Bank Market Power and Liquidity Creation

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Abstract

We empirically investigate how bank market power affects liquidity creation for a large sample of banks in the euro area countries from 2006-2015. Using the instrumental variables approach to deal with possible endogeneity concerns, we find market power as measured by Lerner indices increases liquidity creation significantly. We shed further light on the market power and liquidity creation nexus by examining the interaction effect of market power and regulatory intervention during the global financial crisis. We find that government intervention only affects banks with low market power. Additional results include the effects of market power on various components of liquidity creation as well as bank profitability. Our main results remain robust to several robustness checks.

JEL classification: G21, G28, L16

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1. Introduction

Liquidity shocks that lead to the recent global financial crisis (GFC) highlighted deeper structural changes and pressures in the financial system. The significant transformations that take place in financial markets have changed how banks create liquidity. Nowadays, a significant part of bank liquidity creation lies outside the banking system. Besides the traditional bank liquidity creation, a second and growing component, which depends on the amount of credit that banks are willing to extend to each other. Still market liquidity affects the asset side of banks' balance sheets to the extent they want to actively manage their portfolios. Consequently, liquidity shocks have a bigger impact on market and funding liquidity, which is expected to have potential implications on the level of bank competition among market participants. Also, banking competition affects the availability of credit, access to finance, and ultimately, economic growth (Claessens and Laeven (2004), (2005)). Therefore, understanding how market power affects credit supply is essential for the formulation of appropriate regulatory policies.

The goal of this paper is to empirically examine the effect of bank market power on liquidity creation. Liquidity creation is an essential service that banks provide to the economy. Given the importance of liquidity creation, it is surprising that there is relatively little empirical work on understanding the mechanisms of liquidity creation. It is only recently that Berger and Bouwman (2009) created measures of liquidity creation and thereafter a growing empirical literature has been directed towards understanding the mechanisms of liquidity creation based on the measures offered by Berger and Bouwman (2009). However, little is known about how bank market power after the GFC affect banks' ability to create liquidity for their customers.

As liquidity creation becoming a relatively new research topic, most recent papers investigate the relationship between bank regulatory capital (Horváth *et al.* (2014), Fu *et al.* (2016), Casu *et al.* (2016) and Fungáčová *et al.* (2017)).The macroeconomy following financial crisis (Berger and Bouwman (2015), (2017), and Berger and Sedunov (2017)). Or the effects of regulatory interventions and capital support on liquidity creation (Berger *et al.*, 2010; Berger *et al.*, 2016). Whereas studies that investigate market power have mainly investigate its impact on bank net interest margin (Corvoisier and Gropp, 2002; Amidu and Wolfe, 2013b), financial stability (Berger *et al.*, 2009; Amidu and Wolfe, 2013a), efficiency (Ariss, 2010), and more recently how government interventions affect bank completion (Calderon and Schaeck, 2016).

Our paper adds to the competition and liquidity creation literature and offers several contributions. First, to the best of our knowledge, we are the first study that provide an in-depth analysis on how and to what extent liquidity creation is affected by market power in 22 EU

countries. So far, no studies have explored the relationship between market power and liquidity creation in EU countries, our paper covers this gap in the literature. While previous research in this area relies heavily on Berger and Bouwman (2009) liquidity creation measures, this paper also considers an indicator related to the new liquidity requirements established under Basel III (the inverse of NSFR). Hence, our study provides comprehensive measures of liquidity creation compared to the previous studies. Furthermore, using the efficiency adjusted Lerner and traditional Lerner indices as measures of bank market power, this paper presents the first empirical analysis of the relationship between bank market power and liquidity creation using non-structural measures of market power in banking systems on across-country level. In addition, this paper presents a methodological advancement in the literature on liquidity creation in that we apply an instrumental variable technique not the widely accepted General Methods of Moments (GMM), to investigate the effect of bank market power on liquidity creation. Our identification strategy exploits plausibly exogenous variation in bank market power, which is instrumented using three instruments: financial freedom, banking activity restrictions and entry restrictions instead of using the lagged variables in the GMM approach. Finally, we are the first to examine the interaction effect of bank market power and government intervention on liquidity creation during the GFC.

In this paper, we combine bank-specific data for 2,492 banks from 22 EU countries (15,761 country-year observations) with regulatory and macroeconomic variables over the period 2006 to 2015. We attempt to extend the previous empirical literature and analyse the impact of bank market power on liquidity creation. Due to the conflicting opinions on measuring the degree of market power expressed in the economic literature, it has become an important scope for investigating the competitive features of a banking industry. As a result, we apply a more recent measure of market power that allows for the possibility that firms do not choose the prices and input levels in a profit-maximizing way (Koetter *et al.*, 2012).

Our results indicate that banks with greater market power significantly increase their liquidity creation. Specifically, a greater market power increases liquidity creation by 59 and 7.8 percentage points for INSFR and TLC, respectively. This is large relative to the means of 127% and 21%. We find that market power only increases liquidity creation on the asset side by 12-percentage points for the adjusted Lerner and it reduces liability-side liquidity creation by 3.06 percentage points. Thus these effects when combined, explains why we find the overall effect of bank market power on total liquidity creation (TLC).

We further extend our analysis to demonstrate whether bank market power enhances overall bank profitability. In fact, we are interested to investigate the functionality of banks and to

what extent they will be able to optimise their performance when faced by high-risk exposure in terms of liquidity creation. Our results show that higher market power increases bank profitability by 26-percentage points measured by return on assets, 4% as measured by return on equity and 73-percentage points by net interest margin. All these results are statistically significant at the 1% confidence level. This analysis highlights the importance of adjusting market power for profit inefficiency. Calculating market power using the traditional Lerner index overestimate bank profitability by more than 50%.

Our findings about the combined effect of high market power and government intervention on bank liquidity creation during the GFC reveal a negative relationship between banks with low market power and guarantees suggesting that during the GFC, government intervention through guarantees reduces liquidity creation. In contrast, we find the combined effect of recapitalisation with low market power is positive but only significant at the 10% confidence level for the TLC. This suggests that government intervention through recapitalisation should be targeted at banks with less market power.

We perform a number of robustness checks. First, we investigate how bank specialization affects liquidity creation. Second, we split our sample into under-capitalized and well-capitalized banks to examine whether liquidity creation responds differently at banks with relatively high capital ratios. Third, we re-run our model focusing only on small banks in order to find a link between bank size and liquidity creation. Fourth, we include macroeconomic control variables to investigate their potential influence on our findings. Fifth, we correct standard errors for clustering at the bank and year level to account for the structure of serial correlation within each bank in our tests. Finally, we construct an alternative liquidity creation measure *(LNSFR)* by applying the October 2014 Basel III factors (BCBS, 2014). Our main findings remain robust to all these tests.

The remainder of this chapter is structured as follows: section 2 reviews the related literature and provides the theoretical arguments linking liquidity creation with bank market power and the explicit channels that can influence this relation. Section 3 describes the econometric framework. Section 4 describes the data and the calculation of the market power measures as well as the liquidity creation measures. Section 5 provides the results obtained from examining the impact of bank market power on liquidity creation. Section 6 presents various robustness checks. Finally, section 7 concludes.

2. Literature Review

Following the global financial crisis, Basel III and other strengthening policy responses are expected to affect financial institutions with implications for industry structure and competitive

conduct over longer periods of time (Acharya and Mora, 2012). In turn, such actions might reduce banks' ability to provide lending or create liquidity in the economy. The theoretical literature regarding the impact of bank market power on liquidity creation suggests two opposing hypotheses. The "fragility channel" view by Petersen and Rajan (1995), who argue that increased competition reduces credit supply, as banks are less likely to grant credit to clients. The idea is that decreased market power reduces incentives for banks to establish long-term relationships with new borrowers, or relationships that could create future surpluses to be shared. Banks' propensity to lend and invest in information production may be more limited in competitive environments because competition reduces the possibility that banks can recoup the costs involved in building and nurturing long-term relationships with borrowers.

The second hypothesis, the "price channel" view by Boot and Thakor (2000), suggests that increased competition influences bank pricing policies, leading to diminished loan rates and increased deposit rates. As a consequence, demand for both loans and deposits rise. The more dominant view suggests that competition tends to be associated with lower loan rates, which makes credit more affordable and increases lending and access to finance. More broadly, this view argues that competition promotes credit availability. Several studies provide empirical support for a link between competition and low lending rates (Calderon and Schaeck, 2012; Love and Pería, 2015). Liquidity creation follows what financial intermediation assumes: that banks traditional and core business is to "borrow short and lend long", so they gather deposits and then lend these out.

Which of these two views best describes the nature of the relationship between bank market power and liquidity creation is ultimately an empirical issue. As we noted in the introduction, the empirical literature on this relationship is scarce. There is, however, empirical work on the relationship between banks market power and lending (one element of liquidity creation). The empirical results provided are mixed for example, Besanko and Thakor (1992) and Guzman (2000) find that market power is detrimental in banking as more competition leads to lower costs and better access to finance. Similarly, studies reveal that in a market where banks are concentrated, lending reduces as a result of high lending rates but deposit rates decline where banks have excessive market power in a deposit market (Berlin and Mester, 1999; Black and Strahan, 2002; Kahn *et al.*, 2005). Moreover, Cestone and White (2003) suggest that banks exhibit a reduced willingness to lend to new borrowers in uncompetitive markets because their existing lending relationships are highly valuable. Canales and Nanda (2012) and Cetorelli and Strahan (2006) find that reduced competition decreases bank lending.

Our paper is also related to several other strands in the literature. It builds on previous studies and control for the complex relationship between liquidity creation and capital. Berger and Bouwman (2009) report two opposing hypotheses on the link between capital and liquidity creation. "The financial fragility-crowding out" theory states that higher capital reduces liquidity creation. Contrary, the "risk absorption" theories state that higher capital increases liquidity creation. For instance, Casu *et al.* (2016) find that higher capital requirements may result in reduced liquidity creation in the Eurozone. Similarly, Horváth *et al.* (2014) find Czech banks have a negative and significant relationship between liquidity creation and capital. Furthermore, Fu *et al.* (2016) and Distinguin *et al.* (2013) find similar results when analysing commercial banks in 14 Asia-Pacific economies and a sample containing European and US banks, respectively.

As we investigate the impact of market power on liquidity creation, we only find two papers that explore this relationship. Generally, prior empirical research on bank market power focuses on the relationship between different aspects of bank regulations, supervisory practices, bank performance or financial stability (Beck *et al.*, 2006; Delis, 2012; Tabak *et al.*, 2012; Amidu and Wolfe, 2013a; Beck *et al.*, 2013; Cubillas and Suárez, 2013; Soedarmono *et al.*, 2013; Fiordelisi *et al.*, 2015). However, after the recent global financial crisis, the impact of the rescue operations such as capital injections, state-aid, and bank bailouts on banking competition have been the object of an increasing number of investigation (Beck *et al.*, 2010; Andresen, 2011; Calderon and Schaeck, 2012; Fiordelisi *et al.*, 2015). The financial crisis led to large losses, failure, and closure of many banks, and forced the intervention of both central banks and governments. Our study considers the interaction between market power and government intervention and examines how this might affect liquidity creation during the GFC. Molyneux (2014) states that the on-going reform in the European banking sector since the 2008-10 crisis will lead to a more conservative and less competitive system. In this regards, Ivashina and Scharfstein (2010) find that banks in the U.S. reduced their lending to customers significantly during the crisis period although banks have raised deposit rates to substitute wholesale funding constraints (Acharya and Mora, 2015). Similarly, Cornett *et al.* (2011) find that U.S. banks with more illiquid asset portfolios cut back on lending during crisis periods.

In sum, studies on liquidity creation have mainly focused on the complex relationship between liquidity creation and capital or government intervention. However, there has been no studies devoted to the issue of how liquidity creation measured as the new liquidity requirement in Basel III affects market power in the European banking industry. Our paper covers this gap and contributes to this relatively unexplored avenue of research by providing new insights on the relationship between liquidity creation and bank market power.

3. Econometric Framework

3.1 Identification Strategy

In this paper, we investigate the contribution of Liquidity creation in explaining bank market power beyond the determinants considered in the existing literature. We define market power as the extent to which banks fix prices above marginal costs. To capture market power, we apply the traditional Lerner index as well as an adjusted Lerner index that allows for the possibility that banks do not choose the prices and input levels in a profit-maximizing way, i.e., avoiding the implicit assumptions of full efficiency in the estimation of traditional Lerner index (Koetter *et al.*, 2012). Ignoring profit inefficiency would lead to a large bias in price-cost margin, as well as in consumer and producer welfare losses. Previous studies show that bank market power is an important determinant of bank liquidity creation (Berger and Bouwman, 2009; Distinguin *et al.*, 2013; Fu *et al.*, 2016). Thus, to mitigate simultaneity concerns, we employ a two-stage least squares technique (2SLS/IV) and estimate Equations (1) and (2) as follows:

$$Lerner_{it} = a_0 + b_1 IV_{it} + b_2 X_{i,t-1} + \gamma_t + \gamma_c + \varepsilon_{it}, \quad (1)$$

$$\Delta Y_{it} = c_0 + d_1 \widehat{Lerner}_{it} + d_2 X_{i,t-1} + \gamma_t + \gamma_c + \varepsilon_{it}, \quad (2)$$

Where ΔY_{it} is the change in liquidity creation (or one of its components: asset-side, liability-side, and off-balance sheet liquidity creation or one of the profitability measures: ROA, ROE and NIM) scaled by total assets at bank i from year $t-1$ to year t, $Lerner_{i,t}$ is either the adjusted or unadjusted Lerner index. It denotes bank market power indicators for bank i at time t. $X_{i,t-1}$ is a vector of control variables, defined in detail below. $IV_{i,t}$ are instrumental variables used to predict Lerner indices, γ_t and γ_c are year and country dummies, respectively. The term $\varepsilon_{i,t}$ is the error term. We estimate the first-stage regression between instrumental variables and market power in the EU banking using OLS method. All regressions are based on annual data. In the second stage, we regress liquidity creation on the predicted values of the potentially endogenous explanatory variables, control variables, year and country dummies. Standard errors are clustered at the bank level to control for serial correlation within each bank. We use Wooldridge (1995) overidentification and exogeneity tests as well as the explanatory power of the first-stage regression to select suited instruments.

3.1.1 Instruments

Establishing causality requires variables that explain market power but are neither correlated with bank liquidity creation nor a second-stage error term (Elyasiani and Jia, 2008;

Danisewicz *et al.*, 2016). Consistent with the banking literature (Schaeck and Cihak, 2012; Amidu and Wolfe, 2013a), we instrument market power using three instruments: banking activity restrictions, entry restrictions and banking freedom. We argue that these instruments are suitable to instrument Lerner indices because they provide information concerning how independent a banking system is from government control as well as legal requirements and state interference in various banking activities. Hence, less government state ownership and interference directly affect bank market power. Firstly, we use bank activity regulatory variable to measure the degree to which national regulatory authorities allow banks to engage in the following three fee-based rather than the more traditional interest-spread-based activities: Securities activities, insurance activities and real estate activities. Following Barth *et al.* (2001), this instrument is proxied by an index taking on values between (1) and (4) for categories that capture information on whether banks can engage in securities, insurance, and real estate activities, and if they can hold stakes in non-banks. The activities are classified as unrestricted (1), permitted (2), restricted (3), or prohibited (4). Higher values indicated greater restrictions. Secondly, bank entry requirements (competition regulatory variable) are used to measure the specific legal requirements for obtaining a license to operate as a bank. This variable takes on values between (1) and (8), where higher values indicate lower entry restrictions. Finally, we use banking freedom as an indicator for the openness of a banking system. The index offers data on whether foreign banks are allowed to operate freely, on difficulties faced when establishing banks, and on government influence over credit allocation. The index ranges from 0 to 100 percent, where higher values indicate fewer restrictions.

3.2 The influence of government interventions

Furthermore, we extend our analysis and focus only on the crisis period (2008-2011) by considering whether banks with the highest market power have benefited more from government intervention in terms of creating more liquidity. We sort our sample into four quartiles; quartile four represents banks with the highest adjusted Lerner index and quartile one the lowest. Our pooled-OLS model specification is as follows:

$$\begin{aligned}\Delta Y_{it} = \; & \alpha + \beta_1 Adjusted\ Lernerq1_{i,t-1} + \beta_2 Adjusted\ Lernerq2_{i,t-1} + \\ & \beta_3 Adjusted\ Lernerq4_{i,t-1} + \left[\sum_{j=1}^{2}(\lambda_j + \xi_j Adjusted\ Lernerq_{i,t-1}) * \right. \\ & \left. GovInt^{j}_{c,t-1}\right] + \delta X_{i,t-1} + \gamma_c + \gamma_t + \varepsilon_{it}, \end{aligned} \quad (3)$$

Where $Adjusted\ Lernerq4_{i,t-1}$ is a variable that represents banks with the highest market power, $GovInt^{j}_{c,t-1}$ are two forms of government intervention; guarantees and liquidity measure as well as recapitalisation and asset relief. The coefficient ξ_j represents the interaction between adjusted Lerner index at various quartiles with the government intervention.

4. Data and Summary Statistics

4.1 Data Sources

The data used in this study are taken from several sources. We collect annual income statements and balance sheet data from the Fitch-IBCA BankScope (BSC) database. For our analysis, we distinguish between commercial, savings and cooperative banks from 28 EU countries. Income statements and balance sheets are taken in US dollar terms, using the market rate at the closing dates of the bank-specific accounting exercises. While in many cases BankScope reports both consolidated and unconsolidated financial statements, we use consolidated figures to the extent possible, to reflect the overall liquidity positions of the individual banking group.

For the main regressions we focus on the period from 2006-2015. Country-level data is obtained from the World Development Indicators of the World Bank. In addition, we retrieve the regulatory and institutional setting from Barth *et al.* (2001), Barth *et al.* (2004) and the Heritage Foundation. Variable definitions are provided in Appendix A, in the top panel, variables employed to estimate cost and profit functions using both OLS and SFA (see section 4.3). We apply the following selection criteria: we drop banks with missing or negative total assets, have no loans outstanding loans, zero deposits, or with missing or negative data for three factor prices, tow outputs, cost, profit and equity. We deflate all monetary volumes to 2015 prices using the consumer price index (Koetter *et al.*, 2012; Delis *et al.*, 2016). All balance sheet items and factor prices are then truncated at the 1st and 99th percentile, respectively, to control for outliers. This reduces our final sample to 2,492 banks with 15,761 observations from 22 EU countries.[2] *Table 1* provides the composition of the sample by country and bank type.

Insert Table 1

4.2 Dependent Variables: Liquidity Creation Measures

Our first liquidity creation proxy is based on the regulatory standards proposed by the Basel Committee on Banking Supervision (BCBS, 2010). Following the global financial crisis and in recognition of the need for banks to improve their liquidity management, the Basel Committee on Banking Supervision developed an international framework for liquidity assessment in banking. Among the several guidelines, the Basel III accords include the implementation of a net stable funding ratio (NSFR). This ratio aims to promote resiliency over long-term time horizons by creating additional incentives for banks to fund their activities with more stable sources of funding.

[2] Six countries are removed from our sample as banks in these countries fail to meet our selection criteria. These countries include Estonia, Finland, Lithuania, Poland, Romania and Slovenia.

This liquidity measure is the ratio of the available amount of stable funding to the required amount of stable funding.

We are among the first studies that use the inverse net stable funding ratio (I.NSFR) as a proxy of liquidity creation (Distinguin *et al.*, 2013; Casu *et al.*, 2016). Hence, we calculate our liquidity creation indicator as the amount of required stable funding (RSF) relative to the amount of available stable funding (ASF) (BCBS, 2010).

$$I.NSFR_{it} = \frac{Required\ Stable\ Funding_{it}}{Available\ Stable\ Funding_{it}} \quad (4)$$

Required Stable Funding (RSF) is a weighted sum of the uses of funding sources (assets and off-balance sheet) according to their liquidity. While Available Stable Funding (ASF) is a weighted sum of funding sources according to their stability features. *Appendix A* shows the breakdown of a bank balance sheet as provided by BankScope and its weighting with respect to the Basel III framework to calculate the inverse of the net stable funding ratio. We follow the same assumptions made by Distinguin *et al.* (2013) and Gobat *et al.* (2014) to compute NSFR.

In addition, we calculate four measures of liquidity creations following Berger and Bouwman (2009) and Berger *et al.* (2016) using a three-step procedure. In step 1, we classify all bank balance sheet and off-balance sheet activities using information on the category and maturity of banks' assets and liabilities as liquid, semi-liquid, or illiquid. This is done based on the ease, cost, and time it takes customers to obtain liquid funds from the bank (liability-side of a balance sheet), and based on the ease, cost and time with which banks can dispose their obligations in the case of asset items (asset-side of a balance sheet). In step 2, we assign weights of either +1/2, 0, or -1/2 to the activities classified in step 1. The weights correspond to liquidity creation theory. According to this theory, banks create liquidity by converting illiquid assets into liquid liabilities. In contrast, banks destroy liquidity by transforming liquid assets into illiquid liabilities or equity (see Berger and Bouwman, 2009). In step 3, we combine the activities as classified in step 1 and as weighted in step 2 in different ways to construct our liquidity creation measures. Total liquidity creation *(TLC)* for each bank considers both on- and off- balance sheet activities. Instead of using TLC, we also use an *(off-balance sheet)* measure where we only include off-balance sheet activities. Similarly, we decompose the TLC measure and construct two proxies (*asset-side and liability-side*) that focuses on on-balance sheet activities. *Appendix B* provides a classification of bank activities and construction of four liquidity creation measures.

Higher values of all measures will indicate higher illiquidity. Higher levels of liquidity creation mean that banks invest more liquid liabilities in illiquid assets. In this context, a bank faces

risk if some liquid liabilities invested in illiquid assets are claimed on demand. We run the regressions in changes rather than levels because this allows us to observe how changes in our explanatory variables lead to changes in liquidity creation at one particular bank in the following year and avoids our results being driven by cross-sectional variation in the data (see Berger *et al.* (2010) and Berger *et al.* (2016)).

4.3 Explanatory Variables: Market Power Measures

We examine the impact of market structure in banking on liquidity creation using two Lerner indices as indicators of the degree of market power and clarify which one is our preferred measure. First, the traditional Lerner index that assumes fully efficient banks represents the mark-up of price over marginal costs. Following the banking literature (Amidu and Wolfe (2013a), Fungáčová *et al.* (2014) and Berger and Roman (2015)), the traditional Lerner index is calculated at the bank level as:

$$Lerner_{jt} = \frac{P_{jt} - MC_{jt}}{P_{jt}} \qquad (5)$$

Where P_{jt} is the price of bank output which is calculated as the ratio of total income over total assets for bank j at time t, and MC_{jt} is the marginal cost of the production of that output for bank j at time t. When the marginal cost is not available as in most empirical data sets, it can be estimated using econometric methods. We use a popular approach through estimating a translog cost function and take its derivative to obtain the marginal cost. We follow Koetter *et al.* (2012) and employ the following translog cost function as:

$$\begin{aligned} log\ Cost_{jt} = {} & \alpha + \sum_{i=1}^{3} B_i \log w_{ijt} + \sum_{p=1}^{2} \gamma_p \log y_{pjt} + \sum_{i=1}^{3} (\varsigma_i/2) (\log w_{ijt})^2 + \\ & \sum_{i<k} \sum \eta_{ik} \log w_{ijt} \log w_{kjt} + \sum_{p=1}^{2} (\theta_p/2) (\log y_{pjt})^2 + (\kappa_{12}/ \\ & 2) \log y_{1jt} \log y_{2jt} + \sum_{i=1}^{3} \sum_{p=1}^{2} \lambda_{pi} \log w_{ijt} \log y_{pjt} + \sum_{k=1}^{2} \nu_k trend^k + \\ & \sum_{i=1}^{3} \xi_i \log w_{ijt} trend + \sum_{p=1}^{2} \omega_p \log y_{pjt} trend + \delta log(z_{jt}) + \varepsilon_{jt}, \end{aligned} \qquad (6)$$

Where *Cost* represents total costs including financial and operating costs, w_{ijt} input factors $i = 1,2,3$ of bank j at time t, y_{1jt} is total securities of bank j at time t. Following Koetter *et al.* (2012) Securities include securities held to maturity, securities available for sale and all other stocks, bonds and securities. y_{2jt} is total loans for bank j at time t, z_{jt} is total equity of bank j at time t, and $trend$ is a time trend to capture technical change.

Once the cost function is estimated, marginal cost is evaluated by taking the first derivative with respect to total securities (y_{1jt}) and total loans (y_{2jt}), which yields

$$MC_{jt} = \frac{Cost_{jt}}{y_{1jt}} [\gamma_1 + \theta_1 \, log \, y_{1jt} + (\kappa_{12}/\, 2) \, log \, y_{2jt} + \sum_{i=1}^{3} \lambda_{1i} \, log \, w_{ijt} + \, \omega_1 trend] +$$

$$\frac{Cost_{jt}}{y_{2jt}} [\gamma_2 + \theta_2 \, log \, y_{2jt} + (\kappa_{12}/2) \, log \, y_{1jt} + \sum_{i=1}^{3} \lambda_{2i} \, log \, w_{ijt} + \, \omega_2 trend]. \quad (7)$$

We estimate equation (5) using an OLS approach imposing the restrictions of homogeneity in inputs prices and symmetry in cross-price effects as in Lang and Welzel (1996). We impose homogeneity of degree 1 on input prices and *Cost* by the price of borrowed funds (w_3). Country and time fixed effects are also introduced to control for all unobservable time-variant country-specific factors. We cluster heteroscedasticity-adjusted standard errors at the bank level to account for serial correlation within each bank. The Lerner index ranges between zero and one, and interpreted as follows: zero corresponds to perfect competition and larger values reflect more market power and less competition.

Our second indicator of market power is the adjusted Lerner index estimated using the exact same procedure as Koetter *et al.* (2012). This index allows for the possibility that firms do not choose the prices and input levels in a profit-maximizing way, i.e., avoiding the implicit assumptions of full efficiency in the estimation of the traditional Lerner index. To approximate average revenues, Humphrey and Pulley (1997) propose an alternative profit efficiency model as a more adequate framework when the standard assumptions of a perfectly competitive market do not hold. This model measures to what extent a bank generates maximum profits given its output levels. To measure efficiency, we use profit before taxes (PBT) as the dependent variable in the translog equation (6). We deal with the problem of losses in translog profit models by applying the solution proposed by Bos and Koetter (2011), we specify an additional independent variable, the Negative Profit Indicator (NPI). We define NPI to be equal to one for observations where PBT is positive and equal to the absolute value of PBT for a loss-incurring bank.

We follow the new literature and use stochastic frontier analysis (SFA) to estimate marginal cost and average revenues based on standard assumptions in (Kumbhakar and Lovell, 2000). SFA posits a composed error model $(\varepsilon_j = \nu_j + \mu_j)$, where inefficiencies (μ_j) are assumed to follow an asymmetric distribution, usually the half-normal with a variance σ_μ^2 independent of the $\nu_j's$, while random errors (ν_j) follow a symmetric distribution, normal distribution with mean zero and variance σ_ν^2 . The logic is that the inefficiencies must have a truncated distribution because inefficiencies cannot be negative.

An efficiency-adjusted Lerner index is then calculated using predicted total costs *(Cost),* corresponding marginal costs *(MC)*, and predicted profits *(PBT)* relative to total output (*TO* = total loans + total securities) as:

$$Adjusted\ Lerner_{jt} = \frac{\frac{PBT}{TO}+\frac{Cost}{TO}-MC}{\frac{PBT}{TO}+\frac{Cost}{TO}} = \frac{PBT+Cost-MC*TO}{PBT+Cost} \qquad (8)$$

Assessing market power using the adjusted Lerner index is our preferred measure. This is because Koetter *et al.* (2012) state that firms with market power prefer to operate inefficiently rather than reap all potential rents. Profit inefficiency arises when firms do not fully exploit their pricing opportunity set. Therefore, ignoring both cost and profit inefficiencies would lead to an even larger bias in price-cost margin, as well as in consumer and producer welfare losses.

4.4 Control Variables

Our regressions contain several control variables, which are lagged by one year. We include the following: the natural logarithmic of total assets is included to account for bank size. We control for bank capitalization, using the equity ratio (equity capital to total assets) because Berger and Bouwman (2009) have shown that bank capital is a key determinant for liquidity creation. Furthermore, we follow Berger *et al.* (2010) and Casu *et al.* (2016) and include the return on equity *(ROE)* to control for bank profitability. It is calculated as the ratio of net income to average equity. Finally, we add Loan Loss Provisions *(LLP)* to control for credit risk (Altunbas *et al.*, 2007). According to Berger and Bouwman (2009), it is important to control for risk because adding risk to the regression helps to isolate the role of capial in suppporting bank liquidity creation from the role of capital in supporting banks' function as risk transformers. In addition, we include a dummy variable for commercial banks (Commercial), a dummy variable for savings banks (Savings) and a dummy variable for Cooperative banks (Cooperative) that we drop in the regression to avoid perfect collinerity.

4.5 Summary Statistics and Statistical analysis of Lerner indices

Table 2 presents the descriptive statistics for the variables included in our model. As to our dependent variables, the average inverse net stable funding ratio *(I.NSFR)* is 127%. This result is similar to those reported in US and European banks (90.2% by Distinguin *et al.* (2013)). Total liquidity creation *(TLC)* equals 21% of industry total assets. This result is similar to those reported in Germany (22% by Berger *et al.* (2016)). Banks in our sample create almost all their liquidity on the balance sheet and only 2% liquidity is created off-balance sheet. Distinguin *et al.* (2013) state that the main difference between the liquidity creation indicators based on Berger and Bouwman

(2009) and the liquidity indicator as defined in the Basel III accords stems from the liability side of the balance sheet. The liquidity creation indicator *(TLC)* considers some liabilities as liquid because they can be quickly withdrawn without penalty. However, a large share of these liquid liabilities is considered as stable in the Basel III liquidity indicator because they are expected to "stay" within the institution. Furthermore, higher levels of liquidity creation *(TLC)* mean that banks invest more liquid liabilities in illiquid assets. Whereas, higher *(INSFR)* implies that the amount of assets that cannot be monetized is deviating from the available amount of stable funding. The mean value of the traditional Lerner index is 5%. While the adjusted Lerner index shows a higher value of 9% consistent with Koetter *et al.* (2012), who find that adjusted Lerner indices are larger than conventional Lerner indices.

Insert Table 2

Consistent with Koetter *et al.* (2012), mean Lerner indices per year in *Table3* demonstrate that failure to adjust for inefficiency leads to underestimation of market power. For the period from 2006 to 2010, adjusted Lerner indices are on average about one-third larger compared to unadjusted indices. However, beyond 2010, adjusted Lerner reflect an increase in the level of competition among banks as the adjusted Lerner declined. This could be due to the regulatory reforms after the global financial crisis.

Furthermore, *Table 4* shows the correlation matrix for the sample. It can be seen that no high correlation between the independent variables is present and hence there are no multicollinearity problems.

Insert Table 3 and Table 4

5. Empirical Results

5.1 Main Results

5.1.1 First-stage results: Instruments

Our two first-stage regressions in *Table 5* (column 1 and column 2) analyse the determinants of market power proxied by the adjusted Lerner index and traditional Lerner index. The three instruments are financial freedom, bank activities and entry restrictions. In addition, we use set of control variables as identified in the literature (Claessens and Laeven, 2004; Demirgüç-Kunt and Martínez Pería, 2010).

First, we use financial freedom as an indicator for the openness of a banking system. The index offers data on whether foreign banks are allowed to operate freely, on difficulties faced when

establishing banks, and on government influence over credit allocation. The findings suggest that with the higher financial freedom, banking markets appear to be less competitive. Second, we find that higher financial freedom is associated with weaker bank entry restrictions. This lead to new investment opportunities which lead to higher sophistication in banking products that may in turn affect the degree of bank competition.

Finally, we find a significant and positive impact of bank activities for the adjusted Lerner index only. This indicates that banks with higher market power benefit more when national authorities allow them to engage in fee-based non-traditional activities. Regarding the control variables, most of the control variables have the expected sign and are significant.

5.1.2 Second-stage results: Market power

Our second-stage results are reported in *Table 5 Panel A* (columns 3-6). Our key variables of interest are the adjusted Lerner index and the traditional Lerner index. We present our estimations based on two definitions of liquidity creation: the inverse of net stable funding ratio *(I.NSFR)* under Basel III regulatory requirements and total liquidity creation *(TLC)* based on Berger and Bouwman (2009).

We find that banks with greater market power significantly increase their liquidity creation. Our results show that market power has a positive and significant coefficient whether measured by adjusted Lerner or traditional Lerner index. We obtain this result with both measures of liquidity creation. Specifically, a greater market power increases liquidity creation by 59 and 7.8 percentage points for INSFR and TLC, respectively. This is large relative to the means of 127% and 21%. This result supports the hypothesis that market power can affect the availability of funds Petersen and Rajan (1995) and the distributions of the loan portfolio (Berger *et al.*, 2005). In contrast to Cestone and White (2003), Cetorelli and Strahan (2006), and Canales and Nanda (2012), who find that banks reduce their willingness to lend in uncompetitive markets because their existing lending relationships are highly valuable.

Regarding the control variables, our coefficients are in line with those obtained in previous studies (Distinguin *et al.*, 2013; Berger *et al.*, 2016; Casu *et al.*, 2016) we find that size has a positive and significant impact on liquidity creation. This can be justified by the ability of larger banks to access external funding as they might benefit from a reputational advantage, possibly providing them a broader access to financial markets. Furthermore, for bank capital, profitability and credit risk, we find a negative relationship between these coefficients and liquidity creation. Consistent with the "financial fragility structure" (Diamond and Rajan, 2000; Diamond and Rajan, 2001) and the "crowding-out of deposits" (Gorton and Winton, 2017) theories, higher regulatory capital

ratios are associated with lower liquidity creation and illiquidity. Finally, we find the coefficient for Commercial is positive while negative for Savings, indicating that commercial banks create more liquidity than savings banks.

It is critical that our instruments are econometrically strong because weak instruments can lead to worse biases than OLS (Berger *et al.*, 2016). *Table 5 Panel B* shows several diagnostic tests that we perform on a 2SLS model. Wooldridge (1995) is reported to examine overidentification restrictions as well as exogeneity tests. The results suggest overidentification can be rejected, the null hypothesis that Lerner indices are exogenous can be rejected and explanatory power as indicated by R^2 and F-tests support the choice of instruments. In sum, the results suggest that the three instruments are correctly excluded from the second-stage equation.

Insert Table 5

5.2 Liquidity Creation Components

In this section, we examine whether the impact of market power on liquidity creation comes only from on-balance sheet items: if it is on the asset side or the liability side, or it is also goes through off-balance-sheet items. To examine this issue, we perform estimations by measuring the components of liquidity creation focusing on the measures calculated based on Berger and Bouwman (2009). *Table 6* shows the results for both Lerner indices. We find that market power only increase liquidity creation on the asset side by 12-percentage point for the adjusted Lerner and 32-percentage point for the traditional Lerner.

This analysis also shows that higher market power reduces liability-side liquidity creation by 3.06 percentage points measured by adjusted Lerner and 8.02 percentage points measured by traditional Lerner index. Both results are statistically significant at 1% and 5%, respectively. These effects thus when combined, explain why we find the overall effect of bank market power on total liquidity creation (TLC). We find no significant measured effect of market power on off-balance sheet liquidity creation. Regarding the control variables, we observe that they maintain their signs but are only significant in the asset-side estimation.

Insert Table 6

5.3 Extensions: Bank Market Power, Profitability and government intervention

We further examine whether bank market power enhances overall bank profitability, one of the main objectives of bank when increasing its illiquidity. We measure profitability by ΔROA, ΔROE and ΔNIM. *Table 7* presents our results. Our results show that higher market power increases bank profitability by 27-percentage points measured by return on assets, 4% as measured

by return on equity and 73-percentage points by net interest margin. The results are statistically significant at the 1% confidence level and consistent with (Schaeck and Čihák (2008) Mirzaei *et al.* (2013) and Amidu and Wolfe (2013b)).

This analysis highlights the importance of adjusting market power for profit inefficiency. Calculating market power using the traditional Lerner index overestimate bank profitability by more than 50%.

Insert Table 7

We next examine the combined effect of high market power and government intervention on bank liquidity creation during the Global Financial Crisis (GFC). We sort banks based on their adjusted Lerner index into four quartiles. The combined effects are explored through the interaction between the government intervention and the adjuster Lerner index. Using equation (3), the results are reported in *Table 8*. We find banks in the fourth quartile (*Adjusted Lerner q4)* increase their liquidity creation as measured by *(*Δ*TLC)*. Across both estimations, we find the coefficient of recapitalisation *(Recapitalization)* is positive and statistical significance at the 1% confidence level to bank liquidity creation. Nevertheless, for our key variables of interest, when we consider the combined effect of government intervention with market power. We find the effect is negative for the combined effect of Guarantees with low market power *(Adjusted Lerner q1*Guarantees)* and *(Adjusted Lerner q2*Guarantees)* suggesting that during the GFC, government intervention through guarantees reduces liquidity creation for banks with less market power. The average bank liquidity creation is lowered by 1.28 percentage points and 1.11 percentage points as measured by *(I.NSFR),* respectively. In contrast, we find the combined effect of recapitalisation with low market power *(Adjusted Lerner q1*Recapitalization)* and *(Adjusted Lerner q2*Recapitalization)* is positive and significant at the 10% confidence level for the TLC. This suggests that government intervention through recapitalisation should be targeted at banks with less market power.

Insert Table 8

6. Interaction Effects & Robustness Checks

6.1 Market Power and Bank Specialization

In this analysis, we turn to bank specialization and investigate how different business models affects liquidity creation (*Table 9* column 1 and column 2). We consider liquidity creation as measured by (TLC) based on Berger and Bouwman (2009). We first run our estimation considering only cooperative banks as they represent 61% of our sample. The results provide interesting evidence. First, we find the interaction effect between market power and cooperative

banks negative and strongly significant, suggesting that cooperative banks create less liquidity compared to commercial and savings banks. Second, we rerun our estimations with only commercial and savings banks and find supporting evidence. The coefficients of the interaction term between market power and bank specialization in column 2 are positive and statistically significant at 1% confidence level. In both cases, the adjusted Lerner index remains positive and strongly significant, indicating that higher market enhances liquidity creation.

6.2 Market Power and Bank Capital

In this test, we rerun our main analysis but now splitting the sample at the median equity ratio into under-capitalized and well-capitalized banks to examine whether liquidity creation responds differently at banks with relatively high capital ratios. We construct an interaction variable between bank market power and well-capitalized banks (Adjusted Lerner*Capital). Consistent with our main results, we find an inverse relationship between capital ratio and our liquidity creation proxies. Therefore, banks may reduce liquidity creation as capital increases, as suggested by the "financial-fragility-crowding out" hypothesis. This result is consistent with the findings of (Distinguin *et al.*, 2013; Horváth *et al.*, 2014; Fu *et al.*, 2016). Berger and Bouwman (2009) conclude that the effect of capital on liquidity creation is negative only for small banks. Therefore, we run our next test to investigate whether the interaction between bank size and bank market power impacts liquidity creation.

6.3 Market Power and Bank Size

Both the "fragility channel" and the "price channel" effects on liquidity creation might differ considerably among banks of different size. We address this by testing whether the net effect of liquidity creation on bank market power is negative or positive for different bank sizes as a further robustness check. We re-run our model focusing only on small banks in order to find a link between bank size and liquidity creation.[3] We split our sample at the median of total assets into large and small banks. We expect that the financial fragility channel effect is likely to be relatively strong for small banks. One reason is that small banks deal more with entrepreneurial-type small business, where the close monitoring highlighted in Diamond and Rajan (2000) is important. In contrast, the price channel effect is likely to be stronger for large banks because substantial portions of their liquidity off the balance sheet is higher compared with small banks (Berger and Bouwman, 2009).

[3] We re-run the same test for large banks, our results show that large banks create more liquidity, results are available form authors upon request.

We construct an interaction variable between bank market power and small banks (Adjusted Lerner*Small). Consistent with Berger and Bouwman (2009), small banks create less liquidity compared to large banks.

6.4 Including Macroeconomic Variables

Next, we include macroeconomic contorl variables *GDP* and *Inflation* to investigate their potential influence on the findings. We find that banks operating in countries with an expected economic boom as measured by *(GDP)* have significant impact on liquidity creation. Similarly, we find the inflation rate has a positive and significant impact on liquidity creation. Our main variable of interest *(Adjusted Lerner)* remains positive and statistically significant at the 1% confidence level.

Insert Table 9

6.5 Standard Errors Corrected for Clustering at the Bank and Year

In this test, we deal with serial correlation in the error term. In the main results we clustered hetroskedasticity-adjusted standard errors on the bank level to account for the structure of the serial correlation within each bank in our tests. As an alternative way, we correct standard errors for clustering at the bank and year (Table 10). We find that our results remain robust and do not affect our inferences.

Insert Table 10

6.6 Alternative Liquidity Creation Proxy

As a final robustness check, we construct the *(I.NSFR)* based on Basel III applying the more recent October 2014 factors (BCBS, 2014). The results are shown in *Table 11* column 5 and column 6. We find that both market power measures *(Adjusted Lerner)* and *(Lerner)* remain positive and statistically significant at the 1% confidence level and do not differ substantially from those obtained in Table 5.

The main differences between calculating INSFR based on previous factors used in the literature and the new factors are as follows: With respect to the assets side; first, NSFR as revised in October 2014 requires a higher weight for loans to financial entities. Hence, we apply a 10% weight instead of 0%. Second, government securities receive a 5% weight. Third, corporate loans receive a weight of 85% instead of 100%. Finally, other securities in available-for-sale or trading portfolios (e.g., equities, commodities, and corporate bonds) receive 50% RSF weight consistent with the revised Basel III NSFR. Similarly, on the liability side, the differences are in the factor given to stable deposits, we increase the weight from 70% to 95% and decrease less stable from 100% to 90%. Whereas unsecured wholesale funding increased form 0% to 50%.

Insert Table 11

7. Conclusion

This paper examines the impact of bank market power on liquidity creation for a large sample of banks in the euro area countries from 2006 to 2015. Using an instrumental variable approach, we find market power as measured by Lerner indices increases liquidity creation significantly. Further investigation suggests that market power affects liquidity creation on the asset-side and the liability side of the balance sheet, but it does not affect liquidity creation off the balance sheet. We compute adjusted Lerner index where we explicitly compare it with the traditional Lerner index. We find that it is important to adjust for profit inefficiency as calculating market power using traditional Lerner overestimate bank profitability by more than 50%. Overall, our results show that Lerner indices have a positive impact on bank profitability.

As a further step, we investigate how regulatory interventions during the global financial crisis affect liquidity creation. We find a negative relationship between the combined effect of market power and guarantees and liquidity creation, while it is positive for the combined effect of market power and recapitalisation for the (TLC) only. Our main results remain robust to several robustness tests.

The results also suggest several policy implications. First, bank market power matters for macroprudential policies. We find evidence that banks take on more liquidity risk as they achieve greater market power. As market power can have detrimental economic effects through its impact on liquidity creation. The ECB should monitor the structure of the banking sector not only for financial stability reasons, but also to encourage liquidity creation as it may lead to higher levels of economic growth. However, in light of the recent liquidity rules, as banks are required to hold more liquid assets. Thus, policymakers facing conflicting objectives between sustainable economic growth through liquidity creation and effectiveness of Basel III policy.

Second, we find higher required capital ratios may discourage liquidity creation within banks. Hence, the implementation of Basel III may result in reduced liquidity creation by introducing tightened capital requirements, therefore, slowing economic growth through a reduction in the amount available for financing. Therefore, it is necessary to look for a trade-off between benefits for a financial system from stronger capital and liquidity regulations and benefits of greater liquidity creation.

Furthermore, given the differences between liquidity creation measures based on Berger and Bouwman (2009) and Basel III BCBS (2010), using the *(I.NSFR)* measure for liquidity creation

may be useful to add to the debate on liquidity assessment in banking. This level of liquidity creation could be considered to appreciate the ability of banks to face transformation risk when they create liquidity. However, given the ambiguity in the definition and measurement of liquidity under a global regulatory framework, it is recommended that regulators further clarify what type of liquid liabilities should be considered stable. By better understanding what factors significantly impact bank exposure to transformation risk, it can help banks to improve their risk management framework.

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Table 1: Composition of sample observations by country and bank type

Country	Total	Commercial Banks	Savings Banks	Cooperative Banks
Total number of banks	15,761	2,078	3,994	9,689
percent of sample	100%	14%	25%	61%
of which		Observations by category		
1 Austria (AT)	709	113	379	217
2 Belgium (BE)	72	66	3	3
3 Bulgaria (BG)	10	10	0	0
4 Cyprus (CY)	6	6	0	0
5 Czech Republic (CZ)	89	70	0	19
6 Germany (DE)	9,449	317	3,109	6,023
7 Denmark (DK)	242	143	80	90
8 Spain (ES)	38	22	11	5
9 France (FR)	1,065	406	137	522
10 United Kingdom (UK)	222	221	0	1
11 Greece (GR)	1	1	0	0
12 Croatia (HR)	7	7	0	0
13 Hungary (HU)	2	2	0	0
14 Ireland (IE)	1	1	0	0
15 Italy (IT)	3,444	384	207	2,853
16 Luxembourg (LU)	124	111	3	10
17 Latvia (LV)	47	47	0	0
18 Malta (MT)	17	17	0	0
19 Netherlands (NL)	88	78	0	0
20 Portugal (PT)	88	35	46	7
21 Sweden (SE)	33	15	18	0
22 Slovakia (SK)	7	6	1	0

Notes: This table presents a description of all observations included in the sample by country and bank type. Source: BankScope & authors' calculations.

Table 2: Summary Statistics

	N	Mean	SD	Min	Max
Dependent Variables					
INSFR	15,761	1.27	0 .84	0 .001	32.79
TLC	15,761	0.21	0.21	-0.98	6.64
LC off-balance sheet	15,761	0.02	0.09	-0.009	6.63
LC asset-side	15,761	0.04	0 .21	- 0.78	0.53
LC liability-side	15,761	0.18	0.16	-0.91	0.59
Main Explanatory Variables					
Traditional Lerner index	15,761	0.05	0.34	-6.62	0.92
Adjusted Lerner index	15,761	0.09	0.47	-12.93	0.91
Variables used in the derivation of market power					
Interest income *	15,761	86.16	1315.74	0.01	124074.6
Non-interest income *	15,761	47.75	627.28	0.001	51261.18
Securities*	15,761	1967.31	27163.79	0.001	1534152
Loans*	15,761	3068.88	36556.21	0.15	2974721
Price of physical capital	15,761	1.31	2.65	0.22	26.41
Price of labour	15,761	0.01	0.003	0.002	0.02
Price of borrowed funds	15,761	0.02	0.01	0.002	0.07
Marginal cost (OLS)	15,761	0.02	0.008	0.0007	0.19
Marginal cost (SFA)	15,761	0.03	.0084	0.0007	0.19
Instruments					
Financial freedom	15,761	61.91	8.21	50	90
Banking activities	15,761	1.61	0.49	1.3	2.5
Entry restrictions	15,761	6.65	0.93	1	8
Control Variables					
Total Assets*	15,761	6063.024	72551.92	0.35	5240319
Capital	15,761	2.04	3.07	0.0004	83.64
ROE	15,761	4.87	5.50	-193.54	89.12
LLP	13,636	5.16	0.94	-11.85	-1.38
NII	15,542	1.14	0.95	-6.16	6.03
Commercial	15,761	0.13	0.33	0	1
Savings	15,761	0 .25	0.43	0	1
Crisis dummy	15,761	0.21	0.41	0	1

Notes: This table reports summary statistics on selected variables used throughout the paper from 2006-2015. It contains the means, standard deviations, minimum and maximum values for each variable. * All values are in millions of dollars. Source: BankScope database and the Heritage Foundation.

Table 3: Adjusted and Unadjusted Lerner Indices: EU Banks in the period 2006-2015

	Lerner Index		Spearman's Rank Correlation			Liquidity Creation	
Year	Unadjusted	Adjusted	N	r	p-value	INSFR	TLC
2006	0.005	0.286	1,594	0.813	0.000	1.556	0.254
2007	-0.162	0.140	1,719	0.772	0.000	1.521	0.246
2008	-0.253	0.034	1,659	0.736	0.000	1.083	0.153
2009	-0.025	0.096	1,746	0.708	0.000	1.123	0.158
2010	0.109	0.109	1,796	0.657	0.000	1.130	0.179
2011	0.118	0.075	1,863	0.680	0.000	1.224	0.207
2012	0.136	0.051	1,461	0.692	0.000	1.278	0.202
2013	0.191	0.043	1,339	0.679	0.000	1.316	0.229
2014	0.255	0.057	1,413	0.620	0.000	1.254	0.222
2015	0.280	0.007	1,171	0.599	0.000	1.279	0.243
Total	0.052	0.094	15,761			1.273	0.207

Notes: This table presents the difference between unadjusted and adjusted Lerner indices as well as the mean per year of our liquidity creation measures indicated by INSFR and TLC.

Table 4: Correlation Matrix for all Independent variables

Notes: This table presents the correlation matrix for our independent variables. * Implies significance at 5% or more. Source: BankScope database.

	Size	Capital	ROE	LLP	Commercial	Savings	Crisis dummy
Size	1						
Capital	0.4015*	1					
ROE	0.0925*	-0.0302*	1				
LLP	-0.1095*	0.0260*	-0.1488*	1			
Commercial	0.3222*	0.0450*	0.3779*	-0.0575*	1		
Savings	0.2689*	0.1103*	-0.2408*	-0.0154	-0.2270*	1	
Crisis dummy	-0.1478*	-0.2414*	0.0159*	0.0434*	-0.0382*	-0.0028	1

Table 5: IV Regression Results of the Impact of Bank Market Power on Liquidity Creation

Panel A: IV Regression Model Results						
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Adjusted Lerner	Traditional Lerner	ΔINSFR	ΔTLC	ΔINSFR	ΔTLC
Financial freedom	0.0103***	0.00397**				
	[0.0014]	[0.0014]				
Bank activities	0.234**	0.0642				
	[0.082]	[0.047]				
Entry restrictions	-0.136***	-0.0641***				
	[0.0099]	[0.0051]				
Adjusted Lerner			0.5881***	0.0786***		
			[0.099]	[0.021]		
Lerner					1.5460***	0.2067***
					[0.472]	[0.076]
Size $_{(t-1)}$	-0.0917***	-0.0530***	0.0555***	0.0098***	0.0836***	0.0135***
	[0.0081]	[0.0041]	[0.009]	[0.002]	[0.026]	[0.004]
Capital $_{(t-1)}$	0.103***	0.0426***	-0.0565***	-0.0094***	-0.0619***	-0.0101***
	[0.0078]	[0.0041]	[0.011]	[0.002]	[0.021]	[0.003]
ROE $_{(t-1)}$	0.00305	0.0101***	-0.0009	-0.0004	-0.0146***	-0.0022***
	[0.0036]	[0.0013]	[0.001]	[0.000]	[0.005]	[0.001]
LLP $_{(t-1)}$	0.0363***	0.0436***	-0.0316***	-0.0057***	-0.0775***	-0.0119***
	[0.0087]	[0.0053]	[0.004]	[0.001]	[0.019]	[0.003]
Commercial	-0.0902*	-0.00666	0.0440**	0.0077**	0.0013	0.0020
	[0.046]	[0.024]	[0.019]	[0.004]	[0.022]	[0.004]
Savings	0.0111	0.00539	-0.0311***	0.0031*	-0.0329***	0.0028
	[0.020]	[0.010]	[0.007]	[0.002]	[0.010]	[0.002]
Crisis	-0.333***	-0.279***	0.1091***	0.0141***	0.0269	0.0031
	[0.018]	[0.015]	[0.020]	[0.005]	[0.017]	[0.003]
Constant	0.756***	0.469***	-0.3550***	-0.0599***	-0.4356***	-0.0707***
	[0.18]	[0.12]	[0.062]	[0.013]	[0.130]	[0.021]
Panel B: Specification tests for IV regression models on the adequacy of instruments						
Observations	15,761	15,761	15,761	15,761	15,761	15,761
Wooldrige (1995) overidentification						
Chi square			0.000	0.000	0.000	0.000
p-value			0.980	0.9997	0.981	0.985
Wooldrige (1995) exogeneity test						
score			71.30	16.50	75.90	18.47
p-value			0.000	0.000	0.000	0.000
Robust F statistic			69.72	16.40	74.15	18.34
p-value			0.000	0.000	0.000	0.000
First-stage diagnostics						
R^2 value			0.2529	0.2529	0.4381	0.4381
Robust F-Statistic			64.8617	64.8617	12.7686	12.7686
P-value			0.000	0.000	0.0004	0.0004

Notes: Panel A: reports the first stage regressions in columns 1 and 2 as well as the results from instrumental variable regressions. The dependent variables are measures of liquidity creation. Inverse net stable funding ratio (ΔI.NSFR) in columns 3 and 5, total liquidity creation (ΔTLC) in columns 4 and 6. Robust standard errors are reported in parentheses. Country and time-specific effects included but not reported. Panel B: reports specification tests for validity of instruments. The null hypothesis of the robust Wooldrige overidentification score test is that instruments are valid. The null hypothesis for the exogeneity test is that the instrument variable is not endogenous. F statistic report the explanatory power of the regressions. Significance at *10%, **5%, ***1%. Data source: BankScope database. Coverage: 2006-2015.

Table 6: IV Regression Results of the Impact of Bank Market Power on Components of Liquidity Creation

Panel A: IV Regression Model Results

VARIABLES	(1) ΔLC asset-side	(2) ΔLC liability-side	(3) ΔLC off-balance sheet	(4) ΔLC asset-side	(5) ΔLC liability-side	(6) ΔLC off-balance sheet
Adjusted Lerner	0.1249***	-0.0306***	-0.0023			
	[0.020]	[0.012]	[0.003]			
Lerner				0.3282***	-0.0802**	-0.0059
				[0.097]	[0.036]	[0.009]
Size $_{(t-1)}$	0.0123***	-0.0013	0.0000	0.0183***	-0.0028	-0.0001
	[0.002]	[0.001]	[0.000]	[0.005]	[0.002]	[0.000]
Capital $_{(t-1)}$	-0.0118***	0.0014	0.0001	-0.0130***	0.0017	0.0001
	[0.002]	[0.001]	[0.000]	[0.004]	[0.002]	[0.000]
ROE $_{(t-1)}$	0.0006**	-0.0009***	-0.0000	-0.0023**	-0.0002	0.0000
	[0.000]	[0.000]	[0.000]	[0.001]	[0.000]	[0.000]
LLP $_{(t-1)}$	-0.0073***	0.0016***	-0.0002*	-0.0170***	0.0040***	-0.0000
	[0.001]	[0.001]	[0.000]	[0.004]	[0.001]	[0.000]
Commercial	0.0106***	-0.0010	0.0008	0.0015	0.0012	0.0010**
	[0.004]	[0.002]	[0.001]	[0.004]	[0.002]	[0.000]
Savings	0.0042***	-0.0013	0.0004*	0.0038*	-0.0012	0.0004*
	[0.002]	[0.001]	[0.000]	[0.002]	[0.001]	[0.000]
Crisis	-0.0151***	0.0343***	-0.0015**	-0.0325***	0.0385***	-0.0012***
	[0.004]	[0.003]	[0.001]	[0.004]	[0.002]	[0.000]
Constant	-0.0836***	0.0169**	-0.0017	-0.1007***	0.0210**	-0.0014
	[0.012]	[0.007]	[0.002]	[0.026]	[0.010]	[0.002]

Panel B: Specification tests for IV regression models on the adequacy of instruments

Observations	15,761	15,761	15,761	15,761	15,761	15,761
Wooldrige (1995) overidentification						
Chi square	0.000	0.000	0.000	0.000647	0.000	0.001
p-value	1.00	1.00	1.00	0.980	1.00	0
Wooldrige (1995) exogeneity test	84.96	7.024	0.587	92.39	6.723	0.350
score	0.000	0.00804	0.444	0.000	0.00952	0.554
p-value						
Robust F statistic	83.39	7.002	0.585	90.50	6.704	0.349
p-value	0.000	0.00815	0.445	0.000	0.00963	0.555
First-stage diagnostics						
R^2 value	0.2529	0.2529	0.2529	0.4381	0.4381	0.4381
Robust F-Statistic	64.8617	64.8617	64.8617	12.7686	12.7686	12.7686
P-value	0.000	0.000	0.000	0.0004	0.0004	0.0004

Notes: Panel A: reports the results from instrumental variable regressions. The dependent variables are measures of components of liquidity creation. Asset-side liquidity creation (ΔLC asset-side) in columns 1 and 4, liability-side liquidity creation (ΔLC liability-side) in columns 2 and 5, and off-balance sheet liquidity creation (ΔLC off-balance sheet) in columns 3 and 6. Robust standard errors are reported in parentheses. Country and time-specific effects included but not reported. Panel B: reports specification tests for validity of instruments. The instruments used are 1) financial freedom provides overall measures of the openness of the banking sector. 2) Bank activity restrictions and 3) Entry restrictions. The null hypothesis of the robust Wooldrige overidentification score test is that instruments are valid. The null hypothesis for the exogeneity test is that the instrument variable is not endogenous. F statistic report the explanatory power of the regressions. Significance at *10%, **5%, ***1%. Data source: BankScope database. Coverage: 2006-2015.

Table 7: IV Regression Results of the Impact of Bank Market Power on Bank Profitability

Panel A: IV Regression Model Results

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	ΔROA	ΔROE	ΔNIM	ΔROA	ΔROE	ΔNIM
Adjusted Lerner	0.2690***	4.2812***	0.7338***			
	[0.084]	[1.129]	[0.120]			
Lerner				0.6447***	10.2614***	1.7589***
				[0.244]	[3.517]	[0.497]
Size $_{(t-1)}$	0.0240***	0.3316***	0.0747***	0.0330**	0.4748**	0.0992***
	[0.008]	[0.107]	[0.011]	[0.013]	[0.189]	[0.027]
Capital $_{(t-1)}$	-0.0181**	-0.2778**	-0.0632***	-0.0190*	-0.2922*	-0.0657***
	[0.009]	[0.121]	[0.013]	[0.011]	[0.162]	[0.023]
NII $_{(t-1)}$	0.0698***	0.9737***	0.0363***	0.0681***	0.9457***	0.0315***
	[0.003]	[0.045]	[0.005]	[0.004]	[0.057]	[0.008]
LLP $_{(t-1)}$	-0.0133***	-0.1885***	-0.0604***	-0.0280***	-0.4224***	-0.1005***
	[0.003]	[0.046]	[0.006]	[0.008]	[0.119]	[0.017]
Commercial	0.0034	0.0660	0.0610***	-0.0297**	-0.4607**	-0.0292
	[0.013]	[0.181]	[0.022]	[0.013]	[0.196]	[0.026]
Savings	-0.0300***	-0.3756***	-0.0220***	-0.0211***	-0.2340***	0.0023
	[0.005]	[0.064]	[0.008]	[0.006]	[0.080]	[0.011]
Crisis	-0.0375**	0.2921	0.1427***	-0.0646***	-0.1400	0.0686***
	[0.018]	[0.245]	[0.026]	[0.014]	[0.191]	[0.025]
Constant	-0.2242***	-3.5654***	-0.7568***	-0.2630***	-4.1830***	-0.8627***
	[0.052]	[0.699]	[0.073]	[0.075]	[1.069]	[0.149]

Panel B: Specification tests for IV regression models on the adequacy of instruments

Observations	15,558	15,558	15,558	15,558	15,558	15,558
Wooldrige (1995) overidentification						
Chi square	0.000	0.000	0.000	0.000647	0.000	0.001
p-value	0.999	0.999	1.00	0.999	0.999	0.999
Wooldrige (1995) exogeneity test	10.78	16.73	71.74	10.11	15.97	72.48
score	0.00103	0.000	0.000	0.00148	0.000	0
p-value						
Robust F statistic	10.88	17.01	72.65	10.21	16.24	73.69
p-value	0.000976	0.000	0.000	0.00140	0.000	0
First-stage diagnostics						
R^2 value	0.2544	0.2544	0.2544	0.4345	0.4345	0.4345
Robust F-Statistic	59.8415	59.8415	59.8415	13.4493	13.4493	13.4493
P-value	0.000	0.000	0.000	0.0002	0.0002	0.0002

Notes: Panel A: reports the results from instrumental variable regressions. The dependent variables are measures of bank profitability. Return on assets (ΔROA) in columns 1 and 4, return on equity (ΔROE) in columns 2 and 5, and net interest margin (ΔNIM) in columns 3 and 6. Robust standard errors are reported in parentheses. Country and time-specific effects included but not reported. Panel B: reports specification tests for validity of instruments. The instruments used are 1) financial freedom provides overall measures of the openness of the banking sector. 2) Bank activity restrictions and 3) Entry restrictions. The null hypothesis of the robust Wooldrige overidentification score test is that instruments are valid. The null hypothesis for the exogeneity test is that the instrument variable is not endogenous. F statistic report the explanatory power of the regressions. Significance at *10%, **5%, ***1%. Data source: BankScope database. Coverage: 2006-2015.

Table 8: Pooled ordinary least squares regression during crisis period: from 2008-2011

	(1)	(2)
	ΔTLC	ΔINSFR
Adjusted Lerner $q1_{(t-1)}$	0.0128	0.0153
	(0.0076)	(0.027)
Adjusted Lerner $q2_{(t-1)}$	0.00767	0.00251
	(0.0068)	(0.032)
Adjusted Lerner $q4_{(t-1)}$	0.0191***	0.00387
	(0.0054)	(0.021)
Guarantees $_{(t-1)}$	-0.00707	0.0828
	(0.089)	(0.26)
Recapitalization $_{(t-1)}$	2.786***	16.30***
	(0.63)	(2.94)
Adjusted Lerner q1*Guarantees $_{(t-1)}$	-0.250	-1.284*
	(0.13)	(0.54)
Adjusted Lerner q2*Guarantees $_{(t-1)}$	-0.216	-1.110*
	(0.13)	(0.53)
Adjusted Lerner q4*Guarantees $_{(t-1)}$	0.183	-0.268
	(0.097)	(0.77)
Adjusted Lerner q1* Recapitalization $_{(t-1)}$	1.165*	2.297
	(0.50)	(2.11)
Adjusted Lerner q2* Recapitalization $_{(t-1)}$	1.230*	2.508
	(0.49)	(2.05)
Adjusted Lerner q4* Recapitalization $_{(t-1)}$	0.701	1.517
	(0.43)	(1.95)
Constant	-0.0336**	0.121*
	(0.012)	(0.048)
Country Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Bank Controls	Yes	Yes
Observations	4628	4628
R-squared	0.0737	0.140
Number of Banks	1903	1903

Notes: This table reports the results of a pooled ordinary least squares regression with robust standard errors clustered at the bank level. We control for country and year fixed effect. Bank controls include size, capital, ROE, LLP, Commercial, Savings and crisis dummy. Notice that the total number of observations (4628) reflects the unbalanced nature of the dataset. Significance at *10%, **5%, ***1%. Data source: BankScope database. Coverage: 2008-2011.

Table 9: Robustness Checks

Panel A: IV Regression Model

VARIABLES	(1) ΔTLC	(2) ΔTLC	(3) ΔINSFR	(4) ΔTLC	(5) ΔINSFR	(6) ΔTLC	(7) ΔINSFR	(8) ΔTLC
Adjusted Lerner	0.1411***	0.1040***	0.8223***	0.1096***	0.7353***	0.0859***	0.4896***	0.0743***
	[0.047]	[0.029]	[0.156]	[0.031]	[0.160]	[0.030]	[0.096]	[0.022]
Size $_{(t-1)}$	0.0101***	0.0097***	0.0581***	0.0101***			0.0471***	0.0094***
	[0.002]	[0.002]	[0.011]	[0.002]			[0.009]	[0.002]
Small					-0.0470***	-0.0125***		
					[0.010]	[0.002]		
Capital $_{(t-1)}$	-0.0107***	-0.0094***			-0.0598***	-0.0090***	-0.0450***	-0.0091***
	[0.003]	[0.002]			[0.014]	[0.003]	[0.010]	[0.002]
Well-Capitalized			0.0079	-0.0009				
			[0.007]	[0.001]				
ROE $_{(t-1)}$	-0.0003	-0.0003	0.0002	-0.0002	0.0015	-0.0000	-0.0003	-0.0004
	[0.000]	[0.000]	[0.002]	[0.000]	[0.002]	[0.000]	[0.001]	[0.000]
LLP $_{(t-1)}$	-0.0076***	-0.0050***	-0.0275***	-0.0052***	-0.0421***	-0.0067***	-0.0266***	-0.0053***
	[0.002]	[0.001]	[0.005]	[0.001]	[0.007]	[0.001]	[0.004]	[0.001]
Crisis	0.0111***	0.0166***	0.1262***	0.0164***	0.0285**	0.0012	0.0017	0.0520***
	[0.004]	[0.005]	[0.026]	[0.005]	[0.013]	[0.003]	[0.060]	[0.013]
Commercial		-0.0203***	0.0853***	0.0132***	0.1124***	0.0176***	0.0335*	0.0074*
		[0.007]	[0.027]	[0.005]	[0.032]	[0.006]	[0.018]	[0.004]
Savings		-0.0055	-0.0277***	0.0035**	-0.0105	0.0067***	-0.0311***	0.0030*
		[0.004]	[0.008]	[0.002]	[0.008]	[0.002]	[0.007]	[0.002]
Cooperative	0.0016							
	[0.003]							
Adjusted Lerner*Commercial		0.0989***						
		[0.029]						
Adjusted Lerner*Savings		0.0291***						
		[0.010]						

Table 9 (continued)

Adjusted Lerner*Cooperative	-0.1123***							
	[0.042]							
Adjusted Lerner* Well-Capitalized			-0.2348***	-0.0310***				
			[0.047]	[0.009]				
Adjusted Lerner*Small					-0.5305***	-0.0533**		
					[0.139]	[0.026]		
GDP							-0.0166**	0.0036**
							[0.007]	[0.001]
Inflation							0.0413***	0.0065***
							[0.009]	[0.002]
Constant	-0.0503***	-0.0571***	-0.5203***	-0.0818***	-0.0387	-0.0034	-0.3267***	-0.0812***
	[0.011]	[0.013]	[0.097]	[0.019]	[0.039]	[0.007]	[0.054]	[0.013]
Panel B: Specification tests for IV regression models on the adequacy of instruments								
Observations	15,761	15,761	15,761	15,761	15,761	15,761	15,761	15,761
Wooldrige (1995) overidentification								
Chi square	0.000	0.000	0.00240	0.000733	0.000	0.000	0.0062	0.0062
p-value	1.00	1.00	0.961	0.978	0.710	1.00	0.937	1.00
Wooldrige (1995) exogeneity test	15.65	16.34	72.223	16.695	61.001	11.55	43.85	13.59
Score	0.000	0.000	0.000	0.000	0.000	0.0002	0.000	0.0002
p-value								
Robust F statistic	15.56	16.24	70.661	16.597	59.809	11.50	43.23	13.59
p-value	0.000	0.000	0.000	0.000	0.000	0.0002	0.000	0.0002
First-stage diagnostics								
R^2 value	0.4883	0.3871	0.3941	0.3941	0.2792	0.2792	0.2542	0.2542
Robust F-Statistic	22.1443	50.1485	45.2846	45.2846	27.9362	27.9362	58.721	58.721
P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: this table presents the results of vaious robustness tests. Columns 1 and 2 present the results for bank market power and bank specialization. Columns 3 and 4 present the results for bank market power and capital. Columns 5 and 6 presnt the result for bank market power and small size banks. Finally, columns 7 and 8 presents the results including macroeconomic control variables. Significance at *10%, **5%, ***1%. Data source: BankScope database. Coverage: 2006-2015.

Table 10: Robustness Checks- Clustering Standard Errors by Bank and Year

	(1)	(2)
VARIABLES	ΔINSFR	ΔTLC
Adjusted Lerner	0.5881***	0.0786***
	[0.098]	[0.020]
Size $_{(t-1)}$	0.0555***	0.0097 ***
	[0.009]	[0.001]
Capital $_{(t-1)}$	-0.0565***	-0.0093***
	[0.010]	[0.002]
ROE $_{(t-1)}$	-0.0009	-0.0004
	[0.001]	[0.000]
LLP $_{(t-1)}$	-0.0316***	-0.0057***
	[0.004]	[0.001]
Crisis	0.1091***	0.0141***
	[0.020]	[0.004]
Commercial	0.0440**	0.0077**
	[0.019]	[0.003]
Savings	-0.0311***	0.0031*
	[0.007]	[0.001]
Constant	-0.3549***	-0.0599***
	[0.062]	[0.012]
Observations	15,761	15,761
R^2 value	0.2529	0.2529
Robust F-Statistic	64.8617	64.8617
P-value	0.000	0.000

Notes: This table presents the results as we correct standard errors for clustering at the bank and year. We estimate $\Delta Y_{it} = c_0 + d_1 Adjusted\ \widehat{Lerner}_{it} + d_2 X_{i,t-1} + \gamma_t + \gamma_c + \varepsilon_{it}$, where ΔY_{it} denotes the dependent variable of bank i at time t. The dependent variables are measures of liquidity creation. Inverse net stable funding ratio (ΔI.NSFR) in column1 , total liquidity creation (ΔTLC) in column 2. The main explanatory variable is the (*Adjusted Lerner*). Country and time-specific effects included but not reported. Significance at *10%, **5%, ***1%. Data source: BankScope database. Coverage: 2006-2015.

Table 11: Robustness Checks- Alternative Liquidity Creation Proxy

VARIABLES	(3) Adjusted Lerner	(4) Traditional Lerner	(5) ΔINSFR	(6) ΔINSFR
Financial freedom	0.0113***	0.00356**		
	[0.0020]	[0.0013]		
Bank activities	0.750***	0.0655		
	[0.089]	[0.095]		
Entry restrictions	-0.0969***	-0.0652***		
	[0.0057]	[0.0093]		
Adjusted Lerner			0.3405***	
			[0.070]	
Lerner				1.0841***
				[0.355]
Size $_{(t-1)}$	-0.0949***	-0.0549***	0.0313***	0.0585***
	[0.0078]	[0.0042]	[0.006]	[0.019]
Capital $_{(t-1)}$	0.0654***	0.0238***	-0.0182***	-0.0217***
	[0.0053]	[0.0032]	[0.004]	[0.008]
ROE $_{(t-1)}$	0.00429	0.0110***	-0.0008	-0.0112***
	[0.0035]	[0.0013]	[0.001]	[0.004]
LLP $_{(t-1)}$	0.0442***	0.0432***	-0.0197***	-0.0515***
	(0.0097)	[0.0049]	[0.003]	[0.014]
Commercial	-0.128**	-0.0151	0.0351***	0.0080
	[0.048]	[0.024]	[0.012]	[0.019]
Savings	0.0163	0.0126	-0.0151***	-0.0232***
	[(0.019]	[0.0099]	[0.004]	[0.007]
Crisis	-0.300***	-0.0552***	0.0635***	0.0213
	(0.026)	[0.016]	[0.014]	[0.013]
Constant	-0.191	0.555**	-0.2833***	-0.4086***
	[0.20]	[0.21]	[0.051]	[0.116]
Observations	17,883	17,883	17,883	17,883
Wooldrige (1995) overidentification				
Chi square			0.00	0.00
p-value			1.00	0.9996
Wooldrige (1995) exogeneity test				
score			63.86	65.97
p-value			0.000	0.000
Robust F statistic			65.96	68.07
p-value			0.000	0.000
First-stage diagnostics				
R^2 value			0.1910	0.3879
Robust F-Statistic			40.6667	11.1933
P-value			0.000	0.000

Notes: this table presents the results of a further robustness check of using alternative measure of liquidity creation applying Basel III more recent October 2014 factors to calculate the INSFR in columns 5 and 6. Robust standard errors are reported in parentheses. Country and time-specific effects included but not reported. Panel B: reports specification tests for validity of instruments. The instruments used are 1) financial freedom provides overall measures of the openness of the banking sector. 2) Bank activity restrictions and 3) Entry restrictions. The null hypothesis of the robust Wooldrige overidentification score test is that instruments are valid. The null hypothesis for the exogeneity test is that the instrument variable is not endogenous. F statistic report the explanatory power of the regressions. Significance at *10%, **5%, ***1%. Data source: BankScope database. Coverage: 2006-2015.

Appendix A: Variable Definitions and Sources

Name	Description	Data Source
A. Measures of Market Power		
Cost of fixed assets	sum of general administrative expenses, depreciation, amortisation, occupancy costs, software costs, operating lease rentals and other operating expenses, divided by fixed assets	BankScope database
Cost of labour	personnel expenses divided by total assets	BankScope database
Cost of borrowed funds	total interest expenses divided by total deposits, money markets and short-term funding	BankScope database
Total securities	Sum of reverse repos and cash collateral, trading securities and FV through income, derivatives, AFS securities, HTM securities, at-equity investments in associates and other securities.	BankScope database
Total loans	Sum of residential mortgage loans, other mortgage loans, other consumer/retail loans, corporate and commercial loans and other loans.	BankScope database
Equity	total common equity	BankScope database
Operating costs	sum of total interest expenses, loan impairment charge, other operating expenses and personnel expenses	BankScope database
Profit before tax	Pre-tax profit	BankScope database
B. Measures of Liquidity Creation		
I.NSFR	Required Stable Funding divided by Available Stable Funding (Basel III)	BankScope database
TLC/ Total assets	measure of liquidity creation based on Berger et al., 2016	BankScope database
LC off-balance sheet / Total assets	measure of liquidity creation based on Berger et al., 2016	BankScope database
LC asset side/ Total assets	measure of liquidity creation based on Berger et al., 2016	BankScope database
LC liability side/ Total assets	measure of liquidity creation based on Berger et al., 2016	BankScope database
C. Bank characteristics		
Size	Total assets in logarithmic form.	BankScope database
Capital	Total equity to total assets	BankScope database
LLP	Loan loss provisions divided by total loans	BankScope database
ROE	Return on equity (%)	BankScope database
Crisis dummy	Dummy variable. It takes value 1 for the years 2008 and 2009 and 0 otherwise.	BankScope database
Commercial	Dummy variable. It takes value 1 for commercial banks and 0 otherwise.	BankScope database
Savings	Dummy variable. It takes value 1 for savings banks and 0 otherwise.	BankScope database
Cooperatives	Dummy variable. It takes value 1 for Cooperative banks and 0 otherwise.	BankScope database
D. Country- level variables		
GDP Growth	Rate of growth of the Gross Domestic Product (real)	World Bank
Inflation	rate of consumer price index	World Bank
E. Instrumental variables		
Banking activity restrictions	the degree to which national regulatory authorities allow banks to engage in the following three fee-based rather than more traditional interest-spread-based activities: Securities activities, insurance activities and real estate activities	Barth et al. (2001) and Barth et al. (2004)
Entry restrictions	The specific legal requirements for obtaining a license to operate as a bank. This variable takes on values between (1) and (8), where higher values indicate lower entry restrictions.	Barth et al. (2001) and Barth et al. (2004)
Banking freedom	An indicator for the openness of a banking system. The index offers data on whether foreign banks are allowed to operate freely, on difficulties faced when establishing banks, and on government influence over credit allocation. The index ranges from 0 to 100 percent, where higher values indicate fewer restrictions.	Heritage foundation.

Appendix B: Classification of bank activities as documented in the Basel III report and construction of I.NSFR as a liquidity creation measure from BankScope and associated ASF and RSF.

Basel Proposal	*BankScope Item Structure (Used in NSFR Calculations)*	*Factors following Distinguin et al. (2013)*
Available Stable Funding (ASF)		
Equity & Liabilities		
Total regulatory Capital	Shareholders' Equity	1.00
Secured and unsecured borrowings and liabilities > 1 year	Total long-term funding	1.00
	Senior debt maturing after 1 year	1.00
	Subordinated borrowing	1.00
	Other funding	1.00
Stable deposits < 1 year	Customer deposits- Savings	0.7
	Customer deposits- Term	1.00
Less stable deposits < 1 year	Customer deposits-Current	0.7
Required Stable Funding (RSF)		
Assets		
cash immediately available to meet obligations	Cash and due from banks	0
loans to financial entities < 1 year	Loans and advances to banks	0
Marketable securities ≥ 1 year representing claims on sovereigns, Central Banks, BIS, IMF, EC, non-central government PSEs	Marketable securities and other short-term investments	0
loans to non-financial corporate clients < 1 year	Corporate and commercial loans	1
loans to retail < 1 year	Other consumer/ Retail loans	1
loans to non-financial corporate clients > 1 year	Corporate and commercial loans	0.65
loans to retail > 1 year	Other consumer/ Retail loans	0.85
Residential mortgages of any maturity	Residential mortgage loans	0.65
	other mortgage loans	0.65

Appendix B (Continued)

Basel Proposal	*BankScope Item Structure (Used in NSFR Calculations)*	*Factor October 2014*
Other performing loans with risk weights greater than 35% under the Standardised Approach and residual maturities of one year or more equity securities not issued by financial institutions	Other loans	0.85
All other assets not included in the above categories	Other earning assets	1.00
	Total assets - total earning assets	1.00
	Investment in property	1.00
	Fixed assets	1.00
	Insurance assets	1.00
	Other assets	1.00
Off-Balance Sheet Items		
Irrevocable and conditionally revocable credit and liquidity facilities to any client	Managed Securitized assets reported off-balance sheet	0.05
	Other off-balance sheet exposure to securitizations	0.05
	Guarantees	0.05
	Acceptances & documentary credits reported off-balance	0.05
	Committed credit lines	0.05
	Other contingent liabilities	0.05

Notess: Source: Basel III, BankScope and authors' calculation.

Appendix C: Classification of bank activities and construction of five liquidity creation measures

Step 1: Classify all bank activities as liquid, semi-liquid, or illiquid based on product category "Cat" and maturity "Mat"
Step 2: Assign weights to the items classified in Step 1.

ASSETS

Illiquid assets (weight= 1/2)	**Semi-liquid assets (weight=0)**	**Liquid assets (weight= -1/2)**
Corporate and commercial loans	Residential mortgage loans	Cash and due from banks
other loans	Other mortgage loans	Trading securities and at future
Investments in property	Other consumer/retail loans	Derivatives
Insurance assets	Loans and advances to banks	Available for sale securities
Fixed assets		Held to maturity securities
		At-equity investments in
		Other securities

LIABILITIES PLUS EQUITY

Liquid liabilities(weight= 1/2)	**Semi-liquid liabilities (weight=0)**	**Illiquid liabilities plus equity**
Customer deposits-Current	Customer deposits-Term	Senior debt maturing after 1 year
Customer deposits-Savings	Deposits from banks	Subordinated borrowing
	Repos and cash collateral	Other funding
	Other deposits and short-term borrowing	Other liabilities
	Fair value portion of debt	Total Equity

OFF-BALANCE-SEET ACTIVITIES

Illiquid OBS(weight= 1/2)	**Semi-liquid OBS (weight=0)**	**Liquid OBS (weight= -1/2)**
Acceptances and documentary credits	Managed securitized assets reported OBS	
Committed credit lines	Other OBS exposure to securitizations	
Other contingent liabilities	Guarantees	

Appendix C (Continued)

Step 3: Combine bank activities as classified in Step 1 and as weighted in Step 2 to construct our liquidity creation measures

TLC	+1/2 *illiquid assets + 1/2 * liquid liabilities + 1/2 * illiquid OBS	+ 0 * semi-liquid assets + 0* semi-liquid liabilities+ 0 *semi-liquid OBS	-1/2*liquid assets - 1/2 * illiquid liabilities - 1/2 * equity -1/2 * liquid OBS
LC OBS	+1/2 * illiquid OBS	+ 0 *semi-liquid OBS	-1/2 * liquid OBS
LC asset-side	+1/2 *illiquid assets	+ 0 * semi-liquid assets	-1/2*liquid assets
LC liability side	+ 1/2 * liquid liabilities	+ 0* semi-liquid liabilities	-1/2 illiquid liabilities -1/2 * equity

Notes: We follow Berger and Bouwman (2009), Molyneux et al. (2016) and Berger et al. (2016) to classify the on- and off- balance sheet items. Source: BankScope database.