Lending relationships and the transmission of liquidity shocks:

Evidence from a natural experiment

Yiyi Bai

School of Finance, Zhongnan University of Economics and Law

Email: yiyi.bai@zuel.edu.cn

Tri Vi Dang

Department of Economics, Columbia University

Email: td2332@columbia.edu

Qing He

School of Finance & China Financial Policy Research Center, Renmin University of China

Email: qinghe@ruc.edu.cn

Liping Lu

Department of Finance, VU University Amsterdam

Email: l.lu@vu.nl

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Abstract

We exploit a liquidity crunch of 2013 in China as a negative shock to banks and analyze the wealth effects on listed firms. Our findings show that liquidity shocks to financial institutions impact borrowers' performance negatively, especially for borrowers with outstanding loans. However, firms having long-term relationship with banks outperformed in stock market and subsequently experienced a smaller decline in investment than their peers without such relationship. This effect is the strongest for firms whose relationship banks are state-owned and foreign banks, and the weakest for firms whose relationship banks are local banks. We also document a positive correlation between firms' stock performances and their banks' stock performances, as well as banks' liquidity in the interbank market. These results suggest that banks transmit liquidity shocks to their borrowing firms and that the long-term bank-firm relationship can mitigate such negative effects.

Key words: lending relationship, interbank liquidity crunch, local banks

JEL classification: G30, G140, G210

1. Introduction

The vital role of the interbank market for the liquidity management of financial institutions has become more and more pronounced recently, especially during the global financial crisis in 2008. A liquidity dry-up in the interbank market may spill over to the credit market thus lead to a collapse of the real economy, which has triggered massive interventions of the financial authorities. Given the economic importance and relevant cost of a financial crisis (Ongena et al. (2003), Gan (2007), Iyer and Peydro (2011)), it is essential to understand the channels through which interbank market liquidity shocks affect the real economy. In this paper, we will address the role of financial institution's lending as a transmission channel that link the credit market to the stock market.

A failure of interbank lending makes it difficult for financial institutions to cover their liquidity shortfalls, which may be transmitted to their borrowing firms (Schnabl, 2012). However, banks are less likely to transmit liquidity shocks to those borrowers which have close ties than other borrowers. Bank lending often involves long-term relationship that may attenuate information asymmetry through producing information and setting loan terms (Petersen and Rajan, 1994; Berger and Udell, 1995; He et al., 2016). Banks can directly monitor their borrowers with long-term relationships and therefore prevent risk shifting in response to a liquidity shortfall, but an arm's-length borrower cannot. As a result, the transmission of bank liquidity shocks to their borrowing firms depends on the tightness of bank-firm relationships. However, the role of lending-relationship on the liquidity shock transmission has not been well addressed in the literature.

Liquidity shocks can often affect both the financial institutions and borrowing firms, which makes it difficult to disentangle the liquidity effects (Chava and Purnanandam, 2011; Schnabl, 2012). In this paper, we address this challenge by exploiting an unique event of the interbank liquidity crunch of 2013 in China as a negative liquidity shock, and identifying the role of lending-relationship for the liquidity shock transmission. This is an ideal setting for several reasons. Firstly, the interbank liquidity shock is created under the guidance of the new leadership, to warn interbank participants, mainly banks, to change their expectations for the People's Bank of China (PBOC), and to improve their liquidity management. It is an exogenous event that lasts for only a couple of days and quickly returned to normal. The liquidity crunch started with the reluctance of providing liquidity to the financial institutions by the PBOC, and was alleviated

substantially when the PBOC offered fund to the inter-bank market within a couple of days. Secondly, we collect a novel dataset that covers all the borrower and lender information for the top 5 loans of Chinese listed firms. The loan maturity can capture the tightness of the relationship between a financial institution and a borrowing firm. Thirdly, banks began having concerns about their access to the interbank market in the future, and thus tightened their lending standards after the liquidity crunch. Hence, we can estimate the impact of the bank-firm relationship on the real economy through the lending channels.

To analyze the role of financial institution lending in the transmission of interbank liquidity crunch, we firstly examine the stock market reactions to the inter-bank liquidity crunch. We find that all firms experienced sharp drops in their share prices during this period. The drops are more pronounced for the firms with outstanding loans than others, meaning that the liquidity shock is indeed transmitted from institutional lenders to their borrowers. Among firms that have access to institutional credits, we distinguish between firms with a relationship bank (i.e. having a bank as their largest lender of long-term loans) and firms without. We find that firms with a relationship bank experienced a lower valuation loss than others during the liquidity crunch, which suggests that a bank-firm relationship can mitigate the negative effect transmitted from the interbank liquidity shock.

Secondly, we conduct several tests among the firms that have access to institutional credits to further clarify the role of banking relationship. We find that firms having relationship banks experience a lower valuation loss than their peers borrowing from non-bank institutions. This effect is the strongest for state-owned banks and foreign banks, and the weakest for local banks, which is consistent with the financial deregulation in China during the past few decades, i.e. non-state owned banks, private banks, and even foreign banks have gradually played an important role in the credit market. We further document a positive correlation between firms' stock performances and their lending banks' stock performances, as well as lending banks' liquidity positions in the interbank market.

In the end, we investigate the long-run impact of the liquidity crunch through examining firms' investment afterwards. The liquidity crunch in June 2013 in China served as a warning tool to banks' loan strategies. With an expectation that the PBOC is not willing to provide extra short-term liquidity in the future, banks may adjust their loan terms such as quantity, interest rate, and maturity, etc. Furthermore, this would have an impact on firms' strategies. Consistent with

previous results, we indeed find that firms with outstanding loans on average have lower investment ratio in the post event period while firms that have relationships with banks invest more than their peers after the event. This evidence substantiate the role of the lending channels for the borrowers' performances.

There are three main contributions of this paper. Firstly, using the liquidity crunch in June 2013 in China, we document that the institution lending can serve as a transmission channel of the liquidity shock from the interbank market to the stock market. We use the liquidity crunch plus bank-firm lending relationships as an identification strategy. Michaud and Upper (2008) show that risk premiums are mainly driven by factors related to funding liquidity in the short-term, i.e. the ability to convert assets into cash by individual banks. Besides, lending relationship among banks is also an important factor for banks' abilities to access liquidity in the interbank market (Cocco et al., 2009).

Secondly, our paper contributes to the literature on relationship banking. James (1987) and Lummer and McConnell (1989) find positive market reactions of bank loan announcements from the borrowing firms' perspective, while Megginson et al. (1995) find heterogeneous market reactions from the lending banks' perspective. Solvin et al. (1992) find that small and less prestigious firms have more benefits from the screening and monitoring services associated with bank loans. Moreover, the quality, organizational structure, and origin of the lender also matter for market reactions (Slovin et al., 1988; Billet et al., 1995; Ongena and Roscovan, 2013). However, there is some evidence going against the benefits of relationship banking. Maskara and Mullineaux (2011) find that self-selection bias affects the positive announcement effect in the existing research (see also Ongena and Smith, 2000; Boot, 2000; Ongena, Smith, and Michalsen, 2003). Fields et al. (2006) find that the general advantages of bank-firm relationships have disappeared since the 1980s, although relationship banking may still be beneficial for small and poorly performing firms or during the period of high credit spreads. However, banks' role in certifying corporate borrowers has been revitalized since the global financial crisis in 2008 (Li and Ongena, 2015).

Recent literature has emphasized the impact of the shocks to liquidity providers on their borrowers (Chava and Purnanandam, 2011; Schnabl, 2012). However, the existing literature examines whether financial institutions transmit liquidity shocks to their borrowers and subsequent impacts on firm's investment opportunities and performances, while the economic

factors that trigger the liquidity shocks may also directly affect firms' profitability and growth opportunity, which is a key challenge for empirical identification. Thus, it is difficult to find reliable evidence that bank-firm relationship helps or hurts firm performance on average. We provide novel empirical evidence for the value of bank-firm relationship after addressing the identification limitations in the existing literature.

Thirdly, we also provide evidence on the consequences of interventions by central banks. We document the market reactions to an unexpected change of central banks' policy in the interbank market, which may help understand the effectiveness of financial authorities' policies. Our study also adds to the literature on channels to mitigate negative liquidity shocks. We find that a strong bank-firm relationship can alleviate the liquidity shocks, which might cast light on the impact of financial crisis.

The remainder of the paper is organized as follows. Section 2 describes the institutional background and the testable hypothesis. Section 3 discuss the empirical model and research design. Section 4 shows the summary statistics. Section 5 provide empirical results. Section 6 concludes the paper.

2. Institutional background and testable hypothesis

2.1 Institutional background

China has a bank-centered financial system and an underdeveloped capital market, which makes it difficult for firms to raise external financing from the bond or equity market (Allen et al., 2005). According to National Bureau of Statistics of China, the bank credit to GDP ratio in China is about 112% in 2013, and banks provide about half of the total financing for Chinese firms. Chinese banking system is dominated by the "Big four" state-owned banks and three policy banks.[1] There are twelve joint stock banks and hundreds of local banks.[2] There are also hundreds of branches and representative offices of foreign banks, which can conduct limited business activities in China (He et al., 2016).

[1] The "big four" state-owned banks are Agricultural Bank of China, Bank of China, China Construction Bank, and Industrial and Commercial Bank of China. The three policy banks include China Development Bank, Agricultural Development Bank of China and Export-Import Bank of China.

[2] Local banks include city / rural commercial banks, urban / rural credit cooperatives, rural cooperative banks, and village and town banks.

The Chinese banking sector operated in an uncompetitive environment before the early 1990s (He et al., 2016). Commercial banks especially the "big four" state-owned banks extend a substantial proportion of credit towards political-oriented goals rather than profit maximization (Bailey et al., 2011). The government maintains a strict control on the allocation of bank credit. The Peoples' Bank of China (PBOC) set the base interest rate along with upper and lower bounds for both the deposit and lending market. As a result, banks have few incentives to actively monitor the borrower and curtail the default risk. Most of the bank credit is extended by the state-owned banks to the state-owned enterprises (SOEs) through poor lending practices (Berger et al, 2009). The inefficient lending leads to a huge amount of non-performing loans in the banking sector, which increase the fragility of the country's financial system. Since the late 1990s, the Chinese government has adopted a series of reform to enhance bank efficiency and lower the non-performing loan ratio, e.g., government bail-out and fund injection into financial institutions.

Following China's entry into the WTO in 2001, the government deregulates the financial system in anticipation of an intensive competition from foreign financial institutions. Most Chinese banks are restructured from wholly state-owned banks, and foreign investors can take a minority ownership in these banks now. Western style corporate governance mechanisms, such as shareholder meeting, board of directors and auditing system were adopted to monitor banks' daily operation. Many commercial banks, including the "big four" state-owned banks, have become publicly listed firms with foreign strategic institutional investors.

Despite a remarkable improvement of operation efficiency, there are still many other problems in Chinese banking sector. Chinese government still retains a tight regulation on the banking system in order to manage its economic growth. The bankruptcy law is poorly enforced in the country, as government agencies often try to prevent defaults and bankruptcies for the sake of social stability and employment. Thus, with an expectation of government bailout ex ante, banks often adopt an aggressive strategy in making lending decisions.

In order to alleviate the shocks from the global financial crisis in 2008, the Chinese government launched a 4-trillion RMB (about 650 billion USD) stimulus plan on Nov 9, 2008. With an abundant liquidity and gloomy economy, most banks are engaged in raising short-term funding (e.g. through short-term debt and high-yielding wealth management products) and channel the fund to long-term projects in order to get a higher return. Thus, when redemptions on

such short-term funding are due, banks often refer to the interbank market to accommodate their cash needs, which makes the interbank market more important for the liquidity management of these banks.

2.2 Liquidity crunch

Liquidity dry-up in the interbank market has become a seasonal phenomenon in China since 2010. The cash demand is the strongest at the end of June in each year as banks rely on the funding from the interbank market to meet the semi-annual regulatory requirements, e.g. loan-to-deposit ratios, reserve requirement ratios, and other repayment obligations, etc. The PBOC often injects funding into the inter-bank market during the period of liquidity tightness to avoid potential crises.

At the beginning of June 2013, banks extended credit aggressively to meet their semi-annual performance goals as usual. Newly issued loans increased by 863 billion in June 2013, i.e. a 28.89% increase from the previous month. Banks expected that the PBOC would accommodate their liquidity needs by injecting extra funding into the interbank market. However, it seemed that the PBOC changed its policy stance and abstained from providing extra liquidity to the market.

The interbank market had already witnessed several adverse news since the beginning of June 2013 (see Appendix 1 for an overview of the major events). The bond offered by *Agriculture Development Bank of China* on June 5th, 2013 drew insufficient demand from investors, which brought a pessimistic prospect on the liquidity squeeze in the interbank market. The overnight interbank interest rate was 4.62% on that day. On June 6th-8th, a rumor was flying in the market saying that *China Everbright Bank* (a joint stock bank) defaulted on its repayment obligation (100 billion RMB inter-bank loans) to *Industrial and Commercial Bank of China*. Although the two banks denied the loan default, the panic in the interbank market had arisen afterwards. The interbank market delayed its closing time due to potential defaults of interbank loans, and the interbank rate hiked to 9.58% on June 8th 2013 while reversed to a normal level in subsequent days. On June 14th 2013, an failure of the issuance of treasury bonds aggravated the panic in the interbank market, but the market still expected that the PBOC would provide extra funding to alleviate the potential systemic risk brought by the liquidity dry-up.

The whole episode started with a statement of the State Council by the Premier *Keqiang Li* for the economic and financial reform on June 19th, 2013. He stated that China would continue a prudent monetary policy stance while keeping a reasonable scale of money supply. The interbank rate hiked to 7.66% on that day, which also delayed the closing time of the interbank market by 30 minutes. On June 20th 2013, the panic had spread to the whole interbank market. However, the PBOC insisted on the issuance of treasury bills, which further extracted liquidity from the interbank market. A rumor that *Bank of China* was in default in the interbank market flew. The overnight interest rate hiked to more than 10% at the opening of the interbank market, while it rocketed to an historical high level of 13.44% at the end of this day.

A statement from the PBOC on June 23rd 2013 reiterated that the State Council's stance for a "prudent monetary policy". The PBOC would fine-tune its monetary policy and contain monetary aggregate. The stock market suffered a "black Monday" on June 24th , i.e. the *Shanghai Stock Exchange* composite index decreased by about 5%. In particular, the stock prices decreased by about 10% for most commercial banks. However, the PBOC still kept a neutral attitude and announced that the market liquidity was sufficient. Some financial institutions were forced to sell certain assets in order to meet their liquidity needs.

Due to a concern with the propagation of the crisis, a statement from the PBOC on June 25th 2013 committed to ensure sufficient market liquidity and offer temporary funding to accommodate banks' liquidity needs. It brought a great relief after the *PBOC* suspended the issuance of treasury bills and supplied a liquidity support for certain financial institutions. On June 26th 2013, the overnight interbank interest rate returned to about 5.55%, and the panic in the interbank market was alleviated substantially.

Many researchers treat the liquidity crunch in June 2013 in China as an attempt of the government to rebalance economic growth while avoiding debt-induced financial crisis. In order to push banks to curtail their risky lending, the PBOC initially abstained from injecting extra liquidity but finally gave up its attempts and alleviated the deteriorating liquidity positions due to the crisis concerns.

The main impact of the liquidity crunch in June 2013 is that the PBOC sent a strong message of its monetary stance, i.e. preventing banks from excessive risk taking. The financial institutions that rely heavily on the interbank market in particular for short-term credit were exposed to severe liquidity constraints in case of a tightening of the monetary stance. This event

has a substantial impact on Chinese banks' lending practices afterwards. Fig 2 plots the growth rate of loan supply around the China's liquidity crunch period. We obtain data for all newly issued loans disclosed by listed firms during six months before and after the liquidity crunch. We plot the growth rates during the two periods. We provide the growth rate for all listed firms. As showed in Figure 2, there is a significant drop in the amount of loans issued after the liquidity crunch compared to the pre-liquidity crunch period.

[Insert Figure 2 here]

We also obtain data on the total volume of long-term loans newly issued by chinese financial institutions six months before and after the liquidity crunch, and calculate the monthly percentage of long-term loans over total loans in 2013. We then plot the term structure of newly issued loans in Fig 3, and find a descending trend in the percentage of long-term loans. This result indicates a tightening in chinese banks' lending strategy and changes in their liquidity mangement after the liquidity crunch. It is consistent with the significant drop in the growth of loans shown in Fig 2.

[Insert Figure 3 here]

2.3 Testable hypotheses

In a frictionless financial market, shocks to financial institutions will not affect firms' borrowing, as firms can easily access alternative external financing sources. However, market frictions, e.g. moral hazard and information asymmetry, can undermine firms' capability to access alternative financial channels (Holmstrom and Tirole, 1997).

In an economy with market frictions, shocks that affect financial institutions' capabilities to make loans can also affect the lending to their borrowers (Chava et al., 2011). Banks may reduce the loanable funds to their borrowers, or change their asset portfolios in favor of safer assets rather than risky loans (Stein, 1988). There is no exception in China. With a bank-centered financial system, financial institutions mainly obtain funding from the interbank market, which exposes them to severe constraints during the liquidity crunch. This event adversely affects their abilities to make loans, which in turn leads to a value loss of firms borrowing from banks. Thus we propose our first hypothesis:

Hypothesis 1: Firms that borrow from financial institutions experience a larger value loss during the liquidity crunch than firms that have no institutional borrowing

A large literature suggests that funds do not always flow to firms with profitable investment opportunities due to market frictions such as information asymmetry and agency cost (e.g. Stiglitz and Weiss, 1981). Lenders are uncertain about the creditworthiness of managers and the investment opportunities. Financial institutions, in particular banks, can overcome these frictions by producing and analyzing information of their clients, thus make loan decisions (Petersen and Rajan, 1994).

One feature of bank loans is the relationship lending, through which banks are able to collect proprietary information from their borrowers. Boot and Thakor (1994) show that the duration of bank-firm relationships is associated with loan contract terms. Firms with long-term banking relationship pay lower interest rates and pledge less collateral. Empirical studies are generally consistent with the benefits of banking relationship. Hoshi et al. (1990, 1991) find that banks help their clients with long-term relationships alleviate credit constraints and survive liquidity shocks during the crisis. James (1987), Billett (1995), Maskara (2011) and Ongena (2013) document positive market reactions of bank loan announcements, suggesting that bank relationships are valuable from the perspective of outside investors.

We expect that banks can obtain sufficient information to monitor their borrowers through close and repeated interactions, and therefore prevent risk shifting in response to a liquidity shortfall. Hence, among firms borrowing from financial institutions, the transmission of liquidity shocks by relationship banks is weaker than other non-bank financial institutions. Thus we propose our second hypothesis:

Hypothesis 2: Among firms borrowing from financial institutions, firms having bank relationships experience less value loss during the liquidity crunch, as compared to firms having no bank relationship

One particular feature of Chinese financial system is the dominance of state-owned banks in credit allocation, whose funding is implicitly guaranteed from the government. Relative to local banks and joint-equity banks, state-owned banks typically have more financing flexibility due to their broader geographical presenses, diversification in deposit and other funding sources. Their close ties with the government earn them frequent support from the regulatory authoritiy, especially during crisis period. In addition, foreign banks are immunue from this liquidity crunch that is considered as a warning tool by the new political leadership. The information generated from the lending relationship with foreign banks and state-owned banks has a larger valuation

effect than those with joint-stock and local banks. Thus, the transmission of liquidity shocks by joint-stock banks and local banks is stronger than foreign and state-owned banks. We propose our third hypothesis:

Hypothesis 3: The value loss is the lowest if their relationship banks are state-owned banks and foreign banks, and the highest if their relationship banks are local and joint-stock banks

The liquidity crunch in June 2013 serves as a warning for banks' loan strategy, and banks may change their lending practices to deal with potential interbank liquidity shortfalls. After the liquidity crunch, the newly issued loans only recover to a comparable level of June 2013 in seven months after the liquidity crunch. Thus, this event provides us an additional opportunity to investigate how banks' lending behavior affect firms' investments. If banks have a special role in mitigating frictions in an economy, long-term bank relationships could help firms alleviate credit constraints. With a decreasing loan growth rate, we expect that firms with established banking relationships have a smaller reduction in their investments. We propose our fourth hypothesis:

Hypothesis 4: Firms with bank relationships have smaller reductions in investments than other firms ex post the liquidity crunch

3 Research design, data and discriptive statistics

3.1 Research design

A standard market model (James, 1987) is used to estimate the benchmark returns and then calculate the abnormal returns (ARs). We run a daily market model over the estimation window of [-120, -21] to calculate abnormal returns and cumulative abnormal returns (CARs), with day 0 as the liquidity crunch date. We calculate the CARs over the event windows of [-5, +5] as our main dependent variable. We link the CARs to bank-firm relationship, firm and bank level characteristics in a regression equation:

$$CAR_i = \gamma_0 + \gamma_1 Bank - firm\ relationship_i + \gamma_2 Firm_i + \gamma_3 Bank_i + \gamma_4 Industry_i + \epsilon_i$$

where $Bank - firm\ relationship_i$ equal 1 if a firm's largest lender of long-term loans is a bank, and 0 otherwise. We further categorize banks into *state-owned banks* (i.e. including the "big four" commercial banks and three policy banks), *joint stock banks*, *local banks* and *foreign*

*bank*s. Bank balance sheet data is retrieved from *Bankscope*. The *state-owned banks* dominate Chinese banking sector since the 1980s, which are often considered as the safest banks with implicit government guarantees. Therefore, we propose that firms having relationships with *state-owned banks* may perform better in the stock market during the interbank liquidity crunch. We define *local banks* as city / rural commercial banks, urban / rural credit cooperatives, rural cooperative banks, and village-town banks, i.e. small- and medium-sized banks. Local banks may be quite different from national and regional banks in terms of the geographical presence, organizational structure, business orientation, and the legal reserve requirement ratio, etc. Local banks have lower legal reserve requirement ratio which incentivizes them to finance the SMEs, e.g. since May 2012, the legal reserve requirement ratio is 20% for national and regional banks and 16.5% for local banks.

$Firm_i$ denotes a set of firm characteristics, such as firm size, leverage, profitability, ownership, Tobin's Q, growing prospect, and stock market liquidity. We add firm ownership information from *CSMAR*, a widely used database for the Chinese stock market. and create a SOE dummy variable which equals 1 if a firm's ultimate controller is a state-owned entity. We supplement the *CSMAR* stock data with firm balance sheet data at the end of 2012 from *WIND* database. A detailed definition of variables are listed in Appendix 2.

3.2 summary statistics

Our sample consists of all firms traded in the Shanghai and Shenzhen Stock Exchange in 2013. We retrieve stock return data from *CSMAR*. We include all firms with information on stock returns within the [-5, 5] window around June 20th, 2013, which leaves us with a sample of 42 financial firms and 2,335 non-financial firms.

We first search for all corporate annual reports of 2012 in the websites designated by the *China Securities Regulatory Commission* (*CSRC*). Existing regulations on the disclosure require all listed firms to report the information for the five largest outstanding loans in annual report.[3] A firm's relationship bank is identified as its largest lender of long-term loans disclosed in the firm's 2012 annual report. As a lender could show up multiple times in a firm's top-five long-

[3] The *China Securities Regulatory Commission* (*CSRC*) requires all listed firms to disclose relevant information of their top-five outstanding loans in annual reports, i.e. lender name, loan outstanding, maturity.

term loans, we aggregate and add up loan volumes at the headquarter level of lenders. We take an average of loan volume in the beginning and the end of each year, and identify the largest lender of long-term loans.

We also include bank balance sheet data from *Bankscope*, i.e. bank total assets, bank liquidity ratio, and bank equity ratio. Among all 78 banks that serve as listed firms' largest lenders of long-term loans, 46 banks have balance sheet information in *Bankscope*, which covers about 95% of firms with banks as their largest lenders of long-term loans in our sample.

In the 2,335 non-financial firms with stock price information available in the event window, 1,830 firms have outstanding loans in the end of 2012 (including 767 firms whose largest lenders of long-term loans are non-bank institutions, 1,063 firms that have banks as their largest lenders of long-term loans), 505 firms do not have any loans

Among 1063 firms[4] whose largest lenders of long-term loans are banks, 29 firms borrow the largest proportion from a number of foreign banks, 85 firms borrow from 38 local banks, 240 firms borrow from 12 joint-stock banks, while the majority of the other 649 firms all borrow from 7 state-owned banks.

4. Empirical results

4.1 Abnormal returns around liquidity crunch

Table 1 reports some descriptive statistics of CARs in eight event windows for all 2,377 Chinese listed firms. For all reported windows, CARs are significantly negative at the 1% level. For example, CAR[-1, 1] equals -0.023 and significant at 1% level, meaning that the stock prices on average decrease abnormally by 2.3% for Chinese listed firms within three trading days around the event day. This result is economically significant as the average CARs of bank loan announcements before 2007 is around 0.5% (Li and Ongena, 2015). The negative market reactions to the liquidity crunches in China confirms that the liquidity shortage witnessed by financial institutions in the interbank market may have a negative impact on the financial accessibility, liquidity and cash flow of their borrowing firms as well, through the institutions' lending to their borrowing firms.

[4] This includes 60 firms that do not disclose any lender information for their top 5 long-term loans in the 2012 annual reports, i.e. simply saying that they have some long-term loans outstanding without any further information.

[Insert Table 1 here]

We further categorize the listed firms by the types of their relationship banks in order to examine the role of lending relationships during the interbank liquidity crunch. Table 2 provides summary statistics on the CARs in three different event windows sorted by bank types.

Following previous studies, we choose the standard event window and focus on the CAR over a 3-days window [-1, 1]. We also check other windows such as [0,1] and [-1,0] as a robustness check and find similar results.

Firms with outstanding loans underperform their peers, meaning that the negative liquidity shock happened in interbank market also affect its downstream, i.e. firms with financing needs. In the meantime, among all firms with financing needs, firms borrowing from non-bank institutions clearly have much lower CARs than others borrowing from banks, i.e. the differences are positive and significant in all three event windows. It indicates that investors perceive that banks would continue supporting borrowers with prior lending relationships during liquidity crunch in the interbank market, and therefore give these firms a valuation premium.

[Insert Table 2 here]

The second panel of Table 2 shows CARs in three event windows across four groups of firms that are associated with four different types of banks. Firms that borrow from *foreign* banks have the highest CARs in all three windows, largely insignificant though, while firms that borrow from *Local* banks witness the lowest CARs among all four groups. Moreover, among the other two groups, firms borrowing from state-owned banks always perform slightly better than others borrowing from joint stock banks. The differences in the CARs between firms borrowing from foreign banks and firms in the other three groups are always positive and significant at the 1% level. This evidence suggests that firms having relationship with *Foreign* banks are almost immune to the liquidity shock; *State-owned banks* may have a slight advantage over the rest types of banks, which puts their borrowers in a better position during the interbank liquidity crunch. In contrast, a relationship with *Local* banks are considered to be least valuable in the investors' view. Investors seem to believe that local banks suffer the most from the interbank liquidity crunch, thus firms that have lending relationships with local banks witness more negative market reactions to this event than other firms.

4.2 Cross-sectional regressions

In Tables 3 and 4, we include loans and bank-firm relationship variables respectively in the regression to distinguish between firms with and without outstanding loans, and between firms with bank relationships (i.e. borrowing largely from banks) and without.

Table 3 reports the regression results with an OLS model using a sample of 2,335 Chinese firms listed in the Shanghai and Shenzhen Stock Exchanges. The dependent variables are CAR [-1, 1], calculated using the daily stock return and market index weighted by the market value. In the first three columns, the main independent variable is *Loans*, which equals 1 if a firm has outstanding loans at the end of 2012, and 0 otherwise.

In addition, we include a set of firm balance sheet variables in the previous year 2012: firm size (total assets), leverage, profitability (EBIT), Tobin's Q, state-owned dummy, special treatment dummy, growth rate of sales revenue, and stock liquidity. We further include bank level variables, such as interbank positions, bank CARs, as well as bank fixed effects to control for potential impact from the bank side. We also include the industry fixed effects in some regressions, and the standard errors are clustered at the industry level.

The coefficients of *Loans* are always negative and statistically significant (at least 5% level) in all 4 columns. For example, the coefficient is -0.004 in column (1), i.e. firms with outstanding loans tend to have 0.4% lower CARs than otherwise. This makes sense as firms have no outstanding loans are considered having no financing needs and no relationship with any lender in the interbank market. A negative liquidity shock in the interbank market are less likely to be transimitted to these firms as the lending channel doesn't exist. Adding industry fixed effects and firm balance sheet controls doesn't change the results. The results are robust to other event windows as well.[5]

[Insert Table 3 here]

After knowing that firms with loans underperform in stock market during the interbank liquidity crunch, we want to go a step further to explore the variation in stock market performances among firms with loans, i.e. whether bank relationship plays a role or not. Table 4

[5] Results are available upon request.

reports the regression results with an OLS model using a sample of 1,234 Chinese firms that disclose top 5 long-term loans in the 2012 annual reports, aiming to test whether having a bank as the largest lender of long-term loans makes any difference on firms' stock performances during the interbank liquidity crunch. In column (3) and (4) , the sample is enlarged to 1,830 firms that have institutional lending outstanding at the end of 2012 (i.e. including another 596 firms whose detailed long-term loan information is missing). In columns (5) and (6), the sample is enlarged to all 2,335 Chinese firms listed in Shanghai and Shenzhen exchanges (i.e. including another 505 firms who doesn't have outstanding institutional lending). The dependent variable is CAR [-1,1]. *Bank* equals 1 if a firm's largest lender of long-term loans is a bank, and 0 otherwise.

The coefficients of *Bank* are positive and statistically significant at the 1% level in all six columns. For example, the coefficient is 0.007 in column (1), meaning that firms with the largest lender of long-term loans as a bank tend to have 0.7% higher CARs than otherwise. Adding some firm balance sheet variables to control for other potential impact from the firm side doesn't change the results. The results are robust also for column (5) and (6) when we enlarge the sample to all 2,335 nonfinancial listed firms in China.

The results are robust to including some extra firm characteristics as control variables. *ST* dummy has positive and significant coefficients in all four columns, and the coefficients of leverage, sales growth and stock liquidity are largely negative and significant, suggesting that firms having a higher leverage and liquidity in the stock market tend to have lower CARs. The rest firm level control variables are largely insignificant, indicating that none of them affect the market reactions during the interbank liquidity crunch.

[Insert Table 4 here]

4.3 Results by bank types and firm ownership

Table 5 reports the regression results with an OLS model using a sample of 1,830 Chinese firms that have outstanding loans by the end of 2012. The dependent variable is CAR[-1,1]. *State-owned banks* equals to 1 if a firm's largest lender of long-term loans is one of the "big four" state-owned banks or three policy banks; *Local banks*, *Joint stock banks*, and *Foreign banks* equal 1 if a firm's largest lender of long-term loans is a local bank, a joint stock bank and a

foreign bank respectively, and 0 otherwise. All four columns use 767 firms borrowing from nonbank institutions as the benchmark group.

Table 5 examines whether the ownership structure of the relationship banks makes any difference on firms' stock performances.

With the full sample of 1,830 firms, the coefficient of *SOB* bank is 0.007 and significant at the 1% level in column (1) of Table 5. The coefficient is 0.006 when we add the industry fixed effects and some firm balance sheet control variables in column (4). The results are qualitatively similar for all columns. The positive coefficients of *State-owned banks* are always statistically significant at 1% level in all four columns, meaning that firms whose largest lenders of long-term loans are state-owned banks tend to outperform in stock market during the interbank liquidity crunch than others borrowing from other domestic banks. *Foreign banks* also have significantly positive coefficients that have even larger economic significance than those coefficients of *State-owned banks*. This result is in line with our third hypothesis.

Interestingly, compared to the coefficients of the other three bank types, we observe a consistent pattern that the coefficients of *State-owned banks* always have the second highest economic significance, and the coefficients of *Local banks* always have the lowest economic significance while *Joint-stock banks*' coefficients have slightly larger economic significance. This pattern is very persistent when adding industry fixed effects and firm balance sheet variable as controls.

This result is understandable because *Local banks* are often more fragile in the interbank market due to their small sizes and limited funding sources, which expose them more to the interbank liquidity crunch. Henceforth, firms having lending relationships with local banks are more likely to suffer from the interbank liquidity crunch than others having lending relationships with regional and national banks.

Next, we estimate the regression separately by firm ownership because Brant and Li (2003) show that SOEs in China is treated favorably by commercial banks, especially state-owned commercial banks. Non-SOEs have obstacles in obtaining external finance from SOBs due to eigher short lending history or discrimination. In gerenal, we expect stronger effects for non-SOEs when they borrow mainly from foreign banks because allocation of forein banks' credit is more likely to be based on commercial judgments. We define a firm as SOE if its ultimate largest

shareholder is government related and as Non-SOE otherwise. We add controls for industrial fixed effects and the set of firm characteristics variable.

Panel B reports the results by Non-SOE and SOEs. We find that the coefficients of *SOB*s are around 0.012 and significant at the 1% level for SOEs, while are negative and insignificant for Non-SOEs. The long-term lending relationships with local banks have a positive effect in SOEs while a negative effect in Non-SOEs. A possible explanation is that SOBs and local banks are ineffeicent in accessing information form non-SOEs, and thus less likely to mitigate liquidity shocks to their borrowing non-SOEs. In addition, the results also show that the coefficients of *Foreign banks* are around 0.018 for non-SOEs and 0.010 for SOEs. Consistent with our hypothesis, foreign banks allocate credit by commercial judgements, especially for extending credits to Non-SOEs.

[Insert Table 5 here]

4.4 Bank strength and market reaction

Table 6 examines whether firms' performances in stock market are associated with their banks' stock price change and interbank position. The first two columns in Table 6 are OLS regression results using a sample of 680 Chinese firms whose largest long-term loan lenders are one of the 16 listed banks in China. *Bank CAR* is the CAR of the bank which is the largest lender of long-term loans of a firm, also calculated in the window of [-1,1]. Given that all 16 Chinese listed banks are domestic, *State-owned banks* and *Local banks* are added as control variables in columns (2). We control for firm characteristics and industry fixed effects, bank fixed effects in some specifications and find the results still robust.

In column (1) of Table 6, we find that the coefficient of *Bank CAR* is 0.014, indicating that 1% increase in *Bank CAR* corresponds to about 1.4% increase in the CARs of banks' borrowing firms. This results indicate a positive relationship between firm CAR and bank CAR, which makes sense as the financial healthiness of the lending bank can affect the likelihood of financial distress for its borrowing firms. It is understandable that the coefficient is insignificant given that a group of 16 listed banks takes only a small fraction of the whole sample of 78 banks. Such relationship becomes more pronounced in column (2) where the coefficient of *Bank CAR* rise to 0.834 and becomes significant at 10% level when we add two dummy variables *State-*

owned banks and *Local banks* to control for any potential effect from the bank side. Investors seem to believe that firms do not suffer so much during the interbank liquidity crunch if their relationship banks also suffer little from the liquidity shock.

[Insert Table 6 here]

The last two columns in Table 6 reports the regression results with an OLS model using a sample of 921 Chinese firms whose largest long-term loan lenders are one of the 50 banks that have interbank market information in 2012 from *Bankscope*. The main independent variable is *Bank Interbank Position*, which equals the average ratio of interbank assets over interbank liability in 2012. i.e. a value over 100% indicates that the bank has a high liquidity in the interbank market. We propose that a higher liquidity of a bank in the interbank market is associated with a lower shock to the stock prices of the borrowing firms which have lending relationship with the bank. Standard errors are clustered at the industry level in all four columns. Columns (4) also includes the *State-owned banks* and *Local banks* as control variables, while we find qualitatively similar results.

In column (3) of Table 6, we find that the coefficient of *Bank Interbank Position* is 0.028 and significant at the 1% level, indicating that there exists a positive relationship between firm CAR and banks' position in the interbank market. It makes sense as net lenders in the interbank market, as represented by a *Bank Interbank Position* higher than 1, are less likely to be negatively affected by the liquidity crunch (or maybe even benefit from it). In contrast, a net borrower would suffer more than others as the liquidity crunch would dry up alternative funding sources in the interbank market. Such relationship remains positive but insignificant when we add bank type characteristics as control variables. That could be due to the fact that bank type dummies take away some variation in bank interbank position, as state-owned banks are usually the lenders who lend to small local banks in Chinese interbank market.

4.5 Long run effects

The table reports OLS regression results using a panel data of Chinese listed firms during 2011 and 2015 (i.e. two years before and after the liquidity crunch), aiming to test whether there is any long run effect of the liquidity crunch on the operation of the borrowing firms.

The dependent variable is investment ratio, which is the ratio of investment over total assets. Bank equals 1 if a firm's largest lender of long-term loans is a bank, 0 otherwise. After is a dummy which equals to 1 for observations in the third quarter of 2013 and onwards. The sample contains all 2,355 nonfinancial listed firms in columns (1)-(2), and only 1,830 firms with loans in column (3) -(4).

[Insert Table 7 here]

Column (1) of Table 7 shows that the interaction terms between *Loan* and *After* are always negative and statistically significant at the 1% level, meaning that firms with financing needs (i.e. outstanding loans) invest less after the liquidity crunch than their peers, because of the negative shock to banks' funding. On the other hand, we find positive and significant coefficients for the interaction term between *Bank* and *After* in the last two columns. This suggests that firms that have lending relationships with banks manage to maintain their invesement level better than others that have lending relationships only with nonbank financial institutions. This evidence provides support for our fourth hypothesis. The result is robust to including year and industry fixed effects, as well as some firm balance sheet variables.

In a word, we find that financial institutions' lending is a transmission channel of the liquidity shock. On the one hand, firms with loans perform worse than firms without no long-term loans during the liquidity crunch, indicating that lending relationship with banks helps transmit liquidity shocks from banks to firms. On the other hand, such relationship can help firms alleviate liquidity shocks in the crisis period compared to firms that borrow from other non-bank institutions.

5. Conclusion

We exploit the liquidity crunch in the interbank market in June 2013 in China as a negative shock to banks, and analyze the wealth effects on the borrowing firms. We find that institutional lending can work as a channel of the transmission of liquidity shocks. However, we find that firms having long-term relationships with banks experience less valuation losses than others borrowing from non-bank institutions, but more losses than firms having no long-term

loans (i.e. no lending relationships) during the liquidity crunch. This effect is the strongest for state-owned banks and foreign banks, and the weakest for local banks. We further document a positive relationship between firms' stock performances and their lending banks' stock performances and liquidity positions in the interbank market. We also find evidence for the long-run impact of relationship lending on the effect of liquidity crunch on firm investment.

References

Allen, F., J. Qian, and M. Qian, 2005, "Law, Finance and Economic Growth in China," Journal of Financial Economics 77, 57-116.

Berger, A.N., N.H. Miller, M.A. Petersen, R.G. Rajan, and J.C. Stein, 2005, "Does Function Follow Organizational Form? Evidence from the Lending Practices of Large and Small Banks," Journal of Financial Economics 76, 237-269.

Berger, A.N., I. Hasan, and M. Zhou, 2009, "Bank Ownership and Efficiency in China: What will Happen in the World's Largest Nation?," Journal of Banking and Finance 33, 113-130.

Billett, M. T., M. J. Flannery, and J. A. Garfinkel, 1995, "The Effect of Lender Identity on a Borrowing Firm's Equity Return," Journal of Finance 50, 699-718.

Brandt L, Li H., 2003, "Bank Discrimination in Transition Economies: Ideology, Information or Incentives?" Journal of Comparative Economics 31, 387-413.

Boot, A. W. A., 2000, "Relationship Banking: What Do We Know?," Journal of Financial Intermediation 9, 3-25.

Chava, S., and A. Purnanandam, 2011, "The Effect of Banking Crisis on Bank-dependent Borrowers," Journal of Financial Economics 99, 116-135.

Chong, T., L. Lu, and S. Ongena, 2013, "Does Banking Competition Alleviate or Worsen Credit Constraints Faced by Small- and Medium-Sized Enterprises? Evidence from China," Journal of Banking and Finance 37, 3412-3424.

Cocco, J.F., Gomes, F.j., and Martins, N.C., 2009, "Lending Relationships in the Interbank Market," Journal of Financial Intermediation 18, 24-48.

Ferri, G., 2009, "Are New Tigers Supplanting Old Mammoths in China's Banking System? Evidence from a Sample of City Commercial Banks," Journal of Banking and Finance 33, 131-140.

Fields, L. P., D. R. Fraser, T. L. Berry, and S. Byers, 2006, "Do Bank Loan Relationships Still Matter?," Journal of Money, Credit, and Banking 38, 1195-1209.

James, C. M., 1987, "Some Evidence on the Uniqueness of Bank Loans," Journal of Financial Economics 19, 217-235.

He, Q., C. Xue and C. Zhu, 2016, "Financial Development and the Patterns of Industrial Specialization: the Evidence from China," Review of Finance, forthcoming

Li, C., and S. Ongena, 2015, Bank Loan Announcements and Borrower Stock Returns Before and During the Recent Financial Crisis, Journal of Financial Stability 21, 1-12.

Lin, X. and Y. Zhang, 2009, "Bank Ownership Reform and Bank Performance in China," Journal of Banking and Finance 33, 20-29.

Lummer, S. L., and J. J. McConnell, 1989, "Further Evidence on the Bank Lending Process and the Capital Market Response to Bank Loan Agreements," Journal of Financial Economics 25, 99-122.

Maskara, P. K., and D. J. Mullineaux, 2011, "Information Asymmetry and Self-selection Bias in Bank Loan Announcement Studies," Journal of Financial Economics 101, 684-694.

Megginson, W. L., A. B. Poulsen, and J. F. J. Sinkey, 1995, "Syndicated Loan Announcements and the Market Value of the Banking Firm," Journal of Money, Credit and Banking 27, 457-475.

Michaud, F.L., and C. Upper, 2008, "What Drives Interbank Rates? Evidence from the Libor Panel," BIS Quarterly Review.

Ongena, S., and D. C. Smith, 2000, "Bank Relationships: a Review," in P. Harker and S. A. Zenios, eds, The Performance of Financial Institutions, Cambridge University Press, London.

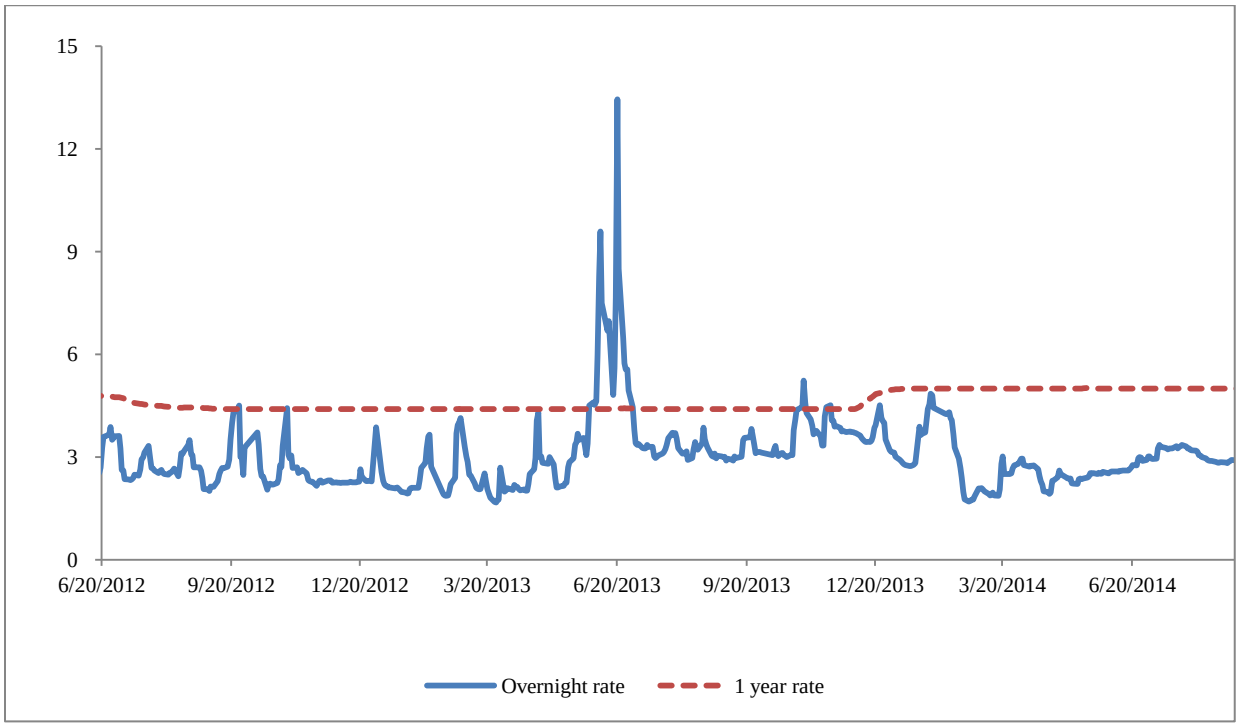
Ongena, S., D.C. Smith, and D. Michalsen, 2003, "Firms and Their Distressed Banks: Lessons from the Norwegian Banking Crisis," Journal of Financial Economics 67, 81-112.

Ongena, S., and V. Roscovan, 2013, "Bank Loan Announcements and Borrower Stock Returns: Does Bank Origin Matter?," International Review of Finance 13, 137-159.

Slovin, M. B., Sushka, M. E., and Hudson, C. D., 1988, "Corporate Commercial Paper, Note Issuance Facilities, and Shareholder Wealth," Journal International Money Finance 7, 289-302.

Slovin, M. B., S. A. Johnson, and J. L. Glascock, 1992, "Firm Size and the Information Content of Bank Loan Announcements," Journal of Banking and Finance 16, 35-49.

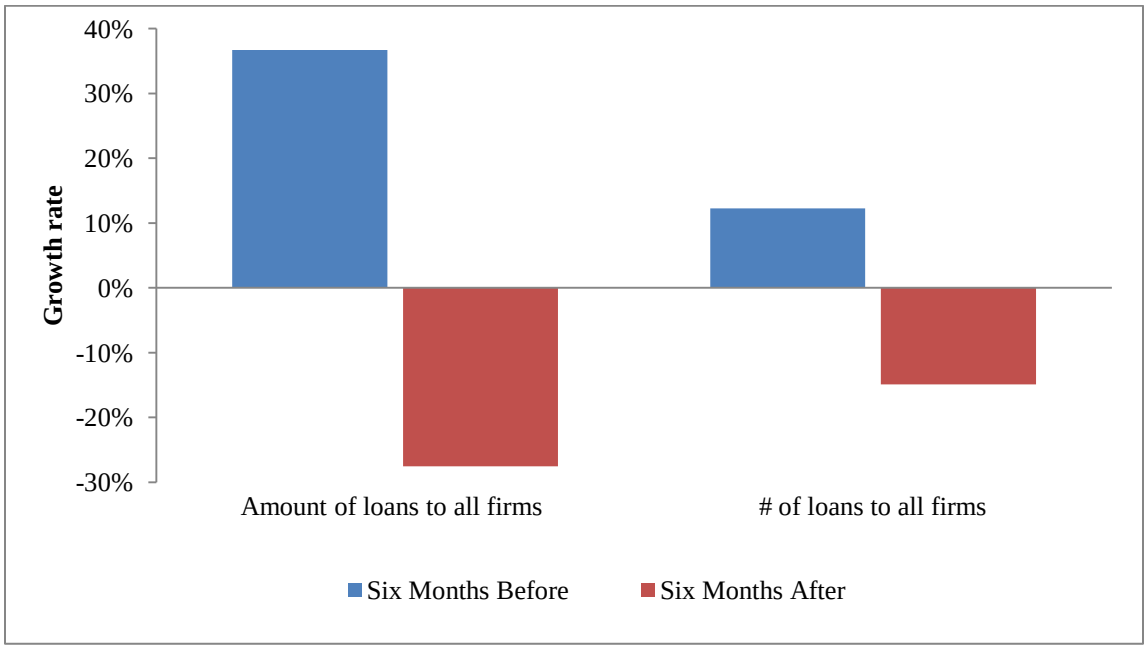
Figure 1: the interbank interest rate from 1-year before and till 1-year after the liquidity crunch of June 20, 2013



Source：CSMAR

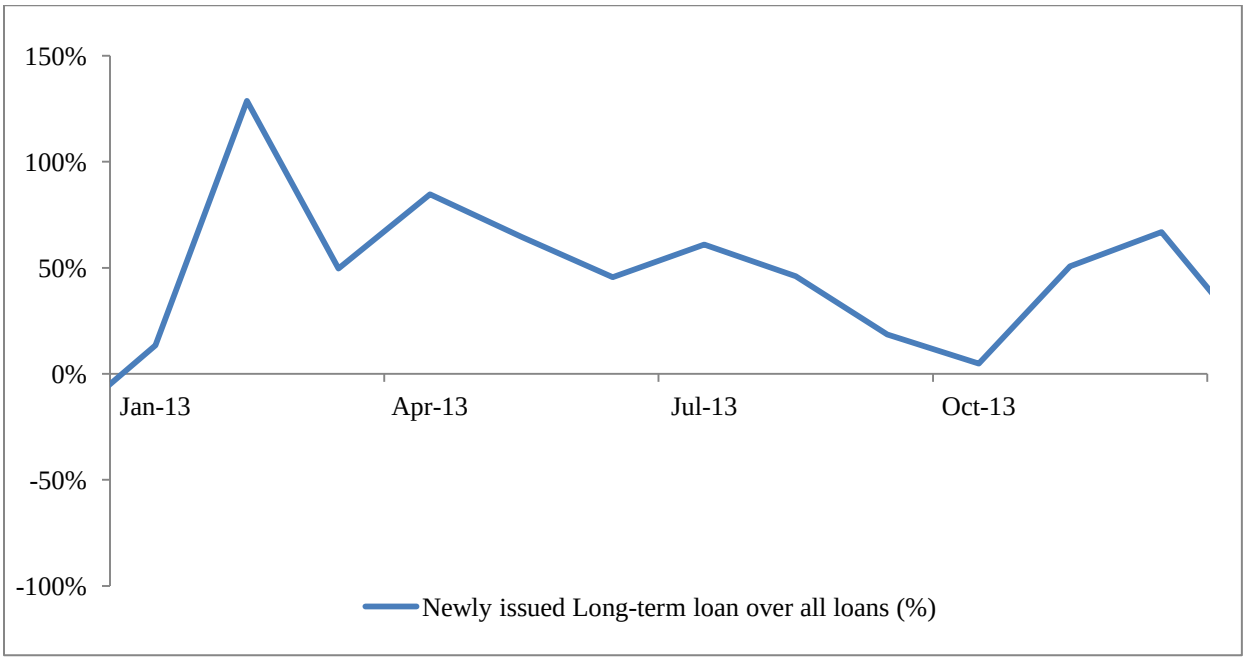
Figure 2. Growth in newly issued bank loans

(Quarterly, Jan 2013 - Dec 2013)



Source: CSMAR

Figure 3: Term Structure of Loans Newly Issued by Financial Institutions (Monthly, Jan 2013 – Dec 2013)



Source：PBOC

Table 1: Descriptive statistics of CARs.

The table reports descriptive statistics of the dependent variable: cumulative abnormal return (CAR). Market index weighted by market value and daily stock returns at each trading day are used to calculate CAR in eight different event windows. Data source: *CSMAR*.

	Mean	**Std. Err.**	**Obs.**	**Min.**	**Max.**
CAR [-1, 1]	-0.022***	0.001	2377	-0.28	0.218
CAR [0, 1]	-0.023***	0.001	2377	-0.148	0.171
CAR [-1, 0]	-0.017***	0.001	2377	-0.262	0.22
CAR [-2, 2]	-0.047***	0.001	2377	-0.318	0.289
CAR [-3, 3]	-0.044***	0.002	2377	-0.291	0.367
CAR [-5, 5]	-0.046***	0.002	2377	-0.397	0.497
CAR [-1, 2]	-0.050***	0.001	2377	-0.303	0.287
CAR [-1, 4]	-0.041***	0.001	2377	-0.286	0.367

Table 2: Firm CARs sorted by firm types.

The table reports the mean and standard error for the CARs in three event windows sorted by firm types. The CARs are calculated using the returns of the daily stock price and market index weighted by market value. Among 2,335 nonfinancial firms with stock price information available in the event window, 1,830 firms have outstanding loans in the end of 2012 (including 1,063 firms that have banks as their largest long-term loan lenders, and 767 firms whose largest long-term loan lenders are non-bank institutions), 505 firms don't. In those 1,063 firms whose largest long-term loan lenders are banks, 649 of which borrow from state-owned banks, 85 firms borrow from local banks, 240 firms borrow from joint-stock banks, 29 firms borrow from foreign banks, and 60 firms borrow from banks without disclosing detailed bank type information. Definitions of bank-type variables, i.e. State-owned banks, Local banks, Joint stock banks and Foreign banks, are listed in Appendix 2. Differences of the means between firm types are reported, and significance indicated at the 1%, 5%, and 10% levels respectively with ***, **, and *.

	# of firms		***CAR[-1,1]***	***CAR[0,1]***	***CAR[-1,0]***
Non-financial firms					
Overall	2,335	Mean	-0.023***	-0.023***	-0.017***
		Std. Err.	(0.001)	(0.001)	(0.001)
No loans	505	Mean	-0.019***	-0.020***	-0.015***
		Std. Err.	(0.002)	(0.002)	(0.002)
Loans	1,830	Mean	-0.024***	-0.024***	-0.017***
		Std. Err.	(0.001)	(0.001)	(0.001)
		Dif No loans	***-0.004*****	***-0.003*****	***-0.002****
No relationship	767	Mean	-0.025***	-0.026***	-0.019***
		Std. Err.	(0.001)	(0.001)	(0.001)
Bank relationship	1,063	Mean	-0.022***	-0.022***	-0.017***
		Std. Err.	(0.001)	(0.001)	(0.001)
		Dif No bank relationship	***0.003*****	***0.004******	***0.002****
Bank Types					
SOB	649	Mean	-0.021***	-0.021***	-0.016***
		Std. Err.	(0.002)	(0.001)	(0.001)
		Dif No bank relationship	***0.004*****	***0.005******	***0.003*****
Local	85	Mean	-0.026***	-0.024***	-0.020***
		Std. Err.	(0.004)	(0.003)	(0.004)
		Dif No bank relationship	***-0.0001***	***0.003***	***-0.001***
Joint	240	Mean	-0.025***	-0.024***	-0.018***
		Std. Err.	(0.003)	(0.002)	(0.002)
		Dif No bank relationship	***0.0005***	***0.002***	***0.001***
Foreign	29	Mean	-0.011	-0.021**	-0.008
		Std. Err.	(0.010)	(0.001)	(0.006)
		Dif No bank relationship	***0.014*****	***0.005***	***0.011*****

Table 3: Firms' borrowing and information disclosure

The table reports regression results with an OLS model using a sample of 2,335 Chinese firms listed in Shanghai and Shenzhen exchanges. The dependent variables are CAR[-1, 1], calculated using daily stock return and market index weighted by market value. *Loans* equals 1 if a firm has outstanding loans in the end of 2012, 0 otherwise. Firm balance sheet controls include the following variables: *Log total assets* is the logarithm of total assets at the end of 2012 in 1,000 RMB; *Leverage* is total liabilities over total assets at the end of 2012; *EBIT* is the industry adjusted EBIT at the end of 2012; *Tobin's Q* is the book value of total liabilities plus the market value of total equity over the book value of total assets at the end of 2012; *SOE* equals 1 if the firm's ultimate controller is state owned at the end of 2012, 0 otherwise; *ST* equals to 1 if the firm is under special treatment, 0 otherwise. Other firm level controls include the following variables: *Growth sales* is the growth rate of sales revenue in 2012; *Stock liquidity* equals to the average ratio of trading volume divided by circulation market value in 30 days before the event. Standard errors are clustered at industry level in all four columns, and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10%.

	(1)	(2)	(3)	(4)
Loans	-0.004***	-0.004***	-0.008***	-0.007***
	(0.001)	(0.001)	(0.001)	(0.001)
Total asset			-0.001	-0.001
			(0.001)	(0.002)
Leverage			0.007	0.005
			(0.005)	(0.004)
EBIT			-0.013	-0.013
			(0.016)	(0.016)
Tobin's Q			-0.002	-0.002
			(0.002)	(0.002)
SOE			-0.002	-0.003
			(0.002)	(0.002)
ST			0.011***	0.010***
			(0.002)	(0.002)
Growth sales			-0.001	-0.001
			(0.002)	(0.002)
Stock liquidity			-0.002***	-0.003***
			(0.001)	(0.000)
Constant	-0.019***	-0.014***	0.014	0.031
	(0.001)	(0.001)	(0.033)	(0.037)
Observations	2,335	2,335	2,207	2,207
R-squared	0.002	0.016	0.024	0.039
Industry FE	no	yes	no	yes

Table 4: Firms with a bank as the largest lender of long-term loans

The table reports regression results with an OLS model using a sample of 1,234 Chinese firms that disclosed top 5 long-term loans in 2012 annual reports. In columns (3) - (4), the sample was enlarged to 1,830 firms that have outstanding loans in the end of 2012 (i.e. including another 596 firms whose detailed long-term loan information is missing). In columns (5) - (6), the sample was enlarged to all 2,335 Chinese firms listed in Shanghai and Shenzhen exchanges (i.e. including another 505 firms who doesn't have outstanding loans). The dependent variables are CAR[-1,1]. Bank equals 1 if a firm's largest lender of long-term loans is a bank, 0 otherwise. Information disclosure equals to 1 if a firm disclose top 5 largest long-term loan information in its 2012 annual report, 0 otherwise. Firm balance sheet controls are the same as in Table 3. Standard errors are clustered at industry level in all four columns, and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10%.

	(1)	(2)	(3)	(4)	(5)	(6)
	Firms disclosing top 5 long-term loan		All firms with loans		All firms	
Bank	0.007***	0.007***	0.007***	0.007***	0.007***	0.007***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
Information Disclosure			-0.005**	-0.007**	-0.007***	-0.010***
			(0.002)	(0.003)	(0.002)	(0.003)
Total asset		-0.001		-0.002		-0.001
		(0.002)		(0.001)		(0.002)
Leverage		-0.001		0.004		0.003
		(0.005)		(0.004)		(0.005)
EBIT		-0.035		-0.035*		-0.016
		(0.023)		(0.018)		(0.016)
Tobin's Q		0.000		0.000		-0.002
		(0.003)		(0.002)		(0.002)
SOE		-0.004		-0.002		-0.003
		(0.003)		(0.003)		(0.002)
ST		0.015***		0.011***		0.011***
		(0.004)		(0.003)		(0.003)
Growth sales		-0.003		-0.001		-0.001
		(0.002)		(0.002)		(0.002)
Stock liquidity		-0.005***		-0.004***		-0.002***
		(0.001)		(0.000)		(0.000)
Constant	-0.032***	-0.003	-0.018***	0.027	-0.017***	0.018
	(0.001)	(0.038)	(0.001)	(0.036)	(0.001)	(0.037)
Observations	1,234	1,200	1,830	1,742	2,335	2,207
R-squared	0.028	0.073	0.018	0.054	0.016	0.039
Industry FE	yes	yes	yes	yes	yes	yes

Table 5: Results by bank types and firm ownership

The table reports regression results by bank types and firm ownership. Panel A shows results with an OLS model using a sample of 1,830 Chinese firms that have outstanding loans in 2012 annual reports. The dependent variables are CAR[-1,1]. *State-owned banks* equals to 1 if a firm's largest lender of long-term loans is one of the four large state-owned banks or three policy banks, local bank, *Local banks*, *Joint stock banks*, and *Foreign banks* equal 1 if a firm's largest lender of long-term loans is a local bank or a joint-stock bank or a foreign bank respectively, and 0 otherwise. All four columns use 171 firms borrowing from nonbank institutions as the underlying comparing group. Firm balance sheet controls are the same as in Table 3. In Panel B, we split sample into Non-SOEs and SOEs. The dependent variables and independent variabes are the same as in Panel A. Standard errors are clustered at industry level in all four columns, and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10%.

Panel A Whole sample

	(1)	(2)	(3)	(4)
State-owned banks	0.007***	0.007***	0.007***	0.006***
	(0.002)	(0.002)	(0.002)	(0.002)
Local banks	0.002	0.001	0.004	0.003
	(0.003)	(0.004)	(0.003)	(0.004)
Joint stock banks	0.003	0.003	0.004	0.004*
	(0.002)	(0.002)	(0.002)	(0.002)
Foreign banks	0.018***	0.018***	0.020***	0.020**
	(0.005)	(0.005)	(0.007)	(0.007)
Firm balance sheet controls	no	no	yes	yes
Observations	1,830	1,830	1,742	1,742
R-squared	0.005	0.021	0.038	0.057
Industry FE	no	yes	no	yes

Panel B Non-SOEs vs SOEs

	(1)	(2)	(3)	(4)
	Non-SOE		SOE	
State-owned banks	-0.004	-0.003	0.012***	0.012***
	(0.002)	(0.002)	(0.003)	(0.003)
Local banks	-0.008*	-0.010	0.015**	0.012*
	(0.004)	(0.006)	(0.007)	(0.006)
Joint stock banks	-0.002	-0.001	0.006	0.005
	(0.003)	(0.003)	(0.003)	(0.004)
Foreign banks	0.017***	0.018***	0.011*	0.009*
	(0.005)	(0.005)	(0.006)	(0.005)
Firm balance sheet controls	yes	yes	yes	yes
Observations	927	927	815	815
R-squared	0.039	0.063	0.095	0.134
Industry FE	no	yes	no	yes

Table 6: Heterogeneity across bank CARs and bank interbank positions

The table reports regression results with an OLS model exploring the heterogeneity across bank CARs and bank interbank positions. The first two columns use a sample of 680 Chinese firms whose largest long-term loan lenders are one of the 16 listed banks in China, while the last two columns use a sample of 921 Chinese firms whose largest long-term loan lenders are one of the 50 banks that have interbank market information in 2012 from Bankscope.. The dependent variables are CAR[-1,1]. Bank CAR is the CAR of the bank which is the largest lender of long-term loans of a firm, also calculated in the window of [-1,1]. The main independent variable is Bank Interbank Position, which equals to the average ratio of interbank assets over interbank liability in 2012. Given that all 16 Chinese listed banks are domestic, *State-owned banks* and *Local banks* bare added in as control variables in columns (2) and (4). Firm balance sheet controls are the same as in Table 3. Standard errors are clustered at industry level in all four columns. Standard errors are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10%.

	(1)	(2)	(3)	(4)
Bank CAR	0.014	0.834*		
	(0.033)	(0.411)		
Bank Interbank Position			0.028***	0.016
			(0.008)	(0.029)
SOB		-0.014***		-0.014***
		(0.003)		(0.003)
Local		-0.105**		-0.020
		(0.045)		(0.013)
Firm balance sheet controls	yes	yes	yes	yes
Observations	680	680	921	921
R-squared	0.140	0.141	0.137	0.137
Industry FE	yes	yes	yes	yes
Bank FE	yes	yes	yes	yes

Table 7: Long-term effect

The table reports OLS regression results using a panel data of 2,335 Chinese listed firms during 2011 and 2015 (i.e. two years before and after the liquidity crunch). The dependent variable is investment ratio, which is the ratio of investment over total assets. *Bank* equals 1 if a firm's largest lender of long-term loans is a bank, 0 otherwise. *After* is a dummy which equals to 1 for observations in the third quarter of 2013 and onwards. The sample contains all 2,355 nonfinancial listed firms in columns (1)-(2), and only 1,830 firms with loans in column (3) -(4). Firm balance sheet controls are the same as in Table 3. Standard errors are clustered at industry level in all four columns, and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10%.

	(1)	(2)	(3)	(4)
	All firms		Firms with loans	
After * Loans	-0.049***	-0.049***		
	(0.001)	(0.001)		
Loans	0.014*	0.015*		
	(0.072)	(0.060)		
After * Bank			0.013**	0.013**
			(0.013)	(0.017)
Bank			0.014***	0.015***
			(0.004)	(0.002)
After	0.051***	0.050***	-0.010***	-0.011***
	(0.001)	(0.001)	(0.047)	(0.046)
Firm Balance sheet controls	yes	yes	yes	yes
Observations	8,247	8,247	6,719	6,719
R-squared	0.026	0.036	0.060	0.094
Year FE	yes	yes	yes	yes
Industry FE	no	yes	no	yes

Appendix 1: Major events around the interbank liquidity crunch on June 20th 2013 in China.

Date	Events
2013/6/5	The bond issuance of *Agriculture Development Bank of China* failed to attract enough subscriptions.
2013/6/14	The issuance of treasury bonds failed to attract enough subscription.
2013/6/19	Premier *Keqiang Li* expressed a determination for the financial reform by the government. The overnight rate increases to 7.66%, i.e. an increase of about 200 basis points. The *PBOC* talked privately with several big banks, which made these banks inject about 400 billion RMB. The interbank market delayed the closing time by 30 minutes.
2013/6/20	The overnight rate hikes to 13.44%, i.e. an increase of 578 basis points. The PBOC initiated the issuance of bills, which extracted liquidity from the interbank market. A Rumor flies that the *Bank of China* was in default in the interbank market.
2013/6/21	The *PBOC* supplied 50 billion RMB to *Industrial and Commercial Bank of China*. The overnight interbank interest rate dropped to 8.49%, i.e. a decrease about 500 basis points from the previous day.
2013/6/23	Several branches of the *Industrial and Commercial Bank of China* in *Beijing* and *Shanghai* closed unexpectedly
2013/6/24	The stock prices of the banks crashes, i.e. *Shanghai Stock Exchange* composite index decreased by about 5%, and the stock prices of *Ping An Bank*, *China Minsheng Bank*, and *China Industrial Bank* falls about 10%.
2013/6/25	The *PBOC* suspended the issuance of bills and supplied liquidity support for certain financial institutions.
2013/6/26	The overnight interbank interest rate decreased to 5.55%

Appendix 2

The table reports definition and descriptive statistics of bank-firm relationship, firm and bank characteristics. The data is sourced from *CSMAR*, *Bankscope*, and *Wind*.

Variable	Definition	Mean	Std. Dev	Obs.	Min.	Max.
Loans	Equals 1 if a firm has outstanding loans in the end of 2012, 0 otherwise	0.774	0.418	2,377	0	1
Information disclosure	Equals 1 if a firm discloses long-term loan information in its 2012 annual report.	0.522	0.5	2,377	0	1
Bank	Equals 1 if a firm has a relationship bank, 0 otherwise	0.581	0.494	1,840	0	1
State-owned banks	Equals 1 if a firm's relationship bank belongs to four large state-owned banks or three policy banks.	0.544	0.498	1,024	0	1
Local banks	Equals 1 if a firm's relationship bank is a local bank	0.072	0.259	1,024	0	1
Joint-stock banks	Equals 1 if a firm's relationship bank is a Joint-stock commercial bank.	0.204	0.169	1,024	0	1
Foreign banks	Equals 1 if a firm's relationship bank is a foreign bank	0.029	0.178	1,024	0	1
Bank Interbank Position	Interbank Asset / Interbank Liability of a bank that is a firm's biggest lender in 2012.	0.75	0.385	954	0.191	3.625
Bank CAR	CAR[-3, 3] of a bank with whom a firm has relationship in 2012.	-0.057	0.041	707	-0.122	0.014
Total asset	Total assets(1000 RMB) in 2012	5.56E+09	6.46E+09	2,377	7.41E+08	2.12E+10
Leverage	Total liability over total asset in 2012	0.435	0.232	2,377	0.038	0.946
EBIT	Industry adjusted EBIT in 2012	0.057	0.052	2,377	-0.105	0.242
Tobin's Q	Book value of total liabilities plus the market value of total equity over the book value of total assets in 2012	1.893	1.087	2,377	0.541	7.079
SOE	Equals 1 if a firm's ultimate controller is government in 2012, 0 otherwise	0.402	0.49	2,377	0	1
ST	Equals 1 if a firm is under special treatment in 2012, 0 otherwise	0.018	0.133	2,377	0	1
Growth sales	Growth rate of sales in 2012	0.156	0.543	2,250	-0.608	3.963
Stock liquidity	The 30-days average ratio of trading volume divided by circulation market value prior to the event	2.453	2.377	2,375	0.009	20
Investment ratio	Investment over total loans	0.116	2.138	11.982	-10.167	134.444