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LIQUIDITY SHOCKS AND "BORROW TO LEND" SHADOW BANKING ACTIVITIES

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Abstract

for state-owned firms. Small private firms engage in the usual "borrow to invest" activities while the large state-owned firms and less profitable firms are more involved with "borrow to lend" activities. Liquidity shocks induce large private firms to take part in more "borrow to lend" activities, but they exert no additional impact on state-owned firms. The findings suggest that a broader focus is necessary to understand the multi-faceted aspects of shadow banking activities in China.

Keywords: Borrow to Lend; Shadow Banking; Liquidity Shocks; Financial Stability

JEL classification: G21, G32, E58

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1. Introduction

Shadow banking activities have recently come under the scrutiny of both academia and policy makers. They not only have serious implications for the functioning of the banking system, the operating situations of firms, and financial stability of the whole economy, but also affect the transmission of monetary policies (Chen et al., 2017).

Shadow banking activities take many different forms. Banks may issue wealth management products (WMPs) to increase deposits and move loans off their balance sheet in order to satisfy the regulation of loan to deposit ratio. Acharya et al. (2017) examine this form of shadow banking activity in detail, study its triggers and explore its impacts on the fragility of the banking system. Banks may also act as the intermediary between firms and facilitate entrusted loans. Chen et al. (2017) compile a detailed dataset covering new entrusted loans between nonfinancial firms and the name of the financial trustee that facilitates each entrusted loan. It studies the different behaviour of state-owned banks and nonstate banks in facilitating entrusted loans in response to monetary policy tightening. In this paper, we focus on another form of shadow banking activity — nonfinancial firms as financial intermediaries. That is, some nonfinancial firms borrow cheaply and then lend the money out to other nonfinancial firms to earn a profit (borrow to lend). The difference between this form of shadow banking activity with entrusted loans is that there is no financial intermediary between the lending firm and the borrowing firm, . It is more opaque than entrusted loans and is basically free from regulations, and hence may accumulate financial risks that are hard to monitor. It also differs from related-party loans as the latter refers to the borrowing and lending between subsidiaries of the same parent company or between the subsidiary and parent company. Such lending receives no interest earnings or very little interest earnings and if we use the consolidated financial statements of the whole business group, such activities may cancel out.

China's institutional background offers a good opportunity to study the nonfinancial firms' "borrow to lend" activities. In China, although the share of state-owned firms is declining, they still play an important role. State-owned firms have more political connections and enjoy the implicit guarantees from government and therefore have better access to finance. On the other hand, their investment and growth opportunities are limited. Therefore, they have stronger incentives to lend the cheaply borrowed money out in order to earn a profit. In comparison, private firms are more financially constrained and possess more limited resources to engage in such kind of activities.

Shin and Zhao (2013) developed a method to identify the nonfinancial firms' "borrow to lend" activities. However, their analysis includes many emerging market economies (China is one of them) and is not able to use the differences between private firms and SOEs to further identify such activities, since for other countries most firms are private-owned and compete on a level playing field. Du et al. (2016)

study this shadow banking activity for Chinese firms, but do not investigate its dynamic patterns and how the liquidity shocks and local banking sector characteristics affect such kind of activities.

Based on the methodology developed by Shin and Zhao (2013) and Du et al. (2016), and the quarterly data about Chinese listed firms, this paper first examines whether such kind of "borrow to lend" (nonfinancial firms as financial intermediaries) shadow banking activities exist for private firms and state-owned firms, and its dynamic patterns. Then the paper utilises the liquidity shock in the second quarter of 2013 and the cross regional variations in banking sector characteristics to investigate how the liquidity shock contributes to the development of such shadow banking activities. Empirical results show that "borrow to lend" activities exist for state-owned firms, especially large SOEs, and such activities become more significant after 2012. Small private firms do not participate in "borrow to lend" activities and they act as usual "borrow to invest" firms. Liquidity shocks trigger large private firms to get involved in the "borrow to lend" activities, but exert no additional impacts on the "borrow to lend" activities of state-owned firms.

The paper contributes to the literature in two aspects. First, it provides up-to-date evidence about one important form of shadow banking activities (nonfinancial firms as financial intermediaries), its manifestation in different kinds of firms (private firms versus state-owned firms and small firms versus large firms) and its dynamic patterns. Second, the paper provides new evidence about how liquidity shocks and local banking sector features contribute to the evolution of shadow banking activities that might have important implications for financial stability.

The rest of the paper is organised as follows. Section 2 briefly reviews relevant literature and compares the paper with them. Section 3 introduces the data and methodology to identify the "borrow to lend" shadow banking activities and the framework to investigate how liquidity shocks and local banking sector characteristics affect such activities. Baseline empirical results and robustness checks results are presented in section 4. Section 5 concludes.

2. Literature Review

Most of the existing literature studies the shadow banking activities in the advanced economies. They investigate the role of the shadow banking system in financial intermediation and financial market, including asset-backed securities, Repos, money market mutual fund and so on. They explore how each activity brings risks to the financial system (Acharya et al., 2013; Kacperczyk and Schnabl, 2013; Krishnamurthy et al., 2014).

There are a few papers studying shadow banking activities in China. Dang et al. (2014) point out that China's shadow banking system has close connection with traditional banks and is built on the asymmetric perception of information sensitivity among shadow banking entities, banks and investors. Li (2014) provides an overview of shadow banking activities in China, discusses their close ties with banks and summarises regulatory issues related to shadow banking. Li (2014) finds that China's shadow banking system does not involve extensive use of financial derivatives. Allen et al. (2015) perform a transaction-level analysis of entrusted loans in China and find that entrusted loans involve firms with privileged access to cheap capital to channel funds to less privileged firms. In addition, entrusted loans increase when credit is tight. Hachem and Song (2015) study the regulatory triggers for shadow banking activities and provide theoretical analysis on the interaction between small and large banks both in the on- and off-balance sheet market. They find that asymmetric competition between banks is both a short-run stabiliser and a long-run risk and the new regulations potentially exacerbate the tipping point. Acharya et al. (2017) find that small and medium-sized banks significantly increased shadow banking activities after the stimulus plan by issuing more wealth management products. Chen et al. (2017) compile two micro dataset at the individual bank level and find that in response to monetary policy tightening, nonstate banks actively engage in intermediating shadow banking products.

The above papers focus on banks' behaviour and explore issuance of wealth management products or intermediation of entrusted loans aspects of shadow banking activities. This paper instead examines the "borrow to lend" behaviour of nonfinancial firms, and investigates how the liquidity shocks and local banking sector characteristics affect such activities. Nevertheless, this paper is inspired by the insights of Acharya et al. (2017) and Chen et al. (2017), which find that state-owned banks and nonstate banks behave differently in shadow banking activities, and go one step further to investigate how the local banking sector characteristics influence nonfinancial firms' "borrow to lend" shadow banking activities. He et al. (2016) evaluate the stock price reaction of borrowing and lending firms after an announcement of inter-corporate loans is made in China. They find that the average abnormal return for the issuers of inter-corporate loans is negative, whereas it is positive for the receivers. Our paper, in comparison, focuses on the triggers of the issuing of inter-corporate loans, rather than its consequences. Moreover, He et al. (2016) do not investigate the role of liquidity shocks, which will be the focus of our paper.

Shin and Zhao (2013) examine the "nonfinancial firms as financial intermediaries" phenomenon with the use of the financial statements data about listed firms in several emerging markets. They find that large non-financial firms in India and China behave like intermediaries rather than textbook nonfinancial firms. Since Shin and Zhao (2013) also explore the firms in other emerging markets, and most other economies do not have many state-owned firms, they do not differentiate the ownership of firms in

the empirical analysis. Considering that state-owned firms and private firms face different financing constraints in China, which will determine the capability to engage in "borrow to lend" activities, a separate analysis of them in this paper will help further identify the "borrow to lend" activities. Du et al. (2016) explore the "borrow to lend" activities of Chinese firms and factors influencing such activities. They find that firms with better growth opportunities, stronger corporate governance and more financial constraints engage less in "borrow to lend" activities. This paper borrows the methodology of these papers to identify the "borrow to lend" activities. However, none of the above papers investigates how liquidity shocks affect such activities and how the characteristic of the local banking sector mediates such effects, which will be the contribution of our paper.

3. Data and Methodology

3.1 Data

The data for the empirical analyses comes from financial statements data about Chinese listed firms. WIND database has compiled the quarterly financial statements for all the listed firms in China. Since the business model is different for financial and nonfinancial firms, and the paper focuses on the shadow banking activities of nonfinancial firms, we only include nonfinancial firms in our sample. Following the common practice of corporate finance literature, we winsorize the top and bottom 5 percentiles of all the financial indicators introduced in the following.

Although there is not a direct measurement of "borrow to lend" shadow banking activities at the macro level, entrusted loans, in spite of a more transparent nature, are the loans between firms that are intermediated by a bank and can act as a proxy for the "borrow to lend" behaviour of firms. People's Bank of China (PBoC) publishes data about entrusted loans and total RMB loans every year. We calculate the ratio of entrusted loans to total RMB loans during 2008-2016 and plot the ratio in Figure 1. Figure 1 shows that shadow banking activities picked up rapidly after the financial crisis. With a minor adjustment in 2012, compared with the 2008 level, the ratio of entrusted loans to total RMB loans almost tripled in 2013 and reached the peak of the sample period. The ratio dropped a little bit in 2014 and plunged to a level even lower than the 2012 level in 2015, although it rose again in 2016. In terms of the general trend, borrowing and lending between firms increased a great deal after the financial crisis and shadow banking activities have become more relevant in this period. So the paper focuses on the 2008-2016 period.

[Figure 1 about here]

3.2 Methodology

3.2.1 Methodology for the identification of "borrow to lend" activities

To illustrate how to identify the "borrow to lend" activities, consider the financial statements of a "borrow to invest" firm and a "borrow to lend" firm. If a firm wants to invest in the fixed asset (for example, $100), according to the pecking order theory, it will first use its internal funding (for example, $50 cash) and then borrow externally ($50) to finance for the investment because external finance is more costly. Such transaction will increase the fixed asset of the asset side by $100, decrease the cash of the asset side by $50 and increase the borrowing of the liability side by $50. Therefore, if a firm "borrows to invest", **the relationship between financial liability (borrowing) and financial assets (cash) is negative and the relationship between financial assets (cash) and fixed assets investment is negative.**

If a firm borrows to lend, it may borrow, for example $120, from banks and then lend the money to other firms. If it does not lend all the borrowed money to other firms, some of the money may appear as an increase in the cash (or an increase in the short term investment, for example, $20). The money lent out (for example, $100) may appear as other receivables. Such transaction will increase other receivables of the asset side by $100, increase cash (or short term investment) of the asset side by $20 and increase the borrowing of the liability side by $120. If the firm lends all the borrowed money out, the transaction will increase other receivables of the asset side by $120 and increase the borrowing of the liability side by $120. Therefore, if a firm "borrows to lend", **the relationship between financial liability and financial assets (cash) is either positive or nil, but not negative. The relationship between financial liability and other receivables is positive.** Since fixed assets investment does not appear in above transactions, **the relationship between financial assets and fixed assets investment is not negative.** Therefore, since the connection between key variables is different for a "borrow to lend" firm and a "borrow to invest" firm, in the following, we rely on the direction of linkages between key variables to detect the "borrow to lend" activities.

Considering that short term investments can also be liquidated at a fast pace, and are approximately equivalent to cash, in the following analyses, financial assets include cash and short term investment. Since borrowing can also include long-term borrowing, financial liability is calculated as the sum of short term borrowing and long term borrowing.

To test the relationship between financial liability and financial assets, the specification is as follows:

$$\text{Financial assets}_{it} = \beta Financial\ liability_{it} + \alpha X_{it} + \gamma_i + \theta_t + \varepsilon_{it} \quad (1)$$

In (1), i and t refer to firms and quarters. Financial assets indicate cash and short term investment to sales ratio (in log form). Financial liability is the short and long term borrowing to sales ratio (in log form). X is control variables, including log of sales

(measuring size) and return to assets (measuring profitability). γ_i and θ_t are firm and quarter fixed effects. ε_{it} is the error term. Following the previous arguments, if $\boldsymbol{\beta}$ is not significantly negative, it indicates the "borrow to lend" shadow banking activities of firms.

Similarly, to test the relationship between financial assets and fixed assets investment, the specification is as follows:

$$\text{Fixed assets investment}_{\text{it}} = \beta Financial\ assets_{it} + \alpha X_{it} + \gamma_i + \theta_t + \varepsilon_{it} \quad (2)$$

In (2), fixed assets investment is the ratio of fixed assets investment to sales. Other variables are the same as those in (1). If a firm borrows to invest, the relationship between fixed assets investment and financial assets should be significantly negative. If $\boldsymbol{\beta}$ is not significantly negative, it indicates the "borrow to lend" shadow banking activities of firms.

To test the relationship between financial liability and other receivables, the specification is as follows:

$$Other\ receivables_{\text{it}} = \beta Financial\ liability_{it} + \alpha X_{it} + \gamma_i + \theta_t + \varepsilon_{it} \quad (3)$$

In (3), the dependent variable is the ratio of other receivables to sales (in log form). Other variables are the same as those in (1). If $\boldsymbol{\beta}$ is significantly positive, it indicates the "borrow to lend" shadow banking activities of firms.

In the notes to the financial statements, it can be seen that other receivables may include many items. It may also include the related-party loans between associated firms or the rent/reparations/bills receivables. So it may not pin down the lending to other firms precisely. In the following analysis, we only use them as suggestive evidence and the main analyses are based on (1) and (2).

3.2.2 Methodology to test how liquidity shocks affect "borrow to lend" activities

After detecting the "borrow to lend" shadow banking activities, the second part of the empirical analysis investigates how liquidity shocks affect the "borrow to lend" activities of different types of firms. To this aim, we focus on one specific event. In May 2013, Federal Reserve Chairman Ben Bernanke announced that the Fed was preparing to scale back its bond purchasing program if the economic recovery was on track and would slowly reduce the amount of money injected into the economy. A surge in   US treasury yields followed and global panic ensued. This shock occurred externally and unexpectedly, and was not due to the changing situations of the Chinese economy or the financing or investment decisions of individual Chinese firms. Therefore, it is not likely to be correlated with the domestic macroeconomic or firm-specific factors that may affect firms' financing or investment decisions.

Furthermore, such shock is beyond the control of individual firms. The reverse causality problem is less of a concern.

We argue that taper tantrum may affect China's market even in the presence of capital controls. With the increase of financing cost, overseas branches or subsidiaries of global banks confronting financing difficulties will ask for lending from the parent bank in China, which will affect the financing situations of the global banks in the domestic market[1]. Since SHIBOR panel banks are composed of 18 banks[2] and 13 of them are global banks, the interbank market interest rate in China might be affected through a global banking channel.

After the announcement, China's financial market indeed experienced a liquidity tightening. Figure 2 presents the Shanghai interbank offered rate (quarterly average of the overnight rate). From Figure 2, it's clear that before the second quarter of 2013, the interbank offered rate was relatively stable and low, at around 3%. However, for the second quarter of 2013, the rate rose sharply to 4.1%. The rate remained high for the next two months and only in the first quarter of 2014 did it go back to a level that was slightly higher than the rate in the first quarter of 2013. In the second quarter of 2014, the rate dropped to 2.6%, even lower than the second quarter of 2012. Therefore, to keep the tightening and loosening sample balanced, the paper treats the 2013q2-2014q1 period as the liquidity tightening period and the 2012q2-2013q1 period as the loosening period.

[Figure 2 about here]

To test whether the taper tantrum can be used as a useful exogenous instrument in our framework, we run the regressions with the overnight SHIBOR as the dependent variable and the after dummy as the explanatory variable (the dummy equals 1 in quarters 2013q2-2014q1 and equals 0 in quarters 2012q2-2013q1), and controlling for usual determinants of SHIBOR, such as the central bank net money injection[3], increase of RMB loans minus increase of RMB deposits, change of money multiplier, and inflation rate (Zhang et al., 2016)[4]. The specification is as follows.

$$\text{Overnight SHIBOR}_t = \alpha \text{After}_t + \beta X_t + \varepsilon_t \quad (4)$$

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[1] According to the State Administration of Foreign Exchange (SAFE), cross-border lending by Chinese companies to overseas subsidiaries and affiliates does not have to obtain prior approval from SAFE if the total lending amount which it has extended does not exceed 30% of its owners' equity.

[2] The name list of these banks can be found at http://www.chinamoney.com.cn/english/mdtmmbspb/.

[3] Central bank net money injection equals sum of net money injection from central bank's open market operations and net money injection due to change of reserve requirement ratio. Net money injection due to central bank's open market operations = (central bank notes amount due + REPO amount due + Reverse REPO transaction amount + bonds purchase amount) - (central bank notes issuance amount + REPO transaction amount + Reverse REPO amount due + bonds amount due). Net money injection due to change of reserve requirement ratio = Change of reserve requirement ratio $\times$ deposits in corresponding month.

[4] The data for all these variables is downloaded from WIND database. ADF tests or PP tests show that these variables are all stationary.

In (4), X indicates the control variables mentioned above. A significantly positive β implies that the overnight SHIBOR increased significantly after the second quarter of 2013.

Besides the variations across time, banking sector characteristic also exhibits large regional variations. Some provinces are dominated by state-owned banks, while others have a larger share of nonstate banks. State-owned banks and nonstate banks' engagement in shadow banking activities is different. Acharya et al. (2017) show that state-owned banks have more branches and a wider coverage of customers while nonstate banks are mostly regional and face greater pressure from deposit shortage and loan-to-deposit regulations. As a result, nonstate banks are more involved in shadow banking activities such as the issuance of wealth management products. Chen et al. (2017) also demonstrate that compared with state banks, nonstate banks actively engage in intermediating entrusted loans in response to monetary policy tightening. Therefore, firms in provinces with a larger share of state-owned banks might be less affected by the liquidity tightening and hence engage in fewer "borrow to lend" activities.

To test how the liquidity shock affects the "borrow to lend" activities of firms, we carry out the following regressions for private firms and state-owned firms:

$$\text{FA}_{\text{ijt}} = \beta_1 \text{FL}_{ijt} \times \text{SOB}_j \times \text{After}_t + \beta_2 \text{FL}_{\text{ijt}} \times \text{After}_t + \beta_3 \text{FL}_{\text{ijt}} \times \text{SOB}_j + \beta_4 \text{SOB}_j \times$$

$$\text{After}_t + \beta_5 \text{FL}_{\text{ijt}} + \beta_6 \text{X}_{\text{ijt}} + \alpha_i + \theta_t + \varepsilon_{ijt} \quad (5)$$

In (5), subscripts *i, j,* and *t* indicate firms, provinces and quarters respectively. *FA* is the financial assets, calculated as the sum of cash and short term investment to sales ratio (in log form). *FL* is the financial liability, calculated as the short and long term borrowing to sales ratio (in log form). *After* is the dummy indicating the liquidity tightening period (it equals 1 for the 2013q2 - 2014q1 period and equals 0 for the 2012q2 - 2013q1 period). *SOB* indicates the share of loans by state-owned banks in total loans in a province. To attenuate the endogeneity issue, we use the share in 2011 to make the variable predetermined. The data source for this variable is People's Bank of China. *X* indicates control variables, the same as those in equation (1). α_i and θ_t are firm and quarter fixed effects, and ε_{ijt} is the error term. In robustness checks, we replace the quarter fixed effects with province×quarter fixed effects to further exclude time varying province factors that may affect financial assets and financial liability simultaneously. The coefficients β_1 and β_2 are to our interest. Significantly positive β_2 and negative β_1 indicate that the association between financial liability and financial assets gets stronger (more prevalent "borrow to lend" shadow banking activities) after the liquidity tightening (for firms in a province fully dominated by nonstate banks). The increment in "borrow to lend" activities is smaller if the local banking system is composed of a larger share of state-owned banks.

Similarly, to check how the connections between financial assets and fixed assets investment change after the liquidity shock, we conduct the following regressions for private firms and state-owned firms:

$$\text{Inv}_{ijt} = \beta_1 \text{FA}_{ijt} \times \text{SOB}_j \times \text{After}_t + \beta_2 \text{FA}_{ijt} \times \text{After}_t + \beta_3 \text{FA}_{ijt} \times \text{SOB}_j + \beta_4 \text{SOB}_j \times$$

$$\text{After}_t + \beta_5 \text{FA}_{ijt} + \beta_6 \text{X}_{ijt} + \alpha_i + \theta_t + \varepsilon_{ijt} \quad (6)$$

In (6), variables are similarly defined as those in (5). The difference is the dependent variable and key explanatory variable. *Inv* is the ratio of fixed assets investment to sales and *FA* is the cash and short term investment to sales ratio (in log form). If β_2 is significantly positive and β_1 is significantly negative, it implies that the linkage between financial assets and fixed assets investment gets stronger (more prevalent "borrow to lend" shadow banking activities) after the liquidity tightening, but such increment in "borrow to lend" activities is smaller if firms are in provinces with a larger share of state-owned banks.

4. Empirical Results

4.1 Identification of "Borrow to Lend" Shadow Banking Activities

Before turning to the regression analysis, we first present the descriptive figures to get an intuitive idea about the relationship between key financial indicators and the dynamic patterns about the "borrow to lend" shadow banking activities.

Figure 3 plots the mean of financial liability and financial assets for private firms and state-owned firms [5] across 2008-2016. For private firms (Figure 3A), during 2008-2011, financial liability and financial assets move in negative direction (the former decreases while the latter increases), and during 2012-2016, in some years financial liability and financial assets move in parallel while in others they move in opposite direction. In comparison, for state-owned firms (Figure 3B), financial liability and financial assets move in tandem with each other for almost every year of 2008-2016. Therefore, it's intuitive from Figure 3 that the association between financial liability and financial assets is positive for state-owned firms in both 2008-2011 and 2012-2016 periods and negative for private firms during 2008-2011. For the period of 2012-2016, it's hard to determine their association for private firms directly from Figure 3.

[Figure 3 about here]

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[5] The paper uses the ownership during registration in the analysis. In the robustness check, the paper also defines SOEs according to their shareholder information (if a firm's largest shareholder is state, then it is defined as SOE). The results are robust.

Figure 4   plots in graph form the dynamic pattern of financial assets and fixed assets investment for private firms and state-owned firms. For private firms, during 2008-2011, financial assets increased a great deal, while fixed assets investment was relatively stable. During 2012-2016, financial assets decreased until 2014 and picked up again in 2015 and 2016 while fixed assets investment decreased. There does not seem to exist a strong positive or negative relationship between the two indicators. For state-owned firms, the two indicators co-moved with each other until 2014 and began to diverge in 2015 and 2016. The positive association between the two indicators is apparent from Figure 4.

[Figure 4 about here]

Figure 5 presents the evolution of financial liability and other receivables for private firms and state-owned firms during 2008-2016. For private firms, these two indicators basically follow the same trend although the variation of other receivables is smaller than the financial liability. For state-owned firms, financial liability hiked in 2009 and its trend in this year diverged with that of other receivables. For other years, both variables follow similar trend. Therefore, there seems to exist a positive linkage between financial liability and other receivables for both private firms and state-owned firms.

[Figure 5 about here]

Although Figures 3-5 have not controlled for other factors, they provide intuitive impressions about linkages between key financial variables. In the following, we carry out regressions to test the above relationship formally. Table 1 tests the connection between financial liability and financial assets based on equation (1). Columns (1)-(2) present the results for private firms during 2008-2011 and 2012-2016. Columns (3)-(4) display the corresponding results for state-owned firms. Consistent with the illustrative results of Figure 1, for private firms, in 2008-2011, the linkage between these two variables is significantly negative while it turns insignificantly positive for the period of 2012-2016. For the state-owned firms, the linkage between these two variables is significantly positive for both periods and such linkage becomes stronger in 2012-2016[6]. Therefore, in terms of the financial liability and financial assets linkage, state-owned firms are more involved with the "borrow to lend" activities than private firms. Moreover, such activities become more prevalent during 2012-2016. This is in accordance with the dynamic patterns shown in Figure 1.

[Table 1 about here]

Based on equation (2), Table 2 examines the linkage between financial assets and

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[6] If we pool the two periods together and add an interaction term between period dummy for 2012-2016 and financial liability, the interaction term is significantly positive.

fixed assets investment for private firms (columns (1)-(2)) and state-owned firms (columns (3)-(4)). Regardless of the sample period, the linkage is not significant for private firms (negative for the period of 2008-2011 and positive for the period of 2012-2016) and significantly positive for state-owned firms. Therefore, as far as the financial assets and fixed assets investment linkage is concerned, "borrow to lend" activities are also more prevalent for state-owned firms.

[Table 2 about here]

Table 3 displays the regression results based on equation (3). From columns (1)-(2) of Table 3, the connection between financial liability and other receivables is significantly positive for private firms in both periods. Columns (3)-(4) further demonstrate that this is also the case for state-owned firms. In terms of the magnitude of the coefficient, such linkage is stronger in the subsample of state-owned firms[7]. Hence, considering the financial liability and other receivables linkage, "borrow to lend" activities are still more common for state-owned firms. Three groups of evidence corroborate with each other and all point to this finding. Since other receivables may contain related party loans or rent/reparations/bills receivables, they may not pin down the lending to other firms precisely. So in the following analysis, we mainly focus on the financial liability-financial assets linkage and the financial assets-fixed assets investment linkage. Considering that the former linkage is more in line with the general dynamic pattern of shadow banking activities exhibited in Figure 1, in the following main text, we report the empirical results based on the former linkage and in the appendix, empirical results on the basis of the latter linkage are presented.

[Table 3 about here]

A potential challenge to the above identification method is that a firm may really borrow for investment, but for some reason cannot make the investment expenditure immediately. Therefore, to reduce the borrowing cost, they may buy some short-term investment product before they use the loan for investment. If this is indeed the case, the balance sheet of the firm should experience an increase of financial liability in period t and an increase of financial assets in period t. In period t+1, there will be a decrease of financial assets and an increase of fixed assets investment. Therefore, the period t's financial assets and period t+1's fixed assets investment should move in the same direction. If such relationship is detected in the data, then the firm may really borrow for the investment. If such connections do not hold, this possibility can be excluded.

A test about the relationship between period t's financial assets and period t+1's fixed assets investment (results available upon request) demonstrates that such connections

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[7] If we pool the private firms and state-owned firms (SOEs) together and add an interaction term between SOE and financial liability, the interaction term is significantly positive in both periods.

do not hold for firms of different size. The firm may make the investment expenditure in period t+2 or even later. By trying different lag periods, thispaper still does not find such connections. Therefore, we can exclude the possibility that the firm may really borrow for investment but for some reason does not make the investment expenditure immediately.

Although there is no direct data about the prevalence of "borrow to lend" activities, an examination of what types of firms are involved in such activities will shed light on how prevalent such activities are. The first hypothesis is that firms with poorer profitability do not have so many decent opportunities in their main business, so they have to resort to "borrow to lend" activities to earn a margin. Therefore, firms with worrisome profitability will engage more in "borrow to lend" activities. To test this hypothesis, we add the interaction term of return to assets and financial liability in equation (1) and test whether the coefficient before the interaction term is significantly negative. The empirical results are presented in Table 4. Table 4 reveals that regardless of whether in the sample of private firms or in the sample of state-owned firms, the interaction term is always significantly negative, indicating that firms with better profitability engage less in "borrow to lend" activities.

[Table 4 about here]

We next extend the analysis by checking whether there is heterogeneity among industries. We calculate the Rajan-Zingales index about dependence on external finance following Rajan and Zingales (1998). The hypothesis is that if a firm belongs to an industry depending a lot on external finance, it lacks the capacity to engage in the "borrow to lend" activities (only firms with free cash and low growth opportunities participate in such activities). The empirical results[8] show that for state-owned firms in low RZ index industries, such "borrow to lend activities" are more apparent. We also check whether there is heterogeneity among mining, real estate, service industries, agricultural industries and manufacturing industries. Even for private firms in mining (low growth prospect and few investment opportunities) or real estate industries (can borrow easily through land collateral and have the capacity to lend), they are involved in "borrow to lend" activities. For firms in service and agricultural industries, their tendency for such activities is weaker.

Empirical results by region further reveal that even for private firms in middle regions and western regions (fewer growth and investment opportunities), they engage in "borrow to lend" activities. For state-owned firms in middle and western regions, their tendency for "borrow to lend" activities is stronger.

Besides the investigation based on the longer period of 2008-2016 to verify the general validity of the detection methods and gain a general picture of the "borrow to lend" activities, we also focus on the period of 2012q2-2014q1, which will be used to

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[8] Due to space limit, these results are not reported in separate tables. They are available upon request.

test the impact of liquidity shocks on the "borrow to lend" shadow banking activities, to ensure that the baseline results still hold in this subperiod. In the following, we rerun the baseline regressions in this subperiod and further divide the full sample of private firms and state-owned firms into four quartiles according to their total assets[9] and explore which group of firms is the driving force of the baseline findings. Since small firms are more financially constrained and do not have the capability to get access to the cheap credit and relend them, this will help us examine whether the above methods are good enough to detect the "borrow to lend" activities.

Table 5 reports the linkage between financial liability and financial assets for private firms with different size during 2012q2-2014q1. From Table 5, it is clear that for the smallest private firms, the connection between financial liability and financial assets is significantly negative, indicating that smallest private firms performed usual "borrow to invest" activities. In comparison, for firms in the second, third and fourth quartile, such connection turns positive from insignificantly negative, and the magnitude of the coefficient gets larger with the increase of firm size. That is, larger firms are more involved with the "borrow to lend" shadow banking activities. For the full sample of private firms, although not significant, the connection is positive, consistent with the results in Table 1.

[Table 5 about here]

Table 6 presents the parallel results for state-owned firms. For the smallest firms, the positive association between financial liability and financial assets is not significant. However, such connection turns significantly positive for the second, third, and fourth quartile of state-owned firms. Furthermore, the magnitude of the coefficient gets larger with the increase of firm size. For the full sample of state-owned firms, such linkage is significantly positive. Therefore, state-owned firms' participation in "borrow to lend" business is mainly driven by large state-owned firms.

[Table 6 about here]

Above results confirm that the linkage of financial liability and financial assets remains robust in the subperiod of 2012q2-2014q1. Small private firms engage in the usual "borrow to invest" activities and large state-owned firms are involved with the "borrow to lend" activities.

4.2 The Effect of Liquidity Shocks on "Borrow to Lend" Activities

Before presenting the results about how the liquidity shock affects "borrow to lend"

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[9] The mean of total assets for the state-owned firms in the first (second/third) quartile is larger than the mean of total assets for private firms in the second (third/fourth) quartile. The total assets of private firms in the fourth quartile account for 70% of total assets of private firms. The corresponding figure for state-owned firms is 85%. The mean of total assets for private firms (state-owned firms) in the fourth quartile is 9.2 (78.7) billion RMB, or 1.48 (12.7) billion USD.

activities, we first test whether there is indeed an increase in the overnight SHIBOR (liquidity tightening) after the second quarter of 2013, during which the taper tantrum occurred. The regression results based on equation (4) are listed in Appendix Table A1. In the first three columns of Appendix Table A1, we add control variables stepwise and find that regardless of the controls, the after dummy is always significantly positive, indicating that SHIBOR indeed increased in the subsequent quarters of the taper tantrum. Columns (4)-(7) use other usual determinants of SHIBOR as dependent variable and test whether these variables experienced a significant change after the taper tantrum. We do not find that these variables changed significantly and therefore they do not account for the significant change of SHIBOR.

[Appendix Table A1 about here]

Table 7 reports the regression results for private firms based on equation (5). We also divide the full sample into four quartiles according to the total assets of firms to test how the liquidity shock affects different kinds of firms. Column (1) reports the regression results based on the full sample and columns (2)-(5) report the regression results based on each quartile. Table 7 demonstrates that for the private firms as a whole, the coefficient before the interaction term between financial liability and after is significantly positive and the triple interaction term is significantly negative, indicating that "borrow to lend" activities get more prevalent after the liquidity shock, but such effect is smaller if the firm is in a province with a larger share of state-owned banks. Further breakdown by firm size shows that the full sample results are basically driven by the largest firms (firms in the fourth quartile). In the subsample of largest firms, the level term of financial liability is significantly negative, implying that before the liquidity tightening, in provinces dominated by nonstate banks, firms engage in the usual "borrow to invest" activities. However, the positive interaction term between financial liability and after shows that these firms are more involved with "borrow to lend" activities after the liquidity tightening. The significantly positive triple interaction term reveals that although the liquidity tightening brings about more "borrow to lend" activities, such effect is weaker in provinces with a larger share of state-owned banks. This is in accordance with the implications of Acharya et al. (2017) and Chen et al. (2017). State-owned banks do not conduct so much shadow banking business as nonstate banks and since they have more branches and a wider coverage of customers, firms may rely on state-owned banks to get financing and the room for "borrow to lend" activities becomes more limited. Such pattern mainly exists in largest firms subsample because only the largest firms have the financial slack to lend out the cheaply borrowed money. When the liquidity tightens and it becomes more difficult to borrow money from banks, more opportunities to lend emerge for the largest firms because they have the capability to do it and their growth potential or investment opportunities are more limited.

[Table 7 about here]

We carry out similar analysis for state-owned firms based on equation (5) and the results are presented in Table 8. Table 8 shows that liquidity shock does not affect the "borrow to lend" activities of state-owned firms. Neither the interaction term of financial liability and after is significant, nor the triple interaction term. That is, before and after the liquidity tightening, for state-owned firms in provinces with different shares of state-owned banks, "borrow to lend" activities are similar. From the results in Table 6, state-owned firms are always involved with the "borrow to lend" activities during the sample period. There does not seem to exist additional effect on such activities after the liquidity tightening. Since state-owned firms enjoy the government's implicit guarantees and subsidies, they absorb enough financial resources to smooth the effect of the liquidity tightening. Moreover, with the tightening of liquidity and rise of uncertainty, more financial resources might flow out of the riskier private firms and flow towards safer state-owned firms, state-owned firms do not suffer so much from the liquidity tightening. With respect to the banking system, no matter its characteristics, all kinds of banks prefer state-owned firms due to their advantages of relative safety brought about by implicit guarantees. Since state-owned firms do not suffer from the shortage of financial resources in different periods and different provinces, the liquidity shock and the banking sector characteristics do not exert additional effects on their "borrow to lend" activities.

[Table 8 about here]

The validity of the above findings relies on the precondition that before the liquidity shock, there is no significant difference in "borrow to lend" activities between firms in provinces with different shares of state-owned banks. To test whether the detected pattern already exists before the liquidity shock, we use the quarter (2013q1) just before the liquidity shock as the reference group and generate the dummies indicating each quarter before 2013q1 (2012q2, 2012q3, 2012q4). We then interact each dummy with financial liability, share of state-owned banks, and the product of financial liability and share of state-owned banks and add these variables to the baseline regressions. Table 9 presents the regression results for private firms. From table 9, none of the interaction terms including the before 2013q1 dummies are significant, implying that before the liquidity shock, there does not exist significant difference in the "borrow to lend" activities between firms in provinces with different shares of state-owned banks. Furthermore, the interaction term between financial liability and after dummy remains significantly positive, and the triple interaction term for financial liability, after dummy, and share of state-owned banks keeps significantly negative for the full sample and the sample of largest firms. That is, full sample patterns are basically driven by the largest firms. Largest private firms began to engage more in "borrow to lend" activities only after the liquidity tightening, but such increment is smaller if the firm is in a province with a larger share of state-owned banks. This verifies that the baseline empirical results are not driven by ex-ante differences among firms.

[Table 9 about here]

Table 10 conducts similar analyses for state-owned firms to examine the trend before the liquidity shock. Table 10 reveals that before the liquidity shock, no significant difference exists for the linkage between financial liability and financial assets among firms in provinces with different prevalence of state-owned banks. Moreover, liquidity tightening does not exert additional effects on the "borrow to lend" shadow banking activities of state-owned firms. This is in accordance with the baseline results in Table 8.

[Table 10 about here]

Although we have tried to control for the quarter and firm fixed effects to exclude the impacts of firm-specific and quarter-specific factors, there might be some time-varying factors at the province level that affect financial liability and financial assets at the same time. To address such concerns, we replace the quarter dummies with the province×quarter dummies to separate the effects of time-varying factors at the province level, and rerun the baseline regressions for private firms and state-owned firms.

Table 11 reports the empirical results with such specifications for small private firms (first quartile of total assets), large private firms (fourth quartile of total assets), small state-owned firms (first quartile of total assets), and large state-owned firms (fourth quartile of total assets) respectively. From Table 11, the baseline results remain robust after considerations of the time-varying confounders at the province level. Large private firms engage in more "borrow to lend" activities after the liquidity tightening, but the increment is smaller in a province with a larger share of state-owned banks. Liquidity tightening imposes no additional effect on state-owned firms. They are always involved with the "borrow to lend" activities.

[Table 11 about here]

Despite the efforts to control for different fixed effects and usual financial indicators to avoid the omitted variables bias, there may still exist some firm-level factors that affect the financial liability and financial assets simultaneously. To ensure that the baseline results are not subject to serious omitted variable bias, we further carry out a falsification test by redefining an "after" dummy. The dummy equals 1 in quarters 2012q2-2013q1, and equals 0 in quarters 2011q2-2012q1. We then replace the new "after" dummy with the original after dummy. If omitted variables problem is a serious concern, these variables will also affect the dependent variable and key explanatory variables in this sample period and we will observe similar patterns with baseline results in such exercises. Otherwise, if the previous patterns disappear, it indicates that omitted variables problem is not a big concern.

Table 12 presents the results of such falsification tests. Columns (1)-(3) of Table 12 reports the results based on private firms (full sample, small firms subsample and large firms subsample) and columns (4)-(6) exhibit corresponding results for state-owned firms. Table 12 reveals that no matter for the full sample, small firms subsample or large firms subsample of private firms or state-owned firms, neither the triple interaction term nor the interaction term is significant, implying that the linkage between financial liability and financial assets does not change during the two periods or vary with the banking sector characteristics. The significant triple interaction term for largest private firms in the baseline regressions is no longer significant in the falsification test, suggesting that the omitted variable bias is not a serious concern.

[Table 12 about here]

Besides the linkage of financial liability and financial assets, we also investigate how liquidity shocks affect the connection between financial assets and fixed assets investment based on equation (6).

Appendix Table A2 presents the empirical results for private firms. Column (1) displays the regression results based on the full sample and columns (2)-(5) divide the full sample into four quartiles according to the total assets and conduct the regressions in each subsample. Appendix Table A2 reveals that the linkage of financial assets and fixed assets investment for private firms gets stronger after the liquidity tightening, but such effect diminishes with the share of state-owned banks in the local banking sector. In addition, such pattern is driven by largest firms. These firms engage in more "borrow to lend" activities after the liquidity tightening. These patterns lend further support to the results in Table 7.

[Appendix Table A2 about here]

Parallel results for state-owned firms are presented in Appendix Table A3. Regardless of the full sample, or the subsamples of firms with different size, the triple interaction term is not significant. Liquidity tightening has no additional effect on the linkage between financial assets and fixed assets investment for state-owned firms. This further corroborates the findings about financial liability and financial assets linkage: state-owned firms are involved with "borrow to lend" shadow banking activities all the time. Financial conditions of state-owned firms are not affected so much by the liquidity shock as those of private firms.

[Appendix Table A3 about here]

5. Conclusion

This paper investigates one facet of shadow banking activities — nonfinancial firms acting as financial intermediaries by lending the cheaply borrowed money to other

firms. If a firm borrows to invest in fixed assets and external financing is more costly than internal financing, the linkage between financial liability and financial assets should be negative and the connection between financial assets and fixed assets investment should be negative. In contrast, if a firm borrows to lend, the linkage between financial liability and financial assets can be nil or positive and the connection between financial assets and fixed assets investment is no longer negative. Based on such identification methods and the institutional feature that state-owned firms and private firms both play an important role in Chinese economy but confront different degrees of financing difficulties, the paper first tests whether "borrow to lend" activities exist for private and state-owned firms with different profitability or size and their evolution process. The paper then explores whether liquidity shocks contribute to more "borrow to lend" activities for different kinds of firms and how the local banking sector characteristics mediates such effects.

Empirical results demonstrate that state-owned firms engage in more "borrow to lend" activities than private firms and such activities have become more prevalent in recent years. Smallest private firms take part in the usual "borrow to invest" activities and large state-owned firms are more involved with the "borrow to lend" activities. After the liquidity tightening, largest private firms embark on more "borrow to lend" activities, but if the local banking sector has a larger share of state-owned banks, such increment is smaller. This liquidity shock does not change the tendency of "borrow to lend" activities for state-owned firms as they are found to engage in such activities during the full sample period.

Above findings suggest the importance of taking into account the generalized credit and monitoring of the "borrow to lend" activities. Since such direct borrowing and lending among firms is not transparent, these activities may accumulate financial risks that cannot be monitored easily. Furthermore, liquidity shocks also have implications for shadow banking activities as they may shut the door of traditional financing for firms facing financial constraints. As a result, these firms will turn to the market-based financing among firms. Therefore, it is critical to understand large firms' lending activities in this circumstance in case that moral hazard, such as "too big to fail" incentives, encourages over-lending by firms that could pose great challenges to financial stability. Although the financing market among nonfinancial firms might alleviate the financing constraints of more efficient firms, it may also create more opaque lending and accumulate more financial risks. A comprehensive evaluation of these different effects is beyond the scope of this paper, but deserves future research.

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Figures and Tables
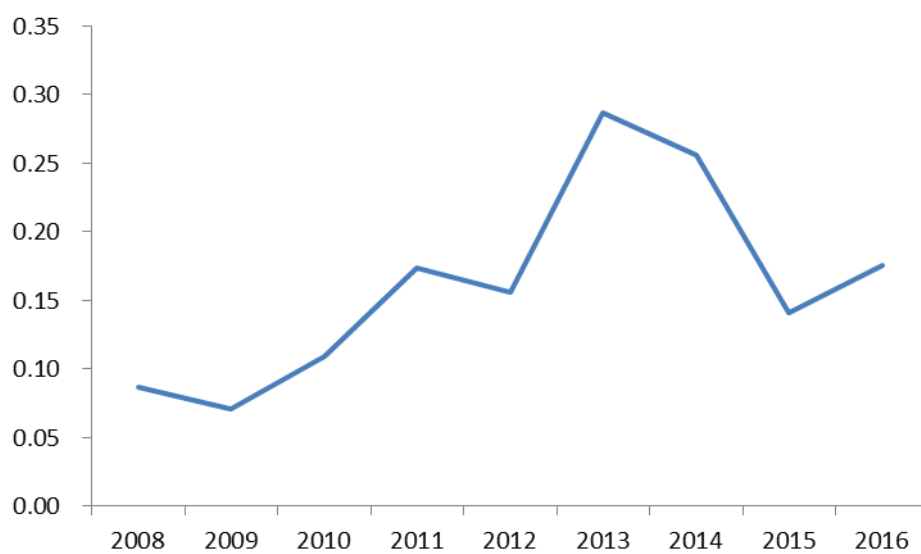
Figure 1. The ratio of entrusted loans to total RMB loans during 2008-2016

Source: People's Bank of China
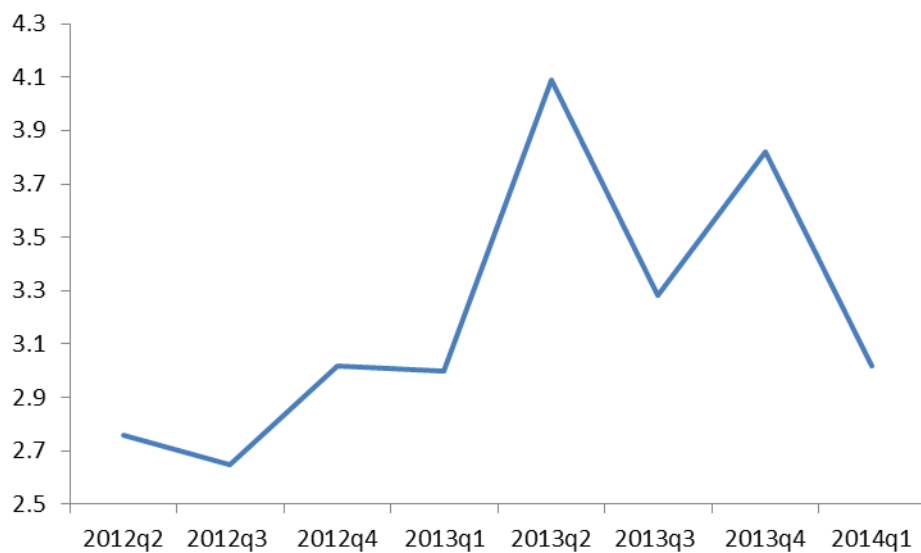
Figure 2. Shanghai interbank offered rate (quarterly average of overnight rate)

Source: CEIC database.
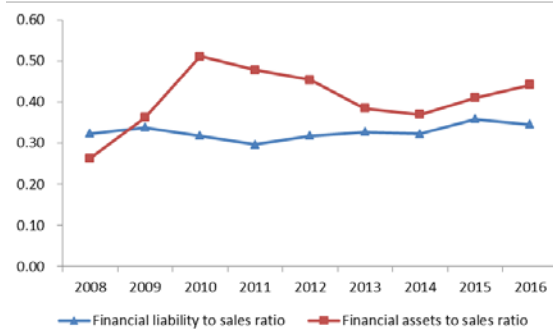
Figure 3A: Private firms   Figure 3B: State-owned firms

Figure 3. Financial liability and financial assets during 2008-2016

Notes: The figure plots the mean of financial liability and financial assets of each year for private firms (3A) and state-owned firms (3B). Financial liability is the ratio of short term and long term borrowing to sales. Financial assets are the ratio of cash and short term investment to sales.
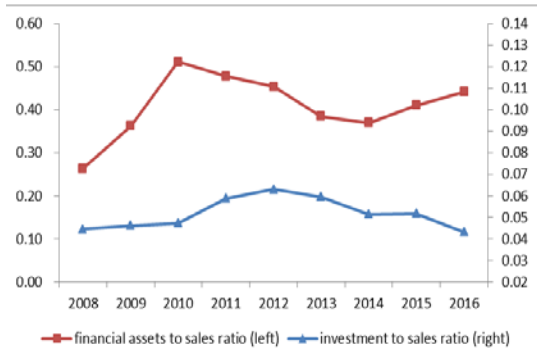
Figure 4A: Private firms   Figure 4B: State-owned firms
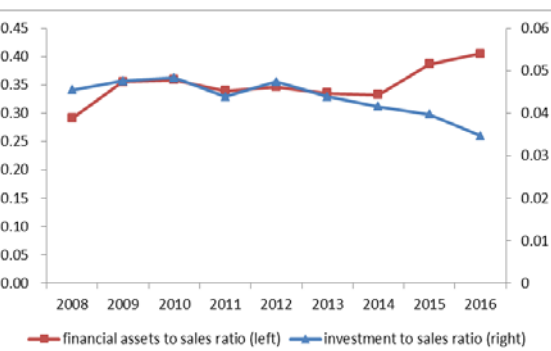
Figure 4. Financial assets and fixed assets investment during 2008-2016

Notes: The figure plots the mean of financial assets and fixed assets investment of each year for private firms (4A) and state-owned firms (4B). Financial assets are the ratio of cash and short term investment to sales. Fixed assets investment is the ratio of change of fixed assets to sales.
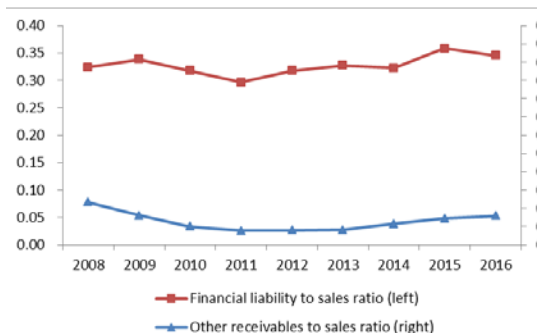
Figure 5A: Private firms   Figure 5B: State-owned firms

Figure 5. Financial liability and other receivables during 2008-2016

Notes: The figure plots the mean of financial liability and other receivables of each year for private firms (5A) and state-owned firms (5B). Financial liability is the ratio of short term and long term borrowing to sales. Other receivables are the ratio of other receivables to sales.

Table 1. The relationship between financial liability and financial assets

Dependent variable: log of financial assets to sales

	Private firms		State-owned firms	
	2008-2011	2012-2016	2008-2011	2012-2016
	(1)	(2)	(3)	(4)
Log of financial liability to sales	-0.077***	0.014	0.088***	0.102***
	(0.024)	(0.013)	(0.026)	(0.020)
Log of sales	-0.296***	-0.367***	-0.364***	-0.323***
	(0.053)	(0.027)	(0.035)	(0.034)
Return on assets	-9.313***	-2.045***	-0.358	0.788*
	(0.529)	(0.348)	(0.494)	(0.405)
Observations	11869	23701	11060	15722
Adjusted R^2	0.699	0.746	0.809	0.826

Notes: firm and quarter fixed effects are controlled in all the regressions. Robust standard errors are in the parenthesis. *, **, and *** denote significance level at 10%, 5% and 1%, respectively.
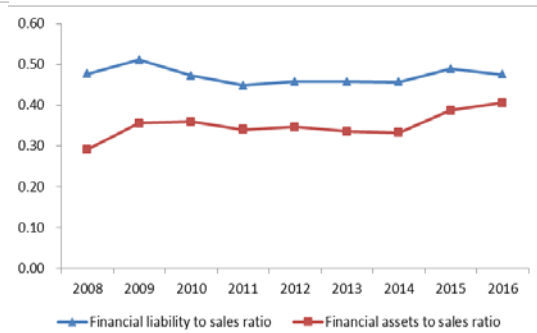
Table 2. The relationship between financial assets and fixed assets investment

Dependent variable: fixed assets investment to sales

	Private firms		State-owned firms	
	2008-2011	2012-2016	2008-2011	2012-2016
	(1)	(2)	(3)	(4)
Log of financial assets to sales	-0.004	0.004	0.022***	0.021***
	(0.005)	(0.005)	(0.007)	(0.007)
Log of sales	0.020***	0.026***	0.032***	0.036***
	(0.007)	(0.008)	(0.010)	(0.010)
Return on assets	-0.817***	-0.762***	-0.441***	-0.348**
	(0.106)	(0.094)	(0.146)	(0.138)
Observations	12330	29666	11861	18198
Adjusted R^2	0.278	0.285	0.307	0.240

Notes: firm and quarter fixed effects are controlled in all the regressions. Robust standard errors are in the parenthesis. *, **, and *** denote significance level at 10%, 5% and 1%, respectively.

Table 3. The relationship between financial liability and other receivables

Dependent variable: log of other receivables to sales				
	Private firms		State-owned firms	
	2008-2011	2012-2016	2008-2011	2012-2016
	(1)	(2)	(3)	(4)
Log of financial liability to sales	0.153***	0.150***	0.175***	0.174***
	(0.022)	(0.015)	(0.028)	(0.024)
Log of sales	-0.456***	-0.333***	-0.445***	-0.304***
	(0.063)	(0.036)	(0.045)	(0.040)
Return on assets	-2.448***	-2.205***	-1.168*	-0.379
	(0.411)	(0.439)	(0.609)	(0.588)
Observations	11850	23684	11043	15717
Adjusted R^2	0.812	0.786	0.819	0.819

Notes: firm and quarter fixed effects are controlled in all the regressions. Robust standard errors are in the parenthesis. *, **, and *** denote significance level at 10%, 5% and 1%, respectively.

Table 4. Profitability and the "borrow to lend" activities

Dependent variable: log of financial assets to sales				
	Private firms		State-owned firms	
	2008-2011	2012-2016	2008-2011	2012-2016
	(1)	(2)	(3)	(4)
Log of financial liability to sales ×Return on assets	-1.534***	-0.627***	-0.729***	-0.924***
	(0.297)	(0.222)	(0.260)	(0.202)
Log of financial liability to sales	-0.020	0.029**	0.103***	0.114***
	(0.027)	(0.014)	(0.027)	(0.020)
Return on assets	-11.782***	-3.153***	-1.454**	-0.685
	(0.858)	(0.634)	(0.735)	(0.582)
Log of sales	-0.264***	-0.359***	-0.353***	-0.313***
	(0.054)	(0.027)	(0.036)	(0.034)
Observations	11869	23701	11060	15722
Adjusted R^2	0.523	0.530	0.613	0.623

Notes: firm and quarter fixed effects are controlled in all the regressions. Robust standard errors are in the parenthesis. *, **, and *** denote significance level at 10%, 5% and 1%, respectively.

Table 5. The relationship between financial liability and financial assets for private firms: split sample by firm size

Dependent variable：log of financial assets to sales

	Full sample	1st quartile	2nd quartile	3rd quartile	4th quartile
	(1)	(2)	(3)	(4)	(5)
Log of financial liability to sales	0.017	-0.070**	-0.025	0.028	0.037
	(0.018)	(0.035)	(0.031)	(0.036)	(0.030)
Log of sales	-0.442***	-0.581***	-0.565***	-0.669***	-0.627***
	(0.041)	(0.070)	(0.128)	(0.117)	(0.045)
Return on assets	-1.496***	-4.910***	0.677	0.826	-1.009*
	(0.479)	(1.406)	(1.165)	(0.940)	(0.575)
Observations	8442	1647	1951	2204	2640
Adjusted R^2	0.866	0.888	0.892	0.874	0.891

Notes: The analysis is based on the quarterly data of 2012q2-2014q1. The full sample is split into four quartiles according to the total assets of firms. 1st quartile indicates the smallest firms and 4th quartile indicates the largest firms. Firm and province×quarter fixed effects are controlled in all the regressions. Robust standard errors are in the parenthesis. *, **, and *** indicate significance level at 10%, 5% and 1% level respectively.

Table 6. The relationship between financial liability and financial assets for state-owned firms: split sample by firm size

Dependent variable：log of financial assets to sales

	Full sample	1st quartile	2nd quartile	3rd quartile	4th quartile
	(1)	(2)	(3)	(4)	(5)
Log of financial liability to sales	0.118***	0.043	0.061*	0.105***	0.133***
	(0.017)	(0.053)	(0.036)	(0.032)	(0.036)
Log of sales	-0.391***	-0.299**	-0.538***	-0.566***	-0.495***
	(0.056)	(0.141)	(0.103)	(0.046)	(0.059)
Return on assets	0.284	0.764	0.636	-1.003	-0.894
	(0.473)	(1.319)	(0.830)	(0.686)	(0.787)
Observations	6243	1343	1537	1632	1731
Adjusted R^2	0.889	0.802	0.895	0.921	0.935

Notes: The analysis is based on the quarterly data of 2012q2-2014q1. The full sample is split into four quartiles according to the total assets of firms. 1st quartile indicates the smallest firms and 4th quartile indicates the largest firms. Firm and province×quarter fixed effects are controlled in all the regressions. Robust standard errors are in the parenthesis. *, **, and *** indicate significance level at 10%, 5% and 1% level respectively.

Table 7. The impact of liquidity shock on the relationship between financial liability and financial assets for private firms

Dependent variable：log of financial assets to sales					
	Full sample	1st quartile	2nd quartile	3rd quartile	4th quartile
	(1)	(2)	(3)	(4)	(5)
Log of financial liability to sales×Share of SOB×After	-0.313*	-0.034	-0.489	0.322	-0.527**
	(0.181)	(0.504)	(0.323)	(0.371)	(0.237)
Log of financial liability to sales×After	0.209**	0.035	0.285*	-0.118	0.315**
	(0.100)	(0.274)	(0.175)	(0.205)	(0.131)
Log of financial liability to sales×Share of SOB	0.163	-0.250	-0.016	0.133	1.026***
	(0.172)	(0.367)	(0.450)	(0.318)	(0.267)
Share of SOB×After	-0.180	0.073	-0.051	-0.094	0.155
	(0.256)	(1.009)	(0.579)	(0.611)	(0.304)
Log of financial liability to sales	-0.081	0.057	-0.015	-0.060	-0.519***
	(0.097)	(0.206)	(0.251)	(0.166)	(0.148)
Log of sales	-0.421***	-0.616***	-0.548***	-0.608***	-0.591***
	(0.044)	(0.066)	(0.101)	(0.112)	(0.042)
Return on assets	-1.395***	-3.899***	0.745	0.698	-1.306**
	(0.458)	(1.220)	(0.947)	(0.794)	(0.555)
Observations	8442	1647	1951	2198	2646
Adjusted R^2	0.864	0.879	0.890	0.870	0.889

Notes: SOB stands for state-owned banks. Share of SOB indicates the share of loans by state-owned banks in total loans in a province. The full sample is split into four quartiles according to the total assets of firms. 1st quartile indicates the smallest firms and 4th quartile indicates the largest firms. Robust standard errors clustered at the province×quarter level are in the parenthesis. Firm and quarter fixed effects are controlled in all the regressions. *, **, and *** indicate significance level at 10%, 5% and 1% level respectively.

Table 8. The impact of liquidity shock on the relationship between financial liability and financial assets for state-owned firms

Dependent variable：log of financial assets to sales					
	Full sample	1st quartile	2nd quartile	3rd quartile	4th quartile
	(1)	(2)	(3)	(4)	(5)
Log of financial liability to sales×Share of SOB×After	-0.402	-0.619	-0.405	-0.320	-0.415
	(0.317)	(0.501)	(0.308)	(0.248)	(0.302)
Log of financial liability to sales×After	0.205	0.336	0.198	0.164	0.222
	(0.243)	(0.269)	(0.167)	(0.133)	(0.210)
Log of financial liability to sales×Share of SOB	0.179	-0.232	0.029	0.020	0.424
	(0.163)	(0.535)	(0.334)	(0.359)	(0.324)
Share of SOB×After	-0.669	-0.696	-0.575	-0.644	-0.646
	(0.481)	(0.869)	(0.369)	(0.419)	(0.531)
Log of financial liability to sales	0.127	0.196	0.071	0.116	0.103
	(0.090)	(0.290)	(0.184)	(0.193)	(0.121)
Log of sales	-0.394***	-0.332**	-0.524***	-0.603***	-0.504***
	(0.052)	(0.128)	(0.087)	(0.047)	(0.050)
Return on assets	0.073	0.595	0.190	-1.109*	-0.743
	(0.437)	(1.119)	(0.724)	(0.628)	(0.651)
Observations	6243	1343	1537	1632	1735
Adjusted R^2	0.888	0.803	0.893	0.917	0.934

Notes: SOB stands for state-owned banks. Share of SOB indicates the share of loans by state-owned banks in total loans in a province. The full sample is split into four quartiles according to the total assets of firms. 1st quartile indicates the smallest firms and 4th quartile indicates the largest firms. Firm and quarter fixed effects are controlled in all the regressions. Robust standard errors clustered at the province×quarter level are in the parenthesis. *, **, and *** indicate significance level at 10%, 5% and 1% level respectively.

Table 9. Test of Pre-treatment trend: Private firms

Dependent variable：log of financial assets to sales

	Full sample	1st quartile	2nd quartile	3rd quartile	4th quartile
	(1)	(2)	(3)	(4)	(5)
Log of financial liability to sales×Share of SOB×B(-4)	-0.101	-0.052	0.832	-0.354	-0.563
	(0.355)	(1.141)	(0.523)	(0.876)	(0.480)
Log of financial liability to sales×Share of SOB×B(-3)	-0.291	0.069	0.586	-0.109	-0.716
	(0.247)	(0.988)	(0.548)	(0.720)	(0.401)
Log of financial liability to sales×Share of SOB×B(-2)	-0.045	0.783	-0.206	0.439	-0.269
	(0.225)	(0.976)	(0.589)	(0.652)	(0.402)
Log of financial liability to sales×Share of SOB×After	-0.396*	0.070	-0.000	0.724	-0.974***
	(0.224)	(0.934)	(0.438)	(0.618)	(0.305)
Log of financial liability to sales×B(-4)	0.023	-0.012	-0.448	0.116	0.286
	(0.198)	(0.643)	(0.292)	(0.496)	(0.268)
Log of financial liability to sales×B(-3)	0.104	-0.063	-0.327	-0.042	0.357
	(0.140)	(0.550)	(0.310)	(0.398)	(0.303)
Log of financial liability to sales×B(-2)	-0.011	-0.389	0.098	-0.324	0.103
	(0.125)	(0.548)	(0.326)	(0.363)	(0.222)
Log of financial liability to sales×After	0.225*	-0.025	0.016	-0.399	0.534***
	(0.126)	(0.519)	(0.243)	(0.346)	(0.165)
Log of financial liability to sales×Share of SOB	0.232	-0.405	-0.477	-0.486	1.501***
	(0.271)	(0.910)	(0.684)	(0.680)	(0.365)
Share of SOB×B(-4)	-0.000	-1.157	0.721	0.086	-0.237
	(0.386)	(1.566)	(0.663)	(1.223)	(0.717)
Share of SOB×B(-3)	-0.384	-0.377	0.445	-2.087	-0.090
	(0.387)	(1.342)	(0.855)	(1.312)	(0.526)
Share of SOB×B(-2)	-0.033	1.695	-1.476	-0.968	0.471
	(0.491)	(1.436)	(1.006)	(1.278)	(0.623)
Share of SOB×After	-0.255	-0.040	0.131	-0.722	0.299
	(0.286)	(1.283)	(0.554)	(0.675)	(0.410)
Log of financial liability to sales	-0.091	0.153	0.236	0.341	-0.751***
	(0.150)	(0.504)	(0.379)	(0.372)	(0.200)
Log of sales	-0.417***	-0.609***	-0.559***	-0.586***	-0.582***
	(0.044)	(0.065)	(0.105)	(0.111)	(0.042)
Return on assets	-1.584***	-3.748***	0.772	0.189	-1.522***
	(0.476)	(1.285)	(0.998)	(0.807)	(0.581)
Observations	8442	1647	1951	2204	2640
Adjusted R^2	0.864	0.879	0.890	0.871	0.889

Notes: We use the first quarter of 2013 (B(-1), the quarter just before liquidity tightening) as the reference group. B(-2), B(-3) and B(-4) indicate the second (2012q4), third(2012q3), and fourth quarter (2012q2) before the second quarter of 2013 (2013q2). "After" indicates the four quarters after the liquidity tightening (2013q2-2014q1). SOB stands for state-owned banks. Share of SOB indicates the share of loans by state-owned banks in total loans in a province. The full sample is split into four quartiles according to the total assets of firms. 1st quartile indicates the smallest

firms and 4th quartile indicates the largest firms. Firm and quarter fixed effects are controlled in all the regressions. Robust standard errors clustered at the province×quarter level are in the parenthesis. *, **, and *** indicate significance level at 10%, 5% and 1% respectively.

Table 10. Test of Pre-treatment trend: State-owned firms

Dependent variable：log of financial assets to sales					
	Full sample	1st quartile	2nd quartile	3rd quartile	4th quartile
	(1)	(2)	(3)	(4)	(5)
Log of financial liability to	0.030	1.138	0.336	-0.256	-0.300
sales×Share of SOB×B(-4)	(0.282)	(0.900)	(0.524)	(0.546)	(0.318)
Log of financial liability to	0.034	1.720	0.357	-0.958	-0.292
sales×Share of SOB×B(-3)	(0.268)	(1.352)	(0.591)	(0.745)	(0.312)
Log of financial liability to	0.166	2.081	0.862	-0.898	-0.040
sales×Share of SOB×B(-2)	(0.331)	(1.756)	(0.675)	(0.553)	(0.345)
Log of financial liability to	-0.602	0.130	-0.783	-0.898	-0.526
sales×Share of SOB×After	(0.456)	(0.871)	(0.512)	(0.756)	(0.426)
Log of financial liability to	-0.009	-0.610	-0.195	0.139	0.170
sales×B(-4)	(0.150)	(0.489)	(0.293)	(0.289)	(0.169)
Log of financial liability to	-0.014	-0.913	-0.192	0.513	0.153
sales×B(-3)	(0.142)	(0.506)	(0.324)	(0.465)	(0.163)
Log of financial liability to	-0.142	-1.145	-0.519	0.439	-0.046
sales×B(-2)	(0.180)	(0.812)	(0.374)	(0.304)	(0.188)
Log of financial liability to	0.303	-0.064	0.388	0.463	0.267
sales×After	(0.203)	(0.467)	(0.335)	(0.347)	(0.234)
Log of financial liability to	0.575	-0.588	0.685	0.684	0.435
sales×Share of SOB	(0.376)	(1.024)	(0.479)	(0.529)	(0.331)
Share of SOB×B(-4)	0.949	1.886	1.375	1.622	-0.465
	(0.751)	(1.182)	(0.926)	(0.996)	(0.515)
Share of SOB×B(-3)	1.564	3.151	2.194	1.152	0.374
	(0.976)	(2.756)	(1.851)	(1.027)	(0.601)
Share of SOB×B(-2)	1.389	4.384	3.048	0.076	-0.460
	(1.251)	(3.214)	(2.972)	(1.260)	(0.717)
Share of SOB×After	0.128	0.983	0.544	0.245	-0.747
	(0.317)	(1.022)	(0.615)	(0.520)	(0.524)
Log of financial liability to	-0.182	0.383	-0.279	-0.232	-0.108
sales	(0.141)	(0.555)	(0.271)	(0.277)	(0.174)
Log of sales	-0.389***	-0.325**	-0.523***	-0.596***	-0.489***
	(0.052)	(0.128)	(0.088)	(0.048)	(0.050)
Return on assets	-0.132	0.548	0.016	-1.255*	-0.972
	(0.464)	(1.189)	(0.766)	(0.662)	(0.691)
Observations	6243	1343	1537	1632	1731
Adjusted R^2	0.889	0.803	0.894	0.917	0.935

Notes: We use the first quarter of 2013 (B(-1), the quarter just before liquidity tightening) as the reference group. B(-2), B(-3) and B(-4) indicate the second (2012q4), third(2012q3), and fourth quarter (2012q2) before the second quarter of 2013 (2013q2). "After" indicates the second, the third and the fourth quarter of 2013 and the first quarter of 2014. SOB stands for state-owned banks. Share of SOB indicates the share of loans by state-owned banks in total loans in a province. The full sample is split into four quartiles according to the total assets of firms. 1st quartile indicates the smallest firms and 4th quartile indicates the largest firms. Firm and quarter fixed effects are controlled in all the regressions. Robust standard errors clustered at the province×quarter level are in the parenthesis. *, **, and *** indicate significance level at 10%, 5% and 1% respectively.

Table 11. Robustness check: Exclude the impact of time-varying factors at the province level

Dependent variable：log of financial assets to sales

	Private Firms		State-owned Firms	
	Small firms	Large firms	Small firms	Large firms
	(2)	(3)	(5)	(6)
Log of financial liability to	-0.003	-0.689**	-0.661	-0.491
sales×Share of SOB×After	(0.767)	(0.355)	(0.739)	(0.321)
Log of financial liability to	0.001	0.398**	0.385	0.254
sales×After	(0.412)	(0.193)	(0.393)	(0.175)
Log of financial liability to	0.001	1.003*	-1.344	0.173
sales×Share of SOB	(0.704)	(0.593)	(1.215)	(0.683)
Log of financial liability to	-0.070	-0.514	0.789	0.042
sales	(0.392)	(0.319)	(0.646)	(0.361)
Log of sales	-0.581***	-0.624***	-0.280**	-0.496***
	(0.070)	(0.044)	(0.139)	(0.061)
Return on assets	-4.910***	-0.960*	0.862	-0.901
	(1.403)	(0.582)	(1.306)	(0.779)
Observations	1647	2640	1343	1731
Adjusted R^2	0.888	0.891	0.803	0.935

Notes: SOB stands for state-owned banks. Share of SOB indicates the share of loans by state-owned banks in total loans in a province. "Small firms" indicate the sample of firms whose total assets are in the lowest quartile of firms. "Large firms" indicate the sample of firms whose total assets are in the highest quartile of firms. Firm and province×quarter fixed effects are controlled in all the regressions. Robust standard errors clustered at the province×quarter level are in the parenthesis. *, **, and *** indicate significance level at 10%, 5% and 1% level respectively.

Table 12. Falsification tests of the impact of liquidity shock on the relationship between financial liability and financial assets

Dependent variable：log of financial assets to sales

	Private Firms			State-owned Firms		
	Full sample	Small firms	Large firms	Full sample	Small firms	Large firms
	(1)	(2)	(3)	(4)	(5)	(6)
Log of financial liability to sales×Share of SOB×After	-0.310	-0.636	0.195	0.018	-0.037	0.088
	(0.233)	(0.395)	(0.367)	(0.230)	(0.375)	(0.306)
Log of financial liability to sales×After	0.174	0.342	-0.073	0.003	0.053	-0.042
	(0.130)	(0.218)	(0.202)	(0.123)	(0.203)	(0.162)
Log of financial liability to sales×Share of SOB	0.341	0.644	0.115	-0.232	0.457	-0.212
	(0.474)	(0.714)	(0.573)	(0.421)	(0.673)	(0.595)
Log of financial liability to sales	-0.240	-0.480	-0.047	0.197	-0.261	0.248
	(0.262)	(0.398)	(0.316)	(0.224)	(0.367)	(0.314)
Log of sales	-0.466***	-0.370***	-0.620***	-0.457***	-0.557***	-0.513***
	(0.036)	(0.068)	(0.036)	(0.039)	(0.060)	(0.052)
Return on assets	-4.862***	-8.585***	-1.012*	0.677	1.230*	-0.277
	(0.674)	(1.170)	(0.536)	(0.467)	(0.749)	(0.537)
Observations	7935	3432	4503	6067	2810	3257
Adjusted R^2	0.833	0.830	0.869	0.881	0.852	0.911

Notes: SOB stands for state-owned banks. Share of SOB indicates the share of loans by state-owned banks in total loans in a province. "Small firms" indicate the sample of firms whose total assets are smaller than the median of the full sample. "Large firms" indicate the sample of firms whose total assets are larger than the median of the full sample. Firm and province×quarter fixed effects are controlled in all the regressions. Robust standard errors clustered at the province×quarter level are in the parenthesis. *, **, and *** indicate significance level at 10%, 5% and 1% level respectively.

Appendix Table A1. Shanghai Interbank Offered Rate before and after the liquidity shock

	(1) SHIBOR	(2) SHIBOR	(3) SHIBOR	(4) CBNMI	(5) $\triangle$ L- $\triangle$ D	(6) $\triangle$ MM	(7) Inflation rate
After	0.698**	0.672*	0.672*	-0.072	0.218	0.011	0.290
	(0.335)	(0.355)	(0.378)	(0.130)	(0.522)	(0.034)	(0.196)
Central bank net money injection (CBNMI)		-0.232	-0.134				
		(0.649)	(0.642)				
Increase of RMB loans minus increase of RMB deposits ($\triangle$ L- $\triangle$ D)		-0.102	-0.071				
		(0.179)	(0.190)				
Change of money multiplier ($\triangle$ MM)			-2.280				
			(2.289)				
Inflation rate			-0.053				
			(0.339)				
Observations	24	24	24	24	24	24	24

Notes: Data source is WIND. The sample period is April of 2012 - March of 2014. After equals 1 in quarters 2013q2-2014q1 and equals 0 in quarters 2012q2-2013q1. SHIBOR indicates Shanghai interbank offered rate (overnight). Central bank net money injection equals sum of net money injection from central bank's open market operations and net money injection due to change of reserve requirement ratio. Net money injection due to central bank's open market operations = (central bank notes amount due + REPO amount due + Reverse REPO transaction amount + bonds purchase amount) - (central bank notes issuance amount + REPO transaction amount + Reverse REPO amount due + bonds amount due). Net money injection due to change of reserve requirement ratio = Change of reserve requirement ratio $\times$ deposits in corresponding month. Robust standard errors are in parenthesis. *, **, and *** indicate significance level at 10%, 5% and 1% respectively.

Appendix Table A2. The impact of liquidity shock on the relationship between financial assets and fixed assets investment for private firms

Dependent variable: fixed assets investment to sales					
	Full sample	1st quartile	2nd quartile	3rd quartile	4th quartile
	(1)	(2)	(3)	(4)	(5)
Log of financial assets to sales×Share of SOB×After	-0.113*	-0.079	0.005	-0.057	-0.311*
	(0.066)	(0.139)	(0.176)	(0.128)	(0.163)
Log of financial assets to sales×After	0.066*	0.049	-0.008	0.048	0.173**
	(0.037)	(0.080)	(0.096)	(0.070)	(0.090)
Log of financial assets to sales×Share of SOB	0.123*	0.003	0.105	0.108	0.212*
	(0.068)	(0.205)	(0.151)	(0.169)	(0.128)
Share of SOB×After	-0.126	-0.288	-0.147	-0.084	-0.048
	(0.092)	(0.201)	(0.218)	(0.164)	(0.211)
Log of financial assets to sales	-0.077**	-0.023	-0.131	-0.084	-0.117*
	(0.039)	(0.117)	(0.085)	(0.092)	(0.071)
Log of sales	0.029**	0.032	-0.069**	-0.064***	-0.017
	(0.013)	(0.025)	(0.032)	(0.024)	(0.021)
Return on assets	-0.761***	-1.301***	-0.855**	-0.441*	-0.759***
	(0.163)	(0.409)	(0.335)	(0.265)	(0.246)
Observations	11099	2529	2818	2871	2887
Adjusted R^2	0.402	0.346	0.379	0.424	0.521

Notes: SOB stands for state-owned banks. Share of SOB indicates the share of loans by state-owned banks in total loans in a province. The full sample is split into four quartiles according to the total assets of firms. 1st quartile indicates the smallest firms and 4th quartile indicates the largest firms. Firm and quarter fixed effects are controlled in all the regressions. Robust standard errors clustered at the province×quarter level are in the parenthesis. *, **, and *** indicate significance level at 10%, 5% and 1% level respectively.

Appendix Table A3. The impact of liquidity shock on the relationship between financial assets and fixed assets investment for state-owned firms

Dependent variable：fixed assets investment to sales					
	Full sample	1st quartile	2nd quartile	3rd quartile	4th quartile
	(1)	(2)	(3)	(4)	(5)
Log of financial assets to sales×Share of SOB×After	0.185	-0.142	0.229	0.327	-0.175
	(0.135)	(0.256)	(0.208)	(0.249)	(0.160)
Log of financial assets to sales×After	-0.094	0.081	-0.102	-0.171	0.081
	(0.073)	(0.137)	(0.114)	(0.106)	(0.086)
Log of financial assets to sales×Share of SOB	-0.142	-0.138	-0.060	-0.314**	0.012
	(0.093)	(0.202)	(0.147)	(0.160)	(0.141)
Share of SOB×After	0.248	-0.315	0.513**	0.255	-0.179
	(0.192)	(0.410)	(0.258)	(0.258)	(0.230)
Log of financial assets to sales	0.090*	0.066	0.012	0.203**	-0.017
	(0.050)	(0.109)	(0.083)	(0.093)	(0.075)
Log of sales	0.071***	0.072**	-0.040	0.051*	0.064**
	(0.018)	(0.033)	(0.032)	(0.028)	(0.031)
Return on assets	-0.426***	-0.169	-0.528*	-0.959***	-0.091
	(0.156)	(0.361)	(0.321)	(0.332)	(0.355)
Observations	7161	1792	1804	1818	1751
Adjusted R^2	0.385	0.348	0.384	0.389	0.515

Notes: SOB stands for state-owned banks. Share of SOB indicates the share of loans by state-owned banks in total loans in a province. The full sample is split into four quartiles according to the total assets of firms. 1st quartile indicates the smallest firms and 4th quartile indicates the largest firms. Firm and quarter fixed effects are controlled in all the regressions. Robust standard errors clustered at the province×quarter level are in the parenthesis. *, **, and *** indicate significance level at 10%, 5% and 1% level respectively.