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How bank competition influence liquidity creation

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How bank competition influence liquidity creation

Abstract

This paper evaluates the effect of bank competition on liquidity creation by banks. Thus, we contribute to the literature on both bank competition and the determinants of liquidity creation by banks. To explore this relationship, we conduct dynamic GMM panel estimations on a dataset of Czech banks from 2002 to 2010. We find that enhanced competition reduces liquidity creation, a finding we observe under different specifications, including alternative measures of liquidity creation. We explain this finding in terms of the impact of increased bank competition on the financial fragility of banks, which leads banks to reduce their lending and deposit activities. The evidence suggests that pro-competitive policies in the banking industry can reduce liquidity provision by banks.

JEL Codes: G21.

Keywords: bank competition, liquidity creation.

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1 Introduction

The increasing globalization of banking activities has brought to the foreground a debate about the role of competition in the banking industry. The effects of bank competition on access to credit (e.g., Beck, Demirgüc-Kunt and Maksimovic, 2004), financial stability (e.g., Berger, Klapper and Turk-Ariss, 2009; Beck, De Jonghe and Schepens, 2013; Fungacova and Weill, 2013) and economic growth (e.g., Cetorelli and Gambera, 2001; Claessens and Laeven, 2005) have now been extensively studied.

However, the burgeoning literature on bank competition has not, to our knowledge, examined the impact of bank competition on liquidity provision by banks. Apart from risk transformation, the central function of banks is to supply liquidity to the economy. Banks create liquidity by financing relatively illiquid assets with relatively liquid liabilities, i.e., by using short-term liquid deposits to finance long-term illiquid lending. In doing so, they contribute to financing economic activity and facilitate transactions among economic agents. For many years, this role of banks has largely been ignored in the empirical literature, in contrast to their role in risk transformation. However, a seminal paper by Berger and Bouwman (2009) proposes a novel approach to the measurement of bank liquidity creation, an approach that has led to an emerging strand of literature devoted to the measurement, causes and consequences of liquidity creation by banks.[1]

The aim of this paper is to investigate how bank competition influences liquidity creation by banks. We thus contribute to both recent strands of the literature focused on bank competition and on bank liquidity creation.

Two opposing hypotheses can be suggested regarding the impact of bank competition on liquidity creation. The first is that increased competition increases the fragility of banks by reducing bank profits, which normally act as a "buffer" against adverse shocks. As a consequence, banks are incentivized to reduce liquidity creation by limiting both the volume of loans granted and the volume of deposits accepted to reduce the threat of bank runs. Thus, according to this "fragility channel" view, bank competition should lead to a reduction in liquidity creation. The fragility channel view is reinforced by Petersen and Rajan (1995), who argue that increased competition reduces credit supply, as banks are less likely to grant credit to clients that are not locked in. The idea is that decreased market

[1] Among others, Berger and Bouwman (2011) examine the role of liquidity creation in financial crises, while Berger and Bouwman (2009), Distinguin, Roulet and Tarazi (2013) and Horvath, Seidler and Weill (2013) investigate the relationship between capital and liquidity creation.

power reduces incentives for banks to establish long-term relationships with new borrowers, relationships that could create future surpluses to be shared.

The second hypothesis regarding the effect of back competition on liquidity creation is that increased competition influences banking pricing policies – specifically, leading to diminished loan rates and increased deposit rates. As a consequence, demand for both loans and deposits rises. Several studies provide empirical support for a link between competition and low lending rates (e.g. Carbo-Valverde, Rodriguez Fernandez and Udell, 2009; Love and Martinez Peria, 2012). Enhanced competition stimulates demand for loans by alleviating financing obstacles. Beck, Demirgüc-Kunt and Maksimovic (2004) provide empirical support for this argument in their finding that increased bank concentration increases financing obstacles in general, while Hainz, Weill and Godlewski (2013) show that increased concentration is associated with higher collateral requirements. Thus, the "price channel" view suggests a positive link between competition and liquidity creation.

We analyze the relationship between bank competition and liquidity creation, using an exhaustive dataset of Czech banks, from 2002 to 2010, provided by the Czech National Bank. We restrict our study to a single country, as the measurement of liquidity creation, following Berger and Bouwman's (2009) methodology, requires very detailed bank-level data, including off-balance sheet items. As a consequence, cross-country databases, such as Bankscope, would not be suitable, as they do not provide bank-level information at a sufficient level of disaggregation.[2] The quarterly frequency of the data allows for the use of dynamic GMM estimation, enabling us to avoid endogeneity problems. In addition, the use of an exhaustive dataset of banks reduces the possibility of selection bias.

We measure bank competition using the Lerner index, which is an individual measure of competition commonly used in recent studies (Turk-Ariss, 2010; Fungacova and Weill, 2013). In comparison with concentration indices, the Lerner index has the major advantage of capturing the effective behavior of banks rather than assuming that concentration is negatively correlated with competition. In addition, the Lerner index enables us to exploit bank-level variations in market power in our estimations.

The Czech banking industry is an interesting case for our study. The Czech Republic has been an EU member since 2004, yet possesses certain key characteristics of an emerging country, such as a dominant role for the banking system in the financing of the

[2] For instance, the disaggregation of loans by category or by maturity, which is required in the computation of liquidity creation measures, is not provided in the Bankscope database for most banks.

economy and a high market share of foreign-owned banks. According to the figures from Czech National Bank, the depth of financial intermediation (measured as the ratio of total financial sector assets to GDP) reached 156%, while the ratio of banking sector assets to GDP was nearly 115% at the end of 2010. About 97% of banking assets are owned by foreign capital.

The impact of bank competition on liquidity creation is of great interest because of its implications for policy. While regulators may be incentivized to favor bank competition to increase the welfare of bank consumers, any result suggesting a liquidity-destroying role of bank competition would indicate the existence of a policy trade-off. Thus, in this study, we seek to improve our understanding of the determinants of liquidity creation and the consequences of bank competition.

The remainder of this paper is structured as follows. Section 2 explains the methodology. Empirical results are presented in Section 3. Section 4 concludes.

2 Methodology

2.1 Data

We use quarterly data, from the Czech National Bank, for all Czech banks operating during the 2002–2010 period. All data are from balance sheets reported by banks to the Banking Supervision of the central bank. We do not include branches of foreign banks but only Czech legal entities. Branches of foreign banks are typically very small and only represent about 10% of total assets of the Czech banking industry. We thus have a sample of 31 banks. Descriptive statistics of the main variables used to compute Lerner indices and liquidity creation measures are presented in Table 1.

2.2 Lerner indices

Tools used to measure bank competition can be divided into the traditional IO and the new empirical IO approaches. The traditional IO approach proposes tests of market structure to assess bank competition based on the Structure Conduct Performance (SCP) model. The SCP hypothesis states that increased concentration causes less competitive behavior among banks and leads to higher bank profitability. Competition can then be measured by concen-

tration indices such as the market share of the largest banks or by the Herfindahl-Hirschman index. However, concentration has been shown to be a poor measure of bank competition (e.g., Bikker, Shaffer and Spierdijk, 2012). The new empirical IO approach provides non-structural tests to circumvent the problems associated with the competition measures based on the traditional IO approach. Non-structural measures do not infer the competitive conduct of banks from an analysis of market structure but rather measure bank behavior directly.

In line with this approach, we compute the Lerner index, an individual measure of competition for each bank and each period, commonly used in recent studies of bank competition (e.g., Fang, Hasan, and Marton, 2011; Fungacova and Weill, 2013). Alternative non-structural measures include the H-statistic and the Boone indicator. These, however, provide aggregate measures of competition that are not suitable to our bank-level investigation of the relationship between competition and liquidity creation.

The Lerner index is defined as the difference between price and marginal cost, divided by price, i.e., it measures the market power of a bank to set a price above marginal cost. Thus, high values of the Lerner index are associated with significant market power. Price here is the average price of bank output (proxied by total assets). Specifically, it is the ratio of total revenues to total assets, following, e.g., Carbo et al. (2009). Marginal cost is estimated using a translog cost function with one output (total assets) and three input prices (price of labor, price of physical capital, and price of borrowed funds). Turk-Ariss (2010) applies this specification of inputs when calculating the Lerner index to banks in developing countries. We estimate a cost function, in which we include bank fixed effects, for all periods. Symmetry and linear homogeneity restrictions on input prices are imposed. The cost function is specified as follows:

$$\ln TC = \alpha_0 + \alpha_1 \ln y + \frac{1}{2}\alpha_2 (\ln y)^2 + \sum_{j=1}^{3} \beta_j \ln w_j + \sum_{j=1}^{3}\sum_{k=1}^{3} \beta_{jk} \ln w_j \ln w_k + \sum_{j=1}^{3} \gamma_j \ln y \ln w_j + \varepsilon \quad (1)$$

where TC denotes total cost, y is total assets, w_1 is the price of labor (the ratio of staff expenses to the number of employees), w_2 the price of physical capital (the ratio of the sum of general and administrative expenses, depreciation and other operating expenses, divided by fixed assets), w_3 is the price of borrowed funds (the ratio of the costs of borrowed funds to borrowed funds). Thus, total cost is the sum of staff expenses, general and administrative expenses, depreciation, other operating expenses, and costs of borrowed funds. The

indices for each bank have been excluded from the presentation for the sake of simplicity. The estimated coefficients of the cost function are then used to compute the marginal cost (MC):

$$MC = \frac{TC}{y}\left(\alpha_1 + \alpha_2 \ln y + \sum_{j=1}^{3} \gamma_j \ln w_j\right) \quad (2)$$

Once marginal cost is estimated and the price of output computed, we can calculate the Lerner index for each bank and each period, thus obtaining the direct measure of bank competition used in the estimations. Lerner indices for each year are presented in Table 2.

Two main findings emerge from the analysis of these measures. First, the values of Lerner indices are high in comparison to what is observed for other countries, suggesting a low degree of competition in the Czech banking industry. Carbo et al. (2009) observe mean Lerner indices at the country level ranging from 11% to 22% for EU countries. However, Fungacova, Pessarossi and Weill (2012) find a mean Lerner index among Chinese banks of 37.8%. In their analysis of the link between competition and cost efficiency in the Czech banking industry, Pruteanu-Podpiera, Weill and Schobert (2008) measure bank competition in the 1994–2005 period, using Lerner indices. For the latter years of their study, they obtain average Lerner indices of around 43%, which accord with the high values that we find.

Second, the evolution of the mean Lerner index shows a stable level of bank competition over the sample period, with yearly means ranging from 49% to 55%. This suggests that no big changes have occurred in the market structure of the Czech banking industry during the period of our study. This finding is in line with the observation that large Czech banks were privatized before the beginning of our study period.

2.3 Measures of banks' liquidity creation

We follow Berger and Bouwman's (2009) methodology in classifying balance sheet items as liquid, semi-liquid, or illiquid. Once all of the balance-sheet items are classified, we assign them weights according to Berger and Bouwman's (2009) four measures of liquidity creation and calculate the measures by summing all weighed items. Their specifications classify all items, except loans, by combining information on both product category and

maturity, while loans are classified based purely on category or maturity ("cat" or "mat" measures). In addition, off-balance-sheet items are either included or excluded ("fat" or "nonfat" measures).

Following Horvath, Seidler and Weill (2013), we classify items based only on maturity, as our data set provides detailed information that allows us to consider on- and off-balance-sheet items by maturity, not by category. Hence, in Berger and Bouwman's (2009) terminology, we consider the "mat fat" and the "mat nonfat" liquidity creation measures. It should be stressed that we expand upon their classification, as they classify only loans by maturity, while we classify all balance sheet items by their remaining maturity.

For the purposes of our analysis, we label these measures broad and narrow liquidity creation, respectively. The broad measure of liquidity creation is our preferred measure because it accounts for off-balance-sheet items that can also provide liquidity. We nonetheless also consider the narrow measure of liquidity creation in our analysis, as it provides a relevant means of testing the robustness of our conclusions. Table 3 provides a detailed description of the classifications, while Table 4 presents the means of the liquidity creation measures by year.

We observe a strong rise in liquidity creation using both measures. The mean ratio of liquidity creation to assets has increased between 2002 and 2010 from 7% to 28% under the broad measure and from 9% to 32% under the narrow measure. A detailed analysis of the path of liquidity creation shows a strong expansion between 2002 and 2008 followed by stabilization between 2008 and 2010. The financial crisis has not caused a reduction in liquidity creation among Czech banks, but it does appear to have occasioned a halt in the growth of liquidity creation. Broadly, this accords with the fact that Czech banks remained largely stable during the financial crisis, requiring no government support and exhibiting high levels of profitability and liquidity (Czech National Bank, 2012), unlike many other European banks.

2.4 The relation between competition and liquidity creation

To analyze the relationship between competition and liquidity creation, we estimate the following equation:

$$LiquidityCreation_{i,t} = f(Lerner\ Index_{i,lag}, LiquidityCreation_{i,lag}, Z_{i,t}) + e_{i,t} \quad (3)$$

where the subscript *i* denotes bank *i*, *t* denotes the time dimension, *Z* represents the control variables, and $e_{i,t}$ is an error term. *LiquidityCreation* is the ratio of liquidity creation to assets. We use the broad and narrow measures of liquidity creation to test the robustness of our results. The *Lerner Index* is our measure of bank market power.

We estimate this equation using GMM estimators, so that we can take into account potential issues of endogeneity and omitted variables, following Arellano and Bover (1995) and Blundell and Bond (1998). Horvath, Seidler and Weill (2013) proceed in the same manner in their analysis of the relationship between capital and liquidity creation among Czech banks. This approach has also been applied by Fiordelisi, Marques-Ibanez and Molyneux (2011) to analyze risk in the European banking industry. We consider four lags to be reasonable, given the quarterly frequency of our data.

We consider several control variables in our estimations, where the selection of these variables is based on Berger and Bouwman (2009) and Horvath, Seidler and Weill (2013), who measure liquidity creation by US banks and Czech banks, respectively.

A first group of control variables consists of bank-level variables. Specifically, we take different dimensions of risk into account using four variables: *Earnings Volatility*, defined as the standard deviation of a bank's monthly returns on assets measured over the previous six months; *Credit Risk*, measured as the ratio of risk-weighted assets and off-balance-sheet activities, divided by assets; *Z-Score*, measured by the return on assets plus the ratio of equity to total assets, divided by *Earnings Volatility; NPL*, defined as the ratio of non-performing loans to total loans. We also include *Capital*, defined as the ratio of equity to total assets, as there is evidence, noted above, for a role of this variable in banks' liquidity creation. We do not use size or market share as control variables, as they are obviously strongly related to our proxy variable for competition.

A second group of control variables consists of macroeconomic variables. Specifically, we use *Inflation* (the year-on-year change in consumer prices) and *Unemployment* (the unemployment rate) to control for the macroeconomic environment. Data for these variables come from the Czech Statistical Office.

3 Results

We present our estimations on both the broad and narrow measures of liquidity creation in Table 5. As noted above, the broad measure of liquidity creation is our preferred one, as it is the most comprehensive measure. However, we use the narrow measure to check the robustness of our regression results. In addition, we test two alternative sets of control variables by including or excluding the macroeconomic control variables *Inflation* and *Unemployment*, so that we can examine their potential influence on the findings.

The major finding is the positive and significant coefficient for the Lerner index. We obtain this result with both sets of control variables and both measures of liquidity creation. We thus observe that greater market power enhances liquidity creation. As a consequence, our estimations clearly support the prediction that bank competition reduces liquidity creation.

This result accords with the hypothesis that competition undermines liquidity creation by increasing the fragility of banks. In particular, increased competition diminishes profits and thus weakens banks' protections against negative shocks. Given reduced profitability, banks have lower incentives to create liquidity, as a higher volume of loans increases potential loan losses and a higher volume of deposits increases sensitivity to bank runs. Thus, we provide evidence that increased bank competition can have detrimental economic effects by reducing liquidity creation of banks.

Regarding the control variables, we observe that *Credit Risk* and *Z-score*, with negative and positive coefficients, respectively, are the only bank-level variables that are significant in both estimations. These findings accord with the view that reduced risk enhances liquidity creation.

We now turn to additional estimations, also displayed in Table 5, using the narrow measure of liquidity creation. Under this specification, we again find a positive and significant influence of the Lerner index on liquidity creation, a result observed both with the macroeconomic control variables both included and excluded. Thus, our main conclusion, that market power of banks favors liquidity creation, is not influenced by inclusion or exclusion of off-balance sheet items in the liquidity creation measure.

We check the robustness of our results in two ways. The results of the robustness tests are displayed in Table 6.

As the number of lags can influence the results, we try an alternative specification, using six lags of the Lerner index instead of four. Under the alternative specification, we again observe a positive and significant effect of the Lerner index on liquidity creation for both measures of liquidity creation. Hence, these results corroborate those obtained with four lags.

Second, as financial crises can influence the relationship between competition and liquidity creation through its effects on the latter, we restrict our sample data to 2000–2007, thereby excluding the period of the financial crisis from the analysis. Again, we find that the Lerner index exerts a positive effect on liquidity creation, suggesting that increased bank competition is likely to lead to less liquidity creation.

Our main result is thus confirmed by robustness tests, supporting the view of the liquidity-destroying effect of bank competition.[3]

4 Concluding remarks

This paper examines the relationship between bank competition and liquidity creation by banks. We find that increased bank competition reduces liquidity creation. We interpret this result in terms of the effect of competition in increasing bank fragility, which reduces banks' incentives to create liquidity.

Our results, which shed light on the debate over the economic effects of bank competition, send two important messages to policymakers. First, bank competition can have detrimental economic effects. In other words, there is a trade-off between the positive effects of competition on consumer welfare, stemming from lower margins, and the negative effects of competition on liquidity creation. Second, regulation of bank competition cannot be considered independently of monetary policy. In particular, if bank competition plays a role in liquidity creation, authorities in charge of policies that influence the financing of the economy cannot ignore the impact of market structure on banking activities.

Our investigation represents, of course, a first analysis of the relationship between competition and liquidity creation. Thus, our results are not generalizable in all respects, as we focus on just one country. But the need to use detailed data in this analysis and the ab-

[3] We also estimated simple correlation coefficients between the Lerner index and our measures of liquidity creation for all banks as well as separately for large and small banks. The correlation coefficients were always positive and statistically significant at the 5% level and varied between 0.1 and 0.45, depending on the measure of liquidity creation, the number of lags of the Lerner index and size of the bank.

sence of previous studies of this issue make our results relevant to an understanding of the effects liquidity-creating effects of bank competition. We hope that further research in other fields of investigation will deepen our understanding of this issue.

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Tables

Table 1 Descriptive statistics

Variable	Mean	Std. Dev.
Assets	102	173
Loans	42.5	69.5
NPL	5.83	7.97
Credit risk	41.24	43.56
Capital	0.08	0.11
Earnings volatility	0.34	0.91
Z-score	11.18	16.87
Price	0.05	0.02
Marginal cost	0.03	0.01
Unemployment	7.19	1.28
Inflation	2.68	1.94
Price of labour	910	489
Price of physical capital	6.45	12.18
Price of borrowed funds	0.025	0.012
Total cost	4.096	6.577
Revenues	6.056	10.6

This table displays the mean and the standard deviation for all variables used to compute the Lerner indices or as control variables in the estimations. Assets, Loans, Total cost, and Revenues are in billion CZK. Price is the ratio of revenues to assets. Marginal cost is estimated using a translog cost function with one output (assets) and three input prices (price of labor, price of physical capital, and price of borrowed funds). Price of labor is the ratio of staff expenses to number of employees. Price of physical capital is the ratio of the sum of general and administrative expenses, depreciation and other operating expenses, divided by fixed assets. Price of borrowed funds is the ratio of expenses for borrowed funds to borrowed funds. Total cost is the sum of staff expenses, general and administrative expenses, depreciation, other operating expenses, and expenses for borrowed funds. Earnings Volatility is the standard deviation of a bank's monthly return on assets measured over the previous six months. Credit Risk is the ratio of risk-weighted assets and off-balance-sheet activities divided by assets. Z-Score is the return on assets plus the ratio of equity to total assets divided by Earnings Volatility. NPL is the ratio of nonperforming loans to loans. Capital is the ratio of equity to total assets. Inflation is the year-on-year change in consumer prices. Unemployment is the unemployment rate.

Table 2 Lerner indices

Year	Mean	Std. Dev.
2002	0.49	0.11
2003	0.52	0.12
2004	0.51	0.11
2005	0.51	0.13
2006	0.51	0.13
2007	0.51	0.12
2008	0.49	0.12
2009	0.51	0.14
2010	0.55	0.10

This table shows the mean and the standard deviation of the Lerner indices computed for each year.

Table 3 Description of classification for liquidity creation

Assets

Illiquid assets (weight ½)	*Semi-liquid assets (weight 0)*	*Liquid assets (weight -½)*
Financial assets held for trading with maturity greater than one year	Financial assets held for trading with maturity between three months and one year	Financial assets held for trading with maturity less than three months
Financial assets designated at fair value through profit or loss with maturity greater than one year	Financial assets designated at fair value through profit or loss with maturity between three months and one year	Financial assets designated at fair value through profit or loss with maturity less than three months
Available-for-sale financial assets with maturity greater than one year	Available-for-sale financial assets with maturity between three months and one year	Available-for-sale financial assets with maturity less than three months
Loans and receivables with maturity greater than one year	Loans and receivables with maturity between three months and one year	Loans and receivables with maturity less than three months
Held to maturity investments with maturity greater than one year	Held to maturity investments with maturity between three months and one year	Held to maturity investments with maturity less than three months
Derivative-hedge accounting (positive fair value) with maturity greater than one year	Derivative-hedge accounting (positive fair value) with maturity between three months and one year	Derivative-hedge accounting (positive fair value) with maturity less than three months
Other assets with maturity greater than one year	Other assets with maturity between three months and one year	Other assets with maturity less than three months
		Cash and cash balances with central banks

Liabilities

Illiquid liabilities (weight -½)	*Semi-liquid liabilities (weight 0)*	*Liquid liabilities (weight ½)*
Financial liabilities held for trading with maturity greater than one year	Financial liabilities held for trading with maturity between three months and one year	Financial liabilities held for trading with maturity less than three months
Financial liabilities designated at fair value through profit or loss with maturity greater than one year	Financial liabilities designated at fair value through profit or loss with maturity between three months and one year	Financial liabilities designated at fair value through profit or loss with maturity less than three months
Financial liabilities measured at amortized cost with maturity greater than one year	Financial liabilities measured at amortized cost with maturity between three months and one year	Financial liabilities measured at amortized cost with maturity less than three months
Derivative-hedge accounting (negative fair value) with maturity greater than one year	Derivative-hedge accounting (negative fair value) with maturity between three months and one year	Derivative-hedge accounting (negative fair value) with maturity less than three months
Other liabilities with maturity greater than one year	Other liabilities with maturity between three months and one year	Other liabilities with maturity less than three months
		Deposits, loans and other financial liabilities vis-à-vis central banks

Off-balance-sheet items

Illiquid items (weight ½)	*Semi-liquid items (weight 0)*	*Liquid items (weight -½)*
Commitments and guarantees given with maturity greater than one year	Commitments and guarantees given with maturity between three months and one year	Commitments and guarantees given with maturity less than three months
Commitments and guarantees received with maturity greater than one year	Commitments and guarantees received with maturity between three months and one year	Commitments and guarantees received with maturity less than three months

This table classifies balance sheet items in terms of their liquidity, which is the basis for calculation of the liquidity creation measures. We take off-balance sheet items into account for the broad measure of liquidity creation but not the narrow measure.

Table 4 Liquidity creation measures

	Liquidity creation – broad measure		Liquidity creation – narrow measure	
Year	Mean	Std. Dev.	Mean	Std. Dev.
2002	0.07	0.23	0.09	0.15
2003	0.09	0.27	0.12	0.17
2004	0.13	0.26	0.16	0.17
2005	0.15	0.26	0.18	0.17
2006	0.20	0.27	0.22	0.18
2007	0.24	0.27	0.26	0.19
2008	0.27	0.26	0.31	0.20
2009	0.29	0.27	0.32	0.20
2010	0.28	0.26	0.32	0.18

This table shows the mean and standard deviation for the liquidity creation measures adopted in the estimations. These measures are ratios of liquidity creation (both the broad measure and the narrow measure of liquidity creation) to total assets.

Table 5 Main estimations

	Explained variable: Liquidity creation – broad measure		Explained variable: Liquidity creation – narrow measure	
	(1)	(2)	(3)	(4)
$LiquidityCreation_{t-1}$	0.18*	0.07	0.30***	0.24*
	(0.10)	(0.14)	(0.11)	(0.13)
$LiquidityCreation_{t-2}$	–0.06	–0.06	0.13**	0.05
	(0.09)	(0.13)	(0.06)	(0.08)
$LiquidityCreation_{t-3}$	0.06	0.01	0.03	0.03
	(0.06)	(0.11)	(0.07)	(0.09)
$LiquidityCreation_{t-4}$	–0.07	–0.02	0.19	0.21**
	(0.07)	(0.12)	(0.08)	(0.09)
$Lerner_{t-1}$	0.24***	0.18**	0.04	0.03
	(0.09)	(0.08)	(0.04)	(0.04)
$Lerner_{t-2}$	0.64***	0.51***	0.17***	0.15*
	(0.18)	(0.18)	(0.06)	(0.08)
$Lerner_{t-3}$	0.15**	0.11*	0.01	0.03
	(0.06)	(0.06)	(0.04)	(0.04)
$Lerner_{t-4}$	0.06***	0.05	0.07***	0.04*
	(0.03)	(0.04)	(0.03)	(0.02)
$Lerner_{total}$	1.09***	0.85***	0.29***	0.25*
	(0.00)	(0.01)	(0.01)	(0.07)
Capital	1.36***	–0.08	–0.17	0.16
	(0.52)	(0.66)	(0.55)	(0.57)
NPL	–0.002	–0.001	–0.01***	–0.01***
	(0.001)	(0.001)	(0.002)	(0.001)
Credit risk	1.2E–05	5.5E–05	2.2E–05	0.9E–05
	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Z-score	–0.0003***	–0.0003**	–0.0001	–0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Earnings volatility	–0.02	–0.01	0.02**	0.02*
	(0.01)	(0.01)	(0.01)	(0.01)
Unemployment		0.003		–0.003*
		(0.004)		(0.002)
Inflation		0.004**		0.001
		(0.002)		(0.001)
Observations	869	869	869	869
Sargan test	13.29	9.98	22.83	23.51
AB test AR(1)	–1.89*	–1.66*	–2.84***	–2.39***
AB test AR(2)	0.42	0.48	–0.32	0.53

We use the two-step system GMM estimator with Windmeijer's (2005) corrected standard errors (reported in brackets). ***, **, and * indicate that p is less than 0.01, 0.05, and 0.1, respectively. The Sargan/Hansen test of the overidentifying restrictions for the GMM estimators is the null hypothesis that instruments used are not correlated with the residuals, and hence the overidentifying restrictions are valid. The Arellano–Bond (AB) test for serial correlation concerns the first differenced residuals. The null hypothesis is that errors in the first difference regression do not exhibit second-order serial correlation. The variable $Lerner_{total}$ is the estimated coefficient for the test that the sum of lagged terms is not different from zero (*p*-values are reported in brackets). Constant not reported.

Table 6 Robustness checks

	Explained variable: Liquidity creation – broad measure		Explained variable: Liquidity creation – narrow measure	
	(1)	(2)	(3)	(4)
	More lags of Lerner index included (6 lags)			
$Lerner_{total}$	0.59**	1.27***	0.19**	0.08***
	(0.02)	(0.00)	(0.04)	(0.00)
Bank controls	Yes	Yes	Yes	Yes
Macro controls	No	Yes	No	Yes
Observations	807	807	807	807
Sargan test	17.65	7.71	17.16	7.14
AB test AR(1)	–2.48**	–2.28**	–2.11***	–2.50***
AB test AR(2)	0.29	0.69	–0.34	0.45
	(5)	(6)	(7)	(8)
	Without the period of financial crisis			
$Lerner_{total}$	0.12**	0.11*	0.16***	0.20***
	(0.03)	(0.09)	(0.01)	(0.00)
Bank controls	Yes	Yes	Yes	Yes
Macro controls	No	Yes	No	Yes
Observations	566	566	566	566
Sargan test	17.30	12.44	22.38	18.33
AB test AR(1)	–3.19***	–2.28**	–2.82***	–2.88***
AB test AR(2)	0.56	–0.08	0.51	–0.24

We use the two-step system GMM estimator with Windmeijer's (2005) corrected standard errors (reported in brackets). ***, **, and * indicate that p is less than 0.01, 0.05, and 0.1, respectively. The Sargan/Hansen test of the overidentifying restrictions for the GMM estimators is the null hypothesis that instruments used are not correlated with the residuals, and hence the overidentifying restrictions are valid. The Arellano–Bond (AB) test for serial correlation concerns the first differenced residuals. The null hypothesis is that errors in the first difference regression do not exhibit second-order serial correlation. The variable $Lerner_{total}$ is the estimated coefficient for the test that the sum of lagged terms is not different from zero (*p*-values are reported in brackets). Other coefficients are not reported for the sake of brevity. Columns (1)–(4) present the results with 6 lags of the Lerner index, while columns (5)–(8) present the results for the period 2000–2007, i.e., excluding the period of the financial crisis.

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