BOFIT Discussion Papers
17 • 2013

Zuzana Fungáčová, Laura Solanko and Laurent Weill

Does bank competition influence the lending channel in the euro area?

EUROJÄRJESTELMÄ
EUROSYSTEMET

Bank of Finland, BOFIT
Institute for Economies in Transition

BOFIT Discussion Papers
Editor-in-Chief Laura Solanko

BOFIT Discussion Papers 17/2013
25.6.2013

Zuzana Fungáčová, Laura Solanko and Laurent Weill: Does bank competition influence the lending channel in the euro area?

ISBN 978-952-6699-21-9
ISSN 1456-5889 (online)

Suomen Pankki
Helsinki 2013

Contents

Zuzana Fungáčová, Laura Solanko and Laurent Weill

Does bank competition influence the lending channel in the euro area?

Abstract

This paper examines how bank competition influences the bank lending channel in the Euro area countries. Using a large panel of banks from 12 euro area countries over the period 2002−2010 we analyze the reaction of loan supply to monetary policy actions depending on the degree of bank competition. We find that the effect of monetary policy on bank lending is dependent on bank competition: the transmission of monetary policy through the bank lending channel is less pronounced for banks with extensive market power. Further investigation shows that banks with less market power were more sensitive to monetary policy only before the financial crisis. These results suggest that the bank market power has a significant impact on monetary policy effectiveness. Therefore, wide variations in the level of bank market power may lead to asymmetric effects of a single monetary policy.

JEL Codes: E52, G21.

Keywords: bank competition, bank lending channel, monetary policy, euro area.

Zuzana Fungáčová, Bank of Finland Institute for Economies in Transition (BOFIT), PO Box 160, FI-00101 Helsinki, Finland. Email: zuzana.fungacova@bof.fi

Laura Solanko, Bank of Finland Institute for Economies in Transition (BOFIT), PO Box 160, FI-00101 Helsinki, Finland. Email: laura.solanko@bof.fi

Laurent Weill, EM Strasbourg Business School, University of Strasbourg, Institut d'Etudes Politiques, Université de Strasbourg, 47 avenue de la Forêt Noire, 67082 Strasbourg Cedex, France. Email : laurent.weill@unistra.fr

We are grateful to Michael Funke, Eric Girardin, Aarti Rughoo, Mervi Toivanen as well as participants of the Finnish Economic Association XXXV Meeting (2013) and 11th INFINITI Conference on International Finance (2013) for their valuable comments and suggestions.

1 Introduction

There has been extensive debate on the economic role of bank competition. Whereas one might expect consensual evidence in favor of positive effects through consumer benefits and better access to credit (Beck, Demirgüc-Kunt and Maksimovic, 2004), there is a burgeoning literature showing that increased competition in banking might be detrimental for the economy since it tends to hamper banking stability (e.g. Berger, Klapper and Turk-Ariss, 2009; Beck, De Jonghe and Schepens, 2013).

Yet another important effect of bank competition may reside in the transmission of monetary policy via the bank lending channel. Namely, we wonder if the degree of bank competition influences the effectiveness of monetary policy by favoring or hampering the transmission of monetary policy decisions. This issue is of particular interest within the euro area, as the degree of bank competition (Carbo et al., 2009; ECB, 2010) and the loan rates vary markedly across the countries[1], in the midst of the single monetary policy.

The bank lending channel is based on the idea that when banks face a funding shock in connection with monetary tightening, the shock will be transmitted to the supply of bank loans if the banks cannot replace their liabilities with other external sources of funding such as money market funds. As a consequence, monetary policy exerts an impact on real activity also through the supply of bank loans. This real effect is particularly important if firms are highly dependent on bank loans. In the case of imperfect substitutability between bank loans and bonds, the reduction in the supply of bank loans has a larger effect on real activity.

Bank competition can alter the transmission of monetary policy through the bank lending channel. If a bank lending channel exists, monetary tightening may force some banks to reduce their supply of loans. These reductions will however differ across banks. Banks with less access to alternative funding sources would probably be hit harder and thus cut their lending more than the other banks. Access to alternative funding sources may depend not only on individual bank characteristics such as bank size, capitalization and liquidity, but also on the structure of the banking sector and the market power of the individual financial institutions. If the level of bank competition is lower, banks are expected

[1] EU Commission provides information on the interest rates charged on loans up to 1 million euro for all EU countries. The average loan rates in 2006 in euro area countries ranged from 4.11% in Austria to 6.24% in Portugal. (http://ec.europa.eu/enterprise/policies/finance/data/enterprise-finance-index/access-to-finance-indicators/loans/index_en.htm).

to have easier access to alternative sources of funding like certificates of deposit or inter-bank loans. The assumption of a positive relation between ease of access to alternative funding and bank competition is readily backed by empirical evidence of the greater market power of banks with higher profitability and lower probability of failure.[2]

The bank lending channel has been extensively investigated inside Europe (e.g. Altunbas, Fazylov and Molyneux, 2002; Gambacorta, 2005) and outside (e.g. Kishan and Opiela, 2000). It is of particular interest for European countries, as the financing of firms by bank loans is clearly more predominant in Europe than in the US.[3] However, the role of bank competition in influencing the lending channel has been widely ignored in the literature, and has never been investigated for Europe. We are only aware of three related works.

Adams and Amel (2005) analyze the role of bank competition in the bank lending channel by looking at how banking sector competition influences the supply of lending to small businesses. The study is based on aggregate regional US data. Using a concentration measure, the Herfindahl index, to measure competition, they find that greater bank concentration amplifies monetary policy transmission. Olivero, Li and Jeon (2011a, b) investigate whether bank competition influences the bank lending channel for a sample of developing countries in Asia and Latin America. The studies differ as to the competition measure: the first one uses two concentration indices (market share of the five largest banks and Herfindahl index) and the second applies the Rosse-Panzar measure. They also differ in terms of findings: the first provides evidence that greater concentration (less competition) weakens the bank lending channel, the second that greater competition weakens the transmission of monetary policy.

Our aim in this study is to investigate how bank competition affects the bank lending channel in the euro area countries. We use a panel dataset of banks from 12 "old" member countries of the Economic and Monetary Union (EMU) covering the period from 2002 to 2010. This setting suits our investigation, as monetary policy is the same in all these countries whereas the level of bank competition differs, and this enables us to clearly identify the role of bank competition. We analyze the reaction of loan supply to monetary policy actions following the methodology by Kashyap and Stein (1995, 2000). According

[2] In line with the theoretical work of Keeley (1990), Fungacova and Weill (2013) show that greater market power reduces the occurrence of failures in the banking industry, while Turk-Ariss (2010) finds a positive relation between bank market power and financial stability.

[3] European Banking Federation reports that the ratio of bank assets to GDP in 2010 stood at 349% in Europe and 78% in the US. Bank loans accounted for 144% of GDP in Europe while the corresponding figure for the US was 45% (http://www.ebf-fbe.eu/uploads/Facts%20&%20Figures%202011.pdf).

to this approach, the bank lending channel is identified if different kinds of banks (measured by e.g. bank size, capitalization or liquidity) react differently to shifts in monetary policy. As summarized in Gambacorta (2005), a monetary tightening should lead to larger reductions in loan supply for small banks. These banks are more dependent on deposits and, being less liquid, they cannot protect their loan portfolios by reducing their liquid assets and, being less well capitalized, they have less access to uninsured funding. In this paper we explore whether the bank lending channel is also shaped by bank market power as well as by traditional bank characteristics (size, liquidity, capitalization). We consider the interaction between bank competition and monetary policy in order to study whether bank competition influences the transmission of monetary policy in the euro area. We measure bank competition by the Lerner index, which is a bank-specific measure of competition.

Our evidence thus advances the understanding of the effectiveness of monetary policy in the euro area by being the first study devoted to the impact of bank competition on the transmission of monetary policy through the bank lending channel in the euro area countries. Nevertheless, the relevance of our results is much broader since, unlike earlier papers dealing with this issue, we use the Lerner index to measure bank competition. This measure has several major advantages over the earlier approaches. Neither the concentration indices nor the Herfindahl index are exact measures of competition. They instead infer the degree of competition from indirect proxies such as market share by assuming that greater market share is associated with greater market power or that concentration is negatively correlated with competition, which may not be the case. The new empirical industrial organization literature provides competition measures that directly quantify the competitive behaviour of banks. The Rosse-Panzar measure, adopted in Olivero, Li and Jeon (2011b), is one such measure. As pointed out by Shaffer (2004), this indicator is a measure of competition useful only for diagnosing the type of market structure (e.g. monopolistic competition or perfect competition). It cannot be considered a continuous measure of competition with greater values meaning higher levels of competition.

Compared to concentration indices and the Rosse-Panzar measure, all of which are aggregate measures of competition, the Lerner index has the advantage of being a bank-level measure of competition. This characteristic is important, as banking markets may be local in nature, which renders it difficult to measure competition at the country level. Moreover when using the approach of Kashyap and Stein (1995) to investigate the bank

lending channel, where bank characteristics play a key role, one must adopt a bank-level measure of competition.

We also contribute to the literature by examining a period including the financial crisis, which allows us to check for the existence of an impact of bank competition on the bank lending channel in normal times and in turbulent times. Since the beginning of the crisis, banks' behavior might indeed have changed. However, few studies examine how the bank lending channel might have been modified during the crisis (Gambacorta and Marques-Ibanez, 2011).

The impact of bank competition on the lending channel has broad implications for policymakers in the euro area. First, any evidence confirming an impact of bank competition on the effectiveness of monetary policy would plead for harmonization of bank competition levels across European countries, so that the single monetary policy would not have asymmetric effects. Second, such evidence could also motivate the fostering of bank competition. As mentioned above, the detrimental effects of bank competition on financial stability have raised concerns about the support of pro-competitive policies. But the finding that greater bank competition strengthens the transmission of monetary policy could be an additional reason to implement procompetitive policies in EU banking industries.

The rest of the article is structured as follows. Section 2 presents the methodology used to measure bank competition and to estimate the lending channel. Section 3 discusses the data and variables, section 4 presents the findings, and section 5 concludes.

2 Methodology

2.1 Lerner index

One of the main contributions of our study is that we employ a bank-level measure of competition that, unlike nation-wide measures, can be used to compare market power among different banks.

In general, the empirical approaches to measuring bank competition can be divided into two groups: traditional and new industrial organization (IO) methods. The traditional approach relies on the structure conduct performance (SCP) model that was widely used until the beginning of the 1990s. The SCP hypothesis is that banks in more concen-

trated banking markets behave less competitively, which leads to higher bank profitability. Thus, bank competition can be proxied by structural measures of market concentration such as the Herfindahl index or the market share of the n-largest banks in the system. Empirical studies however indicate that concentration is generally a poor measure of bank competition (Bikker et al., 2012). The second approach, the so-called new empirical IO method, does not infer the degree of competition from indirect proxies such as market structure and market shares but rather aims to measure bank competition directly. The most widely used non-structural measures include the Lerner index and the Rosse-Panzar H-statistic. Their usage might however be restricted due to a lack of the detailed data needed for their calculation.

Following the new empirical IO approach we account for bank competition by estimating the Lerner index. It measures the mark-up of price over marginal cost, i.e. the bank's market power for setting a price above marginal cost. Higher values of the Lerner index thus imply greater market power. We consider the Lerner index the most suitable measure for our analysis since, unlike the other non-structural measures, it is calculated at the bank level for each time period. Moreover, the Lerner index has been widely used in recent studies investigating bank competition (e.g. Carbo et al., 2009; Beck, De Jonghe and Schepens, 2013), and we employ the same methodology in our calculations.

The Lerner index is calculated as the ratio of the difference between price of output and marginal cost to the price. The price of output is the average price of bank production proxied by total assets, defined as the ratio of total revenues to total assets. The marginal cost is estimated on the basis of 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). We estimate one cost function using panel data with bank fixed effects in which we include time and country[4] dummy variables. Symmetry and linear homogeneity restrictions in input prices are imposed. The cost function is specified as follows:

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

[4] We do not estimate separate equations for each country because for some countries the number of observations is so small that this estimations would not be possible.

where TC denotes total costs, y total assets, w_1 the price of labor (ratio of personnel expenses to total assets)[5], w_2 the price of physical capital (ratio of other non-interest expenses to fixed assets), w_3 the price of borrowed funds (ratio of interest paid to customer deposits and short term funding). Total cost is the sum of personnel expenses, other non-interest expenses and interest paid. The indices for each bank are excluded from the presentation for the sake of simplicity. The estimated coefficients of the cost function from equation (1) are then used to derive 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 price of output computed, we calculate the Lerner index for each bank and thus obtain a direct measure of bank competition for the main estimations.

2.2 Lending channel

The current crisis has underlined the crucial role of banks in the transmission of monetary policy actions to lending for the real economy. It is widely acknowledged that monetary policy is transmitted via various channels to the real economy. The traditional interest-rate channel stresses the direct impact of interest rates on loan demand. Monetary tightening increases interest rates and therefore reduces demand for credit. The credit channel and the risk taking channel highlight the importance of financial intermediaries in the transmission of monetary policy actions to lending for the real economy. The credit channel is traditionally seen as amplifying the effects of the interest rate channel by influencing the supply of bank loans, whereas the risk taking channel acknowledges that monetary policy may also alter the quality of bank lending. The credit channel is generally divided into the 'broad credit channel' (including the asset-price channel), which stresses the effects of monetary policy actions on borrowers' net wealth, and the 'bank lending channel', which examines the effects of monetary policy on actions by depositary financial institutions (Bernanke and Gertler, 1995).

[5] As our dataset does not provide numbers of employees, we use this proxy variable for the price of labor, following Maudos and Fernandez de Guevara (2007).

Following Bernanke and Blinder (1988), the bank lending channel literature argues that monetary policy actions affect the balance-sheet structure of banks, causing changes in banks' loan supply in addition to causing changes in loan demand. The underlying assumption of the bank lending channel is that monetary tightening (loosening) drains (replenishes) banks' reserves and deposits and that this reduction (increase) in loanable funds causes banks to shrink (increase) their loan portfolios. If banks were able to costlessly compensate the loss in loanable funds by e.g. issuing new equity, the bank lending channel would shut down. This is hardly a plausible assumption, and much of the existing empirical literature points out that some banks may find it difficult to compensate for the loss of loanable funds and so may contract their lending (Peek and Rosengren, 2010).

To sort out the changes in loan supply from changes in loan demand, the literature has focused on micro-level evidence on cross-sectional differences between banks. The intuition is that, if changes in bank lending differ across bank types, the reason must be that different types of banks adjust their credit supply differently. The underlying assumption in the literature is that all banks face identical loan demand. This implies that loan demand does not depend on bank characteristics. For instance, if customers of small banks typically reduce their loan demands more than customers of large banks, when faced with an interest rate hike, identification of bank lending behavior becomes impossible. The assumption of homogeneous loan demand is thus crucial. As most customers have no short-term alternative to bank loan financing, this is usually taken as a fairly reasonable presumption, especially for bank-based financial systems like those of the euro area countries.[6]

During the last twenty years various studies have tested the existence of a bank lending channel by considering three bank characteristics connected to bank lending behavior: bank size, capitalization and liquidity. The overall conclusion seems to favor the existence of a bank lending channel in the US. which works through small banks (Kashyap and Stein, 1995), small and illiquid banks (Kashyap and Stein, 1997), and small and undercapitalized banks (Kishan and Opiela, 2000, Van den Heuvel, 2002). The evidence from the European banking system is far less conclusive. Altunbas, Fazylov and Molyneux (2002) find that the bank lending channel works through capital-constrained banks in a dataset of the largest European banking systems. Ehrmann et al. (2001) conclude that illiq-

[6] There is a growing empirical literature examining monetary policy transmission using loan-level data where this assumption can be relaxed (Khwaja and Mian, 2008, Jiménez et al, 2011). As euro area-wide loan-level data are not available, we retain this assumption as a reasonable approximation.

uid banks are most likely to change their loan supplies after a monetary policy change. Matousek and Sarantis (2009) find that bank size and liquidity are most important for shaping loan supply reactions in a dataset of 8 CEE countries.

The comparability of the results for European banking systems is seriously hampered by both the wide variety of geographical coverage in the literature and the apparent structural breaks in monetary policy transmission due to European monetary integration. We therefore focus solely on the euro area countries and on the period after 2000. As the great majority of euro area banks are not listed, we consider it appropriate to use a dataset as wide as possible to ensure a better picture of the whole banking system in the region.

2.3 Lending channel: the empirical model

The simple theoretical framework underlying the empirical model is developed by Ehrmann et al. (2001) and Ehrmann et al. (2003). Following Bernanke and Blinder (1988), the framework assumes that in equilibrium deposit (money) demand D equals money supply M and that money demand depends on monetary policy (mp) as follows:

$$D = M = -\varphi(mp) + \gamma \tag{3}$$

γ represents all other factors that affect deposit demand beyond monetary policy. Loan demand depends on real GDP (y), price level (p) and the loan interest rate (r):

$$Ld = \emptyset_1 y + \emptyset_2 p - \emptyset_3 r \tag{4}$$

The supply of loans depends directly on the amount of loanable funds (deposits or money) D available, the loan interest rate r and the monetary policy stance (mp):

$$Ls = \emptyset_4 D(mp) + \emptyset_5 r + \emptyset_6 mp \tag{5}$$

Monetary policy, typically approximated by a central bank's policy interest rate, enters the loan supply function both directly and indirectly. The direct link is the opportunity cost for a bank that uses interbank markets to finance loans. Secondly, the amount of deposits (or money) available depends negatively on the policy interest rate.

Following Kashyap and Stein (2000) and Ehrmann et al. (2001), we assume that banks are not equally dependent on deposit finance. The impact of deposits on loan supply

depends on the typical bank characteristics $X_{i:}$ bank size, capitalization and liquidity. We propose to add a novel bank-specific variable, the *Lerner index*, to measure bank competition, as we intend to examine whether bank competition influences monetary policy transmission via the bank lending channel.

$$\emptyset_4 = \mu_0 - \mu_1 X_i \tag{6}$$

Assuming the loan market clears and applying the above equations, loan supply can be written as

$$L = ay + bp - c_0 MP + c_1 X_i MP + dX_i + constant \tag{7}$$

Loan supply depends on the level of economic activity (*y*), price level (*p*), monetary policy stance (*MP*), individual bank-level characteristics (X_i) and the interaction of the last two ($X_i MP$). In this framework a significant coefficient c_1 would imply the existence of a bank lending channel, i.e. that monetary policy affects bank loan supply.

Our empirical model is based on (7) and is estimated in first differences.[7] Following Ehrmann et al. (2003), the basic regression model is

$$\Delta \log(L_{i,t}) = a_i + b_i \Delta \log(L_{i,t-1}) + c_i \Delta MP_t + \mathrm{d_i} \Delta\, GDP_t + \mathrm{f_i} X_{\mathrm{i,t-1}} + \mathrm{g_i} X_{\mathrm{i,t-1}} \Delta MP_t + \varepsilon_{\mathrm{it}} \tag{8}$$

where i=1, …, N identifies the bank and t=1, …, T the time period (year), L_{it} denotes total loans by bank i at time t to private non-banking sectors, MP denotes the monetary policy indicator and *GDP* the real GDP. The bank-specific characteristics are denoted by X_i. The model further includes a bank-specific fixed effect a_i.

In the empirical model, the existence of a bank lending channel should be reflected in a significant coefficient for the interaction of the bank characteristics with the monetary policy indicator. The three measures of bank characteristics often used in the literature are bank size, capitalization and liquidity. Bank size and its capitalization and liquidity ratios are factors that may influence a bank's access to and premium on external finance. High levels of liquidity may also allow a bank to draw on its own liquid funds in-

[7] The underlying idea is that banks react to a *change* in the monetary policy indicator by adjusting their *new* loans. The level of loans approximates the stock of loans, whereas the flow of new loans can be best approximated by the first difference.

stead of tapping the market after a monetary tightening. Following Ehrmann et al. (2003), we define bank characteristics as

$$Size_{it} = logA_{it} - \frac{1}{N_t}\sum_i logA_{it}$$

$$Liquidity_{it} = \frac{L_{it}}{A_{it}} - \frac{1}{T}\sum_t (\frac{1}{N_t}\sum_i \frac{L_{it}}{A_{it}})$$

$$Capitalization_{it} = \frac{C}{A_{it}} - \frac{1}{T}\sum_t (\frac{1}{N_t}\sum_i \frac{C_{it}}{A_{it}})$$

$$Market\ Power = Lerner_{it} - \frac{1}{T}\sum \left(\frac{1}{N}\sum Lerner_{it}\right) \quad (9)$$

Size is measured as log of total assets. Liquidity is the share of liquid assets in total assets, as defined by Bankscope. Capitalization is the bank's own-capital-to-total assets ratio, and the Lerner index is as described in the previous sub-section. All these variables are normalized with respect to their sample means. The size variable is normalized with respect to the sample mean for each period, in order to remove the constantly increasing trend in size. Normalization implies that the average interaction term is zero, and the coefficients are directly interpretable as the average monetary policy effects on bank loan supply.

The preceding literature on European economies and emerging countries most often relies on central bank refinancing /repo rates or short-term money market interest rates as the indicator of monetary policy stance.[8] We follow this tradition in using the ECB overnight interbank rate (EONIA) as our main indicator of ECB monetary policy. The period of our study includes the financial crisis, during which changes in the overnight rate might have played a greater role than variations in the refinancing rate, which we employ in the robustness checks.

The dynamic equation (8) is typically estimated by the difference GMM method developed by Arellano and Bond (1991). But in our case the results indicate that the lagged value of loan growth is not significant, which casts serious doubt on the benefits of using difference or system GMM. As we use annual, instead of higher frequency data, the result is not entirely surprising. There certainly can be convincing reasons why lending in the previous quarter may influence current lending, but it is much harder to find an economic rationale for why lending last year should influence current lending. As the lagged de-

[8] See Ehrmann et al (2003), Gambacorta (2005), Olivero, Li and Yeon (2011b).

pendent variable is not statistically significant and we do not find a strong economic rationale for including the variable as a regressor, we prefer to estimate equation (10) without the lagged dependent variable in a standard fixed-effect panel regression framework.

$$\Delta \log(L_{i,t}) = a_i + c_i \Delta MP_t + \mathrm{d_i} \Delta\, GDP_t + \mathrm{f_i} X_{\mathrm{i,t-1}} + \mathrm{g_i} X_{\mathrm{i,t-1}} \Delta MP_t + \varepsilon_{\mathrm{it}} \qquad (10)$$

where Δ= one-period change. The bank-specific variables X_{it} (capitalization, size, liquidity and market power) are lagged one period to ease concerns about endogeneity.

3 Data

Our analysis is based on annual bank-level balance sheet and income statement data from BankScope, a financial database maintained by Bureau Van Dijk. The dataset constitutes a non-balanced panel that covers the time period between 2002 and 2010. In order to prevent double counting, we only consider unconsolidated data. The banks from the "old" euro area member countries are included in our sample: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain. The dataset consists of over 16,800 bank-year observations for 3,032 commercial, savings and cooperative banks, as we aim to include a broad representation of banking sectors in each of the countries.

All the countries in our sample implement the same monetary policy. The monetary policy rate that we use in the estimations is either the euro interbank overnight rate (EONIA)[9] or the main refinancing rate of the Eurosystem for robustness checks. Both of these are calculated as the average for a given year. Figure 1 displays the developments in these policy rates.

The data together with variables that describe the structure of the banking system in euro area countries are from the ECB Statistical Data Warehouse. The data on GDP and inflation are from the World Bank's World Development Indicators Database.

Descriptive statistics of the main variables used in the estimations are presented in Table 1. It is noteworthy that the mean Lerner index is 10.8%, which is of the same order of magnitude as that found in other studies reporting the Lerner value for EU banking in-

[9] It is a measure of the effective interest rate prevailing in the euro interbank overnight market calculated as a weighted average of the interest rates on unsecured overnight lending transactions denominated in euro, as reported by a panel of contributing banks.

dustries. For instance Carbo et al. (2009) obtain country-level average Lerner indices ranging from 11% to 22%, with a EU mean of 16%, for a sample of banks from 14 EU countries over the period 1995−2001.

4 Results

This section presents our results for the impact of bank competition on the transmission of monetary policy via the lending channel. We consider first the main estimations for the entire period of study, and then compare the results for before and during the crisis in order to analyze the impact of the crisis. Finally we provide some robustness tests.

4.1 Main results

The estimations for the full period are presented in Table 2. Three different specifications are tested. The first column gives the results for the standard specification for studying the bank lending channel; we include capitalization, liquidity, size, and terms for their interactions with monetary policy.

In the second column, we add the Lerner index but limit the monetary-policy interaction terms to that with the Lerner index, to analyze its sign. In the third column, we add the monetary-policy interaction terms for the three standard bank characteristics (capitalization, liquidity, and size). Both of the latter two specifications provide evidence on the impact of bank competition on the bank lending channel. Our main findings are as follows.

First, we find evidence that the effect of monetary policy on loan growth has the expected negative sign. The coefficient for monetary policy is significant and negative in all estimations. An increase (decrease) in interest rates leads to a decrease (increase) in loan growth rate.

Second, the monetary-policy interaction terms for capitalization, liquidity are not significant, meaning that these bank-specific characteristics do not influence the way bank lending reacts to monetary-policy changes. As the bank lending channel predicts such different responses of bank lending among banks, our results do not support the existence of a bank lending channel in the euro area countries during the period of study.

These results are not completely at odds with the previous literature. Focusing on a period similar to ours (1999−2009), Gambacorta and Marques-Ibanez (2011) obtain simi-

lar findings in their study of banks from 15 countries (11 euro area countries, Denmark, Sweden, UK, US). For the older periods, the evidence is mixed. For instance, Altunbas, Fazylov and Molyneux (2002) find limited support for the bank lending channel and fairly weak evidence of undercapitalized banks reacting more to changes in monetary policy.

Third, the monetary-policy interaction term for the Lerner index is significantly positive. This result is observed both when we include and exclude the monetary-policy interaction terms for the other bank-specific characteristics. so that we do obtain evidence for the existence of a bank lending channel in the euro area via bank competition. Contrary to the earlier literature, it is bank competition rather than the traditional bank characteristics (size, liquidity, capitalization) that drives the differences in banks' responses to monetary policy changes. Our results show that increased market power makes transmission of monetary policy weaker. In other words, greater bank competition strengthens the transmission of monetary policy.

This result indicates that having less market power makes it more difficult for a bank to access alternative funding sources. Changes in monetary policy influence the available funds and are then more directly transmitted to a bank's loan supply if competition is fierce. This suggests that greater bank competition makes monetary policy more effective.

This is of importance when considering the debates concerning the separation of supervision of banking activities from the conduct of monetary policy and the possibility of conflicting objectives for the two tasks.

When analyzing the other variables in our estimations, we note that well-capitalized, highly-liquid and small banks achieve more robust loan growth. The coefficients of capitalization and liquidity are significant and positive; for size they are significant and negative in all the estimations. We further observe that changes in economic activity, measured by GDP growth, are positively related to loan growth.

4.2 The effect of the financial crisis

Our period of study includes the recent financial crisis, which has clearly influenced the effectiveness of traditional monetary policy measures. This major event is also likely to have influenced banks' behavior. Due to the uncertain economic outlook, massive non-standard monetary policy operations and radical changes in asset valuations, bank competi-

tion is likely to play a less significant role in shaping bank loan supply during episodes of financial distress. Monetary policy might have become less effective for various reasons, including the reluctance of banks to increase their lending whatever the monetary policy decisions (Gambacorta and Marques-Ibanez, 2011). We thus distinguish between two periods in our estimations: the period before the crisis (2002 to 2006) and during the crisis (2007−2010). This allows us to check how the role of bank competition in the bank lending channel changes over time and over the economic cycle. The estimations are displayed in Table 3. We note several striking results.

First, the monetary-policy interaction term for the Lerner index is significantly positive before the crisis but not significant during the crisis. Thus our key finding of a positive impact of bank competition on the transmission of monetary policy via the bank lending channel is driven by what happened in the years before the crisis.

Second, the monetary-policy interaction terms for capitalization, liquidity and size are significant before the crisis but not significant during the crisis. We observe that well-capitalized, highly liquid and smaller banks were better able to buffer their lending activity against shocks affecting the availability of funds before the crisis. These results provide some evidence for the bank lending channel before the crisis, using these bank-specific characteristics as indicators of the distributional effects of monetary policy. They also show that the channel was weakened during the crisis.

These findings moderate our conclusion on the absence of a bank lending channel for the full period, as they provide some evidence of the existence of a bank lending channel during normal times. Nonetheless, they also support the view that monetary policy has not been as effective during the crisis as it was before.

Thus, the main conclusion from our estimations comparing the time periods before and during the crisis is that the bank lending channel was more effective before the crisis. The impact of monetary policy on loan growth was influenced by the differences across banks in market power, capitalization, size and liquidity only before the crisis.

This conclusion accords with a finding of Bech, Gambacorta and Kharroubi (2012) who, based on a dataset of 24 developed countries with data going back to 1960, find that monetary policy is less effective in a financial crisis. Their paper does not focus on the effectiveness of the bank lending channel and so has a different perspective than our work. However, their study provides interesting findings for our analysis of the impact of the crisis on the effectiveness of monetary policy. Namely, the main conclusion of their

study is that monetary policy during an economic downturn that is associated with a financial crisis is less effective than during an economic downturn without such a crisis.

4.3 Robustness tests

We perform alternative estimations to examine whether our findings are robust over an alternative monetary-policy measure, and to our competition measure.

First, we use an alternative indicator for monetary policy: the refinancing rate of the ECB. As mentioned above, several different interest rates can be used to take account of monetary policy. Thus we aim to look at whether our results are robust to the indicator of monetary policy.

Tables 4 and 5 display the results with the refinancing rate as the monetary policy indicator. We present the results for the full period in Table 4, and the separate periods (before and during the crisis) in Table 5 since the refinancing rate might have very different effects over time.

The results covering the full period are similar to those for the overnight rate. First, we do not obtain any significant coefficients for the monetary-policy interaction terms for capitalization, liquidity and size. Second, the monetary-policy interaction term for the Lerner index is significantly positive in all the estimations. Hence we again find support for greater market power hampering the transmission of monetary policy via the bank lending channel.

Examining the results for before and during the crisis, we again obtain results that are similar to the previous ones. The monetary-policy interaction term for the Lerner index is significantly positive before the crisis but not significant during the crisis. Therefore our finding that market power plays a role in the transmission of monetary policy is again driven by the period before the financial crisis. The monetary-policy interaction terms for capitalization, liquidity and size are significant before the crisis but not significant during the crisis, except for size. The result for size is different: its estimated coefficient is significant and negative before the crisis and significant and positive during the crisis. In other words, we find some evidence that larger banks are less affected by changes in monetary policy during the crisis. This could mean that large banks were supported by different measures during the crisis.

Second, we use an alternative measure for bank competition in our estimations. Following the utilization of concentration indices in the literature (e.g. Adams and Amel, 2005; Olivero, Li and Jeon, 2011a), we use bank concentration indicators as natural tools for robustness checks, despite the limitations of such indices for measuring competition. Bank concentration is measured by the Herfindahl index for assets and by the share of the five largest banks in total banking assets. Both measures are computed at the country level, and the results are displayed in Table 6.

We obtain significant and positive coefficients for the monetary-policy interaction term for bank concentration in all the estimations. This means that greater bank concentration hampers the transmission of monetary policy via the bank lending channel. As greater concentration is associated with less competition, these results corroborate those obtained with the Lerner index. These results are in line with the findings of Adams and Amel (2005) and Olivero, Li and Jeon (2011a) on the effects of bank concentration on the bank lending channel respectively in the US and Asian and Latin American countries.

Thus, our main results are confirmed by the robustness tests, supporting the view that a hightened bank competition strengthens the transmission of monetary policy via the bank lending channel.

5 Conclusion

This paper examines the impact of bank competition on the bank lending channel in the euro area countries. We find that a higher level of bank competition, measured as smaller market power, strengthens the transmission of monetary policy via the bank lending channel. We interpret this result to mean that a higher degree of bank competition reduces the access to alternative sources of funding and thereby makes banks more responsive to monetary policy.

The comparison of our results for the periods before and during the crisis shows that this result is driven by the years before the crisis. During the crisis we do not find any influence of bank competition on the transmission of monetary policy. Moreover, before the crisis we observe some evidence in favor of the bank lending channel for the bank-specific characteristics generally used to take account of differences across banks. Poorly capitalized banks and less liquid banks have reduced their loan supplies more following a monetary tightening before the crisis. Overall, we observe that during the crisis the bank lending channel ceased to be a significant channel of monetary policy transmission.

Our findings lead to two implications. From a policy perspective, the level of bank competition matters for monetary policy transmission. As transmission is less effective via less competitive banking systems, monetary authorities have an additional reason to closely monitor the structure of their banking sector. Our result supports the view that greater bank competition and effectiveness of monetary policy are not conflicting objectives but are instead complementary.

From an economic perspective, more integration among euro area countries should contribute to the harmonizing of bank competition levels. As long as substantial cross-country differences persist, the single monetary policy will have asymmetric effects. Monetary policy changes can thus have heterogeneous real effects across euro area countries which may be a cause for concern among monetary policy decision-makers.

The lesson to take form this is that banking integration cannot be considered separately but must be treated in combination with euro-area monetary integration. As a consequence, efforts to enhance convergence in bank competition can be considered a fundamental step to further improve the monetary policy framework in the euro area.

References

Adams, R. and D. Amel, 2005. The Effects of Local Banking Market Structure on the Bank-Lending Channel of Monetary Policy. Working Paper 2005−16, Board of Governors of the Federal Reserve System.

Altunbas, Y., Fazylov, O. and P. Molyneux, 2002. Evidence on the Bank Lending Channel in Europe. Journal of Banking and Finance 26, 11, 2093−2110.

Arellano, M. and Bond, S. 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Review of Economic Studies 58, 277−297.

Bech, M., Gambacorta, L. and E. Kharroubi, 2012. Monetary Policy in a Downturn: Are Financial Crises Special? BIS Working Paper n°388, Bank for International Settlements.

Beck, T., Demirgüc-Kunt A. and V. Maksimovic, 2004. Bank Competition and Access to Finance: International Evidence. Journal of Money, Credit and Banking 36, 3, 627−654.

Beck, T., De Jonghe, O. and G. Schepens, 2013. Bank Competition and Stability: Cross-Country Heterogeneity. Journal of Financial Intermediation 22, 218−244.

Berger, A., Klapper, L. and R. Turk-Ariss, 2009. Bank Competition and Financial Stability. Journal of Financial Services Research 21, 849−870.

Bernanke, B. and Blinder, A., 1988. Credit, Money and Aggregate Demand. American Economic Review 78, 435−439.

Bernanke, B. and Gertler,M., 1995. Inside the Black Box: The Credit Channel of Monetary Policy Transmission. Journal of Economic Perspectives 9, 4, 27−48.

Bikker, J., Shaffer, S. and L. Spierdijk, 2012. Assessing Competition with the Panzar-Rosse Model: The Role of Scale, Costs, and Equilibrium. Review of Economics and Statistics, 94, 4, 1025−1044.

Boone, J., 2004. A New Way to Measure Competition. CEPR Discussion Paper Series n°4330.

Carbo, S., Humphrey, D., Maudos, J. and P. Molyneux, 2009. Cross-Country Comparisons of Competition and Pricing Power in European Banking. Journal of International Money and Finance 28, 115−134.

De Bondt, G., 2005. Interest Rate Pass-Through: Empirical Results for the Euro Area. German Economic Review 6, 1, 37−78.

ECB, 2010. EU Banking Structures, European Central Bank.

Ehrmann, M., Gambacorta, L., Martinez Pagés, J., Sevestre, P. and A. Worms, 2001. Financial Systems and the Role of Banks in Monetary Policy Transmission in the Euro Area. Working Paper, European Central Bank, 105/2001.

Ehrmann, M., Gambacorta, L., Martinez Pagés, J., Sevestre, P. and A. Worms, 2003. Financial Systems and The Role of Banks in Monetary Policy', in Angeloni I., A.K. Kashyap and B. Mojon (eds.), Monetary Policy Transmission in the Euro Area, Cambridge University Press, Cambridge.

Fungáčová, Z., and L. Weill, 2013. How Market Power Influences Bank Failures. Economics of Transition 21, 2, 301−322.

Gambacorta, L., 2005. Inside the Bank Lending Channel. European Economic Review 49, 1737−1759.

Gambacorta, L. and D. Marques-Ibanez, 2011. The Bank Lending Channel: Lessons from the Crisis. Economic Policy April 2011, 135−182.

Jimenez, G., Ongena, S., Peydro, J. and J. Saurina, 2012. Credit Supply and Monetary Policy: Identifying the Bank Balance-Sheet Channel with Loan Applications. American Economic Review 102, 2301−2326.

Kashyap, A. and J. Stein, 1995. The Impact of Monetary Policy on Bank Balance Sheets. Carnegie-Rochester Conference Series on Public Policy, June, 151−195.

Kashyap, A. and J. Stein, 1997. The Role of Banks in Monetary Policy: A Survey with Implications for the European Monetary Union. Economic Perspectives, Federal Reserve Bank of Chicago, Sept.1997, 2−18.

Kashyap, A. and J. Stein, 2000. What Do A Million Observations in Banks Say about the Transmission of Monetary Policy? American Economic Review 90, 407−428.

Keeley, M., 1990. Deposit Insurance, Risk and Market Power in Banking. American Economic Review 80, 1183−1200.

Khwaja, A. and A. Mian, 2008. Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market. American Economic Review 98, 1413−1442.

Kishan, R. and T. Opiela, 2000. Bank Size, Bank Capital, and the Bank Lending Channel. Journal of Money, Credit and Banking 32, 121−41.

Kishan, R. and T. Opiela 2006. Bank Capital and Loan Asymmetry in the Transmission of Monetary Policy. Journal of Banking and Finance 30, 259−85.

Matousek, R. and N. Sarantis, 2009. The Bank Lending Channel and Monetary Policy Transmission in Central and Eastern European Countries. Journal of Comparative Economics 37, 321−34.

Olivero M.P., Li, Y. and B.N. Jeon, 2011a. Consolidation in Banking and the Lending Channel of Monetary Transmission. Journal of International Money and Finance 30, 1034−1054.

Olivero M.P., Li, Y. and B.N. Jeon, 2011b. Competition in Banking and the Lending Channel: Evidence from Bank-Level Data in Asia and Latin America. Journal of Banking and Finance 35, 560−571.

Peek, J. and E. Rosengren, 2010. The Role of Banks in Monetary Policy Transmission. In Berger, A., P. Molyneux and J.O.S. Wilson (eds.) The Oxford Handbook of Banking. Oxford University Press.

Shaffer, S., 2004. Comment on "What Drives Bank Competition? Some International Evidence" by S. Claessens and L. Laeven, Journal of Money, Credit and Banking, 36, 3, 585−592.

Solis, L. and J. Maudos, 2008. The Social Costs of Bank Market Power: Evidence from Mexico. Journal of Comparative Economics 36, 3, 467−488.

Turk-Ariss, R., 2010. On the Implications of Market Power in Banking: Evidence from Developing Countries. Journal of Banking and Finance 34, 4, 765−775.

Van den Heuvel, S., 2002. Does Bank Capital Matter for Monetary Transmission? Economic Policy Review, Federal Reserve Bank of New York, May 2002, 259−65.

Van Leuvensteijn, M., Bikker, J., Van Rixtel, A. and C. Kok-Sorensen, forthcoming. A New Approach to Measuring Competition in the Loan Markets of the Euro Area, Applied Economics.

Weill, L. 2009. Convergence in Banking Efficiency Across European Countries. Journal of International Financial Markets, Institutions and Money 19, 818−883.

Tables and figure

Table 1 Descriptive statistics of the main variables

Whole sample	Obs.	Mean	Median	St.dev.	Min.	Max.
Size	16,857	6.270	6.192	1.388	2.140	13.651
Capitalization	16,857	0.076	0.065	0.045	0.010	0.874
Liquidity	16,857	0.164	0.135	0.124	0	0.884
Lerner index	16,857	0.108	0.098	0.099	−0.788	0.809
Δln(loans)	16,857	0.042	0.026	0.174	−6.882	3.546
GDP	16,857	1.072	1	2.747	−8	7
Overnight rate	16,857	2.170	2.279	1.238	0.355	3.879
Refinancing rate	16,857	2.329	2.250	1.053	1	4

Before crisis (2002−2006)	Obs.	Mean	Median	St.dev.	Min.	Max.
Size	7,492	6.385	6.285	1.408	2.361	13.651
Capitalization	7,492	0.069	0.059	0.042	0.012	0.774
Liquidity	7,492	0.165	0.131	0.129	0	0.877
Lerner index	7,492	0.113	0.100	0.097	−0.788	0.809
Δln(loans)	7,492	0.033	0.018	0.221	−6.882	3.546
GDP	7,492	1.838	1	1.487	−1	6
Overnight rate	7,492	2.582	2.279	0.659	2.053	3.517
Refinancing rate	7,492	2.545	2.250	0.674	2	3.5

During crisis (2007−2010)	Obs.	Mean	Median	St.dev.	Min.	Max.
Size	9,365	6.178	6.118	1.366	2.140	11.666
Capitalization	9,365	0.081	0.070	0.047	0.010	0.874
Liquidity	9,365	0.164	0.138	0.119	0.000	0.884
Lerner index	9,365	0.105	0.096	0.100	−0.771	0.722
Δln(loans)	9,365	0.049	0.032	0.125	−1.518	1.940
GDP	9,365	0.459	1	3.312	−8	7
Overnight rate	9,365	1.841	2.486	1.472	0.355	3.879
Refinancing rate	9,365	2.157	2.500	1.252	1	4

Table 2 Main estimations

	Bank lending channel	Lerner index included	Bank lending channel with Lerner index and all interactions
Specification	(1)	(2)	(3)
MP (overnight rate)	−0.006**	−0.006***	−0.006**
	[0.002]	[0.002]	[0.002]
Capitalization	1.268***	1.294***	1.274***
	[0.352]	[0.368]	[0.342]
Liquidity	0.346***	0.332***	0.340***
	[0.052]	[0.051]	[0.051]
Size	−0.123***	−0.124***	−0.125***
	[0.022]	[0.022]	[0.022]
MP×capitalization	−0.027		−0.069
	[0.065]		[0.071]
MP×liquidity	0.009		0.008
	[0.014]		[0.014]
MP×size	−0.001		−0.001
	[0.001]		[0.001]
GDP	0.005***	0.006***	0.006***
	[0.001]	[0.001]	[0.001]
Lerner index		−0.021	−0.017
		[0.061]	[0.060]
MP×Lerner index		0.039***	0.052***
		[0.013]	[0.018]
Constant	0.038***	0.036***	0.036***
	[0.002]	[0.002]	[0.002]
Observations	16,857	16,857	16,857
R-squared	0.077	0.077	0.078
Number of banks	3,032	3,032	3,032

Panel estimations with bank fixed effects. Dependent variable is the loan growth rate. The monetary policy variable is the difference in overnight interbank rates in the current versus the previous period. The explanatory variables are lagged one period. Robust standard errors are in brackets. *, **, *** denote an estimate significantly different from 0 at the 10%, 5% or 1% level.

Table 3 Main estimations for period before (2002−2006) and during (2007−2010) the crisis

	Before the crisis (2002−2006)			During the crisis (2007−2010)		
Specification	(1)	(2)	(3)	(1)	(2)	(3)
MP (overnight rate)	−0.043** [0.018]	−0.037** [0.015]	−0.038** [0.017]	0.000 [0.002]	−0.001 [0.002]	−0.000 [0.002]
Capitalization	0.143 [0.645]	0.288 [0.497]	0.337 [0.511]	1.470* [0.883]	1.480 [0.979]	1.430 [0.889]
Liquidity	0.399*** [0.104]	0.378*** [0.104]	0.394*** [0.105]	0.398*** [0.057]	0.385*** [0.057]	0.395*** [0.057]
Size	−0.253*** [0.032]	−0.257*** [0.031]	−0.259*** [0.032]	−0.396*** [0.037]	−0.394*** [0.039]	−0.395*** [0.038]
MP×capitaliz	0.392* [0.202]		0.262 [0.230]	−0.042 [0.061]		−0.062 [0.069]
MP×liquidity	0.170*** [0.058]		0.160*** [0.058]	0.008 [0.013]		0.007 [0.013]
MP×size	−0.018** [0.008]		−0.018** [0.008]	0.000 [0.001]		0.000 [0.001]
GDP	0.061*** [0.012]	0.057*** [0.011]	0.061*** [0.011]	0.002** [0.001]	0.002*** [0.001]	0.002*** [0.001]
Lerner index		−0.175 [0.177]	−0.165 [0.175]		0.054 [0.045]	0.063 [0.044]
MP×Lerner index		0.247*** [0.076]	0.167** [0.082]		0.010 [0.013]	0.024 [0.017]
Constant	−0.080*** [0.025]	−0.075*** [0.023]	−0.081*** [0.024]	0.045*** [0.004]	0.044*** [0.005]	0.044*** [0.004]
Observations	7,492	7,492	7,492	9,365	9,365	9,365
R-squared	0.097	0.091	0.100	0.194	0.193	0.195
Number of banks	2,861	2,861	2,861	2,603	2,603	2,603

Specifications from Table 2 estimated for two subperiods. Panel estimations with bank fixed effects. Dependent variable is the loan growth rate. The monetary policy variable is the difference in overnight interbank rates in the current versus the previous period. The explanatory variables are lagged one period. Robust standard errors are in brackets. *, **, *** denote an estimate significantly different from 0 at the 10%, 5% or 1% level.

Table 4 Robustness check: alternative monetary policy measure (refinancing rate)

	Bank lending channel	Lerner index included	Bank lending channel with Lerner index and all interactions
Specification	(1)	(2)	(3)
MP (refinancing rate)	0.000	−0.000	0.000
	[0.002]	[0.002]	[0.002]
Capitalization	1.267***	1.297***	1.282***
	[0.356]	[0.368]	[0.346]
Liquidity	0.344***	0.329***	0.337***
	[0.051]	[0.051]	[0.051]
Size	−0.122***	−0.123***	−0.124***
	[0.022]	[0.021]	[0.022]
MP×capitalization	−0.025		−0.072
	[0.073]		[0.080]
MP×liquidity	0.013		0.012
	[0.015]		[0.015]
MP×size	−0.000		−0.000
	[0.001]		[0.001]
GDP	0.003***	0.003***	0.003***
	[0.001]	[0.001]	[0.001]
Lerner index		−0.029	−0.026
		[0.061]	[0.060]
MP×Lerner index		0.043***	0.058***
		[0.015]	[0.020]
Constant	0.042***	0.041***	0.041***
	[0.002]	[0.002]	[0.002]
Observations	16,857	16,857	16,857
R-squared	0.076	0.077	0.077
Number of index	3,032	3,032	3,032

Panel estimations with bank fixed effects. Dependent variable is the loan growth rate. The monetary policy variable is the difference in refinancing rates in the current versus the previous period. The explanatory variables are lagged one period. Robust standard errors are in brackets. *, **, *** denote an estimate significantly different from 0 at the 10%, 5% or 1% level.

Table 5 Robustness check: alternative monetary policy measure (refinancing rate) before and during the crisis

	Before the crisis (2002−2006)			During the crisis (2007−2010)		
	(1)	(2)	(3)	(1)	(2)	(3)
MP (refinancing rate)	−0.044**	−0.038**	−0.039**	0.001	−0.001	−0.000
	[0.018]	[0.016]	[0.017]	[0.002]	[0.002]	[0.002]
Capitalization	0.164	0.286	0.356	1.487*	1.480	1.452
	[0.643]	[0.497]	[0.510]	[0.896]	[0.980]	[0.901]
Liquidity	0.402***	0.377***	0.398***	0.396***	0.384***	0.393***
	[0.104]	[0.104]	[0.105]	[0.057]	[0.057]	[0.057]
Size	−0.256***	−0.257***	−0.261***	−0.393***	−0.394***	−0.391***
	[0.032]	[0.031]	[0.032]	[0.037]	[0.040]	[0.038]
MP×capitalization	0.383*		0.251	−0.035		−0.060
	[0.203]		[0.232]	[0.070]		[0.078]
MP×liquidity	0.172***		0.161***	0.010		0.009
	[0.058]		[0.058]	[0.015]		[0.015]
MP×size	−0.020**		−0.020**	0.002**		0.002**
	[0.009]		[0.009]	[0.001]		[0.001]
GDP	0.061***	0.057***	0.062***	0.002***	0.002***	0.002***
	[0.012]	[0.011]	[0.012]	[0.001]	[0.001]	[0.001]
Lerner index		−0.174	−0.164		0.052	0.060
		[0.177]	[0.175]		[0.045]	[0.044]
MP*Lerner index		0.254***	0.171**		0.013	0.028
		[0.077]	[0.083]		[0.015]	[0.020]
Constant	−0.082***	−0.075***	−0.083***	0.046***	0.045***	0.044***
	[0.025]	[0.023]	[0.024]	[0.004]	[0.005]	[0.004]
Observations	7,492	7,492	7,492	9,365	9,365	9,365
R-squared	0.098	0.091	0.101	0.195	0.193	0.196
Number of index	2,861	2,861	2,861	2,603	2,603	2,603

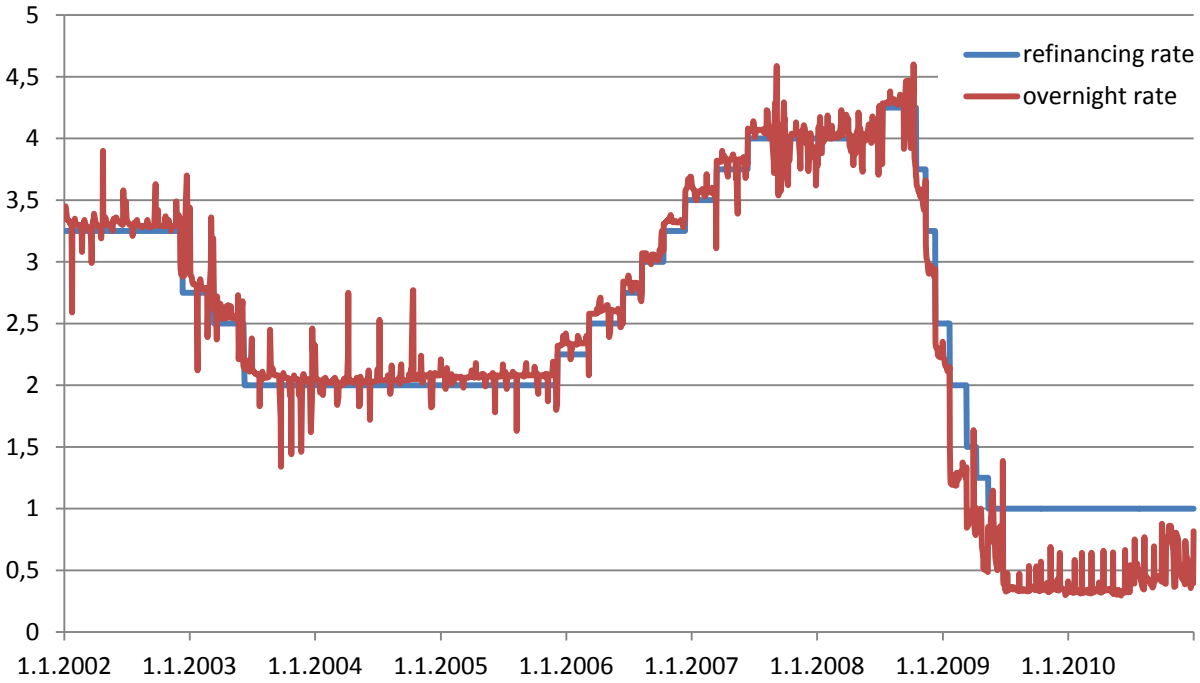
Panel estimations with bank fixed effects. Dependent variable is the loan growth rate. The monetary policy variable is the difference in refinancing rates in the current versus the previous period. The explanatory variables are lagged one period. Robust standard errors are in brackets. *, **, *** denote an estimate significantly different from 0 at the 10%, 5% or 1% level.

Table 6 Robustness check: alternative measures of competition

Competition measure	Herfindahl index		Concentration ratio	
Specification	(2)	(3)	(2)	(3)
MP (overnight rate)	−0.009*** [0.002]	−0.009*** [0.003]	−0.014*** [0.004]	−0.016*** [0.004]
Capitalization	1.260*** [0.367]	1.252*** [0.350]	1.243*** [0.369]	1.232*** [0.350]
Liquidity	0.340*** [0.052]	0.343*** [0.052]	0.337*** [0.052]	0.339*** [0.053]
Size	−0.124*** [0.022]	−0.124*** [0.022]	−0.124*** [0.022]	−0.125*** [0.022]
Competition measure	1.311*** [0.460]	1.266*** [0.480]	0.003*** [0.001]	0.002*** [0.001]
MP*capitalization		−0.030 [0.066]		−0.041 [0.068]
MP*liquidity		0.004 [0.014]		0.002 [0.014]
MP*size		−0.001 [0.001]		−0.002 [0.001]
MP*competition	0.106** [0.054]	0.123** [0.053]	0.0003*** [0.000]	0.0004*** [0.000]
GDP	0.005*** [0.001]	0.005*** [0.001]	0.005*** [0.001]	0.005*** [0.001]
Constant	0.001 [0.014]	0.002 [0.014]	−0.033 [0.024]	−0.029 [0.026]
Observations	16,857	16,857	16,857	16,857
R-squared	0.078	0.078	0.078	0.078
Number of banks	3,032	3,032	3,032	3,032

Panel estimations with bank fixed effects. Dependent variable is the loan growth rate. The monetary policy variable is the difference in overnight interbank rates in the current versus the previous period. Competition measure is either Herfindahl index or concentration ratio accounting for the share of the five largest banks in the banking system assets in each country. The explanatory variables are lagged one period. Specifications (2) and (3) introduced in Table 2 are estimated. Robust standard errors are in brackets. *, **, *** denote an estimate significantly different from 0 at the 10%, 5% or 1% level.

Figure 1 Monetary policy rates (main refinancing rate and overnight rate) during the period 2002−2010



BOFIT Discussion Papers

A series devoted to academic studies by BOFIT economists and guest researchers. The focus is on works relevant for economic policy and economic developments in transition / emerging economies.

2012
- No 1 Walid Marrouch and Rima Turk-Ariss: Bank pricing under oligopsony-oligopoly: Evidence from 103 developing countries
- No 2 Ying Fang, Shicheng Huang and Linlin Niu: De facto currency baskets of China and East Asian economies: The rising weights
- No 3 Zuzana Fungáčová and Petr Jakubík: Bank stress tests as an information device for emerging markets: The case of Russia
- No 4 Jan Babecký, Luboš Komárek and Zlatuše Komárková: Integration of Chinese and Russian stock markets with World markets: National and sectoral perspectives
- No 5 Risto Herrala and Yandong Jia: Has the Chinese growth model changed? A view from the credit market
- No 6 Sanna Kurronen: Financial sector in resource-dependent economies
- No 7 Laurent Weill and Christophe Godlewski: Why do large firms go for Islamic loans?
- No 8 Iftekhar Hasan and Ru Xie: A note on foreign bank entry and bank corporate governance in China
- No 9 Yi Yao, Rong Yang, Zhiyuan Liu and Iftekhar Hasan: Government intervention and institutional trading strategy: Evidence from a transition country
- No 10 Daniel Berkowitz, Mark Hoekstra and Koen Schoors: Does finance cause growth? Evidence from the origins of banking in Russia
- No 11 Michael Funke and Michael Paetz: A DSGE-based assessment of nonlinear loan-to-value policies: Evidence from Hong Kong
- No 12 Irina Andrievskaya: Measuring systemic funding liquidity risk in the Russian banking system
- No 13 Xi Chen and Michael Funke: The dynamics of catch-up and skill and technology upgrading in China
- No 14 Yin-Wong Cheung, Menzie D. Chinn and XingWang Qian: Are Chinese trade flows different?
- No 15 Niko Korte: Predictive power of confidence indicators for the Russian economy
- No 16 Qianying Chen, Michael Funke and Michael Paetz: Market and non-market monetary policy tools in a calibrated DSGE model for Mainland China
- No 17 Pierre L. Siklos: No coupling, no decoupling, only mutual inter-dependence: Business cycles in emerging vs. mature economies
- No 18 José R. Sánchez-Fung: Examining the role of monetary aggregates in China
- No 19 Konstantins Benkovskis and Julia Wörz: Non-price competitiveness of exports from emerging countries
- No 20 Martin Feldkircher and Iikka Korhonen: The rise of China and its implications for emerging markets - Evidence from a GVAR model
- No 21 Pierre Pessarossi and Laurent Weill: Does CEO turnover matter in China? Evidence from the stock market
- No 22 Alexey Ponomarenko: Early warning indicators of asset price boom/bust cycles in emerging markets
- No 23 Gabor Pula and Daniel Santabárbara: Is China climbing up the quality ladder?
- No 24 Christoph Fischer: Currency blocs in the 21st century
- No 25 Duo Qin and Xinhua He: Modelling the impact of aggregate financial shocks external to the Chinese economy
- No 26 Martin Feldkircher: The determinants of vulnerability to the global financial crisis 2008 to 2009: Credit growth and other sources of risk
- No 27 Xi Chen and Michael Funke: Real-time warning signs of emerging and collapsing Chinese house price bubbles
- No 28 Yi David Wang: Convertibility restriction in China's foreign exchange market and its impact on forward pricing
- No 29 Risto Herrala and Rima Turk Ariss: Credit conditions and firm investment: Evidence from the MENA region
- No 30 Michael Funke and Michael Paetz: Financial system reforms and China's monetary policy framework: A DSGE-based assessment of initiatives and proposals
- No 31 Zuzana Fungáčová, Pierre Pessarossi and Laurent Weill: Is bank competition detrimental to efficiency? Evidence from China

2013
- No 1 Aaron Mehrotra: On the use of sterilisation bonds in emerging Asia
- No 2 Zuzana Fungáčová, Rima Turk Ariss and Laurent Weill: Does excessive liquidity creation trigger bank failures?
- No 3 Martin Gächter, Aleksandra Riedl and Doris Ritzberger-Grünwald: Business cycle convergence or decoupling? Economic adjustment in CESEE during the crisis
- No 4 Iikka Korhonen and Anatoly Peresetsky: What determines stock market behavior in Russia and other emerging countries?
- No 5 Andrew J. Filardo and Pierre L. Siklos: Prolonged reserves accumulation, credit booms, asset prices and monetary policy in Asia
- No 6 Mustafa Disli, Koen Schoors and Jos Meir: Political connections and depositor discipline
- No 7 Qiyue Xiong: The role of the bank lending channel and impacts of stricter capital requirements on the Chinese banking industry
- No 8 Marek Dabrowski: Monetary policy regimes in CIS economies and their ability to provide price and financial stability
- No 9 Rajeev K. Goel and Michael A. Nelson: Effectiveness of whistleblower laws in combating corruption
- No 10 Yin-Wong Cheung and Rajeswari Sengupta: Impact of exchange rate movements on exports: An analysis of Indian non-financial sector firms
- No 11 Martin Feldkircher, Roman Horvath and Marek Rusnak: Exchange market pressures during the financial crisis: A Bayesian model averaging evidence
- No 12 Alicia Garcia-Herrero and Le Xia: China's RMB bilateral swap agreements: What explains the choice of countries?
- No 13 Markus Eller, Jarko Fidrmuc and Zuzana Fungáčová: Fiscal policy and regional output volatility: Evidence from Russia
- No 14 Hans Degryse, Liping Lu and Steven Ongena: Informal or formal financing? Or both? First evidence on the co-funding of Chinese firms
- No 15 Iikka Korhonen and Anatoly Peresetsky: Extracting global stochastic trend from non-synchronous data
- No 16 Roman Horvath, Jakub Seidler and Laurent Weill: How bank competition influence liquidity creation
- No 17 Zuzana Fungáčová, Laura Solanko and Laurent Weill: Does bank competition influence the lending channel in the euro area?

BOFIT Discussion Papers
http://www.bof.fi/bofit_en • email: bofit@bof.fi
ISSN 1456-6184, online