since the sub-indexes are constructed in a similar way, the mitigation of moral hazard index ranges from 0 to 3 which varies significantly from the other three sub-indexes. We employ two alternative methods to address this issue. First, we conduct principal component analysis (PCA) on the pairs of the sub-indexes and take the first principal component as the combined supervision or regulation index. Second, we standardize the sub-indexes to have a mean of 0 and standard deviation of 1

[9] Considering that the mitigation of moral hazard associated with deposit insurance can be a separate category from both regulation and supervision, it is important to note that our results hold robustly when including each individual index separately in the regressions.

before adding them up. The results of these tests are presented in columns (1) to (4) of Table 8 and confirm our initial findings for the individual supervision and regulation indexes.[10]

We also use an alternative measure of liquidity creation, in which we replace transactions and savings deposits with short-term deposits according to Berger and Bouwman (2009). These results are presented in columns (5) and (6) of Table 8. We observe that all coefficients maintain their initial signs and significance.

<Insert Table 8 Here>

6.3 Bank Regulation, Supervision and the Components of Liquidity Creation

Liquidity creation contains a very diverse set of balance sheet items, and it would be interesting to see how bank regulation and supervision affect the components of liquidity creation. We therefore conduct additional analyses to examine the effect of regulation and supervision on the two main components of the liquidity creation measure, that is, illiquid assets and liquid liabilities. In this test, we replace our dependent variable LC1 with asset-side liquidity creation (ASLC), illiquid loans (ILQ-LOANS), liability-side liquidity creation (LSLC), liquid deposits (LIQ-DEP) and equity (EQUITY) which we normalize by total assets as with LC1. The results are presented in Table 9 and the signs of the coefficients remain largely in line with the ones in our baseline results. However, the size and significance of the coefficients show that supervision and regulation influence asset-side liquidity creation and illiquid loans a lot more than liability-side liquidity creation and liquid deposits. Surprisingly, bank equity appears to be unrelated to the regulation and supervision indexes. These results support the view that regulation is costly and can hurt liquidity creation on both sides of the balance sheet with activity restrictions and capital regulations. On the other hand, with greater supervision that often focuses more on banks'

[10] However, the coefficient of supervision to regulation is insignificant in these regressions, suggesting that alternative methods to calculate the indexes should be considered.

portfolios and asset risk, banks are more likely to make significant changes to their asset/loan portfolios rather than to their funding structure.

<Insert Table 9 Here>

6.4 Subsample Analysis

Finally, we conduct subsample analysis. Frist, we run the regressions only for the period of 2010 onwards, thus excluding the years of the global financial crisis,[11] as the effect of regulation and supervision may be different when focusing in the long-term compared to the short-term due to the implications of regulatory and supervisory requirements on the stability of the banking system after the global financial crisis. Second, considering the fact that our sample contains a very diverse group of banks from different regions, we run regional regressions for the two main regions in our sample, i.e. Europe and Asia-Pacific. Third, we split the banks in small and large by the median of average total assets in our sample as it is common in the banking literature to anticipate variations in bank behaviour across different bank size classes. Finally, we conduct an additional test in which banks based in countries with the least developed banking sectors are removed from the sample. More specifically, we exclude the 15 countries with the lowest total bank assets to GDP ratio (Demirgüç-Kunt and Huizinga, 1999). The results of these tests are reported in Tables 10 and 11 and fully confirm our baseline findings.

<Insert Tables 10 and 11 Here>

7. Conclusions and Policy Implications

Although regulatory frameworks, such as Basel III, are internationally agreed upon, bank regulators in each country have the freedom to make modifications according to the status of their country's banking system and the problems that it faces. How do these differences at the national

[11] We also run the regressions for the previous periods but fail to find any significant or interesting results and for brevity we do not report those.

level of bank regulation and supervision policies affect banks' contribution to the economy? This paper sheds light on this issue by investigating the effects of country-level bank regulation and supervision on one of banks' main functions in the economy, liquidity creation.

Our results show that regulatory stringency impedes bank liquidity creation, while strong supervision enables it. These findings extend the growing literature on the effects of regulation and supervision policies on bank liquidity creation (e.g. Berger et al., 2016; Jiang et al., 2019; Berger et al., 2020) and assist policymakers in taking better informed decisions. The results suggest that flexible supervision is likely to enable liquidity creation since supervisors with greater freedom to intervene can act promptly and prevent important problems for the individual bank or the wider banking system of the country. Therefore, government and authorities may want to increase their interventions when there are early signs of liquidity issues. Our findings also show that mitigating the moral hazard issues of deposit insurance, which is a key element in the Core Principles for Effective Deposit Insurance Systems jointly issued by the BCBS and the IADI (Bank for International Settlements (BIS), 2009), is effective in promoting liquidity creation.

On the other hand, the results highlight the caution with which more restricting policies (e.g. activity restrictions and capital requirements) should be introduced. We show that regulatory restrictions may not be always beneficial to banks' functioning and hence the overall economy, as this could affect negatively banks' operation, such as limiting banks' ability to create more liquidity to the market. Both capital requirements and activity restrictions have been key elements of the post-2009 regulatory agenda aiming to address the problems arising during/post the global financial crisis and to help banks better absorb unexpected losses. Yet, our results complement the extant literature arguing that regulators need to consider the trade-off between introducing these policies and enabling bank liquidity creation.

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Tables

Table 1
Variable Description.

Variable	Definition	Source
Liquidity creation and individual components		
LC1	LC1 stands for liquidity creation 1 and its calculated as (0.5*illiquid assets + 0.5*liquid liabilities - 0.5*liquid assets - 0.5*illiquid liabilities - 0.5*Equity)/Total Assets LC1 uses transaction and savings deposits as liquid deposits. See Table 1 for the liquidity classification of all balance sheet items.	S&P Global Market Intelligence
LC2	LC2 stands for liquidity creation 2 and its calculated as (0.5*illiquid assets + 0.5*liquid liabilities - 0.5*liquid assets - 0.5*illiquid liabilities - 0.5*Equity)/Total Assets LC2 uses short-term deposits as liquid deposits. See Table 1 for the liquidity classification of all balance sheet items.	S&P Global Market Intelligence
ASLC	ASLC stands for asset-side liquidity creation and contains the asset-side components of LC1 normalized by total assets.	S&P Global Market Intelligence
LSLC	LSLC stands for liability-side liquidity creation and contains the liability-side components of LC1 normalized by total assets.	S&P Global Market Intelligence
ILQ-LOANS	ILQ-LOANS stands for illiquid loans and it is calculated as the ratio of long-term loans to total assets.	S&P Global Market Intelligence
LIQ-DEP	LIQ-DEP stands for liquid liabilities and it is calculated as the ratio of transaction and savings deposits to total assets.	S&P Global Market Intelligence
EQUITY	EQUITY stands for the equity ratio and it is calculated as: Total Equity/ Total Assets	S&P Global Market Intelligence
Regulation and supervision variables		
REGULATION	REGULATION stands for bank regulation and it is constructed as the addition of the activity restrictions (ACT-RES) and capital regulations (CAP-REG) indexes. The activity restrictions index measures the degree to which authorities restrict banks' engagement in activities involving securities, insurance and real estate, while the capital regulations index measures how much capital banks are required to hold and the stringency of regulatory capital requirements. The overall REGULATION index ranges from 3 to 22.	World Bank: Bank Regulation and Supervision Survey 2007, 2011 and 2019

Continued on next page

Table 1 (*Continued*)
Variable Description.

Variable	Definition	Source
SUPERVISION	SUPERVISION stands for bank supervision and it is constructed as the addition of the official supervisory power (S-POWER) and actions taken against moral hazard (MH) indexes. The official supervisory power index measures the degree to which a country's supervisory authorities have the power to intervene and prevent problems, while the actions taken against moral hazard index measures the degree to which authorities have taken actions to mitigate moral hazard issues related with deposit insurance. The overall REGULATION index ranges from 0 to 17.	World Bank: Bank Regulation and Supervision Survey 2007, 2011 and 2019
SUPERVISION/REGULATION	SUPERVISION/REGULATION stands for the ratio of SUPERVISION to REGULATION.	World Bank: Bank Regulation and Supervision Survey 2007, 2011 and 2019
REGULATION-PC	REGULATION-PC stands for the first principal component derived from principal component analysis (PCA) on the activity restrictions and capital regulations indexes.	World Bank: Bank Regulation and Supervision Survey 2007, 2011 and 2019
SUPERVISION-PC	SUPERVISION-PC stands for the first principal component derived from principal component analysis (PCA) on the official supervisory power and actions taken against moral hazard indexes.	World Bank: Bank Regulation and Supervision Survey 2007, 2011 and 2019
SUPERVISION-PC/REGULATION-PC	SUPERVISION-PC/REGULATION-PC stands for the ratio of SUPERVISION-PC to REGULATION-PC.	World Bank: Bank Regulation and Supervision Survey 2007, 2011 and 2019
REGULATION-STD	REGULATION-STD stands for the addition of the standardized activity restrictions and capital regulations indexes so that they have a mean of 0 and standard deviation of 1.	World Bank: Bank Regulation and Supervision Survey 2007, 2011 and 2019
SUPERVISION-STD	SUPERVISION-STD stands for the addition of the standardized official supervisory power and actions taken against moral hazard indexes so that they have a mean of 0 and standard deviation of 1.	World Bank: Bank Regulation and Supervision Survey 2007, 2011 and 2019
SUPERVISION-STD/REGULATION-STD	SUPERVISION-STD/REGULATION-STD stands for the ratio of SUPERVISION-STD to REGULATION-STD.	World Bank: Bank Regulation and Supervision Survey 2007, 2011 and 2019

Continued on next page

Table 1 (*Continued*)
Variable Description.

Variable	Definition	Source
Bank-specific control variables		
LNTA	The natural logarithm of total assets.	S&P Global Market Intelligence
ROAA	ROAA stands for the return on average assets and it is calculated as: Net Income/Average Assets	S&P Global Market Intelligence
COST-TO-INCOME	COST-TO-INCOME stands for the ratio of operating expenses to operating income.	S&P Global Market Intelligence
LLR	LLR stands for the loan loss reserves and it is calculated as total loan loss and allocated transfer risk reserves divided by total loans and leases, net of unearned income and gross of reserve	S&P Global Market Intelligence
Country-specific control variables		
PM	PM stands for private monitoring and measures the degree to which authorities encourage the private monitoring of banks by its creditors. It considers whether subordinated debt is allowed or required as part of regulatory capital, whether banks are required to disclose their off-balance sheet exposures and whether there are mechanisms of cease-and-desist type orders that lead to automatic imposition of penalties on improper bank directors' and managers' actions. The index ranges from 0 to 12 and higher values indicate greater encouragement of private monitoring.	World Bank: Bank Regulation and Supervision Survey 2007, 2011 and 2019
GDPG	GDPG stands for real GDP growth and it is calculated as the annual percentage change of real GDP of the bank's country	International Monetary Fund
UNEMP	UNEMP stands for unemployment and it is calculated as the number of unemployed people as a percentage of the total labour force of the bank's host country	International Monetary Fund

Table 2
Descriptive Statistics

Variable	Obs.	Mean	Median	Std. Dev.	5th Perc.	95th Perc.
LC1	4898	0.153	0.153	0.190	-0.168	0.465
LC2	4898	0.253	0.279	0.187	-0.092	0.515
ASLC	4898	0.058	0.071	0.174	-0.242	0.297
LSLC	4898	0.139	0.125	0.095	0.003	0.314
ILQ-LOANS	4898	0.397	0.392	0.199	0.076	0.694
LIQ-DEP	4898	0.305	0.274	0.183	0.033	0.653
EQUITY	4898	0.089	0.081	0.043	0.033	0.162
REGULATION	4898	13.326	13.150	2.593	9.050	18.200
SUPERVISION	4898	12.284	12.667	1.957	8.000	14.933
SUPERVISION/REGULATION	4898	0.962	0.966	0.237	0.440	1.289
REGULATION-PC	4898	0.002	-0.155	1.137	-2.001	2.007
SUPERVISION-PC	4898	-0.003	0.374	1.073	-2.325	1.435
SUPERVISION-PC/REGULATION-PC	4898	-0.343	-0.386	2.482	-4.761	2.260
REGULATION-STD	4898	0.009	-0.618	2.002	-2.210	3.758
SUPERVISION-STD	4898	-0.004	0.529	1.518	-3.288	2.029
SUPERVISION-STD/REGULATION-STD	4898	-0.371	-0.465	2.191	-4.209	1.892
LNTA	4898	16.902	16.706	1.708	14.057	20.231
ROAA	4898	0.008	0.007	0.031	-0.006	0.023
COST-TO-INCOME	4898	0.568	0.554	0.220	0.307	0.848
LLR	4898	0.035	0.025	0.048	0.003	0.100
PM	4898	8.285	8.500	0.985	6.400	9.800
GDPG	4898	0.027	0.023	0.036	-0.036	0.085
UNEMP	4898	0.077	0.068	0.044	0.032	0.172

This table presents the descriptive statistics for all variables used in our regressions.

Table 3
Distribution of LC1 observations across countries.

Country	LC1 Obs.	Country	LC1 Obs.
France	601	Belgium	28
China	504	Norway	28
Italy	490	Switzerland	26
Germany	258	Croatia	26
Spain	235	Malta	26
Malaysia	226	Bulgaria	26
Hong Kong	213	Latvia	25
Indonesia	199	Philippines	25
Austria	172	Cyprus	23
Turkey	155	Australia	23
Poland	129	Lithuania	22
Russia	116	South Africa	20
Netherlands	113	Nigeria	20
United Kingdom	100	Dominican Republic	18
Portugal	92	Venezuela	16
Denmark	84	Bosnia & Herzegovina	14
Saudi Arabia	65	Moldova	14
Romania	64	Colombia	14
Brazil	49	Serbia	13
Finland	49	Estonia	12
Thailand	49	Morocco	12
Ireland	46	Iceland	12
Panama	46	Sri Lanka	12
Greece	42	Georgia	10
New Zealand	39	Singapore	8
Canada	38	Slovenia	7
Chile	36	Mexico	7
Ukraine	34	Bahrain	5
Czech Republic	34	Hungary	2
Israel	31	Argentina	1
Luxembourg	31	Belarus	1
Peru	31	Azerbaijan	1
Slovakia	30	Total Obs.	4898

Table 4
Liquidity Classification of Bank Activities.

Assets		
Illiquid Assets (weight = 1/2)	**Semi-Liquid Assets (weight = 0)**	**Liquid Assets (weight = -1/2)**
Loans with Maturity > 1 year	(Loans with Maturity <= 1 year)	Cash and Cash Balances
Fixed Assets		Total Securities
Intangible Assets		Trading Assets
Other Assets		
Liabilities & Equity		
Liquid Liabilities (weight = 1/2)	**Semi-Liquid Liabilities (weight = 0)**	**Illiquid Liabilities & Equity (weight = -1/2)**
Transaction and Savings Deposits (Deposits with Maturity <= 1 year)	Deposits with Maturity > 1 year (Time Deposits)	Total Subordinated Debt
Trading Liabilities		Other Liabilities
		Equity

This table presents the liquidity classification of bank balance sheet items and the weight assigned to each item.

Table 5
Mean Difference Tests

	ACT-RES	CAP-REG	REGULATION	S-POWER	MH	SUPERVISION
LC1 Mean Above Index Median	0.122	0.134	0.125	0.165	0.188	0.188
LC1 Mean Below Index Median	0.190	0.169	0.181	0.145	0.111	0.117
Difference	-0.069***	-0.035***	-0.056***	0.021***	0.077***	0.071***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)
LC2 Mean Above Index Median	0.243	0.227	0.244	0.268	0.269	0.268
LC2 Mean Below Index Median	0.265	0.276	0.263	0.243	0.234	0.238
Difference	-0.022***	-0.049***	-0.019***	0.025***	0.035***	0.029***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Obs.	4,898	4,898	4,898	4,898	4,898	4,898
N. of Banks	721	721	721	721	721	721

This table presents t-tests for the mean difference of the liquidity creation measures (LC1 and LC2) between two groups above and below each regulation or supervision index's median. ACT-RES refers to activity restrictions, CAP-REG to capital regulations, REGULATION to the sum of ACT-RES and CAP-REG, S-POWER to official supervisory power, MH to actions taken against moral hazard and SUPERVISION to the sum of S-POWER and MH. Standard errors are reported in parentheses. *** denotes significance at the 1% level.

Table 6
Baseline regressions on the relationship between bank regulation, supervision and liquidity creation.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	LC1	LC1	LC1	LC1	LC1	LC1	LC1	LC1
SUPERVISION	0.024***		0.019***	0.014***	0.012***	0.024***		
	(0.001)		(0.001)	(0.001)	(0.001)	(0.004)		
REGULATION		-0.018***	-0.013***	-0.013***	-0.012***	-0.021***		
		(0.001)	(0.001)	(0.001)	(0.001)	(0.003)		
SUPERVISION/REGULATION							0.154***	0.327***
							(0.014)	(0.029)
LNTA				-0.015***	-0.019***	-0.024***	-0.020***	-0.025***
				(0.002)	(0.002)	(0.007)	(0.002)	(0.007)
ROAA					-0.004	0.008	0.004	0.008
					(0.114)	(0.043)	(0.108)	(0.043)
COST-TO-INCOME					0.027	0.002	0.032*	0.003
					(0.018)	(0.010)	(0.018)	(0.010)
LLR					-0.654***	-0.541***	-0.664***	-0.543***
					(0.081)	(0.113)	(0.082)	(0.113)
PM				0.010***	0.010***	0.013*	0.008***	0.011
				(0.002)	(0.002)	(0.007)	(0.002)	(0.007)
GDPG				-0.490***	-0.599***	0.357***	-0.763***	0.347***
				(0.108)	(0.110)	(0.078)	(0.108)	(0.078)
UNEMP				0.168***	0.307***	-0.166	0.332***	-0.159
				(0.063)	(0.066)	(0.105)	(0.066)	(0.105)
CONSTANT	-0.172***	0.319***	0.067***	0.327***	0.414***	0.412***	0.283***	0.140
	(0.032)	(0.037)	(0.043)	(0.057)	(0.058)	(0.142)	(0.053)	(0.101)
Time Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Obs.	4,898	4,898	4,898	4,898	4,898	4,898	4,898	4,898
N. of Banks	721	721	721	721	721	721	721	721
R2	0.067	0.061	0.095	0.121	0.144	0.111	0.135	0.093
Method	OLS	OLS	OLS	OLS	OLS	RE	OLS	RE

The table reports OLS and Random-Effects regressions. The dependent variable is LC1 which stands for liquidity creation. SUPERVISION is the sum of the official supervisory power and actions taken against moral hazard indexes. REGULATION is the sum of the activity restrictions and capital regulations indexes. LNTA is the natural logarithm of total assets. ROAA is the return on average assets. COST-TO-INCOME is the respective ratio. LLR is loan loss reserves. PM is the private monitoring regulation index. GDPG is the real GDP growth of the host country. UNEMP is the unemployment rate of the host country. Robust standard errors are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

Table 7
Controlling for endogeneity.

	(1)	(2)	(3)	(4)	(5)	(6)
	LC1	LC1	LC1	LC1	LC1	LC1
SUPERVISION	0.048***		0.005**		-0.007	
	(0.018)		(0.003)		(0.010)	
REGULATION	-0.026**		-0.011***		-0.053***	
	(0.013)		(0.002)		(0.008)	
SUPERVISION/REGULATION		0.560***		0.132***		0.626***
		(0.076)		(0.023)		(0.113)
Control Variables	YES	YES	YES	YES	YES	YES
Time Dummies	YES	YES	YES	YES	YES	YES
Obs.	4,898	4,898	4070	4070	4,884	4,884
N. of Banks	721	721	638	638	717	717
R2					0.065	0.0904
Sargan-Hansen	0.003	0.004			0.207	
Hansen J			0.526	0.508		
Diff-in-Hansen			0.588	0.490		
AR(2)			0.978	0.964		
Lag length			2^{nd} to 8^{th} lag	2^{nd} to 8^{th} lag		
Instruments			589	520		
Method	HT	HT	S-GMM	S-GMM	2SLS	2SLS

The table reports Hausman-Taylor, System GMM and 2SLS regressions. The dependent variable is LC1 which stands for liquidity creation. SUPERVISION is the sum of the official supervisory power and actions taken against moral hazard indexes. REGULATION is the sum of the activity restrictions and capital regulations indexes. The same control variables as in Table 6 are used in all regressions. Robust standard errors are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

Table 8
Alternative measurement of regulation, supervision and liquidity creation.

	(1)	(2)	(3)	(4)	(5)	(6)
	LC1	LC1	LC1	LC1	LC2	LC2
SUPERVISION-STD	0.034***					
	(0.005)					
REGULATION-STD	-0.022***					
	(0.004)					
SUPERVISION-STD/REGULATION-STD		-0.002				
		(0.002)				
SUPERVISION-PC			0.054***			
			(0.007)			
REGULATION-PC			-0.037***			
			(0.008)			
SUPERVISION-PC/REGULATION-PC				0.001		
				(0.002)		
SUPERVISION					0.019***	
					(0.004)	
REGULATION					-0.015***	
					(0.003)	
SUPERVISION/REGULATION						0.242***
						(0.029)
Control Variables	YES	YES	YES	YES	YES	YES
Time Dummies	YES	YES	YES	YES	YES	YES
Obs.	4,898	4,898	4,898	4,898	4,898	4,898
N. of Banks	721	721	721	721	721	721
R2	0.119	0.016	0.121	0.016	0.107	0.098

The table reports Random-Effects regressions. The dependent variable is LC1 which stands for liquidity creation. SUPERVISION is the sum of the official supervisory power and actions taken against moral hazard indexes. REGULATION is the sum of the activity restrictions and capital regulations indexes. The same control variables as in Table 6 are used in all regressions. Robust standard errors are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

Table 9
The relationship between bank regulation, supervision and the key components of liquidity creation.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ASLC	ASLC	ILQ-LOANS	ILQ-LOANS	LSLC	LSLC	LIQ-DEP	LIQ-DEP	EQUITY	EQUITY
SUPERVISION	0.022***		0.024***		0.002		0.003		0.0002	
	(0.003)		(0.004)		(0.002)		(0.004)		(0.0006)	
REGULATION	-0.018***		-0.021***		-0.004**		-0.008**		-0.0004	
	(0.003)		(0.004)		(0.002)		(0.004)		(0.0006)	
SUPERVISION/REGULATION		0.274***		0.320***		0.052***		0.098***		-0.003
		(0.025)		(0.027)		(0.016)		(0.033)		(0.007)
Control Variables	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Obs.	4,898	4,898	4,898	4,898	4,898	4,898	4,898	4,898	4,898	4,898
N. of Banks	721	721	721	721	721	721	721	721	721	721
R2	0.129	0.103	0.128	0.106	0.004	0.003	0.016	0.015	0.280	0.280

The table reports Random-Effects regressions. The dependent variables are the key components of liquidity creation (LC1), namely, asset-side liquidity creation (ASLC), long-term loans (ILQ-LOANS), liability-side liquidity creation (LSLC), transaction and savings deposits (LIQ-DEP), and equity, all normalized by total assets. SUPERVISION is the sum of the official supervisory power and actions taken against moral hazard indexes. REGULATION is the sum of the activity restrictions and capital regulations indexes. The same control variables as in Table 6 are used in all regressions. Robust standard errors are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

Table 10
Post-2009 and regional regressions.

	Post-2009		Europe		Asia-Pacific	
	(1)	(2)	(3)	(4)	(5)	(6)
	LC1	LC1	LC1	LC1	LC1	LC1
SUPERVISION	0.024***		0.013*		0.019***	
	(0.004)		(0.008)		(0.005)	
REGULATION	-0.020***		-0.014**		-0.018***	
	(0.003)		(0.007)		(0.006)	
SUPERVISION/REGULATION		0.313***		0.151**		0.266***
		(0.031)		(0.067)		(0.062)
Control Variables	YES	YES	YES	YES	YES	YES
Time Dummies	YES	YES	YES	YES	YES	YES
Obs.	3,734	3,734	3,191	3,191	1,298	1,298
N. of Banks	669	669	473	473	167	167
R2	0.130	0.108	0.098	0.096	0.111	0.085

The table reports Random-Effects regressions. The dependent variable is LC1 which stands for liquidity creation. SUPERVISION is the sum of the official supervisory power and actions taken against moral hazard indexes. REGULATION is the sum of the activity restrictions and capital regulations indexes. The same control variables as in Table 6 are used in all regressions. Robust standard errors are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

Table 11
Splitting the sample by bank size and excluding the 15 counties with the lowest bank assets to GDP ratio.

	Small Banks		Large Banks		Excluded Low Assets/GDP Countries	
	(1)	(2)	(3)	(4)	(5)	(6)
	LC1	LC1	LC1	LC1	LC1	LC1
SUPERVISION	0.025***		0.031***		0.030***	
	(0.004)		(0.006)		(0.005)	
REGULATION	-0.022***		-0.018***		-0.020***	
	(0.004)		(0.004)		(0.004)	
SUPERVISION/REGULATION		0.313***		0.349***		0.343***
		(0.041)		(0.040)		(0.032)
Control Variables	YES	YES	YES	YES	YES	YES
Time Dummies	YES	YES	YES	YES	YES	YES
Obs.	2,457	2,457	2,441	2,441	4,313	4,313
N. of Banks	391	391	330	330	629	629
R2	0.118	0.086	0.196	0.182	0.143	0.117

The table reports Random-Effects regressions. The dependent variable is LC1 which stands for liquidity creation. SUPERVISION is the sum of the official supervisory power and actions taken against moral hazard indexes. REGULATION is the sum of the activity restrictions and capital regulations indexes. The same control variables as in Table 6 are used in all regressions. Robust standard errors are reported in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.