

Master Thesis within Economics

Department of Economics

School of Economics and Management  
(LUSEM)

Lund University, Lund, Sweden

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# Bank Lending Channel of Listed Banks in China

## -- Bank Level Panel Data Analyses

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**Lund, Sweden May 2015**

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## Master's Thesis in Economics

Title:	Bank Lending Channel of Listed Banks in China
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Date:	May – June, 2015
Keywords:	Monetary Transmission Mechanism, bank lending channel, monetary policy, banking sector
Number of Pages:	61 pages in total including misc. parts

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## Abstract

The Bank Lending Channel, proposed by Bernanke & Blinder (1988), among other transmission mechanisms, is hypothesized to exist in China because of the dominance of the Chinese banking system. This paper mainly investigates the effect of monetary policy rate change on the lending behavior of Chinese banks. The study firstly used the aggregated data of all banks including policy banks, commercial ones and rural credit cooperatives, it found no evidence of bank lending channel on the aggregated level, due to the influential of state direction rather than rate change's impact. In contrast, using the bank-level balance sheet data from all sixteen listed banks in China, which allows a detailed investigation on how banks may differ in their responsiveness to a policy rate shock. It found evidence to support bank lending channel (BLC) in the panel level. At the disaggregated level, BLC existences were also found for the Joint-Stock Commercial Banks (JSCB) and medium-sized ones, while no evidence was found for the State-Owned Commercial Banks (SOCB) or the larger and smaller peers. The SOCBs and JSCBs also differ from each other in terms of the deposit/loan ratio's impact over the loans due to their difference in the composition of funding sources.

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## Table of Abbreviations

<b>PBOC</b>	People's Bank of China
<b>SOCB</b>	State-owned Commercial Bank
<b>JSCB</b>	Joint-Stock Commercial Bank
<b>RCC</b>	Rural Credit Cooperatives
<b>RRR</b>	Requirement Reserve Ratio
<b>MTM</b>	Monetary Transmission Mechanism
<b>BLC</b>	Bank Lending Channel
<b>CBRC</b>	China Banking Regulatory Commission
<b>CSRC</b>	China Securities Regulatory Commission
<b>CIRC</b>	China Insurance Regulatory Commission
<b>NPL</b>	Non-performing Loans
<b>SOE</b>	State-Owned Enterprises

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## I INTRODUCTION

Theoretical foundations of the monetary policy transmission mechanisms include four main channels via which the central bank could affect the real economy by using monetary policy tools. Namely these channels are: the interest rate channel, the exchange rate channel, the asset channel and the bank lending channel. Among which the Bank Lending Channel (BLC) proposed by Bernanke & Blinder (1988), is most significant in countries with an under-developed financial sector which relies heavily on the banking system. Because of this reason and the dominance of China's banking system, it is hypothesized that the BLC should be most suitable for the study of monetary policy of China. In the context of China's interest rate marketization and its monetary policy reforms, the understanding of the transmission channel is with particular importance.

BLC implies that policy indicator should have a significant impact on bank loans. Under a more strict empirical examination, it should also be able to prove additional two effects: policy rate over the bank deposits and the impact from bank deposits to bank lending. These are also the hypotheses this paper would test.

In China's case, this paper had chosen the reserve requirement rate RRR among others as the policy rate. The model specification also controlled for effect from the demand side. Moreover, four bank balance sheet indicators and their interaction terms with the RRR are added into the model for the investigation of potential individual bank-level effect.

Because of data quality and frequency, this study will test the aggregated of all banking institutions of China, but will focus on the sixteen listed commercial banks and their disaggregated levels. There are in total sixteen of them in China: five are State Owned Commercial Banks, eight Joint Stock Commercial Banks, and three City Commercial Banks. As the end of 2015Q1, these banks totaled to more than 60% in assets of all China's banking financial institutions. Therefore, their result should be indicative.

The study found no evidence for BLC using the aggregated data from the People's Bank of China, the central bank of China, which may be explained by the administration policy's heavier impact than the monetary rate's effect.



Using quarterly data from 2000Q4 to 2015Q1 obtained from balance sheet, the regressions are estimated with a random effect model accounts for balance sheet indicators. The study found evidence of BLC at the pooled level. On a disaggregated level BLC evidence was found most significant for JSCBs and medium-sized ones, while no evidence for state-owned banks or large and small peers. The state banks and joint-stock ones differ on the deposit/loan ratio's impact over the loans. For example, the sign of deposit/loan ratio's parameter of SOCB tested to be positive but negative for JSCB. This may be explained by relative high variety of financing of the JSCB.

This paper will firstly provide with a background of China's monetary policy structures, and brief overview on its banking system. Then a review of previous theories and empirical studies on BLC. In Section 4, the econometric model and data section, followed by the empirical results. Finally concludes with a discussion of the result and the limitations of this thesis.

## 2 BACKGROUND ON CHINA

Since the 1970s, China has undergone enormous economic transforms and continuous GDP growth. Financial liberalization and institutional development, however, has been gradual and the financial sector remains as one of the most regulated industry today, in which, the state banking sector dominates the financing for economic growth. The interest rate as target would be eventually the case as further reforms happening (Chen and Tang 1994, Wu 2002). Thus, how the central bank of China, People's Bank of China, or PBOC's policy rate influence the economy is crucial to be understood, since it is the main monetary policy authority (Appendix figure A-1 for the authority structures).

### 2.1 Monetary Policy

Before the reform and opening-up policy, the PBOC under mono-banking system had enjoyed basically direct control over all the currency and credits in the economy. Even years after the 1984's break up, until to the 1990s, PBOC still could use the currency and loans as their main policy tool, as it can influence them indirectly via the SOCBs major dominance (Chen and Werner 2011).

It was from the early 1990s that the dominance of SOCBs had been seen trembled as more sources of financing emerged. The authority decided to switch from such direct/indirect regulation on credit and currency to intermediate targets such as monetary aggregate, credit and policy rates (The US State Council, 1993). Chen and Werner (2011) suggested that even before 1990s, the CB had already, in operation, implemented such practice. Later, in 2004, the PBOC abandoned the quantity of money as the intermediate of monetary policies. Instead, the central bank targets the interest rates, it also managed to fix the exchange rate but later allowing it to float with limits (Dai 2006).

More contemporarily, the main policy tools for PBOC are open market operations, reserve requirement, 'windows guidance' of lending and other policy rates (PBOC). However it is subject to argument, which one is the primary tool by the PBOC- most economists are for the benchmark one-year lending rate and reserve requirement rate

(RRR). Some studies found out a mixture of them to be significantly affecting the economy. Others are for the very short-term one like the overnight rate that some argues PBOC was using increasingly (Ma 2014), one day it may even become the policy tool that is equivalently important to the Fed Funds Rate of the US or the repo rate in UK (for a comparison of main tools, see appendix figure A-2). This paper has checked PBOC's announcements, the benchmark lending rate, and the reserve requirement rate are the most frequently used ones (Table 2.2, an overview of monetary policy by PBOC from 2010 to 2015Q1).

From the announcements, there are few observations made. Firstly the increase of reserve requirement rate, or RRR, was most frequently used. For example, for contractionary purpose, in 2010 PBOC has raised it six times; in 2011, again RRR has been raised by six times; for expansionary, at the year-end of 2011, a lowering the RRR; In 2014-2015, the reduction of RRR had also been commonly used, with the supplements of interest rate cuts.

Secondly, PBOC also gives preferential rates and special treatment to Rural Credit Cooperatives (RCC) and agricultural lending, in most contractionary cases they've been excluded.

Additionally, the PBOC gradually lead interest rate marketization by using a dual-track system- a benchmark rate with upper and lower limit for the market rate- "control the upper limit for deposits and lower limit for loans".

Noticeably in July 2013, PBOC removed the lower limit for lending rate for all banks. While Bank of International Settlement (2008) gives thumbs-up for China's steady marketization of interest rate and reforms of the financial sector, Dobson & Kashyap (2006) argues that the gradual dual-track system are too less too slow, making policy less effective. Market researchers also found that few loans are priced below the benchmark rate, but they anticipate more reforms in the near future (BBVA 2013).

Another problem is, by the Central Bank Laws of China, the PBOC's monetary policy object is the maintaining of 'stable currency value and economic growth'. However, due to the widely known Obstfeld & Taylor (1997) trilemma- any central bank cannot have all three at the same time: fixed exchange rate, free capital flow, and efficient monetary policy. Therefore, economists argue that current policies by PBOC are not sustainable.

Moreover, unlike what the central banks do in the west- using more price-based policy tools to influence market rates and expectations, the PBOC and relative government agencies in China set the benchmark rates and limits, which the market itself may or may not react accordingly, so PBOC have been using quite a mix of policy instruments to influence the market such as open market operations, reserve requirement, benchmark rates, central bank's re-lending re-discount, window guidance and standing facility (short, medium and long term) etc. The mix could leave the market expectations impaired, argued by Morgan Stanley Research (2014).

Policy advisors (McKinsey 2006) voiced for the relaxation of capital flow to create more funding and investment channels. Increasing competition could also drive up the efficiency of the state banks by a large extent. IMF (2014) suggested that authority should be more cautious to the banking risks, especially local governments' debt problem, given the anticipated slowing economic growth in the coming years, reform of the financial system is challenging, but also a must-to-do.

Table 2-1 Monetary Policy by PBOC 2010-2015

Date (from latest to oldest)	Monetary Policy (+/- indicates increase or drop)
2015 - May 10	One-year lending rate - ; one year deposit rate -, upper limit of deposit rate + (now 1.5 * the benchmark rate)
Apr 19	Reserve requirement rate (RRR) -, RRR – more for banks with agricultural loan ratios meets standard and Agricultural Development Bank
Feb 28	One-year lending rate - ; one year deposit rate -, upper limit of deposit rate +
Feb 04	Reserve requirement rate (RRR) -, RRR – more for banks with SME loan ratios meets standard and Agricultural Development Bank
2014 – Nov 21	One-year lending rate - ; one year deposit rate -, upper limit of deposit rate +
Aug 27	Credit to branches to promote agricultural landings and poor area landings
June 09	promote agricultural landings and SME landings
Apr 22	RRR _
Jan 20	Liquidity support to Medium-small financial institutions (overnight, 7 day, 14 day products)
2013 - Jul 19	Interest rate marketization. <b>Removal of lower limit of lending rate.</b> For rural credit cooperation, removal of upper limit of lending rate.
2012 – Jul 5	One-year lending rate - ; one year deposit rate -, lower limit of lending rate to 0.7 of benchmark rate
Jun 7	One-year lending rate - ; one year deposit rate -, lower limit of lending rate to 0.8 of benchmark rate
May 12	RRR -
Feb 18	RRR-
2011 Nov 30	RRR -
Jul 6	Deposit rate and lending rate +
June 14	RRR +
May 12	RRR +
Apr 17	RRR +
Apr 5	Deposit rate and lending rate +
Mar 18	RRR +
Feb 18	RRR +
Feb 8	Deposit rate and lending rate +
Jan 14	RRR +
2010 - Dec 25	Deposit rate and lending rate +
Dec 10	RRR +
Nov 19	RRR +
Nov 10	RRR +
Oct 19	RRR +, deposit and lending rate +
May 2	RRR +
Feb 12	RRR +
Jan 12	RRR +

\* Source: PBOC announcements

(<http://www.pbc.gov.cn/publish/english/955/index.html>)

## 2.2 Chinese Banking System

The 1978's introduce of 'reform and opening-up policy' gradually changed various aspects of China, including the financial sector. The 1979's break of the mono-banking system has separated commercial banks from the central bank, marks the start of the commercialization of the banking system. The central bank took the role of monetary policy setting and regulating functions. Not until the early 2000s, did the China Banking Regulatory Commission and China Securities Regulatory Commission (CBRC & CSRC) take over the regulatory power.

During the following years of early development of the country, state-owned commercial banks, enjoyed nearly no competition from others, they, together with the central bank, had been under tight lead by the state to accommodate the needs of various infrastructure projects and to finance state-owned firms' development. It is not until 1995 that China had its laws on central bank and commercial banks. The laws recognized the independent role of the central bank, at least on paper. They also supported the progress of commercial bank liberalization. Dated to 1998, the central bank has finally abandoned mandatory credit control, replaced by 'guidance of the state', which is a looser and softer 'encouragement' to promote lending over certain locations, sectors or firms.

Due to the repression over interest rates and limited competitions in early years, the state-owned commercial banks, SOCBs have developed into the de facto dominators. As for 2014Q1, SOCBs accounted for 43% (and more than 50% in some periods) the majority of total assets of banking financial institutions, according to CBRC (2014) statistics. Apart from the financial repression, Justin Lin & Zhang (2006) further argued that the state support in the early reforming years, has contributed a lot to their dominance later on. Although all types of banks had been developed largely in the last years, as in 2014, 11 Chinese banks are among the Fortune 500 list, in which the five SOCBs are particularly ahead. The big five controlled 75% of capital in the country and accounted for 63% of the net profits of the whole banking industry. The heavy weight of state banks comes with problems.

Lin & Zhang (2006) argued that due to SOCB's the soft budget constraints and loan directions by the governments, has put negative impact on their performance, efficiency

and has raised the level of non-performing loans (NPL). They also favor for the giant state-owned enterprises (SOE) in lending, while for SMEs it is hard to get bank credits (Lin & Li 2001), SOCBs and SOEs go hand in hand in the bank lending as the implicit backup by the state, and for these loans, NPL ratios are very high (Allen, Qian & Qian 2006). Dobson & Kashyap (2006) were among the many economists that vocally against the 'policy loans' of China, calling it the 'Achilles' heel' of the Chinese economy. Such practice also pushed out many non-state firms to seek credit in informal channels. Although the official NPL ratio was as low as 1% in 2013 1.3% in 2014, BNP estimated that ratio now hitting up to 7%+ (SCMP 2015), Tsai (2002) estimated the shadow financing counted for 1/4 of all financial transactions. Reports also say banks had either removed, or re-categorized large part of the NPL from the book, making it worse with the riskiness could potentially spread over the whole financing system (IMF 2014).

Nevertheless, the state banks are not without competitors, with the financial reforms the traditional State Owned Commercial Banks, has been getting more competitions from other Joint-Stock Commercial Banks, or JSCBs and private banks. The very first private bank in China established in 1996, and other players joined the crowd since then. Apart from them, the three state policy banks, city banks, postal savings, rural credit cooperatives and other financial institutions have gradually entered the market.

Although their smaller in size, as JSCBs only accounts for 18% of total assets, due to their independence from the state and close relation to the market, they could respond differently to state policy (Table 2-3 for a summery). For example, the state council directly in charge of policy banks, and majority of their funding comes from the government, so their deposit and loan don't necessarily have any reaction to rate change as BLC proposed, rather, their lending decision are more state-led, at preferable rate levels. As for SOCBs, the very large ones, they should not be so responsive to policy rate either, since they are large in size, abundant with capital and cash, their lending and deposit are more prone to their own internal efficiency of allocation, marketing. However, SOCBs may react more on policy like 'window guidance' as state as their owner, a U.S. Congressional Research report (Martin 2012) recognized this. However, to the smaller JSCBs and some of the city commercial banks, due to limited access to capital (cannot compete with state players in drawing deposit) and their targeted market (some are local), they may be more sensitive to rate change, as they have to

accommodate with the market in order to survive. On the other hand, their funding sources are with more variety, so the deposit should not be that responsive compared to the lending. Lastly, for the even smaller banks and rural credit cooperatives, they are very local focused and their main target is to agricultural-related loans, less reactive to market or policy environment (Ong 2013). They are actively promoted by the state with preferable treatment on policy rates, most of cases in rate change they are excluded (Table 2-2), so they are the less sensitive ones to rate change. This paper will test the difference of SOCK and JSCBs, Large vs Small banks.

Table 2-2 Constraints and Ownership by Bank's Type

	Policy Bank	SOCB	JSCB	Rural Credit Cooperation
Object	Policy-led lending, for state-promoted development projects/sector/area	Commercial Lending	Commercial Lending	Commercial Lending
Ownership	State	State	Mixed	Collective
Political Independence	Low	Low-Medium	High	Medium
Budget Constraint	Soft	Medium	Hard	Hard
Policy Rate Sensitivity	Not sensitive to rate change, but direct policy lending decisions from the state.	Not sensitive to rate change- the giant assets they have provided more funding	Sensitive, they have limited capital so rate changes should impact more on them	Not sensitive, they are promoted by the state; so in most cases of policy rate change they are excluded.

Source: Andersson et al. (2013), except the last row.

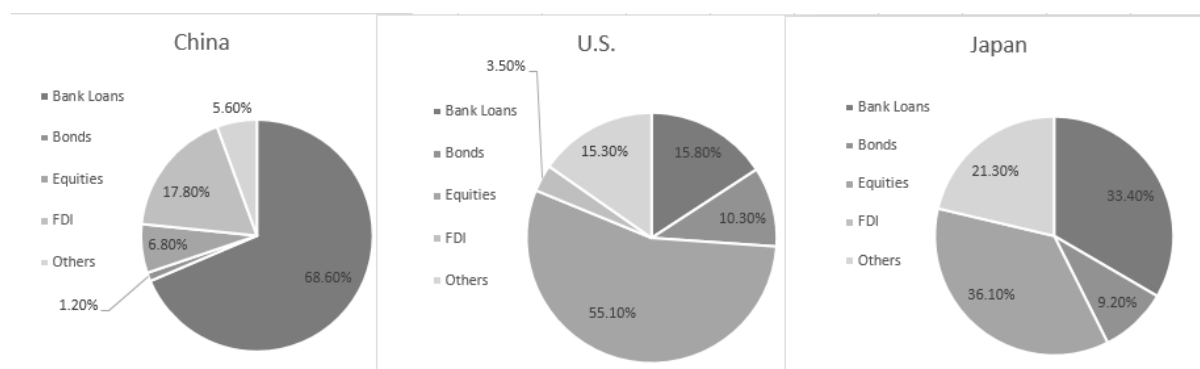
Lastly, apart from banking system, borrower and investor could choose from, other financing channel like the stock and bond market are with limited size. According to CSRC, the China's Security Regulatory Commission, 60.3% of the shares are non-tradable. The tradable market capitalization to GDP ratio is merely 0.16 (Pistor & Xu 2005), only a comparable level of the average transition economies of Eastern Europe, and far behind developed states. According to the same statistics, the size of the bond



market is as small as the tradable stock shares. That may be contributed to the tightly controlled quota IPO system, high listing requirement, weak protection of shareholders and weak policing, as Porta et al. (1997) claimed. As a result, they are not the prime financing source for firms seeking loans, nor they are major investment target for the public. It is widely known that China has one of the highest private saving rate in the world, the household saving rate raised drastically during the 2000s. It is now well above 30%, and the marginal propensity to save is at 50%, according to study by the Bank of International Settlements (BIS 2010). Accordingly, the stock market, the bond market and other financial products, remained at a limited degree and this would put constrain on the monetary policy transmission (Morgan Stanley 2014). The size of non-bank financing in China only counts for less than 10% of the whole financial intermediary market, compare to a 30% level in Britain and a 60% of the US (IMF 2014, Appendix figure A-3). The banking system is still the first, and many may say the only place to go for borrower and investor in China. According to PBOC, the size of bank credit is 128% of GDP, while around 40% for stock market. In terms of business liabilities, majority of them 68.6% are to the banks, while bond, equity and other financing accounted to only 13% (see Figure 2-1).

Under these particular conditions of China, namely, the dominance of commercial banks in lending, and the frequently used policy tool- interest rates and reserve requirement rate, the bank lending channel, should in theory more relevant to Chinese monetary policy environment, and due to the reasoning above, different types of bank may differ in their responsiveness to policy rate changes. Whether it is true with empirical evidence or not, is left to be studied.

Figure 2-1 China' Rely on Bank Loans - Composition of Business Liabilities



\* Source: RAND (2007).

### 3 THEORY & LITERATURE

This part will introduce the theoretical foundations associated with the monetary policy transmission mechanisms and elaborate why in China's case the Bank Lending Channel is the most relevant one and to be studied. Then this section provides a review of some previous influential empirical studies based on such theories.

#### 3.1 Monetary Transmission Mechanism (MTM)

The monetary authority uses policy tools to influence monetary aggregate targets such as money supply, various type of interest rates, bank loans and sometimes the exchange rate, to fulfill their macroeconomic goals. However, with regard to how exactly this chain of effect works- from policy to targets, from targets to real economy, economists have identified different channels based on different point of emphasis (Abel & Bernanke 2008). They are, in name, the interest rate channel, the exchange rate channel, the asset channel and the bank lending channel (the main channel under the credit view). Hereby this section will have them reviewed, mainly focused of the Bank Lending Channel, and the interest rate channel that had been the foundation of other channels. For a more intuitive overview, diagram and a summarized table will be provided using the contractionary monetary policy as examples (Figure 3-1 & Table 3-1).

#### The Interest Rate Channel (IRC)

Almost all economic textbook would date back the very first study on the mechanisms regarding monetary policy to the earliest as the Keynesian theory. The IS-LM structure (Hansen 1953) provided with a model demonstration and since then, has become the cornerstone for other major channels. According to the classical theory, monetary policy of a country is associated with the costs business borrow to reinvestment and also affect more or less consumer will spend (Mishkin 1995, 1998). Under this model, the LM curve (demand for money) is the function of national income and interest rate, assuming that cash and deposit/bond being perfect substitutions, money supply is exogenously set by central banks and price level being constant. Therefore, if a central bank increase its money supply by buying domestic bonds, that'll shift LM curve to the right. Price level in the short term is slow to adjust, such a movement will translate into

lower short-term real market interest rate, which for firms and households, lowered borrowing cost and return to deposit. Finally, the economy reaches at a higher income level with a lower interest rate. But for a fixed exchange rate regime, or a managed floating system like China's, LM curve will shift back when the central bank attempts to maintain the exchange rate then the monetary policy would be ineffective (Young & Zilberfarb 2000).

Wapshott (2012) pointed out that scholars disputed on this channel. Still, it is quite important as the underline theory and logic for other channels to build upon. Oppositions led by Bernanke & Gertler (1995), however, found no empirical evidence to support the interest rate channel, they augmented it with the Bank Lending Channel. While Taylor (1977, 1993) improved it by arguing interest rate is a function of inflation and output and they are associated with expectations. McCallum (1979), on the other hand, differed with Taylor suggesting monetary base targeting rather than interest rate targeting. The potential problems with the interest rate model, opponents argued, are: Firstly, investment and consumption's sensitiveness to interest rate is constrained by the slope of the IS curve. Moreover, new equilibrium is associated with an inflation/deflation level which is hard to forecast, and may have unexpected effect; the classical assumption of the model such as closed economy are not applicable anytime anywhere. Further, due to 'liquidity trap' (Bernanke et al. 2004), where under very low level of interest rate, central banks fail to cut interest rate any further. Agreed with all these objections, Hannsgen (2006) recommended that interest rate channel should be considered to be with a stabilizing effect rather than a 'gas paddle' to the economy.

### **Exchange Rate Channel, ERC**

With the globalization and economic integration, later theories of Fleming-Mundell, Dornbusch, and the New Keynesians, had associated the monetary policy with open economy situation. The policy change would have an additional effect through the exchange rate over its exporting/importing counterpart (Krugman, Obstfeld & Melitz 2012). When the domestic country raises its interest rate, it will break the interest rate parity between the two economies. A rising rate is a natural incentive to the inflow of funds into the investment in domestic currency that would drive up the price of domestic currency. Again, the domestic prices are slow to adjust, so that the relative

price of domestically produced goods are more expensive than foreign ones. Demand for domestic goods decreases and the state as a whole would see a drop in net export and a drop in aggregated output.

Compared to the interest rate channel, the higher domestic price level will be offset by the appreciation of its currency, thus the inflation problem with the former model is less grave. Theoretical and empirical studies by Taylor (1995), Obstfeld & Rogoff (1995) had recognized its importance. On the other hand, the magnitude of such impact is positively related to the openness level and demand elasticity of the products so that the policy shocks can be difficult to accommodate. Due to the reason that countries differ from each other in exchange rate regimes and capital flow controls, this channel is relatively less studied and harder to be as a central bank's monetary policy model (Taylor 1995).

### **Asset Price Channel**

Advocated by the Monetarists and opponents to the Keynesian theory, they thought that the previous models had constrained to the short-term with assumption of price stickiness, the two channels also over-simplified borrowing cost to interest rate alone (Snowdon & Vane 2002). The monetarists as summarized by Meltzer (1995), emphasized the importance of the policy spillover to variety of markets and on people's financial wealth. For instance, stock price, financial assets, property, and goods market- all their prices could be influenced by the monetary policy change. Tobin (1969) focused on equity valuation and investment, whereas Ando & Modigliani (1963) on the wealth and consumption.

Tobin's 'q ratio' is the stock market valuation divided by replacement cost of physical capital- a higher q means equipment and resources are relatively cheap relative to firm's valuation. Under a nominal interest rate increase, i.e. a monetary tightening, it will make the money supply drop relative to demand, the public has to cut their spending and investment to accommodate making the equity prices including stock price to fall. So does firm valuation, which makes 'q-ratio' to a lower level. Thus firm investment spending again drops since it is relatively more costly. The market as whole, contracts. Ando & Modigliani argued rather than firm valuation and investment, people's wealth is the major impactor of consumer spending. Then contractionary policy would shrink

financial wealth of the public, understandably that would decrease their consumption levels, such process will eventually cool down the real economy.

### **Bank Lending Channel**

Bernanke & Gertler (1995) found no evidence to support the interest rate channel and built the Bank Lending Channel (BLC) upon its underlying theory with a recognize of the critical role of banks. Two channels under credit view differ with each other very slightly: bank lending channel and the balance sheet channel. Arestis & Malcolm (2006) found that BLC, among other channels, most relevant to most countries in the world.

Kashyap & Stein (1994) explained the bank lending channel's (BLC) importance in situations where bank lending, or the credit market, provides the primary source of financing to firms and households. For example, larger firms could issue stock shares or bonds to the public to raise more capital. Nevertheless, for small businesses, there exists an asymmetric information problem regarding financing, thus banks can play the critical intermediary role- matching borrowers and lenders.

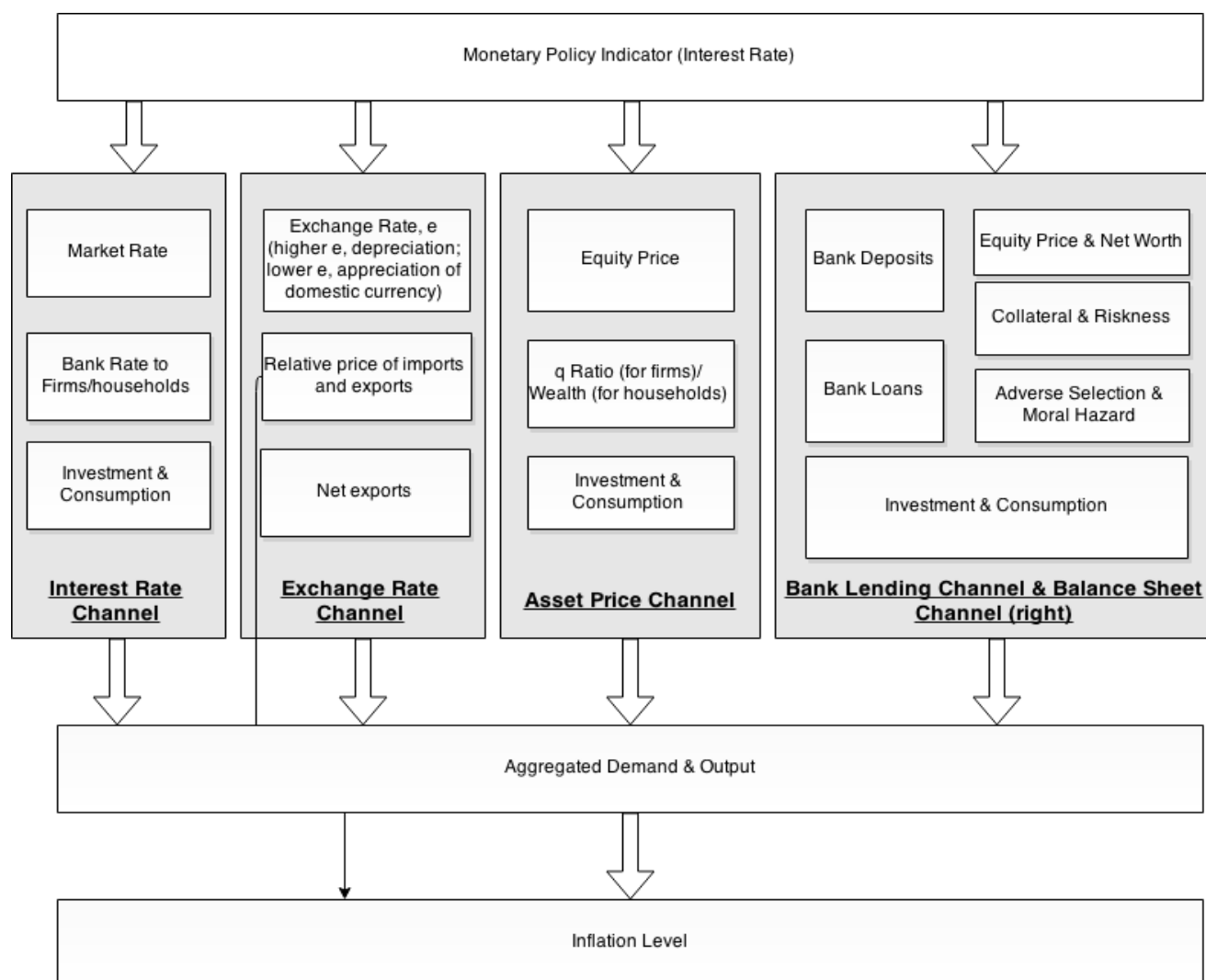
In the example of monetary expansion, the raised money supply would increase bank reserves and deposits, thus for banks, their sources for lending is more abundant, which will increase bank credit. For borrowers now with more financing, they could invest more, and the economy as a whole will see growth in its output.

Bernanke and Gertler also proposed the balance sheet channel, which related more of adverse selection and moral hazard, but later researchers had focused mostly on the BLC as Arestis & Malcolm (2006) argues that it has the most evidence to support.

Bernanke claims that the theory applies to private consumers as the investment of the firms. Moreover, banks depending less on the deposits may react less to policy; firms who depend less on the bank landings are also less sensitive to policy; financial market imperfection is related to higher response sensitivity (Ireland 2008).

In the context of China, still dominated by the bank lending and especially landings from the state banking system, it is important to see if the BLC exists in China and how banks react differently.

Figure 3-1 Monetary Transmission Mechanism - *Transmission Channels*



*Influence Direction within channel is from above to below, influence direction see the following table;  
Based on Arestis & Sawyer (2006); Mishkin (1995, 1998); Abel & Bernanke (2008)*

Table 3-1 Transmission Mechanism by Channel, in Simplified Scheme

Channels	Monetary Contractionary: + for increase, – for decrease
Interest Rate Channel	For closed economy; monetary policy not effect under fixed exchange rate regime; not effective with very low interest rate level; higher inflation hard to be forecast. MS - $\rightarrow i + \rightarrow I \& C - \rightarrow Y +$
Exchange Rate Channel	Not suitable for fixed exchange rate regime and country which has capital control. MS - $\rightarrow i + \rightarrow e - \rightarrow \text{Net exp} - \rightarrow Y -$
Asset Price Channel	Focuses more on stock market and financial wealth. MS - $\rightarrow P - \rightarrow \text{wealth}/q\text{-ratio} - \rightarrow I\&C - \rightarrow Y -$
Bank Lending Channel	For under-developed financial sector with high dependence on banking system. MS - $\rightarrow (P - \rightarrow \text{adverse selection \& moral hazard} +) \rightarrow \text{deposits \& loans} - \rightarrow I\&C - \rightarrow Y -$

*The monetary expansionary policy works the opposite; MS denotes for money supply,  $i$  is the interest rate,  $I \& C$  the investment and consumption,  $Y$  output,  $e$  the exchange rate (higher  $e$  means domestic currency depreciation),  $P$  is the price level.*

### **3.2 Previous Empirical Studies**

As mentioned earlier, the BLC was firstly introduced by Bernanke & Blinder (1988), they proposed the BLC, which emphasized the critical role of banks. They claim that a monetary contraction policy would reduce the deposits of banks and require more reserve money to the central bank, thus the liability side's shrink would cause the asset side's decreasing, so does the scale of loans.

The empirical framework by Bernanke & Blinder and further developed by Taylor (1995), Kashyap & Stein (1994), provided foundations for researchers to come, and indeed in many countries, empirical evidence were found to support the BLC. They proposed that by testing how the monetary policy rate affects the loan growth provided only moderate BLC evidence. For further identification of BLC, it should also be approved that the policy indicator also moves the deposit, and thirdly, changes in the deposit are associated with changes in loan growth. Based on the foundations, studies on various countries had found evidence supporting the BLC.

The aggregated level model was developed by Bernanke & Blinder (1992) in testing their BLC theory on the US banking system. Kashyap & Stein (1994) found that using bank-level data can control for other effects thus solve the identification problem, so they developed bank-level empirical framework, in a later inquiry on the US commercial banks, which has ambitiously used quarterly data of every single insured US banks from 1970s to 1993- summing up to one million of observations. They found for banks with lower security to asset ratio, reacts stronger to policy change, this finding was especially significant for those very small banks.

On the other side of the Pacific, Bondt (1998) investigated six continental European countries 1990 to 1995. Bondt found that Germany, Belgium, and the Netherlands showed strong BLC evidence, Italy and France less so. While interestingly the BLC does not exist in the UK, where the author presumes that the demand factors dominated the British bank lending. Later research of the countries (Altunbas, Bondt, Ibariez 2004) using the data from 1991 to 1999, it produced similar results, but they also found the capitalization and Basel capital requirements can also affect BLC. For the Scandinavia, more recently Westerlund (2003) of Sweden used monthly data to capture the short-term reactions. He controlled for the demand side effect using (two-period-lagged)

GDP indicator, and found that twelve Swedish banks are in line with BLC hypothesis. Banks with less liquidity and less capital react significantly to policy shocks.

As the integration process of the European countries, Campa & Minguez (2006) found that the pass-through via BLC in Europe is relatively slow and differ from different financial product and varies country by country. For new EU members, Jimborean (2008) covered 10 central and eastern European states from 1998-2006, this study found that bank size and liquidity have a significant effect over the BLC, while capitalization to be insignificant.

Olivero, Li & Jeon (2010) in their works for twenty Asian and Latin American countries including China using annual data from 1996-2006, found that they are largely showed BLC evidence. They also introduced the bank competition indicators that posted result suggests that increasing competition has a negative impact on monetary policy's effectiveness. Other countries' evidence found to be supporting BLC including Zambia (ADB 2014), Chu & Lin (2005) for Taiwan.

Regarding China specifically, Chen & Gerlach (2011) rules out interbank rate as policy stance and argues the require reserve rate and open market operations are the significant policy tools by the PBOC. Sun, Ford & Dickinson (2009) using data from 1996-2006 and VECM model, found evidence to support all three channels in the transmission of China's monetary policy. They also concluded that policies like 'window guidance', besides the one-year lending rate and reserve rate, are significant in influencing loans.

More detailed papers on MTM from bank-side angle were mainly concerning the western world, particularly the European Union, since the union members experienced the transition into one single monetary authority, but result varies a lot in how banks accommodate those policies. However, former studies on China were more concerned on the monetary aggregates as variables, since, at that time, the PBOC was still targeting the money rather than the rates.

From the banking sector level, this research would be more detailed on how banks adjust loans. Having a strong state banking sector, it is also important to investigate how different types of bank react differently to policy fluctuations. This paper made such efforts by using publicly available balance sheet data of Chinese commercial banks to identify the bank-lending channel.



## 4 ECONOMETRIC MODEL & DATA

Using two sets of data- aggregated one and a disaggregated panel data of all sixteen listed commercial banks<sup>1</sup> of China, this paper tries to identify how bank loans and deposits react with an exogenous policy shock.

### 4.1 Econometric Model

Based on Kashyap & Stein (1994), Kishan & Opiela (2000). The following model was prepared to be used to test the reactions to monetary policy shocks. This model regresses the loan change over the policy rate shock, controlled for the lasting effect from last period, also, it controlled for the demand side effect by using Demand terms. Further, this paper contributes the Bank Characteristics terms and their interaction term with policy rate, into the model to investigate how banks may react differently.

$$\Delta \log Loans_{it} = \sum_0^j \alpha Rate'_{t-j} + \beta \log Loan_{it-1} + \delta \log Depo_{it-1} + \theta Demand'_{t-1} + \gamma BankChact'_{it-1} + \sigma Interaction'_{it-1} + QtDum + \tau_i + \mu_{it} \quad (1)$$

Where  $i=1 \dots N$  as for individual banks;  $t = 1..T$ , indicates the quarter. *Rate'* is a vector of potential policy rates (PBOC's one-year lending rate, the PBOC overnight rate, and the reserve requirement rate) which are the main variables the paper is looking; *Demand'* is a vector of demand indicators (GDP growth and inflation rate); *BankChact* terms include four ratios: cash and reserve ratio, deposit-loan ratio, liquidity ratio and the deposit financing ratio. Due to the unavailability of seasonal adjusted data, the quarter dummies are also included for filtering out seasonality. The last two items are the between-entity error and the within-entity error.

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<sup>1</sup> In the bank category of the CSRC, the China Security Regulatory Commission, who oversees the stock market. <http://www.csrc.gov.cn/>

Argued by Gambacorta (2004), due to various reasons (such as contact binding, policy reaching), that the policy rate change would take time to have any influence on the dependent variable so that their lagged terms should be included. So does lagged terms of the loan and deposit themselves and lagged term of bank's own characteristics variables. Ehrmann et al. (2001), Kashyap & Stein (2000) argued that these explanatory items would be fine entering the model with one period of lag for better estimations. Considering the quarter data used by this paper, four lags for every term were tested, and results showed that lagged terms beyond one period had no significant influence on the model.

For the specification process of the model, VIF test for multicollinearity suggests the inflation term with a high level of multicollinearity. It may be explained by the fact that inflation rate would go to the same direction of the GDP growth very closely (as the Figure A-1 in Appendix shows), therefore the inflation term was removed in later regressions.

Moreover, for policy rates, as argued by previous studies in the previous part, the monetary aggregates were abandoned as a policy tool. After the post-crisis time's hike in M2, its growth has been very steady. So three main rates used by the PBOC were included. However, firstly the 1-year lending rate shows high close relation to the deposit rate and the overnight rate (Figures A-2 of Appendix), so that it is more efficient to remove the overnight rate, testing lending rate and the reserve requirement ratio, RRR. From various regressions, that the interest rate and its lagged terms were insignificant across the models, which is consistent with Dobson & Kashyap (2006)'s argument and Liao et al. (2013)'s empirical findings. Consequently, both rates were eventually removed and this paper only focused on the RRR change's effect on bank loans and deposits.

LLC test (Levin-Lin-Chu test) found that loan and deposit variables have unit root at level, but stationary at first difference. Therefore, that for loan and deposit variables first difference was applied to the data before estimations. Hausman test result was supporting the random effect model- which indicating that the variation across items is random and uncorrelated with the regressors (Arellano 2003).

Other methods like generalized method of moments, GMM, was also considered, but it fits more with the inconsistent problem under the situation that N is large to fixed T-

this dataset was not the case, further the moment conditions introduced by GMM may not bring much efficiency considering the relatively small sample (Arellano 2003), so a GLS estimation of the random effect model is sufficient. Breusch-Pagan LM test prefers the random effect model over OLS regression, no serial correlation, and cross-sectional dependence were found (the coverage of this dataset is less than ten years).

After the removal of the consistently insignificant lagged terms, and inflation term with high multicollinearity, the regression of model (1) was simplified into the test of Loan to the RRR, controlled for one-period lagged of: GDP, loan, deposit, bank characteristic ratios, and their interaction terms. By the introducing of interaction terms, which can also be regarded as a robust check on how the bank balance sheet indicators influence the policy rate's effectiveness.

To further investigate the BLC, two more tests are done: a second model putting deposit as the dependent variable, and a third model testing how loan growth reacts to the change in deposit.

Although the focus of this thesis is on commercial banks, and the listed firms accounted for a large proportion of the banking sector. For the purpose of interest, the paper also tested the aggregated banking sector to gain an outline of the banking system. After all, others, and most importantly policy banks, also play a significant role in the bank lending, especially after the loss of PBOC's direct control over the commercial banks. However, the individual data on policy banks were with poor quality and only on an annual basis, the availability of other smaller banks were even worse. The PBOC should have regulatory reports filled by all the institutions, however, were not publically accessible.

Using PBOC's aggregated data combining other policy banks and banking institutions over the same period. By lagging and differencing and various diagnostic tests, followed by procedures of Simonoff (2015), OLS models were tested with similar composition of variables, to ensure the consistency with previous models with panel data. However, the main interest of this paper is to investigate the listed banks, as their data are better in quality and quantity.

Based on the theories, BLC will be supported if the policy rate can significantly affect the bank loans. For better identification, if the policy rate can greatly affect the bank

deposits, and lastly is deposit change is associated with a change in bank lending. These led to the hypothesis that this study will test:

- Policy Rate should have a negative correlation with loans.
- Policy Rate should have a negative effect with deposits.
- Deposits should have a positive impact on the loans.

## 4.2 Data

The paper was intended to include as many banks as possible, and as frequently as possible. However, due to the trade-offs between data reliability, availability, and frequency, this paper would limit the dataset to those listed banks on the stock market of China, the Shanghai Stock Exchange and the Shenzhen Stock Exchange. Thus, the data can be found quarter-by-quarter, as they are required to submit the quarterly audited financial statement and balance sheet to shareholders and the public.

By checking with the security regulatory authority of China, that over the two stock exchanges, there are 16 banks listed in total, among which 5 SOCBs, 8 JSCBs and 3 city banks by the categorization of the banking regulatory authority the China Banking Regulatory Commission (CBRC)<sup>2</sup>, because that there are only 3 city banks, so that they were combined with JSCBs in this paper. The banks including: Industrial and Commerce Bank of China, Agricultural Bank of China, China Construction Bank, Bank of China, Bank of Communications, Citic Bank, Everbright Bank, China Industrial Bank Co., Merchants Bank, Pudong Development Bank, Minsheng Bank, Huaxia Bank, Beijing Bank, Ping'an Bank, Ningbo Bank and Nanjing Bank. Two of the banks listed in Shenzhen, while others listed in Shanghai Stock Exchange.

Data are from their balance sheet published on the investor relation web pages, from the security regulatory authority or other financial outlets. Public listing on stock exchange ensures the reliability of the data since the financial statements and reports

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<sup>2</sup> See the categorization at: <http://www.cbrc.gov.cn/chinese/jrjg/index.html>

must comply with universal accounting standards, the auditing process, and various regulations. Consequently getting data from the listed stocks ensured the data quality, quantity, and consistent frequency. Macroeconomic data are from PBOC, or via the FRED database by the US Federal Reserve. Detailed information see the data appendix in the end.

As for the 2015 Q1, these banks as a whole marks 62% of the total asset of all the banking financial institutions. So that this dataset is a prominent indicator for the banking system's reaction to the monetary policy.

The data, due to different listed time, and removing the breaks of the data, they are mostly from financial quarter of 2000Q4 to the latest Q1 of 2015, number of observations total at 613.

Besides the variables mentioned in the econometric method part, the model also includes the banks' balance sheet indicators, some of them were also under regulatory monitoring as the measurement of liquidity or business riskiness, they may have different effect by different banks (also see Table 2-3).

The cash and reserve share in total assets (cashrsv ratio), which is one of the core regulatory indicators in China, and being implemented by the Basel standards. As for this dataset, this ratio averaged 13%, which is above the minimal requirement by the regulatory commission (the higher ratio, the stricter control over risk). It is hypothesized that this ratio would be negatively related to bank loans, the higher the ratio, more reserve required, thus a contractionary policy.

The deposit/loan ratio, also a core indicator for banks. Under the situation of under-developed banking sector, the deposit and loan are the major part of the liability and asset side respectively; hence, the ratio could indicate the liquidity of the banks. The commercial banking laws set the upper limit to 75%, and this paper's sample averaged at 0.68. It is unknown how the ratio would affect bank loans, on the one hand the lower the ratio, more loans related to deposits thus could have continuous effect on loans; but a lower ratio also indicated lower deposit thus less funding for the loans.

The liquidity/asset ratio. It measures the proportion of liquid assets, which in this dataset, including cash, reserves put in the central bank, deposit in other banks and receivables in investments. This dataset averaged at 20%, and a large part of liquid assets is the reserve required by the PBOC. The ratio's impact depends on the

composition of cash and reserve, more cash may associate with higher loans, but a higher level of reserves indicated the PBOC's contractor stands.

Deposit financing ratio, which is the deposit / total debt rate, is an indicator of banks' diversity in funding sources- the less the ratio indicates a more diverse of the business. At an average at 78% (the banking sector average was as high as 89% in 2004), the commercial banks are still relying much on the deposit to financing loans and their business. The lower the ratio is, the more alternative funding the bank has, thus in theory less sensitive to the policy rate change.

### 4.3 Descriptive Statistics

As the tables on the next two pages showed the descriptive statistics of the panel data.

That firstly the difference between loan and deposits are not so significant between JSCBs and SOCBs. The size in terms of assets, however, SOCB average ten times of those of JSCB's. Out of the four balance sheet indicators, only the depo/loan ratio lower for SOCB, while other three are higher than their JSCB peers, nonetheless, that gap is very small.

In the tables in appendix, table A-3, and table A-4, the dataset was divided by their asset size into three groups- large, medium and small. The size categorization takes the average assets of each bank and divide them into three groups by percentile position of their asset value (see table below).

For this categorization, variables showed up very slight difference across groups, except the asset, the asset level largely tilts towards the big ones, they are almost eight times of the medium ones', and smaller banks are 1/3 of the medium banks. As a result, the regression result may suggest similar or minor difference regarding the effect of the corresponding variables.

From the plots of Asset, deposit and loan (from left to right, up and down of figure A-3). It is evident the increasing trend across the banks, and the five SOCBs are at much higher levels in all the three variables. The banking sector as a whole, also see steady increasing of the loan, deposit and asset levels (right bottom).

Table 4-1 Categorization of Banks

	Bank ID	Asset (average cross time)
Small	Nanjing	273 580 596 206
	Ningbo	276 996 238 196
	Pingan	746 456 131 576
	Beijing	864 916 200 935
	Huaxia	882 841 037 786
Medium	Minsheng	1 380 204 415 892
	Pufa	1 551 346 766 263
	Merchants	1 886 425 590 130
	Cib	2 144 028 693 477
	Everbright	2 148 442 260 650
Large	Citic	2 382 485 343 750
	Bankcomm (SOCB)	3 777 478 179 487
	BOC (SOCB)	10 204 736 527 778
	CCB (SOCB)	11 594 110 312 500
	ABC (SOCB)	12 897 200 454 546
	ICBC (SOCB)	14 383 456 363 636
	33.3333 th percentile	1 377 717 599 001.82
	66.6666 th percentile	2 380 144 912 919.00

*Nb. bank id with SOCB label indicate such banks are State Owned Commercial Banks, and without such label are all Joint-stock Commercial Banks; detailed bank information, see appendix, data table A-1,2.*

## 5 EMPIRICAL RESULTS

### 5.1 OLS Result of Aggregated Data

At the aggregated level, Table 5-1 (due to data availability only the first two balance sheet indicator were available) summarized the regression estimation, star sign indicates significant parameters. It is evident that policy rate change's impact is only tested to be significant on the dependent variable of the deposits. The indicator of deposit/loan ratio and its interaction with policy rate are significant, but with opposite direction.

This result may be because policy banks and others are included by the aggregated dataset. As hypothesized and argued in previous section (Table 2-3), the policy banks and other smaller local ones should be, and here as a matter of fact, tested to be reluctant to the policy rate. The reason is that the policy banks are directly reporting to the State Council, their funding are not from deposit, but from the treasure and governments, their lending decisions are following state mandate. As for the smaller local ones, they enjoyed preferable treatment on policy rate and by related policies; as a result, they are not following the policy rate change that much. Also for the smaller banks, most of them situated in the rural area or in fact are rural credit cooperatives (RCC), their deposit and loan size per se are at a somewhat inadequate level, their lending behavior reaction to policy rate are very limited. Not mention the fact that as discussed in the monetary policy section, they are excluded from the policy rate change, especially the reserve requirement changes, as a manner to encourage lending in rural and under-developed areas.

The result may also reflect the Dobson & Kashyap (2006)'s argument on the market rates' disjoint with the official rates, making the policy rate ineffective to change the lending behavior of the banks. BBVA (2013) also confirmed this by the data gathered from the various banks real rate charged to their borrowers. As other researchers argue, other tools such as 'windows guidance' were with equal or even more importance, so that under certain circumstances, the direct guidance of money and credit via policy banks was more efficient (GJ Securities 2015), UBS (2015) holds the same view. As a result aggregated level test does not generate much detailed information on different banks' responsiveness, that's another reason for this paper targeting the narrower level.



Table 5-1 OLS on the Aggregated Data

	Loan		Deposit		Loan
RRR	-0.001 (0.004)	RRR	-0.000 (0.003)	log Depo	-0.146 (0.256)
RRR. -1	-0.007 (0.010)	<b>RRR. -1</b>	<b>-0.022</b> <b>(0.007)***</b>	log Depo -1	0.209 (0.185)
log.Loan.-1	0.323 (0.137)**	Log Depo -1	0.038 (0.136)	log Depo -2	0.464
log.Deposit.-1	0.070 (0.191)	GDPgrwoth-1.	-0.004 (0.002)*	<b>log.Loan.-1</b>	<b>(0.170)***</b>
GDPgrwoth-1.	-0.006 (0.003)**	(a.)CashRsvRat tio.-1	0.346 (0.295)	GDPgrwoth-1.	(0.003)*
(a.)CashRsvRat io.-1	-0.340 (0.409)	<b>(b.)Depo/Loan Ratio.-1</b>	<b>-0.280</b> <b>(0.078)***</b>	(a.)CashRsvRati o.-1	-2.116 (10.678)
(b.)Depo/Loan Ratio.-1	0.047 (0.119)			(b.)Depo/LoanRa tio.-1	0.298 (1.258)
(a.)* RRR.-1	0.003 (0.033)	(a.)* RRR.-1	-0.015 (0.024)	(a.)* RRR.-1	(0.346)
(b.)* RRR.-1	0.009 (0.007)	<b>(b.)* RRR.-1</b>	<b>0.021</b> <b>(0.005)***</b>	(b.)* RRR.-1	-0.005 (0.040)
R <sup>2</sup>	0.59	R <sup>2</sup>	0.75	R <sup>2</sup>	0.55
No. of obs.	55	No. of obs.	55	No. of obs.	55

\* indicates significance at the 0.10 level, \*\* 0.05, \*\*\* 0.01; "-1" indicated lag of 1; (a),(b),(c),(d)\* RRR-1 are the four interaction terms for the lagged reserve requirement ratio RRR and the four bank balance sheet situation indicators above the interaction terms, detailed info see the previous section on data.

## 5.2 Policy Rate's Impact on Loans

Table 5-2 shows how the central bank's monetary policy rate change would affect the loan growth. It firstly would provide the overview of these 16 listed banks pooled together in column i, then the effect comparison across groups by two different categorization: by ownership type (state-owned commercial banks, vs. joint-stock commercial banks, in column ii and iii), lastly column iv to vi, the categorization by size.

It is known that for a log-level regression, a one-unit increase in the corresponding explanatory variable  $X$ , would multiply the expected value of the dependent variable  $Y$  by  $e^\beta$ , for small  $\beta$  that is approximately  $(1+\beta)$ , which means in terms of change in  $Y$ , approximately by  $(100*\beta)\%$ . In this case, the explanatory variable RRR, in value, is the percentage point, so the 1-unit increase of RRR (i.e. 1% or 100 basis point, BPS), would in average contribute to  $\beta\%$  change in the loan growth.

For the sixteen listed banks in this dataset, pooled estimation results (column i in table 4-1) can show that main relation under investigation, the policy rate change's effect on the amount of loans, is highly significant with one-quarter-lag. Whereas in column ii and iii, it is less significant for SOCBs, but highly significant for JSCBs; in terms of size, only medium size banks react to such rate change. This is consistent with the bank lending channel hypothesis (BLC), that the monetary authority could influence the amount of loans by changing the policy rates. In an average of all these banks, a 1% increase in the rate last quarter would result in a 0.049% decrease in the loan growth of the current period. For an expansionary policy, it is the opposite direction: that a reduction of 1% RRR last quarter eventually would increase current loan growth by 0.049%. Look into the contrast effect of different banks, for JSCBs, 1% RRR increase is associated with a larger 0.054% drop in their loans, while the state players are at the threshold of significance level. For banks across size, only the medium banks react significantly with a level of 7.5 basis points.

In sum, although at the panel level, the results proved to be consistent with the BLC theory: loans negatively react to the policy rate change, SOCBs react passively compared to the JSCBs, meanwhile, medium banks are more vigorously react compared to the larger or smaller one.

The included GDP growth terms are used as exogenous indicators to filter out the effect from macroeconomics' demand side. Although they are significant and negative sign, but the effects are too small (<1 basis point) to have much economic significance. The last term's amount of loans and deposits may, in theory, have some lagged continuous effect on current time; however, this is only true for the SOCB and large banks in the one-quarter-lagged deposit variable.

To the extent of bank balance sheet indicators, in name, the cash and reserve to total asset ratio, the deposit/loan ratio, the liquidity ratio and the deposit ratio. Only the deposit/loan ratio, which is also an indicator that monitored and regulated by the central bank, is significant across different banks. It alone contributes positively to the loan growth for the SOCBs and larger ones, but will have a negative effect on other banks' loans. So that larger amount of net deposit received by the SOCBs and large banks, would increase their loan growth in the current period while others the opposite. Furtherly study the interaction term with the policy indicator, RRR, then such ratio would strengthen the effect of RRR to loan growth, except for the SOCBs, the more deposit to loan would weaken RRR's influence.

In summary, only at the pooled level, or for medium-sized banks and JSCBs did the RRR change in the last quarter had a significant impact on loan growth, as suggested by the BLC theory. For the majority of the banks, only deposit/loan ratio was significant with a negative sign, suggesting that the loan contraction the last period would reduce this period's lending.

Table 5-2 Policy Rate Change's effect on Growth of Loans

	i.) All 16 Banks	ii) SOCB	iii) JSCB	iv) Large	v) Medium	vi) Small
RRR	-0.004 (0.004)	0.003 (0.004)	-0.004 (0.005)	0.003 (0.004)	-0.001 (0.007)	-0.004 (0.008)
RRR. -1	<b>-0.049</b> <b>(0.009)***</b>	0.055 (0.032)*	<b>-0.054</b> <b>(0.011)***</b>	0.029 (0.029)	<b>-0.075</b> <b>(0.014)***</b>	-0.032 (0.025)
log.Loan.-1	-0.066 (0.047)	-0.019 (0.103)	-0.047 (0.054)	0.001 (0.088)	0.040 (0.076)	-0.082 (0.099)
log.Deposit.-1	0.046 (0.050)	0.212 (0.093)**	-0.059 (0.063)	0.159 (0.083)*	-0.130 (0.092)	-0.049 (0.102)
GDPgrwth-1.	-0.008 (0.002)***	-0.006 (0.002)***	-0.008 (0.003)***	-0.008 (0.002)***	-0.007 (0.003)**	-0.006 (0.005)
(a.)CashRsvRatio.-1	-0.312 (0.349)	0.080 (0.642)	-0.817 (0.450)*	0.726 (0.687)	-0.142 (0.600)	-2.078 (0.737)***
(b.)Depo/LoanRatio.-1	-0.769 (0.106)***	0.799 (0.355)**	-0.924 (0.123)***	0.591 (0.311)*	-1.444 (0.189)***	-0.567 (0.262)**
(c.)Liquid.Ratio.-1	-0.174 (0.276)	0.749 (0.471)	0.302 (0.358)	0.369 (0.451)	0.080 (0.460)	0.902 (0.650)
(d.)Depo.Ratio.-1	-0.431 (0.120)***	0.457 (0.411)	-0.433 (0.142)***	0.295 (0.366)	-0.340 (0.181)*	-0.222 (0.320)
(a.)* RRR -1	0.004 (0.020)	0.015 (0.036)	0.033 (0.030)	-0.028 (0.035)	0.004 (0.043)	0.098 (0.047)**
(b.)* RRR -1	0.038 (0.006)***	-0.046 (0.020)**	0.043 (0.008)***	-0.030 (0.019)	0.077 (0.013)***	0.024 (0.016)
(c.)* RRR -1	0.006 (0.015)	-0.048 (0.028)*	-0.019 (0.019)	-0.022 (0.025)	-0.008 (0.025)	-0.049 (0.036)
(d.)* RRR -1	0.023 (0.007)***	-0.030 (0.024)	0.025 (0.008)***	-0.013 (0.022)	0.018 (0.011)	0.015 (0.017)
No. of obs.	512	136	376	166	207	139

\* indicates significance at the 0.10 level, \*\* 0.05, \*\*\* 0.01; "-1" indicated lag of 1; (a),(b),(c),(d)\* RRR-1 are the four interaction terms for the lagged reserve requirement ratio RRR and the four bank balance sheet situation indicators above the interaction terms, detailed info see the previous section on data.

### 5.3 Policy Rate's Impact on Deposits

Table 5-3 illustrates how the central bank's monetary policy rate change would affect the deposit growth. Like the previous table, the results were divided into all 16 listed banks in column i, then the effect comparison across groups by two different categorization: by ownership type, (state-owned commercial banks, vs. joint-stock commercial banks, in column ii and iii), lastly column iv to vi, the categorization by size.

It seems that for SOCB and large banks, as BLC hypothesized that monetary contraction would cause both loan and deposit level down, the negative relation of the policy rate and deposit are significant in the contemporary.

Lagged RRR rate only influences the deposit for medium banks, at a slight level, though (around 0.01%'s impact). For medium banks, a 100 basis points rise in the RRR last quarter, would cause a 0.03% increase in loan growth of current period.

For other indicators like last period's deposit, were less significant or the parameters were so negligible. For large banks, a 1% raise in cash reserve ratio is associated with a 1.31% increase in current period's deposit growth.

While the deposit-financing ratio, is negatively related to deposit for medium banks, and the banks at the panel level (the interaction term has the negative impact on RRR over the deposit). For medium banks, the Depo/Loan Ratio can strengthen the effects of RRR over the deposit.

So as a result, that for SOCB, medium and large banks, BLC evidence of deposits have been proved.

Table 5-3 Policy Rate Change's effect on Growth of Deposits

	i.) All 16 Banks	ii) SOCB	iii) JSCB	iv) Large	v) Medium	vi) Small
RRR	-0.005 (0.003)	<b>-0.008</b> <b>(0.004)**</b>	-0.004 (0.004)	<b>-0.010</b> <b>(0.004)**</b>	-0.003 (0.005)	-0.003 (0.007)
RRR -1	-0.003 (0.007)	0.000 (0.016)	-0.005 (0.008)	0.006 (0.017)	<b>-0.038</b> <b>(0.010)***</b>	0.003 (0.014)
log.Depo -1	-0.090 (0.042)**	-0.001 (0.087)	-0.099 (0.052)*	-0.045 (0.079)	-0.114 (0.069)*	-0.138 (0.084)*
GDPgrwoth-1.	-0.007 (0.002)***	-0.001 (0.002)	-0.008 (0.002)***	-0.001 (0.002)	-0.013 (0.003)***	-0.005 (0.004)
(a.)CashRsvRatio.-1	-0.261 (0.325)	0.732 (0.630)	-0.495 (0.419)	1.316 (0.655)**	-0.698 (0.492)	-0.364 (0.719)
(b.)Depo/LoanRatio.-1	0.066 (0.047)	0.068 (0.112)	0.017 (0.054)	0.067 (0.120)	-0.149 (0.091)	0.032 (0.079)
(c.)Liquid.Ratio.-1	0.210 (0.237)	0.370 (0.461)	0.402 (0.316)	-0.211 (0.403)	0.032 (0.374)	0.529 (0.542)
(d.)Depo.Ratio.-1	-0.256 (0.104)**	-0.434 (0.305)	-0.223 (0.122)*	-0.093 (0.310)	-0.375 (0.146)**	-0.143 (0.228)
(a.)* RRR -1	-0.009 (0.019)	-0.041 (0.036)	0.010 (0.027)	-0.074 (0.033)**	0.064 (0.035)*	-0.017 (0.045)
(b.)* RRR -1	-0.004 (0.003)	-0.005 (0.008)	-0.001 (0.003)	-0.002 (0.008)	0.023 (0.009)***	-0.002 (0.005)
(c.)* RRR -1	-0.014 (0.013)	-0.016 (0.028)	-0.025 (0.017)	0.008 (0.023)	-0.010 (0.020)	-0.027 (0.029)
(d.)* RRR -1	0.014 (0.006)**	0.020 (0.017)	0.012 (0.007)*	0.012 (0.017)	0.016 (0.009)*	0.011 (0.014)
No. of obs.	562	147	415	177	210	175

\* indicates significance at the 0.10 level, \*\* 0.05, \*\*\* 0.01; "-1" indicated lag of 1; (a),(b),(c),(d)\* RRR-1 are the four interaction terms for the lagged reserve requirement ratio RRR and the four bank balance sheet situation indicators above the interaction terms, detailed info see the previous section on data.

## 5.4 Deposit's Impact to Lending

Table 5-4 demonstrates the estimation output on how the banks deposit could affect the loan growth. Results were divided into all 16 listed banks in column i, then the effect comparison across groups by two different categorization: by ownership type, (state-owned commercial banks, vs. joint-stock commercial banks, in column ii and iii), lastly column iv to vi, the categorization by size.

The deposit and loan have very significant positive relations between sections. Thus it is proved that the deposits and lending of the banks would move by the same direction as the BLC theory proposed. The lagged deposit also significant except medium and small firm. However, last period's loan would have a negative impact on the contemporary value.

The interaction terms here are the lagged deposit with the bank balance sheet indicators. Liquidity ratio negatively contributed to the deposit's impact over the loans for SOCBs. Depo/loan ratio give additional power to deposit's impact over the loans for large banks.

The BLC theory has proposed that a deposit drop would cause the funding of lending plunge as well, banks then, had to accommodate it with less signing of lending. The evidence has proved this.

Table 5-4 Deposit to Loan Impact

	i.) All 16 Banks	ii) SOCB	iii) JSCB	iv) Large	v) Medium	vi) Small
log. Depo	<b>0.475</b> (0.045)***	<b>0.424</b> (0.071)***	<b>0.500</b> (0.056)***	<b>0.483</b> (0.066)***	<b>0.546</b> (0.085)***	<b>0.419</b> (0.084)***
log. Depo -1	<b>0.179</b> (0.047)***	<b>0.195</b> (0.080)**	<b>0.166</b> (0.058)***	<b>0.155</b> (0.072)**	0.022 (0.090)	0.093 (0.091)
log Loan -1	-0.192 (0.044)***	-0.020 (0.086)	-0.197 (0.053)***	0.129 (0.076)*	-0.144 (0.071)**	-0.223 (0.093)**
GDPgrwoth-1.	-0.003 (0.002)**	-0.002 (0.002)	-0.003 (0.002)	-0.003 (0.002)*	-0.002 (0.003)	-0.006 (0.004)
(a.)CashRsvRatio.-1	-1.889 (1.646)	-9.240 (5.364)*	-3.147 (4.153)	5.176 (4.150)	6.858 (6.998)	-6.078 (6.315)
(b.)Depo/LoanRatio.-1	-0.596 (0.329)*	-0.897 (1.213)	0.508 (0.799)	-2.947 (1.047)***	-0.799 (1.692)	-0.163 (1.500)
(c.)Liquid.Ratio.-1	-0.918 (0.836)	12.743 (3.823)***	-1.870 (1.390)	2.097 (2.270)	4.399 (3.217)	0.493 (2.525)
(d.)Depo.Ratio.-1	1.128 (0.423)***	-0.228 (1.075)	0.503 (0.945)	1.421 (1.031)	-0.816 (1.676)	1.293 (1.841)
(a.)* RRR -1	0.064 (0.059)	0.317 (0.181)*	0.113 (0.155)	-0.167 (0.141)	-0.264 (0.257)	0.220 (0.239)
(b.)* RRR -1	0.016 (0.012)	0.027 (0.041)	-0.027 (0.031)	0.096 (0.035)***	0.011 (0.063)	0.003 (0.058)
(c.)* RRR -1	0.029 (0.030)	-0.433 (0.130)***	0.064 (0.051)	-0.076 (0.078)	-0.155 (0.114)	-0.020 (0.095)
(d.)* RRR -1	-0.039 (0.015)**	0.007 (0.037)	-0.016 (0.035)	-0.049 (0.036)	0.033 (0.061)	-0.044 (0.070)
No. of obs.	512	136	376	166	207	139

\* indicates significance at the 0.10 level, \*\* 0.05, \*\*\* 0.01; "-1" indicated lag of 1; (a),(b),(c),(d)\* RRR-1 are the four interaction terms for the lagged reserve requirement ratio RRR and the four bank balance sheet situation indicators above the interaction terms, detailed info see the previous section on data.



## 6 CONCLUSION & DISCUSSION

The main findings are that, the bank lending channel was observed for the pooled level of banks, for the JSCBs and medium banks. By the strictest criteria of the augmented BLC theory by Kashyap & Stein (1994), which is the fulfillment of all three standards, only the medium banks satisfied.

Additionally, it is found that the deposit/loan ratios are all significant for banks across types; however, SOCB and JSCB differ with each other, on the deposit/loan ratio's contribution to the rate change's impact.

These findings, as summarized in table 6-1, with the aggregated empirical results found in the tests by this paper. For the discussion section, only those are most relevant, with high significance level, and parameter estimations are more than negligible level are considered.

Table 6-1 Pooled Empirical Results

		Pooled 16 Banks	SOCB	JSCB	Large	Medium	Small
RRR --> Loan	Main Indpdt Var.	Negative		Negative		Negative	
	Balance Sheet Indicator	Depo financing ratio negative		Depo financing ratio negative			Cashsv ratio negative
	Interaction term	Depo/loan*RRR term positive	Depo/loan*RRR term negative	Depo/loan*RR term positive		Depo/loan*RRR term positive	Cashsv ratio*RRR term positive
RRR --> Deposit	Main Indpdt Var.		Negative		Negative	Negative	
	Balance Sheet Indicator	Depo financing ratio negative		Depo financing ratio negative	Cashsv ratio positive	Depo financing ratio negative	
	Interaction term	Depo financing*RRR positive			Cashsv ratio*RRR negative	Depo/loan*RRR term positive	
Deposit --> Loan	Main Indpdt Var.	Positive	Positive	Positive	Positive	Positive	Positive
	Balance Sheet Indicator	Depo financing positive	Liquid ratio positive		Depo/loan ratio negative		
	Interaction term	Depo financing*RRR negative	Liquidratio*RRR negative		Depo/loan*RRR positive		

*Nb. cashsv ratio is the cash and reserve put in central banks / total asset; depo/loan ratio is the total deposits/total loan outstanding, which is also an regulatory indicator of banks risk; liquid ratio, is the proportion of liquidity assets a bank holds; Depo (financing) ratio, is the proportion coms from deposit in all sources of financing, lower it is the bank is more diverse in terms of financing source. Empty cell indicates not significant at conventional levels, → indicates the direction from main independent variable to the dependent variable. Estimation values see previous result tables.*

## 6.1 Discussions & Policy Implications

The reserve requirement ratio was just lowered by 1% in April, which based on this paper's regression estimation, that would increase the May loan growth by 0.049%. Using the Q1 data of the 16 banks that would lead to a boost of lending by them to the amount up to the over 9 billion in just one month.

The findings are to some degree, in line with study such as Gunji & Yuan (2008) that the bank lending reaction to rate change is weaker for larger banks; banks' profitability is negatively related to the sensitiveness to monetary policy. Zen & Zhao (2006), Zhan & Jiang (2001), also found the bank lending channel being obstructed.

A policy report by the United Nations (2008) had pointed out that during 1998-2006, by the comparison of the actual growth of domestic loans vs the target growth set by the central banks, the report found that the actual loan growth missed the targets by an average of 5-8%, higher or lower. The response of the loan to rate change was at very low level. The report contributed the low level of lending controllability to the policy rate inelasticity due to the mixture of various policy tools used by the PBOC altogether. Other reasons, like the low demand of loans from the non-SOEs, largely portion of them even with demand, seldom borrow from banks (World Bank 2014), - could also contributed to the low responsiveness of loans to the policy rate change.

As for the balance sheet indicators, Deposit/Loan ratio is significant across groups, but for SOCB a positive sign and negative for JSCB, for the size categorization, all signs are negative, the same results and signs with its interaction term with RRR. For SOCBs, more deposit funding would rise the loan levels; but for JSCBs, the opposite.

Jia (2007) argues that for JSCBs, they incline to be more cautious than their state counterparts. They tend to have more excess reserves and have lower loan/asset ratios. So that it explained the reason the increasing of deposit/loan ratio would not introduce more lending from the JSCBs. They are more cautious and more efficient on the decisions regarding the asset distribution.

Further, due to the reason that the JSCBs have experienced much more competitions from both the state players and smaller local ones as suggested by Liu (2002), hence

their sources of funding and profitability are relatively much diverse compared to SOCBs. So that to a less extent that the deposit level and lending are related, the increase in deposit level would not have the same impact on their lending as SOCBs.

The deposit-financing ratio had a negative sign for JSCBs and the panel level banks. Nevertheless, the interaction term with RRR showed as positive. For SOCBs, they are insignificant. Again by Liu (2002)'s findings of SOCBs are less diverse in their funding, the deposit ratio remains high for them, to a level that the change in this ratio, would not affect its lending behavior. However, for a more market practiced JSCBs, the diversity is important though it alone has some negative influence, the increased diversity would enforce the RRR's power over bank lending.

The very limited impact by the policy rate change at aggregated level, may be due to the reasons as following, as argued by Moody (2004): the influence from local government may not be in line with the central banks position; the traditional manufacturing sector with a high demand of loans, after the growth of all these years, now facing the near-zero marginal returns; in practice the banks charge the loan with a rate around the benchmark, rather than charging the borrower by their risk of default.

An UN report argues that the PBOC should focus on a smaller set of sound policy tools and commit to it. Zhan & Jiang (2001) found that the impact of interest rate marketization alone to be questionable, so they argued for financial innovation and less dependent over the bank lending.

As the empirical results are largely in line with previous sections' discussions (Table 2-3 for reference), the reaction to policy rate change is limited to average listed banks, JSCBs, or medium ones; even for them, the reaction to rate change is relatively limited and the bank lending channel seems weak.

Reason contributed to this may be again, the state's direct influence over banks rather than by monetary authority changing rates or market forces. Secondly, a mix of large variety in the policy instruments by PBOC, may send conflicting signal to the market expectations. Moreover, the financial market apart from the banking system remained

less developed compared to the economy, which may constrain the transmission mechanism. Last but not least, the soft budget constraint (regarded as implicit back by the central government, Morgan Stanley: “close to sovereign debt”) of the state owned bank, enterprises and local government debts, has weakened the bank lending channel in China.

So based on that, this paper would also call for further reform of not only the banking system but also relative reforms in all sectors (SOEs, local-central government fiscal arrangements), an improve of the competitiveness and efficiency of the financial sector. Lastly, apart from the less efficient rate tools, large-scaled market operations taken by the developed world may be a model for the PBOC to learn.

In the near future, as the undergoing interest rate marketization, we may see a stronger interest rate transmission channel, as evidenced in the western developed countries. This may also change the PBOC leaning towards more price-and-market-based policy tools. The PBOC may also reduce the use of some less-known-to-public instruments whose signaling effects are weak. More transparent and independent role of the central bank is also critical to any economy’s development.

## **6.2 Limitation**

The possible limitation of this study lies in the dataset. The data obtained from the financial statements, which were disclosed to the Stock Exchanges and public, though were audited and reported according to the recognized financial reporting standards. However, all public data in the banking sector were in theory biased towards compliance to banking regulations (such as deposit/loan ratio), and different auditing houses may vary in their quality.

Further, though the listed banks accounted for a majority of the bank lends and deposits, smaller banks that are non-listed were missing from this study, for example, small banks that operate only locally; rural credit institutions; no publically available data on the Postal Service Savings; lastly, policy banks only disclose their data on a yearly frequency.

Lastly, China's banking system biased heavily towards the SOCBs, so that in almost all indicators, such as asset, loans and deposit gradient towards the big ones, while under regulatory monitoring, the balance sheet ratios reaming largely equivalent across those banks. Because of this, the regression result may suggest similar or minor difference regarding the effect of the corresponding variables

## **6.3 Suggestions for Further Study**

Due to the limitations mentioned above, the first advice for future researchers would try to find the data with the best quality and quantity as possible. For instance, Bankscope is a commercial database from Bureau Van Dijk (BvD), the business intelligence company. It is with comprehensive data of banks, for example, some of the researches in the literature review part were based upon this database. Other sources may include non-public reports within both the banks and their supervision authorities, which may beyond the accessibility of most scholars.

Second of the suggestions would be the categorizing of the banks under investigation. This paper for reasons mentions in the text, distinguished them by SOCBs, JSCBs and policy banks. Categorize them by their capitalization/liquidity status may also provide interesting results; previous studies in other countries, in fact, did have done this.

Categorized by efficiency/performances such as ROA and ROE, may also be fruitful in the context of organizational and operational differences.

Moreover, indicators used in the regressions may subject to change. For instance, the one-year lending rate and reserve requirement rate are mostly commonly used across studies, but it may generate different yet motivating results using shorter terms of rates, using inter-bank rates, depending on the topic of the research. Particularly, in the context of China's interest rate liberalization, it is unavoidable that PBOC would eventually shift from targeting this rate. If that were the case in the future, the research could be updated using the latest data and indicator.

On a more aggregated level, one could also study the country's banking sector, even the financial sector, for example, the institutional development of financial markets and the contribution to other areas.

## **7 ACKNOWLEDGMENT**

I would like to extend my sincere appreciation to Ms. Liu Lu, my supervisor for this thesis, for the academic advice, the valuable time and patience in the process of the thesis researching.

I also express thankfulness for the helps from Katarzyna Burzynska; your essays on China's financial sector inspired me a lot, not mention your Stata manuals- they are very handy.

Of course none of this would be possible if not taking the master program of Economics here at Lund University, for which I convey my deepest gratitude to the professors, lecturers and staff members, among which, especially, to Ms. Sonja Opper. Your courses and researches were thought provoking and fascinating, your attitude and passion on academic research are so inspirational to a pursuing in academia.

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## Appendix

Table A-1 Bank-level data source detail (balance sheet)

Category	Short ID	Official Name in English and Chinese	Listing Code*	Data Source**	Data Span
SOCB	ICBC	Industrial and Commercial Bank of China 中国工商银行	601398.SH	Balance sheet data from quarterly financial report of the listed stock, official website's Investor Relation page; ICBC.com.cn	2007Q1-2015Q1
	ABC	Agricultural Bank of China 中国农业银行	601288.SH	Same as above; abchina.com	2009Q4-2015Q1
	BOC	Bank of China 中国银行	601988.SH	Same as above; bank-of-china.com	2006Q2-2015Q1
	CCB	Construction Bank of China 建设银行	601939.SH	Same as above; ccb.com	2007Q2-2015Q1
	BANK COMM	Bank of Communications 交通银行	601328.SH	Same as above; bankcomm.com	2005Q2-2015Q1
JSCB	CITIC	China Citic Bank 中信银行	601998.SH	Same as above; ecitic.com	2007Q2-2015Q1
	EVERBRIGHT	China Everbright Bank 光大银行	601818.SH	Same as above; cebbank.com	2010Q2-2015Q1
	CIB	Industrial Bank Co Ltd (CIB) 兴业银行	601166.SH	Same as above; cib.com.cn	2006Q2-2015Q1
	MERCHANTS	China Merchants Bank 招商银行	600036.SH	Same as above; cmbchina.com	2001Q4-2015Q1
	MINSHENG	China Minsheng Bank 民生银行	600016.SH	Same as above; cmbc.com.cn	2000Q4-2015Q1
	HUAXIA	Huaxia Bank 华夏银行	600015.SH	Same as above; hxb.com.cn	2003Q2-2015Q1
	PINGAN	Ping'an Bank 平安银行	000001.SZ	Same as above; bank.pingan.com	2001Q4-2015Q1
	PUFA	Shanghai Pudong Development bank (SPD Bank, or 'Pufa') 上海浦东发展银行	600000.SH	Same as above; spdb.com.cn	2001Q2-2015Q1
City Bank	BEIJING	Bank of Beijing 北京银行	601169.SH	Same as above; bankofbeijing.com.cn	2007Q3-2015Q1
	NINGBO	Bank of Ningbo 宁波银行	002142.SZ	Same as above; nbc.com.cn	2007Q2-2015Q1
	NANJING	Bank of Nanjing 南京银行	601009.SH	Same as above; njcb.com.cn	2007Q2-2015Q1

n.b.: Categorization by China Banking Regulatory Commission ([www.cbrc.com.cn/chinese/jrjg/](http://www.cbrc.com.cn/chinese/jrjg/)), the 3 city banks are also JSCBs.

\* Appendix 'SH' means listed in ShangHai Stock Exchange; 'SZ' indicates ShenZhen Stock Exchange.

\*\* Complimentary data source on banks' balance sheets include: The database of the *Stock Exchanges of Shanghai and Shenzhen*: <http://www.sse.com.cn/disclosure/listedinfo/regular>, <http://www.szse.cn/main/disclosure>; Established financial information corporate intelligence sites: *Sina Finance* ([finance.sina.com.cn](http://finance.sina.com.cn) biggest financial news site) and *Xueqiu* ([xueqiu.com](http://xueqiu.com) Snowball Finance, member of the Securities Association of China, SAC).

Table A-2 Macroeconomic Data Source

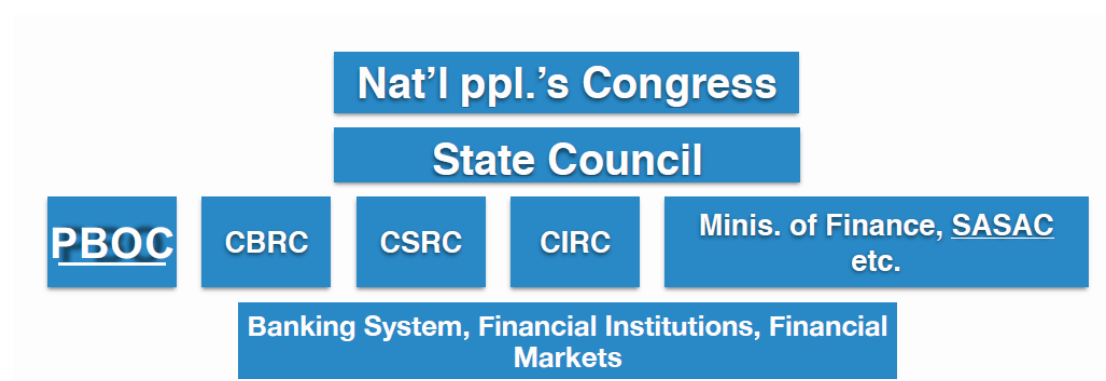
Item	Data	Data Source *
Monetary Policy Indicator- Main Policy Rate	Central bank (PBOC's) 1-year base lending rate; quarterly	People's Bank of China (PBOC) via <a href="http://Tradingeconomics.com/china">Tradingeconomics.com/china</a>
Potencial Monetary Policy Indicator- Immediate Rate	Immediate Rates: Less than 24 Hours: Central Bank Rates for China	US Federal Reserve Bank of St. Louis , FRED (series ID: IRSTCB01CNQ156N)
Economic Activity	Real GDP Growth; quarterly	National Bureau of Statistics of China, via <a href="http://Tradingeconomics.com/china">Tradingeconomics.com/china</a> ; yearly data (from World Bank) used for policy banks
Price Level	Inflation Rate; quarterly (data used at the end of each quarter)	National Bureau of Statistics of China, via US Federal Reserve Bank of St. Louis , FRED (series ID:CPALTT01CNQ659N); yearly data (from World Bank) used for policy banks

*n.b. Trading Economics is a commercial database for world macroeconomics indicators, it aggregates data from authorities of countries, such as central banks and statistics bureaus across 232 countries.*

\* Source websites: Trading Economics <http://www.tradingeconomics.com/china>; National Bureau of Statistics of China <http://data.stats.gov.cn>; US Federal Reserve Bank of St. Louis FRED Database <https://research.stlouisfed.org/fred2/>; World Bank Database <http://data.worldbank.org/>; China's Central Bank Database <http://www.pbc.gov.cn/>.

Aggregated data used in OLS estimations are from aggregated balance sheet of the banking financial sector of China, reported on the Almanac of China's Finance and Banking (中国金融年鉴)-  
<http://tongji.oversea.cnki.net/resources.asiaportal.info/chn/navi/HomePage.aspx?id=N2014010041&name=YXCVB&floor=1>

Figure A-1 China - Monetary Authorities



Source: PBOC

n.b.: PBOC, People's Bank of China, the central bank. CBRC, Chinese Banking Regulatory Commission. CSRS, Chinese Securities Regulatory Commission. CIRC, Chinese Insurance Regulatory Commission. SASAC, State-owned Assets Supervision and Administration Commission.

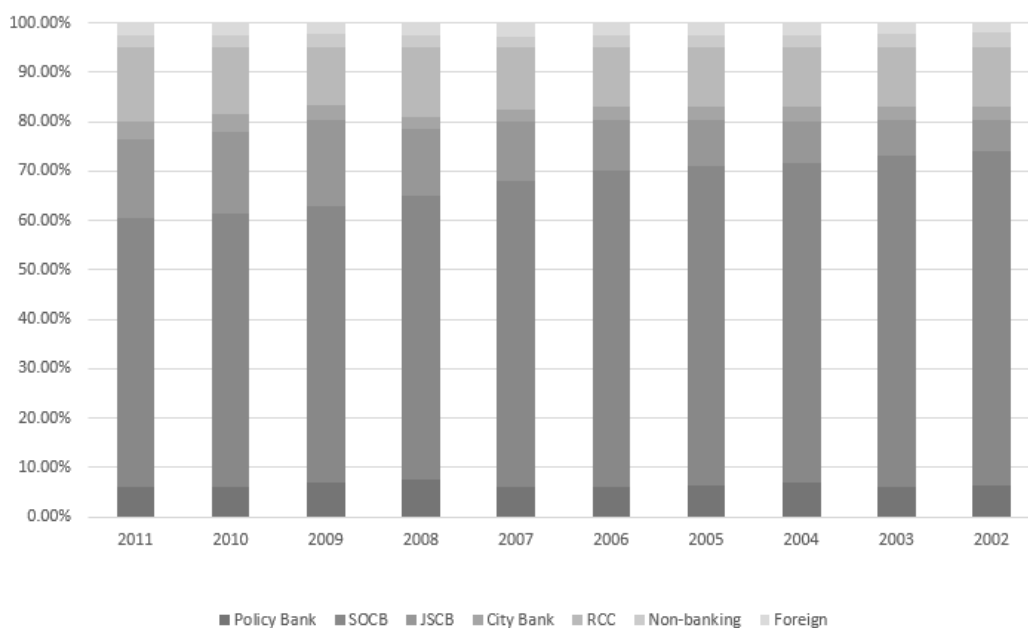
Figure A-2 China's Policy Tools, vs. Developed Country

	Credit ceilings	Reserve requirement	Discount rates	Open-mkt operations	FX MKT operations	Moral suasion	Others
<b>China</b>		<b>X</b>		<b>X</b>		<b>X</b>	
<b>US</b>		<b>X</b>	<b>X</b>	<b>X</b>			
<b>Japn</b>		<b>X</b>	<b>X</b>	<b>X</b>			
<b>EU</b>		<b>X</b>	<b>X</b>	<b>X</b>			
<b>UK</b>		<b>X</b>	<b>X</b>	<b>X</b>			

Source: BIS



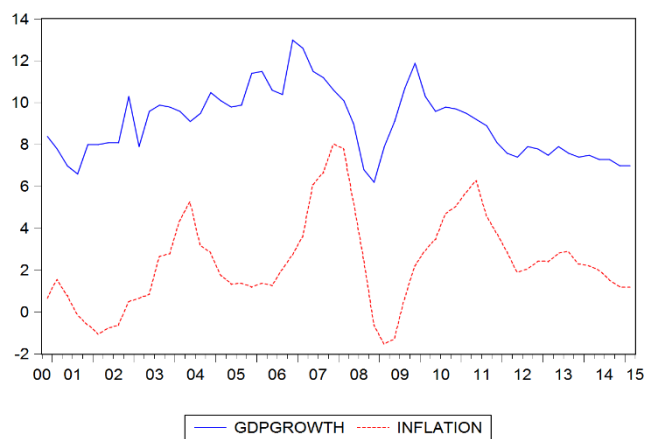
Figure A-3 Asset Proportions of Financial Institutions, by type



Source: IMF, PBOC

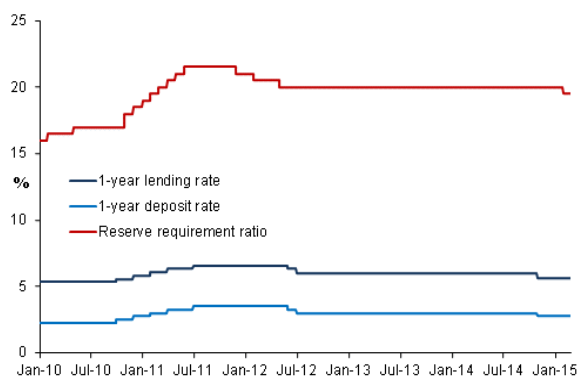
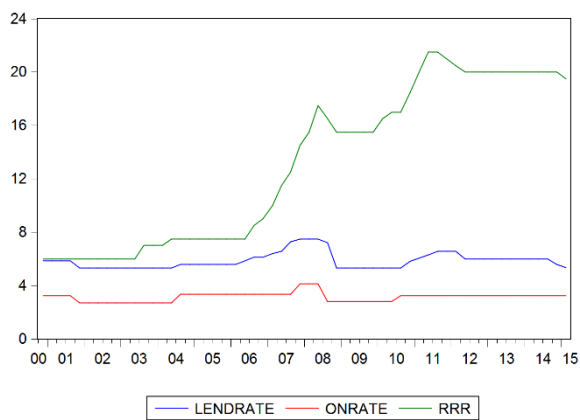
n.b. latest to older years: from the left to right.

Figure A-4 GDP Growth and Inflation Variables



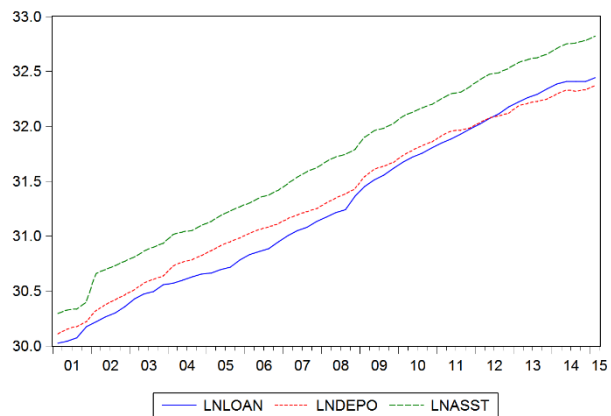
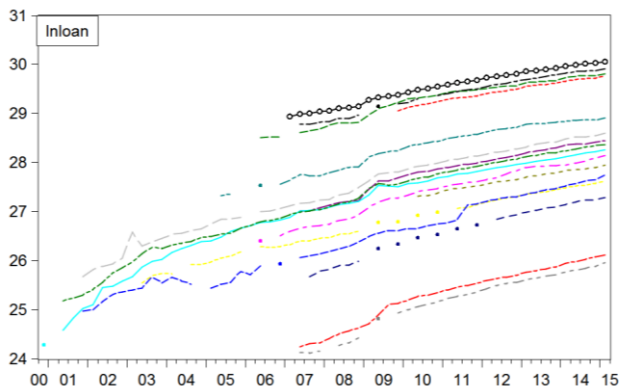
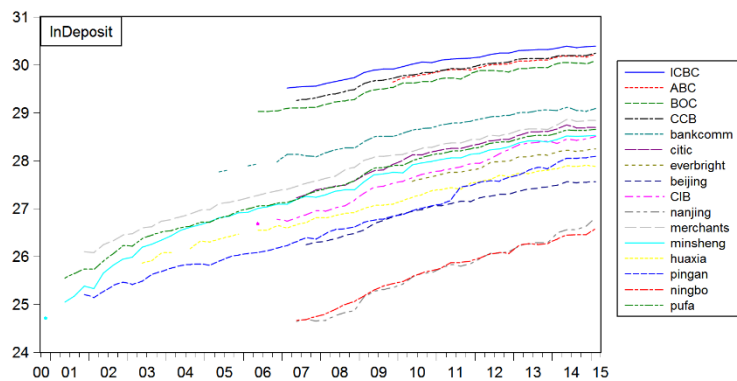
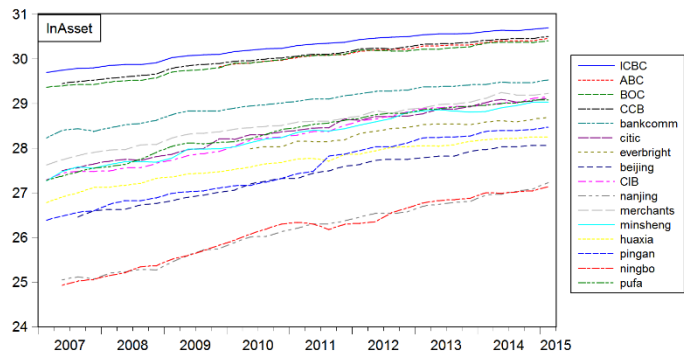
\*Data Source: PBOC via focus-economics.com

Figure A-5 Policy Rates



\*Data Source: PBOC via focus-economics.com

Figure A-6 Plots of Loan Deposit and Asset, by banks



## Appendix

Table A-7 Descriptive Statistics 1

Variable		Pooled			SOCB			JSCB		
		Mean	Std. Dev.	Observations	Mean	Std. Dev.	Observations	Mean	Std. Dev.	Observations
Inloan	overall	27.42	1.41	N = 586	29.14	0.62	N = 156	26.80	1.05	N = 430
	between		1.38	n = 16		0.51	n = 5		0.87	n = 11
	within		0.66	T-bar = 36.625		0.39	T-bar = 31.2		0.74	T-bar = 39.0909
Indepo	overall	27.75	1.43	N = 610	29.54	0.65	N = 161	27.11	1.03	N = 449
	between		1.41	n = 16		0.60	n = 5		0.82	n = 11
	within		0.66	T-bar = 38.125		0.33	T-bar = 32.2		0.75	T-bar = 40.8182
Assets in billions CNY	overall	3 640.00	4 780.00	N = 613	10 100.00	5 000.00	N = 162	1 310.00	1 180.00	N = 451
	between		4 950.00	n = 16		4 100.00	n = 5		760.00	n = 11
	within		1 830.00	T-bar = 38.3125		3 170.00	T-bar = 32.4		972.00	T-bar = 41
ratio1 a) cashrsv ratio	overall	0.13	0.03	N = 613	0.15	0.03	N = 162	0.12	0.02	N = 451
	between		0.02	n = 16		0.02	n = 5		0.01	n = 11
	within		0.02	T-bar = 38.3125		0.02	T-bar = 32.4		0.02	T-bar = 41
ratio2 b) depo/loan ratio	overall	0.69	0.14	N = 604	0.65	0.14	N = 161	0.70	0.14	N = 443
	between		0.08	n = 16		0.07	n = 5		0.09	n = 11
	within		0.12	T-bar = 37.75		0.13	T-bar = 32.2		0.12	T-bar = 40.2727
ratio3 c) liauid ratio	overall	0.20	0.06	N = 613	0.22	0.04	N = 162	0.19	0.06	N = 451
	between		0.03	n = 16		0.03	n = 5		0.03	n = 11
	within		0.05	T-bar = 38.3125		0.03	T-bar = 32.4		0.06	T-bar = 41
ratio4 d) Depo financing	overall	0.78	0.09	N = 610	0.83	0.05	N = 161	0.77	0.09	N = 449
	between		0.07	n = 16		0.04	n = 5		0.07	n = 11
	within		0.06	T-bar = 38.125		0.04	T-bar = 32.2		0.07	T-bar = 40.8182

Table A-8 Descriptive Statistics 2 - by bank size

Variable		Large			Medium			Small		
		Mean	Std. Dev.	Observations	Mean	Std. Dev.	Observations	Mean	Std. Dev.	Observations
Inloan	overall	28.92	0.78	N = 188	27.22	0.87	N = 221	26.10	0.91	N = 177
	between		0.72	n = 6		0.28	n = 5		0.73	n = 5
	within		0.40	T-bar = 31.3333		0.83	T-bar = 44.2		0.66	T-bar = 35.4
Indepo	overall	29.30	0.82	N = 193	27.51	0.87	N = 222	26.48	0.88	N = 195
	between		0.81	n = 6		0.29	n = 5		0.68	n = 5
	within		0.35	T-bar = 32.1667		0.84	T-bar = 44.4		0.67	T-bar = 39
Assets in billions CNY	overall	8 870.00	5 420.00	N = 194	1 730.00	1 280.00	N = 223	640.00	547.00	N = 196
	between		4 960.00	n = 6		347.00	n = 5		309.00	n = 5
	within		2 930.00	T-bar = 32.3333		1 240.00	T-bar = 44.6		480.00	T-bar = 39.2
ratio1 a) cashrsv ratio	overall	0.15	0.03	N = 194	0.12	0.02	N = 223	0.12	0.03	N = 196
	between		0.02	n = 6		0.01	n = 5		0.02	n = 5
	within		0.02	T-bar = 32.3333		0.02	T-bar = 44.6		0.02	T-bar = 39.2
ratio2 b) depo/loan ratio	overall	0.66	0.13	N = 193	0.74	0.07	N = 222	0.65	0.19	N = 189
	between		0.07	n = 6		0.01	n = 5		0.11	n = 5
	within		0.12	T-bar = 32.1667		0.07	T-bar = 44.4		0.16	T-bar = 37.8
ratio3 c) liauid ratio	overall	0.21	0.05	N = 194	0.18	0.06	N = 223	0.20	0.07	N = 196
	between		0.03	n = 6		0.03	n = 5		0.04	n = 5
	within		0.04	T-bar = 32.3333		0.05	T-bar = 44.6		0.06	T-bar = 39.2
ratio4 d) Depo financing	overall	0.83	0.05	N = 193	0.77	0.10	N = 222	0.75	0.08	N = 195
	between		0.04	n = 6		0.09	n = 5		0.05	n = 5
	within		0.04	T-bar = 32.1667		0.06	T-bar = 44.4		0.07	T-bar = 39