Reserve Requirements and the Bank Lending Channel in China

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Abstract

This paper examines how reserve requirements influence the transmission of monetary policy through the bank lending channel in China while also taking into account the role of bank ownership. The implementation of Chinese monetary policy is characterized by the reliance on the reserve requirements as a regular policy tool with frequent adjustments. Using a large dataset of 170 Chinese banks for the period 2004–2013, we analyze the reaction of loan supply to changes in reserve requirements. We find no evidence of the bank lending channel through the use of reserve requirements. We observe, nonetheless, that changes in reserve requirements influence loan growth of banks. The same findings hold true for other monetary policy instruments. Further, we show that the bank ownership format influences transmission of monetary policy.

JEL Codes: E52, G21, P54.
Keywords: Chinese banks, bank lending channel, bank ownership.

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1. Introduction

The aim of this research is to provide new evidence on the transmission of monetary policy in China. This question is of high importance as banks play a key role in the Chinese financial system and provide most of the funding to firms.[1] We investigate the effectiveness of the bank lending channel which is a key mechanism for the transmission of monetary policy.

The bank lending channel is based on the idea that, owing to imperfect substitutability between bank lending and bonds, monetary policy influences the supply of bank loans. A monetary policy tightening increases the opportunity cost of holding deposits, resulting in a decrease in bank lending in line with the reduction in funding sources. It has been widely investigated in the US and in Europe (e.g., Kashyap and Stein, 1995; Altunbas, Fazylov and Molyneux, 2002; Gambacorta, 2005; Fungacova, Solanko and Weill, 2014), but less so in China (Gunji and Yuan, 2010).

Contrary to advanced economies, however, Chinese monetary policy relies on a wide palette of instruments. In addition to traditional price-based instruments such as interest rates, the central bank uses quantity-based instruments such as the reserve requirement ratio and less orthodox "window guidance" policies. Most policy decisions, including interest rate changes, must first be cleared with the State Council before they are implemented. In the case of the reserve requirement ratio (RRR), however, the People's Bank of China (PBC) retains direct control. This particular instrument is thus seen to play a special role in Chinese monetary policy. Indeed, the PBC's reliance on the RRR has increased since the mid-2000s (Ma, Xiandong and Xi, 2013).

Impliedly then, gauging the monetary policy transmission mechanism in China involves assessing the effectiveness of this monetary policy tool. In most developed countries, monetary policy is implemented through standard tools such as open market operations and the discount rate. Reserve requirements have either been phased out or are used for other motives.[2] China, however, is an excellent example of a country, where

[1] Bank loans are the largest source of external funding for firms comprising 75% of all external funding sources at the end of 2010.

[2] The active use of reserve requirements as a monetary policy instrument, however, has been quite common in developing countries, where undeveloped financial markets may limit the efficiency of market-based instruments. For the period 1970–2011, Federico, Vegh and Vuletin (2014) find that 32 out of the 52 countries studied were engaged in

reserve requirements are used intensively as a regular policy tool. [3] The reserve requirement ratio was adjusted ten times in 2007 alone, and then changed another 24 times between 2008 and 2013. In comparison, this ratio was changed only once in the Eurozone since the creation of the euro in 1999. Moreover, reserve requirement ratios in China can vary from bank to bank. Since 2008, separate RRRs are set and reported for large, medium-sized, and small banks, as well as rural credit cooperatives. Glocker and Towbin (2015) argue that for reserve requirements to be an effective policy instrument two conditions need to be met: banks cannot easily substitute away from deposits as a funding source and firms cannot easily substitute away from bank credit. China fulfills both of these conditions.

The objective of this paper is to examine the effect of changing reserve requirement ratios on the transmission of the monetary policy through the bank lending channel in China. To this end, we analyze the reaction of loan supply to monetary policy actions using the methodology of Kashyap and Stein (1995, 2000). Following this approach, the existence of the bank lending channel is identified when banks react differently to shifts in monetary policy actions based on differences in size, capitalization, or liquidity as these factors influence access to external funding that in turn impacts their ability to supply loans. This methodology is commonly used in the literature on the bank lending channel (e.g. Gambacorta and Marques-Ibanez, 2011; Fungacova, Solanko and Weill, 2014). We also apply it here.

The paper contributes to the literature on two fronts. First, it provides evidence on how adjustments in reserve requirements influence bank lending in China. We also consider other monetary policy tools, including the benchmark lending rate to assess whether reserve requirement ratios are more effective than other monetary policy instruments. As such, the impact of reserve requirement ratios is of prime concern not only in absolute terms but also relative to other monetary policy tools.

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active RRR policy, and most of them were developing economies. In contrast, the role of RRR in developed countries as a policy tool seemed to be on the wane. The authors note that none of the major industrial countries studied had engaged in active RRR policy since 2004. In contrast, over half of the developing countries in their sample had done so. Reinhart and Reinhart (1999) also show that several developing countries have turned to the RRR instrument to mitigate the impact of large capital flows.

[3] China ranks high among nations in terms of required reserves. The current level of RRR in China (around 20 %) is high by international standards, but not the peak. Especially in developing economies, reserve requirement ratios over 20 % are not unheard of (see Reinhart and Reinhart, 1999).

Second, this work helps clarify how bank ownership influences transmission of monetary policy. Bhaumik, Dang and Kutan (2011) note that, in the case of Indian banks, ownership exerts an impact on the reaction of banks to monetary policy changes. Here we ask whether the effectiveness of changes in reserve requirements is influenced by the ownership structure of the bank. The Chinese banking industry is characterized by the coexistence of several bank ownership formats. In addition to the huge state-owned banks, there are joint-stock commercial banks, city commercial banks, foreign banks, and rural financial institutions. The degree of influence of the central government on banks is a factor that may impact the loan supply reaction of banks to PBC monetary policy decisions. Surprisingly, while there is a large strand of literature on the consequences of ownership structure of banks in China with regard to competition and efficiency (e.g. Berger, Hasan and Zhou, 2009; Fungacova, Pessarossi and Weill, 2013), the influence of bank ownership on transmission of monetary policy has been largely ignored.

In our empirical analysis, we augment Bankscope's bank-level financial statement data for Chinese banks with hand-collected data from annual reports of individual banks from their websites. Unlike previous studies on Chinese banks that only use data for the largest or listed banks (e.g. Gunji and Yuan, 2010), we include over 170 banks in our dataset. These banks account for the vast majority of Chinese banking sector assets. Our observation period covers 2004 to 2013.

This research has important normative implications for the design of monetary policy in China. First, it provides evidence on the effectiveness of the reserve requirement ratio for the bank lending channel and helps clarify the transmission mechanism of monetary policy. This evidence has policy implications for the use of the RRR as a monetary policy tool in other emerging markets. Second, it contributes to the debate over bank ownership in China. By analyzing how ownership structures in the banking industry shape the transmission of monetary policy, we provide insights into the possible consequences of privatization and foreign entry policies.

The rest of the article is structured as follows. Section 2 presents the main elements of the monetary policy in China. Section 3 discusses the data. Section 4 develops the methodology. Section 5 presents the findings and section 6 concludes.

2. Monetary policy in China

In this section, we describe the monetary policy framework in China and discuss the characteristics of various types of banks in China. We finish with a brief review of the empirical literature on monetary policy in China.

2.1 China's monetary policy framework

Unlike central banks in advanced economies, Chinese monetary authority does not operate in a single interest rate framework. Instead, the PBC employs a wide variety of policy instruments, and policy changes are often implemented using a mixture of tools. China's monetary policy framework has evolved in step with the country's economic development. Direct credit plans were abolished in 1998, when the policy was shifted towards a more market-based direction. At present, the PBC's policy toolbox includes price-based tools such as benchmark and other policy interest rates and open market operations, as well as quantity-based tools such as deposit reserve requirement ratios (RRRs), "window guidance," and other administrative measures.

Perhaps the most fascinating aspect of monetary policy is the PBC's active reliance on the RRR, i.e. the share of deposits banks must hold in central bank reserves. Indeed, the RRR is considered to be one of the most important policy instruments in China. Changes in reserve requirements tend to signal policy intent to tighten or loosen bank lending, and hence, the monetary policy stance. The RRR was adjusted more often in our observation period (2004–2013) than benchmark interest rates (Figure 1).

In our estimation period, bank deposit and lending rates have largely been controlled. The PBC controls financial institutions' interest rates by setting benchmark deposit and lending rates for RMB-denominated loans of different maturities. Prior to 2004, banks had to set their retail rates in line with the corresponding benchmark rate. Banks were allowed to freely set lending rates above the benchmarks and deposit rates below the benchmarks starting in 2004. A small downward divergence from the lending rate benchmark was also permitted. Lending rates were liberalized in 2013. Deposit rates

still remain subject to a lower limit, but a slight upward divergence from the benchmark has been allowed since 2012. Interbank rates, bond, and repo rates, as well as foreign currency denominated retail rates were largely liberalized already before 2004.

A unified interbank lending market in China was established in 1996 with the introduction of the China Interbank Offered Rate (CHIBOR). Interbank rates were fully liberalized later the same year. Banks in China have been increasingly active in interbank lending, with the annual turnover of the interbank money market rising from one trillion yuan in 2002 to 38 trillion yuan in 2014. The National Interbank Funding Center records the daily CHIBOR rates for eight different maturities from overnight to 120 days. The overnight and 7-day maturities are by far the most liquid, and the two categories together account for well over 90 % of all transactions.[4]

The PBC operates under the State Council, and thus is not independent in its policy decisions. The State Council must approve interest rate decisions, for example, before they can be implemented. An advantage of the RRR instrument over interest rates is that the PBC enjoys greater discretion in making reserve requirement ratio decisions, thus making the RRR instrument more immediate in its effect.

All banks in China are required to hold central bank reserves, but RRRs across banks differ, and the sophistication of the instrument increased over the years.[5] In 2008, the RRR system was differentiated for several types of banks (Figure 1).[6] China's largest commercial banks currently have RRRs two percentage points higher than those of smaller banks.[7]

In 2011, the PBC introduced an opaque "dynamically differentiated RRR" scheme to guide the aggregate credit supply in countercyclical fashion. The RRRs for

[4] In promoting market-based interest rate reforms in China, the government introduced the Shanghai Interbank Offered Rate (SHIBOR) in 2007. The SHIBOR is currently calculated from the rate quotes of a panel of 18 commercial banks. The SHIBOR is a quote-based average, and thus unaffected by trading volumes. The CHIBOR, in contrast, is based on rates of actual interbank transactions. Since their introduction, SHIBOR rates have nevertheless closely tracked CHIBOR rates. The correlation coefficient between the daily 7-day CHIBOR and SHIBOR rates in 2007–2013 is 0.99. Due to the lack of data prior to 2007, the CHIBOR rate is selected as the interbank interest rate for our study.

[5] For detailed discussion, see Ma, Xiandong and Xi (2013).

[6] In addition, foreign currency deposits are subject to smaller reserve requirements than RMB deposits.

[7] This classification is relatively opaque. Ma, Xiandong and Xi (2013, p. 124) explain that the highest RRR ratio is "for the six or seven largest commercial banks." In other words, it concerns the "Big Five" and one or two other large banks. Rural credit cooperatives and other small financial institutions are subject to lower reserve requirement ratios than most other banks.

individual banks are adjusted taking into account e.g. the credit portfolio, soundness, and systemic importance of the bank (People's Bank of China, 2012, p. 15).

In addition to typical monetary policy objectives (price stability and economic growth), PBC policy is also directed to fiscal goals such as providing affordable financing to preferred functions, sectors, or specific geographical areas. In this framework, the central bank has found that the RRR provides a practical means for implementing differentiated policy treatment according to bank type, location, or lending portfolio. Ma, Xiandong and Xi (2013) note that the RRR in China can be seen as a multi-purpose instrument for targeting monetary policy, credit policy, and macroprudential objectives.

The RRR further serves as an important instrument in sterilizing the excess liquidity resulting from foreign exchange interventions. China currently holds about $3.8 trillion in foreign reserves that it can use in adjusting the yuan's exchange rate. To control the increases in domestic money supply from foreign currency purchases, the PBC neutralizes some of its purchases.[8] Ma, Xiangdong and Xi (2013) show that the RRR has become the most favored neutralization instrument since 2007. The RRR is favored over open market operations mainly because reserve requirement changes withdraw liquidity on a more permanent basis and are cheaper from the PBC's point of view. The withdrawal of excess liquidity in response to foreign currency purchases is carried out through the banking system regardless of the neutralization instrument used. Nevertheless, whether the PBC uses OMOs (such as the sale of repos and central bank bills) or the RRR, the ultimate result is a reduction in funds available for bank lending.

An increase in the RRR tightens bank lending capacity only in the situation where the bank does not hold reserves in excess to the required rate. Historically, bank excess reserves in China have been high, hindering the effectiveness of the RRR policy. The interest on excess reserves was drastically lowered in 2003 from 7.02 % to 1.62 % to

[8] China does not report official foreign exchange intervention data, nor the amount of offsetting sterilization operations. Ma, Xiangdong and Xi (2013) calculate that reserve requirements, central bank bills, and government deposits accounted for 90 % of outstanding foreign reserves in 2011. In contrast, Tan & Yang (2012) find that the PBC has failed to effectively neutralize contemporaneous changes in net foreign assets and that neutralization has become increasingly difficult in recent years. After the second quarter of 2014, the PBC has retired from day-to-day forex interventions.

encourage interbank lending. Thereafter, excess reserves fell sharply.[9] Since 2007, the use of RRR as a policy instrument has also become more active.[10]

2.2 Structure of the banking sector in China

State-owned banks dominate the banking sector in China. Different state authorities are involved depending on the type of bank. Thus, banks in China can be classified into several groups. The first group consists of the traditional "Big Four" state banks, i.e. Agricultural Bank of China (ABC), Bank of China (BOC), Industrial and Commercial Bank of China (ICBC), and China Construction Bank (CCB). The Bank of Communications (BCOM) is often considered the fifth big state bank. Since 2005, all banks in the "Big Five" have been transformed into joint-stock companies and all have private and foreign minority owners. Four of the five banks were listed on the stock exchanges in 2005–2006. ABC was listed in 2010. All of the "Big Five" rank among the world's largest banks.[11] They provide nationwide wholesale and retail services, and have strong focuses on funding state-owned enterprises (SOEs). The majority stakes in ABC, BOC, CCB, and ICBC are held by Chinese government entities, and this questions the separation of these banks from government control (Martin, 2012).

In addition to the big state-owned banks, there are other types of commercial banks in China, even though their market share is much smaller than that of the big banks. The China Banking Regulatory Commission (CBRC) reports that the big state-owned banks held 43 % of all commercial banking system assets in 2013, followed by joint-stock banks (18 %), city commercial banks (10 %) and rural commercial banks (6 %). The share of the largest banks has been decreasing, however. In 2008, they still accounted for 52 % of banking sector assets. On the other hand, the shares of the joint-stock and city commercial banks have been increasing at the expense of the largest banks. Foreign banks have held fairly constant market shares of around 2 %. In addition to the

[9] According to the PBC statistics, the amount of excess reserves relative to deposits has dropped from over 6 % in 2001 to around 1 % in 2011. However, in 2012–2013 excess reserves picked up slightly and were little over 2 % on average. Big banks in China hold less excess reserves than the smaller banks. In 2010, the average excess reserve holdings of big, medium-sized, and small banks were 1.3 %, 1.6 % and 3.2 %, respectively.

[10] Interest is paid on both required and excess reserves. Legal reserves are currently remunerated at 1.69 % p.a. and excess reserves at 0.72 % p.a.

[11] In 2012, ICBC replaced Bank of America to become the world's biggest bank measured by Tier-1 capital.

commercial banks, there are three fully state-owned policy banks in China providing government policy lending to specified sectors.

The twelve joint-stock commercial banks in China operate nationwide. They are usually mid-sized banks with mixed ownership, and are relatively new banks as the youngest of them were established in the early 2000s. The minimum capital requirement for joint-stock commercial banks is substantially larger than for regionally operating commercial banks. Joint stock banks largely operate on a commercial basis and have private domestic and foreign shareholders. For example, while large global banking institutions have invested in Chinese joint-stock banks, state-owned entities are still important shareholders in many of these banks.

Banks operating regionally are city commercial banks and rural commercial banks, as well as small local banks such as rural cooperative banks, rural credit cooperatives, and village and township banks. City commercial banks are smaller than joint-stock commercial banks and originally were created to carry out local government lending operations. Some of these banks are still owned by local governments. These banks are the successors to urban credit unions and were created in the late 1990s as part of a government effort to improve the efficiency of credit cooperatives. City commercial banks are often unable to compete directly with the big state-owned banks, but have an advantage in handling government-related accounts due to their close relations with the local city or province (Martin, 2012). While big banks mainly finance the SOEs, city commercial banks are important in providing financing to small and medium-sized enterprises (SMEs). The city commercial banks operate locally and majority of their lending goes to entities within the same city. Rural banks mainly serve the rural population and usually operate within a small township or village. Due to the lack of other investment options, rural banks are important in managing the savings of rural population. The government is in the process of transforming rural credit cooperatives to rural commercial banks and rural cooperative banks, so their number has soared. The CBRC reports there were 145 city commercial banks, nearly 500 rural commercial banks and nearly 2,000 other small rural banks at the end of 2013 (CBRC, 2013).

In 1997, foreign-owned banks were first permitted to carry out limited banking operations in China. In 2004, their scope of allowed operations was expanded to local

currency services for Chinese enterprises in specific areas. Foreign bank operations were liberalized further in 2007 in accordance with China's 2001 WTO commitments, and allowed to enter the retail banking market. In general, foreign banks in China are allowed to offer the same services and are subject to the same legal restrictions as domestic banks. However, before being eligible for applying for a permit to provide yuan-denominated services, Chinese regulations require that the foreign bank has been in operation in China for at least three years and profitable for at least two years prior the application (Martin, 2012). Currently, there are around 40 foreign financial institutions operating in China. In addition, many foreign banks have opened branches in China.

Foreign owners have been allowed to hold minority stakes in certain state-owned banks since 1996. Many banks where the state holds a majority stake also have foreign owners. From the Chinese side, strategic partnership with foreign banks has been seen as a way to improve corporate governance and efficiency. Foreign shareholders, in turn, hope for easier access to the Chinese market. Nevertheless, the participation of foreign investors in the Chinese banking sector is still regulated. Foreigners can in aggregate only own up to 25 % of Chinese banks and ownership by individual institutions is limited to 20 %.

Foreign banks differ from the other banks in China in many respects. For example, Berger, Hasan and Zhou (2009) find foreign banks to be the most profitable in China. Fungacova, Pessarossi and Weill (2013) show that foreign banks are the most efficient.

2.3 Literature review

The recent literature on the monetary policy transmission using the different instruments in China offers somewhat contradictory findings. He, Leung and Chong (2013) find that, in the period 1998–2010, the Chinese economy responded strongly to total lending and money supply shocks, but only mildly to shocks from the benchmark lending rate, market interest rate, and other "market-based" shocks. Fernald, Spiegel & Swanson (2014) provide an opposite finding, whereby the RRR and benchmark interest rate instruments

were found to be effective in determining inflation and economic activity in 2000–2013. They also test the standard quantity-based measures, i.e. money supply and loan growth, but find their roles to be insignificant, providing evidence that the monetary policy transmission mechanism in China is beginning to look 'more standard'.

Relevant to this discussion, we find just one study (Gunji and Yuan, 2010) that uses the approach of Kashyap & Stein (1995, 2000) on the bank lending channel in China. Gunji and Yuan (2010) study the impact of monetary policy on bank lending for a small sample of 19 banks, including the five largest state-owned banks and the twelve joint-stock commercial banks, for the period 1985–2007. They consider several monetary policy instruments (including reserve requirements), and find limited evidence for the bank lending channel when considering bank responses to monetary policy depending on their capitalization, liquidity, and size. The impact of monetary policy changes on credit supply only varies across banks for differences in size. They note, however, that the greater a bank's profitability, the less sensitive it is to shifts in monetary policy.

Finally, Nguyen and Boateng (2013) measure involuntary excess reserves and investigate their impact on monetary policy. Xiong (2013) examines the effect of implementing capital requirements in 2004 on the effectiveness of monetary policy. Hou and Wang (2013) investigate the implications of banking marketization for the bank lending channel.

3. Data

Our empirical analysis is based on yearly bank-level financial statement data of Chinese banks from Bankscope. We supplement missing values or variables with hand-collected data from the annual reports of the relevant bank's website to flesh out the Bankscope data. This gives us a unique dataset containing over 950 observations for 170 banks. These banks account for the vast majority of China's banking sector. In comparison, Gunji and Yuan (2010) use a 19-bank sample in their analysis of the bank lending channel, Berger, Hasan and Zhou (2009) a 39-bank sample in their efficiency analysis, and Fungacova, Pessarossi and Weill (2013) a 76-bank sample in their investigation of competition and efficiency in the Chinese banking industry.

We consider the period from 2004 to 2013. Descriptive statistics of the main variables are presented in Table 1 for the full sample and for each ownership type of bank. In addition, we retrieve information on monetary policy tools from the PBC website and macroeconomic variables from publications of the National Bureau of Statistics of China.

The banks in our sample can be divided into several categories based on ownership structure. In line with the development of the Chinese banking sector and the classifications used by the Chinese Banking Regulatory Commission (CBRC), we distinguish among (1) the large state-owned commercial banks, i.e. the Big Four, plus Bank of Communications (the "Big Five"), (2) joint-stock commercial banks, (3) city commercial banks, (4) foreign banks, and (5) rural commercial banks and other banks.

4. Methodology

To investigate the presence of the bank lending channel, we rely on the empirical model that is based on the theoretical framework of Kashyap and Stein (1995, 2000) and extended by Ehrmann et al. (2001, 2003). This model has been frequently employed in studies investigating the bank lending channel. The estimated equation has the form:

$$\Delta \log(L_{i,t}) = a_i + b_i \Delta MP_t + \mathrm{c_i} \Delta GDP_t + \mathrm{d_i X_{i,t-1}} + e_i \mathrm{X}_{i,t-1} \Delta MP_t + \varepsilon_{\mathrm{it}} \qquad (1)$$

where i identifies the bank and t is 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* is real GDP growth. Bank-specific characteristics are denoted by $X_{i.}$ To ease possible endogeneity problem, these variables are lagged one period. The model further includes a bank-specific fixed effect a_i.

The main monetary policy indicator we employ in our analysis is China's reserve requirement ratio. We consider the change in the average RRR between the years. Since 2008, this ratio has been separately set and reported for large banks, small and medium-sized banks, as well as rural credit cooperatives.

Consistent with the bank lending channel literature, we consider three bank-specific characteristics: bank size, capitalization, and liquidity. All of these factors influence a bank's access to external funding, which further impacts the bank's ability to supply loans. In an episode of monetary tightening, high levels of liquidity may also allow the bank to draw on its own liquid funds rather than resort to the market. Following Ehrmann et al. (2003), we define bank characteristics as:

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

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

$$Capitalization_{it} = \frac{C_{it}}{A_{it}} - \frac{1}{T}\sum_t \left(\frac{1}{N_t}\sum_i \frac{C_{it}}{A_{it}}\right), \qquad (2)$$

where i=1, …, N identifies the bank, and t=1,…., T is the time period (year).

We measure bank size using logarithm of total assets (*A*). Capitalization is defined as the ratio of the bank's equity capital (*C*) to total assets. Liquidity is the share of liquid assets (*L*) in total assets as defined by Bankscope. The bank-specific variables are normalized with respect to their sample means. The size variable is normalized with respect to the sample mean for each period to remove the persistent upward trend in size. Normalization implies that the average interaction term is zero, and the coefficients are directly interpretable as average monetary policy effects on bank loan supply. The presence of the bank lending channel is identified when the estimated coefficients for the interactions of bank-specific characteristics and monetary policy indicator are significant and positive in line with the view that banks with a lower access to external funding (proxied by lower capitalization, liquidity, and size) are expected to react more to monetary policy variations.

Several papers have estimated this equation with the difference GMM method developed by Arellano and Bond (1991). However, this technique is not as relevant in the context of annual data as with monthly or even quarterly data. Indeed, there is no expectation the lagged value of loan growth would be significant as no economic rationale supports the view that current lending growth influences lending growth next year. Thus, we follow the approach of Fungacova, Solanko and Weill (2014) on annual

data for the Eurozone and estimate the equation in a standard fixed-effects panel regression framework without the lagged dependent variable.

5. Results

This section presents the results of our estimations. We consider first the main estimations investigating the influence of reserve requirements on the transmission of monetary policy through the bank lending channel. We then present the estimations with other monetary policy indicators to compare their effectiveness through the bank lending channel. Finally, we provide the estimations by bank ownership type to examine if the influence of reserve requirements differs across the various types of Chinese banks.

5.1 Main results

We examine the influence of reserve requirements on the transmission of monetary policy through the bank lending channel. The estimations are displayed in Table 2. The main estimation for the full period (2004-2013) is presented in column (1). Additionally, we perform two estimations by considering two alternative periods: 2006–2013 in column (2), i.e. the period during which the PBC actively used changes in reserve requirements,[12] and 2008–2013 in column (3), i.e. the period including the emergence and fallout from the global financial crisis, as well as China's fiscal easing carried out mainly through increased bank lending.[13] We obtain several findings.

First, we find evidence that loan growth is adversely affected by a tightening of reserve requirements. The coefficient of reserve requirements, which captures the direct impact of monetary policy on loan growth, is significant and negative in all estimations, in line with the expectations. An increase (decrease) in reserve requirements leads to a decrease (increase) in loan growth rate. Hence, we support the view that reserve requirements are an effective monetary policy instrument.

[12] In addition, IPOs of four of the Big Five banks were conducted in 2005 and early 2006.
[13] The increase in bank credit in 2009 was equivalent to around 30 % of GDP and largely directed to state-funded infrastructure projects.

Second, the monetary policy interaction terms for liquidity and size are overall not significant, meaning that both of these bank-specific characteristics do not influence how bank lending reacts to changes in monetary policy. In addition, the interaction term between monetary policy and capitalization is significant, but negative. Our results for the monetary policy interaction terms do not support the existence of a bank lending channel in China through the use of reserve requirements. The literature on the bank lending channel (Kashyap and Stein, 1995, 2000; Kishan and Opiela, 2000, 2006) predicts that banks with lower capitalization, liquidity, and size, are expected to boost their credit supply, yet we observe no such results. We find evidence of an asymmetric loan response with respect to capitalization, but it does not accord with the prediction that contractionary monetary policy should have more severe effects on capital-constrained banks in line with the evidence provided by Kishan and Opiela (2000, 2006).

In analyzing the other variables, we point out that the coefficients of capitalization and liquidity are significant and positive, while they are significant and negative for size in all estimations. These results mean that well-capitalized, highly liquid, small banks achieve more robust loan growth than other banks. We also observe that changes in economic activity, measured by GDP growth, are positively related to loan growth. Interestingly, these results are similar to those observed in e.g. Eurozone countries (Fungacova, Solanko and Weill, 2014).

In a nutshell, our estimations show that the RRR does not influence monetary policy through the bank lending channel, even if it exerts an impact on loan growth.

5.2 Alternative monetary policy instruments

Our evidence that reserve requirements do not affect loan growth through the bank lending channel raises the question of whether this result is specific to this monetary policy instrument or general conclusion to all monetary policy instruments in China. Former studies on this issue provide ample warning that evidence on the bank lending channel in China should not be taken for granted. Gunji and Yuan (2010) find limited evidence only for the influence of size on the transmission of monetary policy.

We perform estimations with two alternative monetary policy measures: the 7-day interbank rate and the benchmark lending rate[14]. The PBC regularly adjusts the benchmark rates to influence bank credit in China, while the interbank rate can be seen to more broadly reflect policy conditions in the interbank market (Figure 1). The interbank rate is also a common proxy for monetary policy in the bank lending channel literature. In any case, all of these are often used as monetary policy instruments in China (e.g. Gunji and Yuan, 2010). Table 3 displays the results with these instruments for the full sample covering the period 2004–2013. Two main conclusions emerge.

First, the coefficients of monetary policy are significantly negative for both estimations. The growth rate of loans declines when the PBC tightens its monetary policy and there is an increase in any of the interest rates. These results are in line with the expectation that interest rates, in general, are effective monetary policy instruments in China.

Second, the interaction terms between monetary policy instruments and the three bank-specific characteristics are never significantly positive. In most cases, they are not significant. Only the interaction term with size is negative and significant for the lending rate. This result again indicates no support for the bank lending channel. Smaller banks, as well as less-capitalized or less-liquid banks, do not experience greater increases in their credit supply when monetary policy is relaxed.

As a consequence, the main conclusion is that the RRR cannot be considered a different monetary policy tool from the effectiveness perspective. On the one hand,

[14] We report the results using PBC benchmark 1-year lending rate as the benchmark interest rate. The results for the benchmark deposit rate are in line with the reported results, as the PBC alters both of these rates simultaneously (Figure 1).

changes in reserve requirements contribute in the same way as changes in the interbank rate, or lending rate to influence loan growth. Tightening of any of these instruments deteriorates loan growth. The PBC can use the RRR or different interest rate instruments in a similar way to influence loan growth. On the other hand, changes in reserve requirements do not influence loan supply through the bank lending channel, nor do changes in any of the interest rates.

Hence, reserve requirements are an effective monetary policy instrument in China, even if the transmission does not go through the bank lending channel. The reason for this result is not related to the nature of this instrument, but to the absence of the bank lending channel in China.

All in all, our study tends to support the view of the absence of bank lending channel in China. This finding is not at odds with former studies. As stressed above, related studies are still scarce. The closest, Gunji and Yuan (2010), which uses a limited sample of 19 large Chinese banks in a period ending in 2007, also finds limited evidence.

5.3 Estimations by ownership type

Our findings on the bank lending channel have been obtained for the whole sample of banks. However, the Chinese banking industry is composed of different types of banks in terms of ownership. We thus examine the impact of ownership type on the transmission of monetary policy through the bank lending channel.

A few papers investigate the influence of ownership on the reaction of banks to monetary policy. Bhaumik, Dang and Kutan (2011) have examined how ownership can exert an impact on the reaction of banks to monetary policy in India. They analyze differences between public, private, and foreign banks. To this end, they explain variations in bank lending by the interaction terms between changes in monetary policy and ownership dummy variables. In addition, they consider whether the reaction is different in easy and tight monetary policy regimes, and find differences in the reactions of various types of banks to monetary policy changes.

In the case of China, Gunji and Yuan (2010) perform separate estimations on the five largest Chinese banks and on the 14 joint-stock banks of their sample to investigate

the bank lending channel. They do not observe differences between these categories of banks: the interaction terms between the three bank-specific characteristics and monetary policy instruments are not significant for any of these subsamples. However, their sample is limited solely to these two categories of banks.

To test the hypothesis that ownership influences the bank lending channel, we perform new estimations by adding four interaction terms to our main regressions. We create five dummy variables corresponding to each bank ownership type: Big Five, joint-stock banks, city commercial banks, rural commercial banks, and foreign banks. We add an interaction variable between the difference in reserve requirements and each bank type dummy variable in a separate regression to consider the possibility that changes in reserve requirements exert a different influence on loan growth based on ownership type. We perform five estimations by considering separately each type of banks. Every time we include three interaction variables between the difference in reserve requirements, each bank-specific characteristic (capitalization, liquidity, size), and each bank type dummy variable. This way, the results are easier to interpret to find out if any ownership type differs from the others regarding the transmission of monetary policy changes. Table 4 displays the results. Each column corresponds to the estimations for one type of bank.

First, we observe that the impact of changes in reserve requirements on loan growth differs across types of banks. The interaction term between the monetary policy indicator and the type of bank is significantly negative for city commercial banks and for rural commercial banks, while it is significantly positive for foreign banks. These results suggest that loan growth of city commercial banks and of rural commercial banks is more adversely affected by a tightening in reserve requirements, while the opposite is observed for foreign banks (they reduce their lending less than other banks after an increase in the reserve requirement). These findings are of interest as they show that ownership structure of banks in China can influence the transmission of monetary policy. In particular, they stress the amplification of changes in monetary policy for city commercial banks and for rural commercial banks. This result may reflect more limited possibilities to obtain external funding for city commercial and rural commercial banks when monetary policy is tightened. The positive coefficient for the interaction of monetary policy instrument and foreign banks suggests that greater presence of these banks can hamper the

effectiveness of monetary policy. The finding that foreign banks can weaken the effectiveness of monetary transmission comports with the evidence observed in other emerging countries (e.g. Jeon and Wu, 2014, for Asian countries).

Second, we find some differences concerning the transmission of monetary policy through the bank lending channel across banks. The interaction term for capitalization is significantly positive for Big Five, meaning that less-capitalized Big Five banks tend to increase their credit supply more following a reduction of RRR. The interaction term for size is significantly positive for city commercial banks. Smaller city commercial banks enhance their credit supply in a greater extent following a decrease of RRR. This suggests some limited evidence for the bank lending channel for these types of banks.

We also observe two interaction terms that are significantly negative and at odds with the bank lending channel: the interaction term for liquidity for rural commercial banks and the interaction term for capitalization for foreign banks.

All the other interaction terms with ownership dummy variables are not significant, meaning that these bank-specific characteristics do not influence the manner in which bank lending reacts to monetary policy changes differently depending on the type of banks.

We extend the analysis of the influence of ownership type by considering the other monetary policy measures (7-day interbank rate and 1-year PBC benchmark lending rate) to investigate whether the RRR differs from other monetary policy measures and has different impact on the transmission of monetary policy when accounting for different bank ownership types. The results are reported in tables 5 and 6.

The first finding is that the influence of monetary policy changes on loan growth differs across bank types. For all monetary policy instruments, we observe that the interaction term between monetary policy and city commercial banks is significantly negative, while the interaction term between monetary policy and foreign banks is significantly positive. Both of these findings corroborate with what is observed for reserve requirements, i.e. loan growth of city commercial banks is more adversely affected by a tightening of any monetary policy instrument, while loan growth of foreign banks is less hampered by such tightening.

The interaction term between monetary policy and rural commercial banks is significantly negative with the benchmark rate, but not with the interbank rate. It is also significantly negative with reserve requirements. This tends to support the view that a tightening of monetary policy hampers loan growth of rural commercial banks more than for other banks.

We also find differences across monetary policy instruments for joint-stock banks. The interaction term between monetary policy and the dummy variable for such banks is negative in all estimations, and only significant when the interbank rate is considered as the monetary policy instrument. This additional finding supports the conclusion that monetary policy instruments can have different impacts on different types of banks.

The second finding deals with the limited evidence on the bank lending channel. Interestingly, we observe exactly the same findings with the benchmark rate as with the RRR. First, we have some limited evidence for the bank lending channel for Big Five and for city commercial banks, with significantly positive coefficients for capitalization and for size, respectively. Second, two interaction terms are significantly negative. This does not accord with the bank lending channel, i.e. the interaction term for liquidity for rural commercial banks and the interaction term for capitalization for foreign banks. Third, none of the other interaction terms with ownership dummy variables is statistically significant.

The estimations with the 7-day interbank rate show a different picture of the influence of ownership type on the transmission of monetary policy. No interaction term between monetary policy, bank-level characteristics, and ownership type dummies is significantly positive. Hence, there is no result in favor of the bank lending channel. In addition, two interaction terms with liquidity are significantly negative with Big Five banks and rural commercial banks, respectively. For the rest, all the other interaction terms are not significant.

To sum up, the estimations based on the bank ownership type provide two major conclusions. First, the ownership type influences the impact of changes in reserve requirements on loan growth. This result also stands for alternative monetary policy measures, and supports the view that the ownership structure of the banking industry affects the transmission of monetary policy. We can relate this conclusion to the finding

of Bhaumik, Dang and Kutan (2011) on Indian banks that, based on their ownership type, react differently to changes in monetary policy.

Second, we see some differences across bank types for the transmission of changes in reserve requirements through the bank lending channel. We observe that the well-capitalized Big Five banks and larger city commercial banks are better able to buffer their lending activity against restrictive monetary policies. Some leads supporting the existence of the bank lending channel through alternative monetary policy indicators are also observed.

These findings moderate our conclusion on the absence of a bank lending channel in China for all banks, because they provide a degree of evidence for the existence of a bank lending channel for certain types of banks. Consequently, they complement our investigation on the full sample of banks and stress the importance of taking ownership type into account.

6. Conclusion

This paper examines the transmission of monetary policy in China, where the implementation of monetary policy differs from other countries in terms of frequent adjustments of reserve requirements. It therefore provides a relevant framework to investigate how reserve requirements can affect the bank lending channel. We note three main findings.

First, the bank lending channel is not effective through reserve requirements in China. However, this conclusion also stands for changes in other monetary policy measures. Therefore, our results support the absence of the bank lending channel in China.

Second, changes in reserve requirements influence loan growth directly. We find that a tightening in reserve requirements adversely influences loan growth. Thus, our results support the effectiveness of monetary policy through reserve requirements in China. We obtain the same finding for the other monetary policy instruments. In other words, monetary policy is effective through multiple instruments including reserve requirements.

Third, the ownership structure of the banking industry influences the transmission of monetary policy. The impact of changes in reserve requirements on loan growth differs across types of banks, with limited evidence that some types of banks have a different reaction to changes in reserve requirements on their lending behavior based on their capitalization and their size. Our analysis by ownership type moderates to some extent the global view of the absence of the bank lending channel for all banks.

Our findings have major policy implications for monetary and banking policies in China. In terms of instruments, we suggest that, even if reserve requirements do not influence the transmission of monetary policy through the bank lending channel, they constitute an effective monetary policy instrument that can be used as a substitute to other monetary policy instruments in China.

In terms of channels of transmission, the bank lending channel does not play a major role in the transmission of monetary policy in China. Rather, the transmission seems to take place through other channels. Additionally, it means that monetary policy could be strengthened in China when taking into account the potential influence of the bank lending channel to favor transmission of monetary policy.

In terms of banking structure, our findings reveal that the ownership structure of banking industry influences the transmission of monetary policy in China. As a consequence, the changes in the ownership structure can foster or hamper the effectiveness of the monetary policy. Therefore, banking policies to promote privatization or foreign bank entry should not be implemented without considering their impacts on monetary policy transmission.

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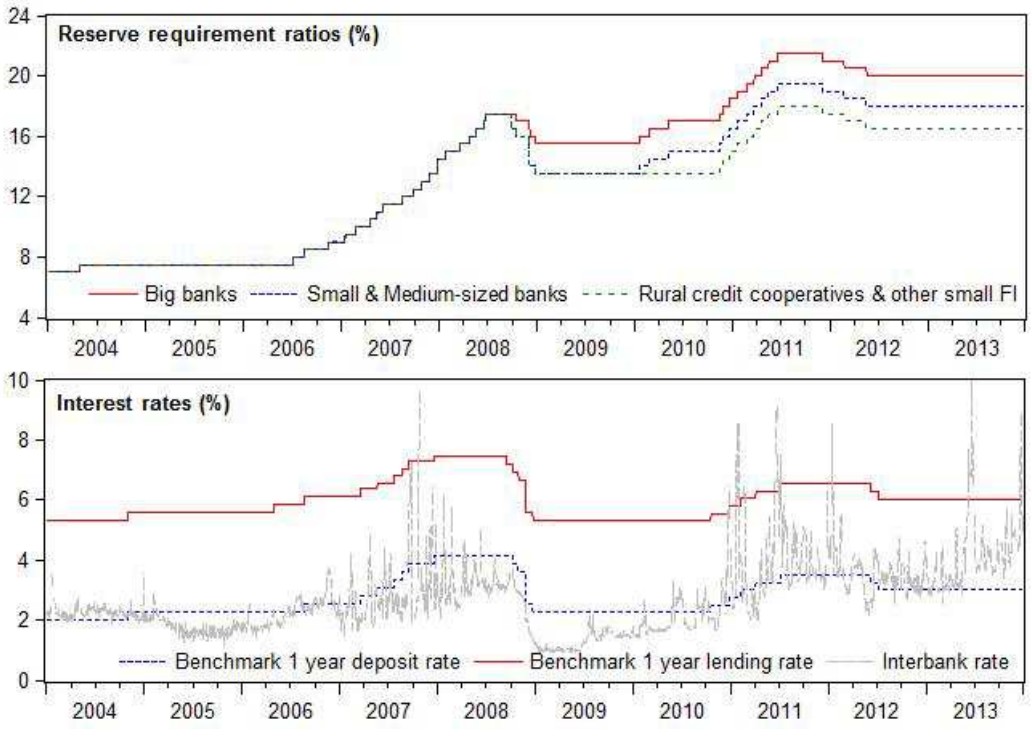
Figure 1.
Changes in monetary policy instruments in China



Sources: PBC & National Interbank Funding Center.

Table 1.
Descriptive statistics

Whole sample	Obs.	Mean	Median	Std.dev.	Min.	Max.
Loan growth	968	0.192	0.185	0.218	-1.782	2.008
Total assets (RMB million)	968	513337	44059	1819867	701	17500000
Capitalization	968	0.087	0.062	0.088	-0.064	0.947
Liquidity	968	0.291	0.266	0.134	0.001	0.893
Change in reserve requirements	968	1.232	0.501	2.306	-2.515	4.663
Change in interbank rate	968	0.249	0.497	1.060	-1.737	1.896
Change in lending rate	968	0.041	0.044	0.830	-1.863	0.973
GDP growth	968	9.955	9.300	1.990	7.653	14.162

Big Five banks	Obs.	Mean	Median	Std.dev.	Min.	Max.
Loan growth	45	0.139	0.136	0.085	-0.120	0.399
Total assets (RMB million)	45	7547079	6598177	4019315	1144005	17500000
Capitalization	45	0.055	0.059	0.015	0.015	0.078
Liquidity	45	0.204	0.209	0.054	0.103	0.309
Change in reserve requirements	45	1.184	0.501	2.228	-2.515	4.663

Joint-stock commercial banks	Obs.	Mean	Median	Std.dev.	Min.	Max.
Loan growth	105	0.227	0.188	0.152	-0.269	0.960
Total assets (RMB million)	105	956234	666487	848783	10307	3408219
Capitalization	105	0.048	0.045	0.034	-0.013	0.313
Liquidity	105	0.284	0.267	0.094	0.124	0.500
Change in reserve requirements	105	1.201	0.501	2.244	-2.515	4.663

City commercial banks	Obs.	Mean	Median	Std.dev.	Min.	Max.
Loan growth	517	0.223	0.208	0.128	-0.657	0.969
Total assets (RMB million)	517	73532	36164	116674	1754	1119969
Capitalization	517	0.062	0.059	0.026	-0.064	0.308
Liquidity	517	0.269	0.250	0.110	0.045	0.684
Change in reserve requirements	517	1.319	1.349	2.327	-2.515	4.663

Rural commercial banks	Obs.	Mean	Median	Std.dev.	Min.	Max.
Loan growth	88	0.169	0.161	0.070	-0.006	0.394
Total assets (RMB million)	88	108405	58927	107133	7071	433823
Capitalization	88	0.063	0.064	0.019	0.005	0.108

Liquidity	88	0.266	0.260	0.087	0.021	0.536
Change in reserve requirements	88	1.088	0.125	2.291	-2.515	4.663

Foreign banks	Obs.	Mean	Median	Std.dev.	Min.	Max.
Loan growth	182	0.119	0.126	0.396	-1.594	2.008
Total assets (RMB million)	182	40026	17457	52010	701	298508
Capitalization	182	0.202	0.152	0.148	0.047	0.947
Liquidity	182	0.390	0.356	0.188	0.001	0.893
Change in reserve requirements	182	1.163	0.501	2.377	-2.515	4.663

Table 2.
Main estimations

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

	Full period	2006-2013	2008-2013
Specification	(1)	(2)	(3)
MP (reserve requirements)	-0.007**	-0.008**	-0.012***
	[0.003]	[0.003]	[0.003]
Capitalization	1.406***	1.582***	1.618***
	[0.501]	[0.454]	[0.531]
Liquidity	0.460***	0.386***	0.547***
	[0.141]	[0.110]	[0.122]
Size	-0.132***	-0.142***	-0.199***
	[0.041]	[0.038]	[0.067]
MP×capitalization	-0.133*	-0.178*	-0.206*
	[0.079]	[0.092]	[0.106]
MP×liquidity	0.030	0.032	0.009
	[0.055]	[0.056]	[0.062]
MP×size	-0.001	-0.001	-0.002*
	[0.001]	[0.001]	[0.001]
GDP	0.023***	0.023***	0.048***
	[0.004]	[0.004]	[0.007]
Constant	-0.003	-0.005	-0.221***
	[0.038]	[0.040]	[0.064]
Observations	968	914	741
R-squared	0.160	0.194	0.228
Number of banks	170	166	153

Table 3.
Estimations with alternative monetary policy measures

Panel estimations with bank fixed effects. Dependent variable is the loan growth rate. The monetary policy variable is the difference in the instrument mentioned at the top of the column. The explanatory variables are lagged one period. Robust standard errors are in brackets. *, **, *** denote an estimate significantly different from zero at the 10 %, 5 % or 1 % level.

	7-day interbank rate	Benchmark lending rate
Specification	(1)	(2)
MP	-0.023***	-0.031***
	[0.004]	[0.007]
Capitalization	1.252**	1.146**
	[0.507]	[0.483]
Liquidity	0.584***	0.565***
	[0.129]	[0.121]
Size	-0.147***	-0.149***
	[0.039]	[0.037]
MP×capitalization	-0.094	-0.305
	[0.176]	[0.237]
MP×liquidity	-0.002	0.137
	[0.086]	[0.153]
MP×size	-0.002	-0.008***
	[0.002]	[0.002]
GDP	0.025***	0.027***
	[0.004]	[0.004]
Constant	-0.022	-0.052
	[0.046]	[0.046]
Observations	967	968
R-squared	0.156	0.168
Number of banks	170	170

Table 4.
Estimations by ownership type with reserve requirements

Panel estimations with bank fixed effects. Dependent variable is the loan growth rate. The monetary policy variable is the difference in reserve requirements ratios. We perform five estimations by considering separately each type of banks. Every time we include interaction variables between the difference in reserve requirements, each bank-specific characteristic (capitalization, liquidity, size), and each bank type dummy variable.The explanatory variables are lagged one period. Robust standard errors are in brackets. *, **, *** denote an estimate significantly different from zero at the 10 %, 5 % or 1 % level.

	Big5	Joint-stock	CCB	RCB	Foreign
Specification	(1)	(2)	(3)	(4)	(5)
MP	-0.007**	-0.007**	0.006	-0.007**	-0.011***
	[0.003]	[0.003]	[0.007]	[0.003]	[0.003]
MP×type	0.017	-0.003	-0.018**	-0.010***	0.034***
	[0.023]	[0.007]	[0.008]	[0.004]	[0.010]
Capitalization	1.396***	1.376***	1.416***	1.406***	1.397***
	[0.505]	[0.516]	[0.485]	[0.501]	[0.478]
Liquidity	0.460***	0.456***	0.488***	0.469***	0.516***
	[0.141]	[0.141]	[0.139]	[0.141]	[0.137]
Size	-0.133***	-0.130***	-0.133***	-0.132***	-0.131***
	[0.042]	[0.040]	[0.039]	[0.041]	[0.038]
MP×capitalization	-0.133*	-0.137*	-0.229**	-0.136*	-0.048
	[0.080]	[0.081]	[0.094]	[0.080]	[0.098]
MP×liquidity	0.031	0.035	0.035	0.034	-0.005
	[0.056]	[0.058]	[0.083]	[0.057]	[0.030]
MP×size	-0.001	-0.000	-0.006**	-0.001	0.000
	[0.002]	[0.001]	[0.002]	[0.001]	[0.001]
MP×capitalization×type	0.767***	0.132	0.128	-0.030	-0.337**
	[0.120]	[0.119]	[0.166]	[0.150]	[0.155]
MP×liquidity×type	-0.259*	-0.032	-0.024	-0.141**	0.062
	[0.131]	[0.066]	[0.081]	[0.056]	[0.098]
MP×size×type	-0.004	0.001	0.007***	-0.003	-0.015
	[0.007]	[0.002]	[0.003]	[0.004]	[0.013]
GDP	0.023***	0.023***	0.023***	0.023***	0.024***
	[0.004]	[0.004]	[0.003]	[0.004]	[0.003]
Constant	-0.001	-0.002	-0.007	-0.004	-0.010
	[0.039]	[0.038]	[0.036]	[0.039]	[0.034]
Observations	968	968	968	968	968
R-squared	0.162	0.161	0.172	0.162	0.186
Number of banks	170	170	170	170	170

Table 5.
Estimations by ownership type with interbank rate

Panel estimations with bank fixed effects. Dependent variable is the loan growth rate. The monetary policy variable is the difference in 7-day interbank rate. The explanatory variables are lagged one period. Robust standard errors are in brackets. *, **, *** denote an estimate significantly different from zero at the 10 %, 5 % or 1 % level.

	Big5	Joint-stock	CCB	RCB	Foreign
Specification	(1)	(2)	(3)	(4)	(5)
MP	-0.022***	-0.021***	-0.004	-0.022***	-0.037***
	[0.004]	[0.004]	[0.008]	[0.004]	[0.004]
MP×type	0.078	-0.075***	-0.033***	-0.008	0.070***
	[0.106]	[0.028]	[0.009]	[0.007]	[0.016]
Capitalization	1.247**	1.283**	1.241**	1.249**	1.227**
	[0.508]	[0.520]	[0.488]	[0.507]	[0.483]
Liquidity	0.584***	0.586***	0.594***	0.589***	0.600***
	[0.129]	[0.129]	[0.130]	[0.129]	[0.128]
Size	-0.149***	-0.146***	-0.145***	-0.148***	-0.141***
	[0.039]	[0.039]	[0.039]	[0.039]	[0.040]
MP×capitalization	-0.090	-0.088	-0.228	-0.102	-0.307**
	[0.180]	[0.179]	[0.210]	[0.178]	[0.139]
MP×liquidity	0.000	0.006	0.012	0.006	-0.076**
	[0.086]	[0.091]	[0.140]	[0.090]	[0.035]
MP×size	-0.002	-0.001	-0.008**	-0.002	-0.003*
	[0.003]	[0.003]	[0.004]	[0.002]	[0.002]
MP×capitalization×type	-0.480	-0.566	-0.055	-0.042	0.173
	[0.692]	[0.478]	[0.263]	[0.352]	[0.326]
MP×liquidity×type	-0.837**	-0.063	-0.049	-0.199*	0.171
	[0.333]	[0.142]	[0.133]	[0.110]	[0.190]
MP×size×type	-0.033	0.013	0.006	0.002	0.029
	[0.020]	[0.010]	[0.005]	[0.008]	[0.025]
GDP	0.024***	0.025***	0.025***	0.025***	0.025***
	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]
Constant	-0.019	-0.022	-0.025	-0.023	-0.021
	[0.046]	[0.046]	[0.043]	[0.046]	[0.042]
Observations	967	967	967	967	967
R-squared	0.157	0.158	0.162	0.157	0.172
Number of banks	170	170	170	170	170

Table 6.
Estimations by ownership type with lending rate

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

	Big5	Joint-stock	CCB	RCB	Foreign
Specification	(1)	(2)	(3)	(4)	(5)
MP	-0.031***	-0.028***	0.007	-0.030***	-0.043***
	[0.007]	[0.007]	[0.015]	[0.007]	[0.006]
MP×type	0.024	-0.043	-0.051***	-0.028*	0.109***
	[0.087]	[0.030]	[0.018]	[0.015]	[0.024]
Capitalization	1.141**	1.131**	1.103**	1.141**	1.027**
	[0.483]	[0.503]	[0.462]	[0.484]	[0.426]
Liquidity	0.565***	0.564***	0.565***	0.574***	0.580***
	[0.122]	[0.121]	[0.123]	[0.121]	[0.122]
Size	-0.149***	-0.149***	-0.143***	-0.149***	-0.139***
	[0.037]	[0.037]	[0.037]	[0.037]	[0.036]
MP×capitalization	-0.309	-0.314	-0.610**	-0.318	0.047
	[0.238]	[0.244]	[0.280]	[0.239]	[0.172]
MP×liquidity	0.139	0.146	0.188	0.151	-0.001
	[0.154]	[0.161]	[0.233]	[0.158]	[0.050]
MP×size	-0.008**	-0.006**	-0.022***	-0.008***	-0.005**
	[0.004]	[0.003]	[0.005]	[0.002]	[0.002]
MP×capitalization×type	1.875**	0.462	0.587	0.150	-1.113***
	[0.728]	[0.448]	[0.362]	[0.607]	[0.423]
MP×liquidity×type	-0.536	0.040	-0.166	-0.432**	0.234
	[0.436]	[0.188]	[0.232]	[0.189]	[0.271]
MP×size×type	-0.002	0.014	0.017**	0.008	-0.039
	[0.025]	[0.009]	[0.007]	[0.015]	[0.032]
GDP	0.027***	0.027***	0.027***	0.027***	0.028***
	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]
Constant	-0.050	-0.054	-0.054	-0.053	-0.061
	[0.046]	[0.045]	[0.042]	[0.046]	[0.038]
Observations	968	968	968	968	968
R-squared	0.169	0.170	0.181	0.170	0.201
Number of banks	170	170	170	170	170