TWO ESSAYS ON CHINA'S ECONOMY AND FINANCIAL MARKETS

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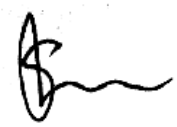
DECLARATION

I hereby declare that this thesis is my original work and it has been written by me in its entirety. I have duly acknowledged all the sources of information which have been used in the thesis.

This thesis has also not been submitted for any degree in any university previously.



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CONTENTS

SUMMARY

This thesis includes two essays on China's economy and financial markets.

Essay 1 examines the impact of state ownership of borrowers on the finance-growth nexus in China. Using a sample of 31 provinces from 2004 to 2013, I find that the growth effect of bank deepening is more evident with a larger fraction of State-Owned Enterprises (SOEs) while Non-State-Owned Enterprises (NSOEs) contribute to economic growth with the expansion of equity market. The results may result from the mismatch of maturity between short-term bank loans and long-term innovation activities for NSOEs. Based on the World Bank Enterprise Surveys database, I collect survey data of 2838 private firms and find that, compared with NSOEs, SOEs allocate more resource in R&D sector if they have access to bank loans. Using R&D expenditure data of 8150 public firms, I find that for non-state-owned public firms, which do not suffer from the maturity mismatch problem, the marginal effect of the financial deepening on firm innovation is positive and the results are significant for both bank financing and equity financing. The evidence suggests that if NSOEs can get rid of the problem of maturity mismatch, lending to these firms will promote innovation and thereby boost economic growth.

Essay 2 examines the impact of funding liquidity on market liquidity by using a nature experiment in Chinese stock market in April 2015 when China Securities Regulatory Commission (CSRC) decides to restrict Off-market margin trading.

With the exogenous decline in funding liquidity, the stocks those are not included in the official margin trading list experience a larger decline in market liquidity. I find similar results within the Growth Enterprise Market (GEM) which attract most of the positions of investors trading with Off-market margin. My results also reveal that the commonality in liquidity within the Off-market margin stocks increases with the negative shocks to Off-market margin trading, while the change of commonality in liquidity within the official margin trading stocks is insignificant.

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Chapter 1: Financial Deepening, Firm Innovation and Economic Growth in China: The Role of State Ownership

1.1 Introduction

In the past three decades, China has experienced great economic growth along with rapid expansion of its financial sector. The M2/GDP ratio, an index of financial deepening, was 194.5% in 2013, seven times higher than that in 1977, while the GDP per capita has grown from 182.7 US$ to 6807.4 US$ during the same period.

In traditional theory, financial development could boost economic growth by improving the allocation of resources, identifying highly productive projects and supporting entrepreneurial start-up as well as innovation activities (see, e.g., Boyd and Smith (1992); Aghion, Howitt and Mayer (2005); Allen (1990); Blackburn and Hung (1998); Galetovic (1996); Greenwood and Jovanovic (1989); King and Levine (1993); Morales (2003)).

Hence, much effort has been made to identify the growth effect of financial development in China. Prior studies on the topic have had differing conclusions. While some researchers find empirical evidence that China's financial development does indeed spur the economic growth (Zhang, Wang and Wang, 2012), others take the position that the effect of financial deepening on economic growth is either negative or insignificant (Boyreau-Debray(2003)); Guariglia and Poncet (2008); Hasan, Wachtel and Zhou (2009)).

To explain the weak evidence of finance-growth nexus China, one strand of prior research suggests that State-Owned Enterprises (SOEs) are the impediment to the channel of finance and economic growth. State-Owned Enterprises, which play a dominant role in China's economy, control more than 2/3 of industrial capital and bank loans of China (Allen, Qian and Qian (2005)). However, compared with Non-State-Owned enterprises (NSOEs), SOEs are inefficient and less productive (Firth, Fung and Rui (2006); Lin et al. (2011)) but they still obtain much more support from the Chinese government. Allen, Qian and Qian (2005) suggest that the annual growth rate of the Non-State sector is about 3 times as much as that of the State sector while most of the bank credit is granted to State sector, while the Non-State sector utilizes relationship and reputation as substitutes for external financing. Therefore, some scholars argue that lending to SOEs is not efficient and thus has a negative impact on the finance-growth nexus in China. However, if lending to SOEs is inefficient, why do the banks, which are controlled by the Chinese government, prefer to SOEs rather than NSOEs that are able to provide more profitable and less risky projects? Is there any social benefit for banks' lending to SOEs? Whether the benefits of lending to SOEs outweigh the cost and in turn spur economic growth in China?

To answer these questions, we should first understand the financial system in China. The financial system is dominated by the banking sector where the impact of the supply side is much more significant than the demand. Since most of the firms in China are highly constrained by the undeveloped financial market, the investment and innovation activities solely depend on the supply of bank loans. In

other words, without the support of a bank, the firm may not be able to invest in the projects that can increase the productivity and create great net present value. Moreover, when the firm makes the decision of its investment policy, it would not only take into account the current credit they get from the banks but also consider whether they can get bank supply when the current loans mature. For example, a financially constrained firm has an opportunity to introduce a new product line that will largely increase the productivity and thereby bring positive NPV. Suppose the total cost of the project is 1 million dollars and the net present value is 2 million dollars. The firm can finance the project by bank loans but it will take 5 years to recover the cash (1 million dollars) invested in the new product line. If the firm is able to get bank loans with a maturity of 5 years, it will definitely invest in the project. However, if the firm only gets support from banks with short-term loans that mature within 3 years, it may give up the valuable investment opportunity due to the rollover risk. In other words, the short maturity debt would lead to a potential rollover risk that impedes long-term investment and innovation activities (Diamond (1991)).

Figure 1.1 presents the proportion of short-term loans of the "big four" state-owned commercial banks in China. As shown in the figure, all of the four banks hold at least 30% loans with a maturity period less than one year and the short-term loans account for about 42% of the total loans of Agricultural Bank of China, suggesting a high supply of short-term funds of the banks in China.

Figure 1.2 shows the proportion of debt issued in China's bond market. Basically, there are two bond market in China, exchange bond market and interbank bond

market. As the name implies, the main participants trading in the interbank bond market are commercial banks. Individual investors are not allowed to trade in the interbank bond market but they have access to the exchange bond market. However, Chinese government forbids banks from trading in the exchange bond market. Therefore, the variation of participants in the interbank market and exchange market provide a benchmark to gauge whether banks has a preference for short-term debts. I collect the debt issuance data in 2015 for both markets and divide the data into 11 groups by maturity. As shown in figure 1.2, more than 60% of the debt has a maturity less than 1 year in the interbank bond market while the proportion in exchange bond market is less than 1%. I also find that the bonds with a maturity period less than 3 years account for about 80% of the total bonds in the interbank bond market, while the number of exchange bond market is only 20%. Therefore, the distribution of bonds maturity across the two markets, combining with the proportion of short-term loans of the "big four" banks, indicating that bank financing in China, compared with equity financing, relies heavily on short-term loans.

Since most of the bank loans mature in the short-term, the rollover risk plays a significant role in the finance-growth nexus in China. However, SOEs in China suffer much less from the problem because SOEs get lots of supports from government. Lending to SOEs can reduce the risk under the government guarantees and SOEs have a priority to get bank credit. Therefore, banks usually regard SOEs credit as safety asset and the loans may flow from NSOEs to SOEs under a tight monetary policy or in a slowdown in economic activity, giving rise

to a risk of liquidity crunch for NSOEs. Such risk will further lead to a problem of maturity mismatch for NSOEs that acquire debt financing through short-term loans and allocate the funds to long-term projects such as innovation and research activities that are not able to provide cash flows in the short-term. Namely, these NSOEs face a high risk of bankruptcy if they cannot get new loans to repay the old one. This mismatch problem is evident in China as the financial system is dominated by the banking sector and bank financing in China, compared with equity financing, relies heavily on short-term loans.

The mismatch between short-term loans and long-term investment may not cause problems in a frictionless market, but it is indeed a big trouble in China where the monetary policy changes both dramatically and frequently. In other words, when the central bank reduces the money supply, the commercial banks in China will support the SOEs first while the NSOEs may suffer from the liquidity crunch. Therefore, when NSOEs get loans from banks, they may not allocate the resources to innovation and research activities but instead keep the money as precautionary savings while SOEs can invest in those long-term projects and finally boost economic growth.

With a sample of 31 provinces from 2004 to 2013, I examine whether the benefits of lending to SOEs could enhance the growth effect of financial deepening in China. The empirical evidence reveals that the bank deepening indicator, bank loan to GDP ratio, is negatively associated with annual GDP growth rate, while the marginal effect on the SOEs is positive and significant. Namely, the growth effect of bank loans on GDP is more evident with a larger fraction of State sector.

To further verify my hypothesis that the mismatch between short-term bank loans and long-term innovation activities hinder the finance-growth nexus in China, I collect equity issuance data of Non-financial corporations for each province and take the ratio of equity issuance to GDP as the equity deepening measure. With the new equity financing indicator, the regression results suggest a different story. Compared with the bank loans, equity financing has a positive and significant impact on income growth while the marginal effect of the State sector is negative. In other words, income grows with the expansion of equity market and grows faster with a larger Non-State sector.

Although the relationship between long-run economic growth and finance development has been discussed extensively (see e.g., Levine and Zervos (1998); Guiso, Sapienza and Zingales (2004); Berger, Hasan and Klapper (2004); Benhabib and Spiegel (2000); Rioja and Valev (2004); Rousseau and Wachtel (1998)), most of the studies fail to explain how financial deepening is associated with a higher growth rate. Solow (1957) argues that instead of capital accumulation and labor force growth, technological progress is the only factor that contributes to per capital growth in the long-run. Aghion, Howitt and Mayer (2005) illustrate that financial development accelerates the convergence rate in developing countries by encouraging technology transfer and R&D investment. Using firm-level data across 47 emerging countries, Ayyagari, Demirguc-Kunt and Maksimovic (2012) find that firms are more likely to innovate with access to external finance.

Therefore, I investigate, especially for SOEs, the channel through which the financial deepening affects economic growth in China. I manually collect the annual domestic grants for patents of each province in China from the state intellectual property office of the P.R.C. The impact of the state ownership on the finance-innovation association is consistent with that on the finance-growth nexus. The results reveal a positive relation between patents grants and equity financing, which is more evident with a large size of Non-State sector. But the effects of bank loans on innovation are significant and positive with a high fraction of State sector.

To gauge the causal effect of financial deepening on innovation activities, I introduce firm-level innovation data for public firms listed in Chinese stock market. The maturity mismatch problem is evident for private firms, which are financially constrained and relies heavily on bank loans. However, for the less financially constrained public firms, the rollover risk is low so I expect to find a strong finance-growth nexus. Namely, when the short-term loans mature, public firms can easily repay the debt since they can either issue new equities in the stock market or pledge the shares of stock as collateral to get new loans. In other words, public firms do not suffer from the liquidity crunch caused by the mismatch of maturity. Therefore, I expect that, for public firms, NSOEs will allocate more resources to research and development activities with the development of both bank financing and equity financing. To verify my hypothesis, I collect research and development expenditure data of public firms from 2006 to 2013 and investigate the impact of state ownership on the relation

between finance deepening and R&D expenditure. To alleviate the concern of endogeneity, I use the data at the provincial level, rather than firm-level, to measure the level of bank deepening and equity deepening. I find that the marginal effect of the financial deepening on the firm innovation is positive for non-state-owned public firms and the results are significant for both bank financing and equity financing. The evidence suggests that if NSOEs can get rid of the problem of maturity mismatch, lending to these firms will promote economic growth since these productive NSOEs are willing to allocate the loans to innovation and research activities.

My research makes two main contributions to the extant literature. First, to gauge the role of SOEs in the real economy and financial deepening, I use provincial level data to find out whether and how SOEs affect the finance-growth nexus in China, providing a better understanding of the inconclusive results in the prior research. Second, using firm-level data, I empirically test the channel through which SOEs affect the finance-growth nexus in China. In other words, I investigate whether SOEs are more willing to innovate with access to bankloans.

The rest of the paper proceeds as follows: Section 1.2 describes the data. In section 1.3, I develop the empirical models. Section 1.4 presents the results. I conclude in Section 1.5.

1.2 Data

To investigate the finance-growth nexus in China, I first collect provincial level data over 2004 to 2013 across 31 provinces from CEIC database. Following

Boyreau-Debray (2003), I take the bank loan to GDP ratio as the proxy of financial deepening in each province. To measure SOE, I divide the number of industrial State-Owned Enterprises by the total number of industrial enterprises[1] in each province. I make use of the Consumer Price Index to gauge the annual inflation rate of each province. Besides, I also calculate the fraction of college students in the total population to control for education level.

I collect survey data of more than 2000 private firms, which are financially constrained and suffer from the problem of maturity mismatch in China from World Bank Enterprise Surveys database to gauge whether the state ownership will increase innovation with access to bank loans for private firms.

Using WIND database, I collect research and development expenditure data of public firms from to investigate the impact of state ownership on the relation between finance deepening and R&D expenditure. The data is not available before 2006 so I only collect the R&D expenditure from 2006 to 2013, including 8150 public firms across 28 industries.

Table 1.1 presents the summary statistics of the variables. Lnpgdp is the log of GDP per capita of province i in year t. Lnpatents is the annual growth rate of the domestic grants for patents. Soe denotes the share of SOEs in province i, which is measured by the number of industrial state control enterprise divided by the total number of industrial enterprise. Bankloan is the bank loan to GDP ratio in each province. Equity denotes the equity issuance to GDP ratio. Cpi is the annual

[1] I collect the data from Chinese Industrial Enterprises Databasewhich incorporates the industrial enterprises whose annual sale is above 5,000,000RMB in each province. The total production quantity of those enterprises accounts for 95% of Chinese industrial production quantity.

inflation rate of province i in year t. Edu is the level of education measured by the number of people with bachelor degree divided by the total population for each province.

Panel B presents the summary statistics of the firm-level data. Innodummy is a dummy that values one if the private firm introduced any new products or services. Rddummy equals to 1 if the firm spends on research and development activities. TotalInn, the sum of the innovation activities conducted by the firm, values between 0 to 8. Bankloan equals to 1 if the firm has a line of credit or a loan from a financial institution. World Bank Enterprise Surveys database also provide the share of the private firm owned by government or state, which is denoted by Soe_private. Age is the year of the survey minus the year of establishment. Size takes values between 1 to 3, representing small firms, medium firms and large firms, respectively. Establishment is the number of establishments that form the firm. Incorporate values 1if the firm is legally incorporated. Capacity is the output produced as a proportion of the maximum output when using all the resources available. For the public firm sample, Rd denotes the log of R&D expenditure. Soe_public values 1 if the controlling shareholder of the public firm is the state, which is provided by WIND database.

1.3 Model

1.3.1 SOEs, Economic growth and Financial Deepening

To test the hypothesis that finance-growth nexus is positively associated with the fraction of the State-Owned Enterprises. I develop the following panel regression:

$$\Delta \ln PGDP_{i,t} = \alpha_i + \alpha_t + \alpha \ln PGDP_{i,t-1} + \beta SOE_{i,t} Bankloan_{i,t} + \lambda SOE_{i,t} + \gamma Bankloan_{i,t} + \theta Control_{i,t} + \varepsilon_{i,t} \quad (1.1)$$

Where $\ln PGDP_{i,t}$ is the log of GDP per capita of province i in year t. α_i and α_t denote the province fixed effect and time fixed effect, respectively. $SOE_{i,t}$ denotes the share of SOEs in province i. $Bankloan_{i,t}$ is the level of financial deepening, measured by the loan to GDP ratio in each province at year t. $Control_{i,t}$ include other time-variant controls.

However, after controlling the province fixed effect α_i, the lagged dependent variable $\ln PGDP_{i,t}$ is correlated with error term $\varepsilon_{i,t}$, leading to endogeneity. To solve the problem, I introduce the dynamic panel model (GMM) which takes the first difference for each variable to get rid of province fixed effect:

$$y_{i,t} - y_{i,t-1} = \alpha_t - \alpha_{t-1} + \alpha(y_{i,t-1} - y_{i,t-2}) + \beta(X_{i,t-1} - X_{i,t-2}) + \varepsilon_{i,t} - \varepsilon_{i,t-1}$$

However, there is a new problem since $y_{i,t-1}$is correlated with $\varepsilon_{i,t-1}$. To address the endogeneity, I use the lags of the endogenous variables as instruments if the following moment conditions are satisfied.

$$E[y_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0$$

$$E[X_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0$$

Where s >= 2.

Although the financial system is dominated by the banking sector in China, equity financing also plays a significant role in boosting economic growth (Hasan,

Wachtel and Zhou (2009)). Therefore, I take the ratio of equity issuance to GDP as a measure of financial development and further test the impact of equity financing on income growth in China. The equity issuance data are released by the People's Bank of China. I collect the value of equity issuance of Non-financial corporations from China Regional Financial Performance Report and then divide it by the GDP in each province. The ratio captures the development of equity market in China, which is much different from banking sector since bank loans usually mature in two years in China and thereby lead to bankruptcy risk that can be avoided by equity financing.

$$\begin{aligned}\Delta \ln \mathrm{PGDP}_{i,t} = {} & \alpha_i + \alpha_t + \alpha \ln \mathrm{PGDP}_{i,t-1} + \beta_1 \mathrm{SOE}_{i,t} \mathrm{Bankloan}_{i,t} + \gamma_1 \mathrm{Bankloan}_{i,t} \\ & + \beta_2 \mathrm{SOE}_{i,t} \mathrm{Equity}_{i,t} + \gamma_2 \mathrm{Equity}_{i,t} + \lambda \mathrm{SOE}_{i,t} + \theta \mathrm{Control}_{i,t} \\ & + \varepsilon_{i,t} \qquad (1.2)\end{aligned}$$

Where $\mathrm{Equity}_{i,t}$ denotes the equity issuance to GDP ratio in province i at year t.

1.3.2 SOEs, Firm Innovation and Financial Deepening

To investigate, especially for SOEs, the channel through which the financial deepening affects economic growth in China, I manually collect the annual domestic grants for patents of each province from the state intellectual property office of the P.R.C and develop the following regression:

$$\begin{aligned}\Delta \ln \mathrm{Patents}_{i,t} = {} & \alpha_i + \alpha_t + \beta_1 \mathrm{SOE}_{i,t} \mathrm{Bankloan}_{i,t} + \gamma_1 \mathrm{Bankloan}_{i,t} \\ & + \beta_2 \mathrm{SOE}_{i,t} \mathrm{Equity}_{i,t} + \gamma_2 \mathrm{Equity}_{i,t} + \lambda \mathrm{SOE}_{i,t} + \theta \mathrm{Control}_{i,t} \\ & + \varepsilon_{i,t} \qquad (1.3)\end{aligned}$$

The dependent variable is the annual growth rate of the domestic grants for patents of province i in year t. $\alpha_i$and $\alpha_t$denote the province fixed effect and time fixed effect, respectively. $\mathrm{SOE}_{i,t}$ denotes the share of SOEs in province i. $\mathrm{Bankloan}_{i,t}$ is bank loan to GDP ratio. $\mathrm{Equity}_{i,t}$ denotes the equity to GDP ratio. $\mathrm{Control}_{i,t}$ denotes other time-variant controls including education level, inflation. I use GMM estimator to address endogeneity. For robustness, I rerun the model with simple OLS estimator.

To better understand how state ownership amplify the effect of bank loans on innovation activities, I collect survey data of more than 2000 private firms, which are financially constrained and suffer from the problem of maturity mismatch in China from World Bank Enterprise Surveys database to gauge whether the state ownership will increase innovation with access to bank loans for private firms. I estimate the following model:

$$\mathrm{Innovation}_i = \alpha + \beta \mathrm{SOE\_private}_i \mathrm{Bankloan}_i + \lambda \mathrm{SOE\_private}_i + \gamma \mathrm{Bankloan}_i + \theta \mathrm{Control}_i + \varepsilon_i \qquad (1.4)$$

The dependent variable, $\mathrm{Innovation}_i$, denotes firm innovation. I define three innovation variables to measures whether the firm invest in innovation or not. 1) $\mathrm{Innodummy}_i$ is a dummy that values one if the firm introduced any new products or services; 2) $Rddummy_i$ equals to 1 if the firm spends on research and development activities. 3)$TotalInno_i$ values between 0 to 8, which is sum of the innovation activities conducted by the firm $\mathrm{SOE\_private}_i$ the share owned by government or state. $\mathrm{Bankloan}_i$ is a dummy that values 1 if the firm has access to

bank loans. Control_i include other control variables such as firm size, age, capacity, etc.

I also conduct empirical analysis on public firms by collecting annual research and development expenditure from 2006 to 2013. I combine the firm-level panel data with province level macro variables and estimate the following model:

$$\begin{aligned}\text{Innovation}_{it} = {} & \alpha_k + \alpha_t + \beta_1 \text{SOE\_public}_{i,t} \text{Bankloan}_{j,t} + \gamma_1 \text{Bankloan}_{j,t} \\ & + \beta_2 \text{SOE\_public}_{i,t} \text{Equity}_{j,t} + \gamma_2 \text{Equity}_{j,t} + \lambda \text{SOE\_public}_{i,t} \\ & + \theta \text{Control}_{j,t} + \varepsilon_{i,t} \qquad (1.5)\end{aligned}$$

The dependent variable is the log of annual R&D expenditure of firm i in year t. α_k and α_t denote the industry fixed effect and time fixed effect, respectively. $\text{SOE\_public}_{i,t}$ values 1 if the controlling shareholder of the public firm is the state. $\text{Bankloan}_{j,t}$ is bank loan to GDP ratio in province j. $\text{Equity}_{j,t}$ denotes the equity to GDP ratio. $\text{Control}_{j,t}$ denotes other time-variant controls.

1.4 Results

Table 1.2 presents the results of Eq. (1.1). As shown in the table, the coefficient of the interaction term $\text{SOE}_{i,t}\text{Bankloan}_{i,t}$ is positive and significant at 1% level, which suggests that lending to SOEs is associated with higher economic growth. To be more specific, I find that the finance-growth nexus will increase by 5 percent when the fraction of State-Owned Enterprises increases by 10 percent. The table also suggests that the level of bank financing is negatively associated with income growth if the size of the State sector is low. Therefore, my results

show that the finance-growth nexus could be either positive or negative across different province conditioning on the fraction of state ownership, which explain the inconsistent findings between finance development and GDP growth rate in prior literature. Consistent with prior literature, the results suggest a negative association between state ownership and income growth, indicating a low productivity of State sector.

My results are robust after controlling for education, inflation and year dummies. The Hansen test suggests that I cannot reject the orthogonality condition. Besides, I also test the second order autocorrelation for the residuals and again demonstrate the validity of the instruments. To be more confident with the results, I rerun Eq. (1.1) with a simple OLS estimator. The results also reveal a significant positive effect of state ownership on the finance-growth nexus. After controlling for inflation and education, the results remain significant. Namely, the OLS estimator is consistent with the GMM method.

To further verify my hypothesis that the mismatch between short-term bank loans and long-term innovation activities hinder the finance-growth nexus in China, I collect equity issuance data of Non-financial corporations for each province and take the ratio of equity issuance to GDP as an alternative measure of financial development. As shown in table 1.3, the coefficient of the interaction term $\mathrm{SOE}_{i,t}\mathrm{Bankloan}_{i,t}$ remains positive and significant after introducing the equity financing indicator to the model. However, compared with the bank loans, equity financing has a positive and significant impact on income growth while the

marginal effect of the State sector is negative. In other words, income grows with the expansion of equity market and grows faster with a larger Non-State sector.

The results show opposite effects of state ownership on finance-growth nexus, depending on equity-based or bank-based financing channels. SOEs promote income level with access to bank loans while NSOEs contribute to economic growth with the expansion of equity market. To explain such phenomenon and to better understand the role of state ownership in finance-growth nexus in China, I investigate the channel through which the financial deepening affects economic growth in China. I manually collect the annual domestic grants for patents of each province in China from the state intellectual property office of the P.R.C. Table 1.4 shows the impact of the state ownership on finance-innovation association, which is consistent with that on the finance-growth nexus. I find a positive relation between patents grants and equity financing, which is more evident with a large size of Non-State sector. But the effects of bank loans on innovation are significant and positive with a high fraction of State sector. The results comply with my mismatch story that short-term bank loan brings about liquidity risk that suppresses the long-term innovation activities. Such conflicts could be alleviated by the state ownership since SOEs can easily obtain new loans to pay the old ones under government guarantees while NSOEs may face a liquidity crunch and keep the loans as precautionary savings. However, financing from equity market avoid the mismatch problem and thereby allow NSOEs to invest in research and innovation activities.

I further use firm-level data from the World Bank Enterprise Surveys database to gauge whether the state ownership can alleviate the problem of maturity mismatch. As shown in table 1.5, the fraction of the state-owned shares is negatively associated with my innovation indicator while the coefficient of the interaction term is positive. Therefore, the results suggest that, although unconditionally, SOEs are less likely to innovate, they do invest more in innovation and research activities if they have access to bank loans. Namely, although SOEs are less productive, lending to SOEs is still efficient since the marginal effect of bank loans is higher for SOEs. Therefore, the survey data of private firms also provide evidence that consistent with my story. I also use different measure of innovation such as innovation dummy, research dummy and total innovation to verify the robustness of our model and the results are quite similar.

Table 1.6 presents the impact of financial deepening on public firms and the role of state ownership. As public firms can easily refinance their loans by equity issuance, they do not suffer from the problem of maturity mismatch. Namely, compared with private firms, the Non-State-Owned public firms are more willing to invest in long-term projects with short-term loans. The empirical evidence is consistent with this argument. I find that the marginal effect of the financial deepening on the firm innovation is positive for Non-State-Owned public firms and the results are significant for both bank financing and equity financing. The evidence suggests that if NSOEs can get rid of the problem of maturity mismatch,

lending to these firms will promote economic growth since these productive NSOEs are willing to allocate the loans to innovation and research activities.

1.5 Conclusion

In this paper, I examine the impact of state ownership on the finance-growth nexus in China. Using a sample of 31 provinces from 2004 to 2013, I find that the size of bank loans is negatively associated with annual GDP growth rate while the marginal effect of the State sector is positive and significant. Namely, the growth effect of bank loans is more evident with a larger fraction of SOEs while NSOEs contribute to economic growth with the expansion of equity market. The impact of the state ownership on finance-innovation association is consistent with that on the finance-growth nexus. Based on the World Bank Enterprise Surveys database, I also find that, compared with NSOEs, SOEs are more willing to allocate resource in R&D sector and technology investment if they have access to bank loans. The results imply that lending to SOEs help banks to detect the innovative firms and finally promote economic growth in China.

One potential explanation of the results is the “Big Push” theory. According to the theory, the underdeveloped economy requires a high minimum amount of investment across its different sectors to overcome trap of vicious circles of poverty. Therefore, the Chinese government makes great amount of investment in the State sector, which require the support from the banks. Although the “Big Push” theory explain why the banks prefer to SOEs, it is still interesting to ask

why NSOEs, which are more productive but financially constrained, are less likely to innovate with bank loans.

The key to understand the results is the mismatch of maturity between short-term loans and long-term projects such as innovation and R&D expenditure. In China, bank loans are usually matured in two years while the innovation and research activities require long-term investment and may not able to provide cash flows in the short-term, leading to high risk of bankruptcy if the firms cannot get new loans to repay the old one. Such situation may not happen in a frictionless market, but it is indeed a big problem in China where the monetary policy changes both dramatically and frequently. For example, to boost the economy after 2008 global crisis, Chinese government announced the so-called "4 trillion yuan stimulus package" and commercial banks grant massive credit to both SOEs and NSOEs. However, due to the high inflation rate, the central bank of China decided to tighten money supply in 2010 when many NSOEs fail to get new loans to repay the old one. But the SOEs suffer less from the problem since they can easily get support from government and avoid the bankruptcy risks.

Namely, when the central bank reduces the money supply, the commercial banks in China will support the SOEs first while the NSOEs may face a liquidity crunch. Therefore, when NSOEs get the loans from banks, they may not invest in long-term project but instead keep that money as precautionary savings. This explanation is consistent with my findings that NSOEs are less likely to innovate with access to bank credit.

Recently, to maintain the high-income growth, Chinese government implements several policies to encourage commercial banks to grant loans to NSOEs. However, based on my findings, simply lending to NSOEs does not solve the problem since the NSOEs are not willing to utilize the short-term loans regarding the liquidity risk. My result also suggests that financing from equity market can avoid the mismatch problem and thereby allow NSOEs to invest in research and innovation activities. Therefore, to boost the economy, Chinese government should develop the public debt and stock market since the access to long-term debt and equity based financing is crucial for such productive NSOEs.

References I

Aghion, P, P Howitt, and D Mayer. 2005. “The Effect of Financial Development on Convergence.” Quarterly Journal of Economics.

Akerlof, George A. 1970. “The market for” lemons”: Quality uncertainty and the market mechanism.” The quarterly journal of economics, 488–500.

Allen, Franklin. 1990. “The market for information and the origin of financial intermediation.” Journal of financial intermediation, 1(1): 3–30.

Allen, Franklin, Jun Qian, and Meijun Qian. 2005. “Law, finance, and economic growth in China.” Journal of financial economics, 77(1): 57–116.

Ayyagari, Meghana, AsliDemirguc-Kunt, and Vojislav Maksimovic. 2012. “Firm innovation in emerging markets: the role of finance, governance, and competition.” Journal of Financial and Quantitative Analysis, 46(06): 1545–1580.

Benhabib, Jess, and Mark M Spiegel.2000. “The role of financial development in growth and investment.” Journal of economic growth, 5(4): 341–360.

Berger, Allen N, Iftekhar Hasan, and Leora F Klapper. 2004. “Further evidence on the link between finance and growth: An international analysis of community banking and economic performance.” Journal of Financial Services Research, 25(2-3): 169–202.

Blackburn, Keith, and Victor TY Hung. 1998.“A theory of growth, financial development and trade.”Economica, 65(257): 107–124.

Boyd, John H, and Bruce D Smith. 1992. “Intermediation and the equilibrium allocation of investment capital: Implications for economic development.” Journal of Monetary Economics, 30(3): 409–432.

Boyreau-Debray, Genevieve. 2003. “Financial intermediation and growth: Chinese style.”

Diamond, D. W. 1991. Debt maturity structure and liquidity risk. Quarterly Journal of Economics 106: 709–37.

Firth, Michael, Peter MY Fung, and Oliver M Rui. 2006. “Corporate performance and CEO compensation in China.” Journal of Corporate Finance, 12(4): 693–714.

Galetovic, Alexander. 1996. “Specialization, intermediation, and growth.” Journal of Monetary Economics, 38(3): 549–559.

Greenwood, Jeremy, and Boyan Jovanovic. 1989. “Financial development, growth, and the distribution of income.” National Bureau of Economic Research.

Guariglia, Alessandra, and Sandra Poncet. 2008. “Could financial distortions be no impediment to economic growth after all? Evidence from China.” Journal of Comparative Economics, 36(4): 633–657.

Guiso, Luigi, Paola Sapienza, and Luigi Zingales. 2004. “Does local financial development matter?” The Quarterly Journal of Economics, 119(3): 929–969.

Hasan, Iftekhar, Paul Wachtel, and Mingming Zhou. 2009. “Institutional development, financial deepening and economic growth: Evidence from China.” Journal of Banking &Finance, 33(1): 157–170.

King, Robert G, and Ross Levine. 1993. “Finance, entrepreneurship and growth.” Journal of monetary Economics, 32(3): 513–542.

Levine, Ross, and Sara Zervos. 1998. “Stock markets, banks, and economic growth.” American economic review, 537–558.

Lin, Chen, Ping Lin, Frank M Song, and Chuntao Li. 2011.“Managerial incentives, CEO characteristics and corporate innovation in Chinas private sector.” Journal of Comparative Economics, 39(2): 176–190.

Morales, Maria F. 2003.“Financial intermediation in a model of growth through creative destruction.” Macroeconomic Dynamics, 7(03): 363–393.

Rioja, Felix, and Neven Valev. 2004. “Does one size fit all?: a reexamination of the finance and growth relationship.” Journal of Development economics, 74(2): 429–447.

Rousseau, Peter L, and Paul Wachtel.1998. “Financial intermediation and economic performance: historical evidence from five industrialized countries.” Journal of money, credit and banking, 657–678.

Solow, Robert M. 1957. “Technical change and the aggregate production function.” The review of Economics and Statistics, 312–320.

Zhang, Jin, Lanfang Wang, and Susheng Wang. 2012. “Financial development and economic growth: Recent evidence from China.” Journal of Comparative Economics,40(3): 393–412.

Figure 1.1 Proportion of Short-term Loans of Banks in China

This figure presents the proportion of short-term loans of the "big four" state-owned commercial banks in China. Short-term loans are defined as the loans with a maturity period less than one year.

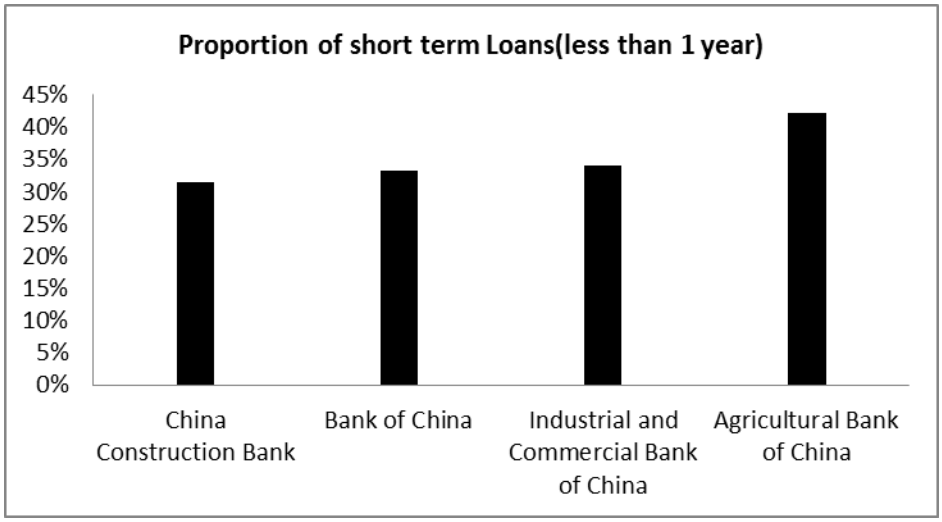

Figure 1.2 Debt Maturity in China's Bond Market

This figure shows the proportion of debt issued in China's bond market. I collect the debt issuance data in 2015 and divide the data into 11 groups by maturity. There are two bond market in China, exchange bond market and interbank bond market. Banks are not allowed to trade in the exchange bond market while the interbank bond market is only available to banks and institutional investors.

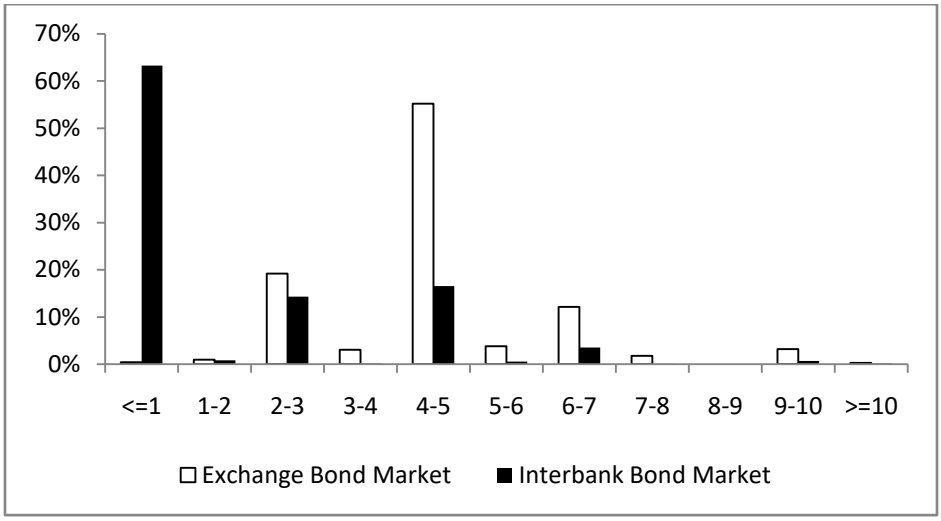

Table 1.1 Summary Statistics

Panel A presents the summary statistics of the provincial level data. Lnpgdp is the log of GDP per capita of province i in year t. Lnpatents is the annual growth rate of the domestic grants for patents. Soe denotes the share of SOEs in province i, which is measured by the number of industrial state control enterprise divided by the total number of industrial enterprise. Bankloan is the the bank loan to GDP ratio in each province. Equity is the equity issuance to GDP ratio. Cpi denotes the annual inflation rate while Edu is the level of education measured by the number of people with bachelor degree divided by the total population for each province. Panel B presents the summary statistics of the firm-level data. Innodummy is a dummy that values one if the firm introduced any new products or services. Rddummy equals to 1 if the firm spend on research and development activities. TotalInn values between 0 to 8, which is sum of the innovation activities conducted by the firm. Bankloan equals to 1 if the firm has a line of credit or a loan from a financial institution. Soe_private denotes the share owned by government or state. Age is the year of the survey minus the year of establishment. Size takes values between 1 to 3, representing small firms, medium firms and large firms, respectively. Establishment is the number of establishments that form the firm. Incorporate values 1 if the firm is legally incorporated. Capacity is the output produced as a proportion of the maximum output when using all the resources available. Rd is the log of R&D expenditure of the public firms. Soe_public values 1 if the controlling shareholder is the state.

Panel A: Provincial Level Data					
Variable	OBS	Mean	Std. Dev.	Min	Max
Lnpgdp	310	9.90259	0.591562	8.331	11.233
Lnpatents	310	8.549226	1.717812	3.14	12.51
Bankloan	310	1.068516	0.373835	0.54	2.58
Equity	310	0.010968	0.022577	0	0.27
Soe	310	0.149774	0.126241	0.01	0.87
Cpi	310	1.032419	0.020581	0.98	1.1
Edu	310	0.040887	0.0108	0.015	0.062
Panel B: Firm-Level Data					
Variable	OBS	Mean	Std. Dev.	Min	Max
Innodummy	2839	0.464248	0.498808	0	1
Rddummy	1714	0.417153	0.493233	0	1
TotalInn	1700	4.709412	2.796034	0	8
Bankloan	2732	0.312592	0.463634	0	1
Soe_private	2838	6.789288	24.03647	0	100
Age	2767	13.10119	8.870313	0	133
Size	2848	2.196278	0.765263	1	3
Establishment	2847	2.462943	5.989386	1	90
Incorporate	2848	0.069523	0.254385	0	1
Capacity	1691	86.79657	10.76467	0	100
Rd	8150	1.786039	1.933143	.0000452	40.9575
Soe_public	8150	0.400859	0.490103	0	1

Table 1.2 Bank Deepening, Economic Growth and State Ownership

The table presents the impact of state ownership on the finance-growth nexus in China.

$$\Delta \ln PGDP_{i,t} = \alpha_i + \alpha_t + \alpha \ln PGDP_{i,t-1} + \beta SOE_{i,t} * Bankloan_{i,t} + \gamma Bankloan_{i,t} + \lambda SOE_{i,t} + \theta Control_{i,t} + \varepsilon_{i,t}$$

The dependent variable is the annual growth rate of GDP per capita of province i in year t. α_i and α_t denote the province fixed effect and time fixed effect, respectively. $\ln PGDP_{i,t}$ is the lagged level of GDP per capita. $SOE_{i,t}$ denotes the share of SOEs in province i. $Bankloan_{i,t}$ is the level of financial deepening measured by the bank loan to GDP ratio. $Control_{i,t}$ denotes other time-variant controls including education level, inflation rate. I use GMM estimator to address endogeneity. For robustness, I rerun the model with simple OLS estimator.

VARIABLES	GMM			OLS		
Bankloan*Soe	0.139***	0.219***	0.156*	0.189***	0.148***	0.144**
	(0.0523)	(0.0657)	(0.0866)	(0.0586)	(0.0567)	(0.0568)
Bankloan	-0.0101	-0.0228	-0.0337	-0.064***	-0.0411***	-0.040***
	(0.0181)	(0.0167)	(0.0253)	(0.0108)	(0.0113)	(0.0114)
Soe	-0.52***	-0.46***	-0.43***	-0.145**	-0.141**	-0.138**
	(0.133)	(0.151)	(0.148)	(0.0579)	(0.0554)	(0.0556)
L.inpgdp	-0.14***	-0.075***	-0.095**			
	(0.0437)	(0.0258)	(0.0385)			
Edu		0.555	0.224		1.267***	1.269***
		(1.057)	(0.880)		(0.237)	(0.237)
Cpi			-0.824**			0.103
			(0.390)			(0.104)
Constant	1.588***	0.858***	1.931**	0.170***	0.0998***	-0.00769
	(0.462)	(0.283)	(0.754)	(0.0112)	(0.0170)	(0.110)
Year Dummy	YES	YES	YES	NO	NO	NO
Observations	279	279	279	310	310	310
Hansen Test	1.000	1.000	0.998			
Arellano-Bond	0.146	0.160	0.262			

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 1.3 Equity Deepening, Economic Growth and State Ownership

The table presents the impact of state ownership on the finance-growth nexus in China.

$$\Delta \ln \mathrm{PGDP}_{i,t} = \alpha_i + \alpha_t + \alpha \ln \mathrm{PGDP}_{i,t-1} + \beta_1 \mathrm{SOE}_{i,t} * \mathrm{Bankloan}_{i,t} + \gamma_1 \mathrm{Bankloan}_{i,t} + \beta_2 \mathrm{SOE}_{i,t} * \mathrm{Equity}_{i,t} + \gamma_2 \mathrm{Equity}_{i,t} + \lambda \mathrm{SOE}_{i,t} + \theta \mathrm{Control}_{i,t} + \varepsilon_{i,t}$$

The dependent variable is the annual growth rate of GDP per capita of province i in year t. α_i and α_t denote the province fixed effect and time fixed effect, respectively. $\ln \mathrm{PGDP}_{i,t}$ is the lagged level of GDP per capita. $\mathrm{SOE}_{i,t}$ denotes the share of SOEs in province i. $\mathrm{Bankloan}_{i,t}$ is bank loan to GDP ratio. $\mathrm{Equity}_{i,t}$ denotes the equity to GDP ratio. $\mathrm{Control}_{i,t}$ denotes other time-variant controls including education level, inflation rate. I use GMM estimator to address endogeneity. For robustness, I rerun the model with simple OLS estimator.

VARIABLES	GMM			OLS		
Bankloan*Soe	0.222**	0.209*	0.166*	0.214***	0.175***	0.171***
	(0.0906)	(0.112)	(0.0914)	(0.0594)	(0.0573)	(0.0575)
Bankloan	-0.0446	-0.0418	-0.0265	-0.073***	-0.0505***	-0.0490***
	(0.0273)	(0.0267)	(0.0207)	(0.0116)	(0.0118)	(0.0120)
Equity*Soe	-2.118	-2.129	-1.565	-2.401**	-2.503**	-2.486**
	(1.409)	(1.685)	(1.832)	(1.132)	(1.082)	(1.082)
Equity	0.455*	0.461*	0.320	0.535**	0.590**	0.580**
	(0.236)	(0.275)	(0.285)	(0.244)	(0.234)	(0.234)
Soe	-0.513***	-0.491***	-0.407**	-0.151***	-0.148***	-0.145***
	(0.142)	(0.139)	(0.199)	(0.0578)	(0.0552)	(0.0553)
L.inpgdp	-0.135***	-0.137***	-0.123**			
	(0.0425)	(0.0464)	(0.0595)			
Edu		-0.350	-0.278		1.292***	1.292***
		(1.068)	(1.497)		(0.236)	(0.236)
Cpi			-0.987			0.0913
			(0.967)			(0.103)
Year Dummy	YES	YES	YES	NO	NO	NO
Constant	1.519***	1.552***	2.398*	0.175***	0.103***	0.00774
	(0.462)	(0.517)	(1.373)	(0.0114)	(0.0170)	(0.110)
Observations	279	279	279	310	310	310
Hansen Test	1.000	1.000	1.000			
Arellano-Bond	0.048	0.046	0.148			

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 1.4 Financial Deepening, Innovation and State Ownership

The table presents the impact of state ownership on the finance-growth nexus in China.

$$\Delta \ln \text{Patents}_{i,t} = \alpha_i + \alpha_t + \beta_1 \text{SOE}_{i,t} * \text{Bankloan}_{i,t} + \gamma_1 \text{Bankloan}_{i,t} + \beta_2 \text{SOE}_{i,t} * \text{Equity}_{i,t} + \gamma_2 \text{Equity}_{i,t} + \lambda \text{SOE}_{i,t} + \theta \text{Control}_{i,t} + \varepsilon_{i,t}$$

The dependent variable is the annual growth rate of the domestic grants for patents of province i in year t.$\alpha_i$andα_t denote the province fixed effect and time fixed effect, respectively. $\text{SOE}_{i,t}$ denotes the share of SOEs in province i. $\text{Bankloan}_{i,t}$ is bank loan to GDP ratio. $\text{Equity}_{i,t}$ denotes the equity to GDP ratio. $\text{Control}_{i,t}$ denotes other time-variant controls including education level, inflation. I use GMM estimator to address endogeneity. For robustness, I rerun the model with simple OLS estimator.

VARIABLES	GMM			OLS		
Bankloan*Soe	0.850	2.275*	2.874**	1.313*	1.228*	1.277*
	(1.534)	(1.356)	(1.379)	(0.720)	(0.724)	(0.727)
Bankloan	0.249	-0.172	-0.424	-0.167	-0.116	-0.132
	(0.490)	(0.462)	(0.482)	(0.131)	(0.138)	(0.140)
Equity*Soe	-91.53***	-108.1***	-119.5***	-77.71***	-77.62***	-77.75***
	(10.53)	(8.870)	(12.28)	(12.36)	(12.36)	(12.37)
Equity	11.59***	16.15***	20.15***	11.63***	11.70***	11.79***
	(2.465)	(2.390)	(3.955)	(2.646)	(2.646)	(2.650)
Soe	-0.389	-1.621	-2.297*	-0.965	-0.981	-1.023
	(1.216)	(1.299)	(1.358)	(0.688)	(0.688)	(0.691)
Edu		2.028	7.653		3.072	3.005
		(7.288)	(8.260)		(2.772)	(2.776)
Cpi			4.663			-0.858
			(4.274)			(1.164)
Year Dummy	YES	YES	YES	NO	NO	NO
Constant	1.519***	1.552***	2.398*	0.175***	0.103***	0.00774
	(0.462)	(0.517)	(1.373)	(0.0114)	(0.0170)	(0.110)
Observations	279	279	279	310	310	310
Hansen Test	1.000	1.000	1.000			
Arellano-Bond	0.843	0.959	0.900			

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 1.5 Financial deepening, Innovation and State Ownership: Private Firms

The table presents the impact of financial deepening on firm innovation.

$$\text{Innovation}_i = \alpha + \beta \text{SOE}_i \text{Bankloan}_i + \lambda \text{SOE}_i + \gamma \text{Bankloan}_i + \theta \text{Control}_i + \varepsilon_i$$

I define three innovation variables to measures whether the firm invest in innovation or not. 1)InnovationDummy is a dummy that values one if the firm introduced any new products or services; 2)ResearchDummy equals to 1 if the firm spend on research and development activities. 3)TotalInnovation values between 0 to 8, which is sum of the innovation activities conducted by the firm. SOE_itakes the value of 1 if the firm is state-owned. $\text{Bankloan}_i$is a dummy that values 1 if the firm has access to bank loans.Control_iinclude other control variables such as firm size, age, capacity, etc.

Variable	innodummy		rddummy		TotalInn	
Bankloan*Soe	0.00779**	0.0207***	0.0187***	0.0216***	0.0395***	0.0294**
	(0.00386)	(0.00691)	(0.00696)	(0.00753)	(0.0127)	(0.0121)
Bankloan	0.543***	0.277**	0.880***	0.737***	0.751***	0.478**
	(0.0866)	(0.113)	(0.109)	(0.115)	(0.206)	(0.205)
Soe	-0.0106***	-0.0180***	-0.0108***	-0.0135***	-0.0196***	-0.0213***
	(0.00216)	(0.00389)	(0.00356)	(0.00372)	(0.00515)	(0.00506)
Age		-0.00229		0.00515		0.0128
		(0.00654)		(0.00644)		(0.0112)
Size		0.376***		0.430***		1.037***
		(0.0799)		(0.0831)		(0.140)
Establishment		0.0197*		0.0308**		0.0682***
		(0.0118)		(0.0122)		(0.0214)
Incorporate		0.0816		-0.409*		1.807***
		(0.207)		(0.217)		(0.398)
Capacity		0.00334		0.00394		0.0267***
		(0.00480)		(0.00504)		(0.00864)
Constant	-0.280***	-1.390***	-0.629***	-1.992***	5.156***	0.0342
	(0.0488)	(0.446)	(0.0658)	(0.471)	(0.123)	(0.797)
Observations	2,718	1,587	1,656	1,584	1,640	1,569

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 1.6Financial deepening, Innovation and State ownership: Public Firms

The table presents the impact of financial deepening on the innovation of public firms.

$$\begin{aligned}\text{Innovation}_{it} = {} & \alpha_k + \alpha_t + \beta_1 \text{SOE}_{\text{public }i,t}\text{Bankloan}_{j,t} + \gamma_1 \text{Bankloan}_{j,t} \\ & + \beta_2 \text{SOE}_{\text{public }i,t}\text{Equity}_{j,t} + \gamma_2 \text{Equity}_{j,t} + \lambda \text{SOE}_{\text{public }i,t} + \theta \text{Control}_{j,t} \\ & + \varepsilon_{i,t}\end{aligned}$$

The dependent variable is the log of annual R&D expenditure of firm i in year t. α_k and α_t denote the industry fixed effect and time fixed effect, respectively. $\text{SOE}_{\text{public }i,t}$ values 1 if the controlling shareholder of the public firm is the state. $\text{Bankloan}_{j,t}$ is bank loan to GDP ratio. $\text{Equity}_{j,t}$ denotes the equity to GDP ratio. $\text{Control}_{j,t}$ denotes other time-variant controls.

VARIABLES	R&D Expenditure			
Bankloan*SOE_public	-0.598***	-0.599***	-0.345***	-0.327***
	(0.0928)	(0.0927)	(0.0860)	(0.0855)
Bankloan	0.883***	0.791***	0.459***	0.472***
	(0.0625)	(0.0732)	(0.0687)	(0.0686)
Equity*SOE_public	-6.248***	-6.726***	-3.027*	-5.613***
	(1.859)	(1.862)	(1.713)	(1.723)
Equity	3.376**	3.809***	-0.400	4.618***
	(1.458)	(1.462)	(1.348)	(1.473)
SOE_public	0.157	0.170	-0.0258	0.0624
	(0.116)	(0.116)	(0.108)	(0.108)
Edu		-5.220**	-8.246***	2.126
		(2.600)	(2.424)	(2.550)
Cpi		-4.320***	-3.541***	-11.01***
		(1.152)	(1.057)	(3.801)
Constant	0.889***	5.629***	4.768***	10.85***
	(0.0785)	(1.205)	(1.116)	(3.850)
Industry Fixed Effect	NO	NO	YES	YES
Year Fixed Effect	NO	NO	NO	YES
Observations	8,150	8,150	8,147	8,147
R-squared	0.069	0.071	0.222	0.240

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Chapter 2: Funding Liquidity and Market Liquidity: Evidence from a Natural Experiment in China

2.1 Introduction

There is extensive literature that investigates the impact and determinants of market liquidity. Amihud and Mendelson (1986) find that stock returns are positively associated with illiquidity cost measured by relative bid-ask spreads. Datar, Naik and Radcliffe (1998) provide an alternative measure of liquidity, the turnover rate, and find positive and significant illiquidity return premium. Using data from 45 countries, Amihud et al. (2015) conclude that illiquidity plays an important role in explaining excess stock return. Their results are robust after controlling for risk factors as well as firm characteristics. Researchers also provide evidence that volatility of stocks, which brings about high inventory risk and adverse selection risk, reduces the level of market liquidity (Stoll (1978), Ho and Stoll (1981), Stoll (2000)). Chan, Hameed and Kang (2013) show a positive association between stock return co-movement and liquidity.

In recent studies, much attention has been paid to the links between funding liquidity and market liquidity. Brunnermeier and Pedersen (2009) develop a theoretical model showing that a decline in traders' funding liquidity (the ability and access to funds) will reduce market liquidity (the ease of trading a security). The theory also predicts that the commonality in liquidity, which measures the comovement of liquidity of the stocks, would increase with shocks to funding liquidity. Consistent with the theory, Hameed, Kang and Viswanathan (2010)

document that market downturns decrease the liquidity of underlying stocks and such positive association between market liquidity and funding liquidity are more evident during times of tightness in the funding market. Using an international setting, Karolyi, Lee and Van Dijk (2012) show that high market volatility, sharp market declines and large fraction of foreign investors lead to high commonality in stock liquidity.

Although many efforts have been made to investigate the links between funding liquidity and market liquidity, most of the research does not clear identify the impact of funding liquidity and thereby suffer from endogeneity. Therefore, in this paper, I take advantage of a recent event in Chinese stock market to directly gauge the causal effect of funding liquidity on market liquidity. To be more specific, I find that, after the restriction of Off-market margin trading, the stocks that are not included in the official margin trading list experience a larger decline in market liquidity. I find similar results within the Growth Enterprise Market (GEM) which attract most of the positions of investors trading with Off-market margin. To gauge the impact of capital shocks on commonality in market liquidity, I calculate the market-level illiquidity for both Off-market and official margin trading stocks and find that the commonality in liquidity within the Off-market margin stocks increases with the negative shocks to Off-market margin trading, while the change of commonality in liquidity within the official margin trading stocks is insignificant.

My research contributes to the extant literature in two ways. First, I introduce a nature experiment that directly measures the shocks to funding liquidity and

thereby provide more convincing evidence of the causal effect on market liquidity. Second, my research also contributes to the literature of commonality in liquidity by illustrating that the commonality in stock liquidity will increase when capital is scarce.

The rest of the paper proceeds as follows: In Section 2.2, I review the development of margin trading in China and provide details of the natural experiment I used for my empirical analysis. Section 2.3 presents the data. The impact of funding liquidity on market liquidity is explored in Section 2.4. Section 2.5 documents the association between capital shocks and commonality in stock liquidity. I conclude in Section 2.6.

2.2 Margin Trading in China

In China, investors were not allowed to use leverage prior to 2010 when China Securities Regulatory Commission (CSRC) decides to promote margin trading business. At the beginning, investors can only trade 90 stocks with margin debt while the number of stocks on the official margin trading list expands to 869 in 2015 since the CSRC still want to control the risk of margin trading. Corresponding with the stock market boom, the total margin position grows rapidly since Sep. 2014. As shown in figure 2.1, the officially sanctioned margin balance outstanding in China increase from 500 billion yuan to 2 trillion yuan in 9 months.

With the rapid growth of the stock prices, more and more individual retail investors rush into the market. To amplify the stock returns, a lot of investors

borrow from brokerage firms that offer margin trading. However, according to the restrictions of CSRC, only 869 stocks are available to investors through officially sanctioned margin trading while the total number of listed firms is greater than 2000. But investors can still use margin debt to buy stocks not included in the official list via so-called Off-market margin trading, which is highly risky and lack of regulation. Such Off-market margin trading business ran out of control with the stock market bubble. The leverage increase so fast and CSRC decide to restrict the Off-market margin transactions starting from mid-April, 2015.

Actually, CSRC announced on April 17 that all the security companies are not allowed to participate in the Off-market margin trading business. On May 21, CSRC required the security companies to stop providing the HOMS (Hundsun Order Management System) service for the margin trading business. On June 12, the ChangJiang Security Company claimed that all the communication interfaces of the HOMS is closed. On July 16, Hundsun Technologies Inc. said it will stop opening new accounts on its trading system.

If investors trade more with the stocks not available on the officially sanctioned margin list through the Off-market margin trading, the market liquidity of these stocks should experience a larger decline with the limitation of Off-market margin transactions.

Hypothesis 1: The market liquidity of stocks not available on the officially sanctioned margin list will experience a larger decline with the limitation of Off-market margin transactions.

Basically, the assumption of H1 is that, in the Off-market, investors will trade more with the stocks not included in the officially sanctioned margin trading list. However, one can argue that investors may not trade all stocks that are not on the official list but instead buy some specific stocks with Off-market margin debt. Actually, the Growth Enterprise Market (GEM) attracts a lot of individual retail investors in China. GEM is a stock market initiated in 2009 by CSRC for growth companies that do not fulfill the requirements of the main board. As shown in figure 2.2, GEM index increase from 900 and peaks at 4000 in June 2015 with a price-earnings ratio of 137, attracting a lot of speculators as well as Off-market margin debt. If investors trade more with the stocks listed on GEM through the Off-market margin trading, I would expect a larger decline of market liquidity of the GEM stocks.

Hypothesis 2.1: The market liquidity of GEM stocks will experience a larger decline with the limitation of Off-market margin transactions.

Hypothesis 2.2: The market liquidity of GEM stocks that are not available on the officially sanctioned margin list will experience a larger decline with the limitation of Off-market margin transactions.

According to Brunnermeier and Pedersen (2009), a decline in funding liquidity will increase commonality in market liquidity. Hence, with the negative shocks to Off-market margin trading business, the commonality in liquidity within the Off-market margin stocks should increase more than the commonality in liquidity within the officially sanctioned margin stocks.

Hypothesis 3: With the limitation of Off-market margin transactions, the commonality of liquidity across assets increases more for stocks that are not available on the officially sanctioned margin list.

2.3 Data

To investigate the impact of funding liquidity on market liquidity, I collect monthly firm-level data from China Stock Market Accounting Research (CSMAR). To measure the illiquidity of each individual stock, I follow Amihud (2002):

$$Illq_{i,t} = \frac{1}{\mathrm{N}_{i,t}} \sum_{d=1}^{N} \frac{|R_{i,d,t}|}{Vol_{i,d,t}}$$

Where $Illq_{i,t}$ directly reflects the price impact of trading of each individual stock. $R_{i,d,t}$ denotes the daily stock return and $Vol_{i,d,t}$ is the trading volume in 1 million RMB yuan on day d in month t. $\mathrm{N}_{i,t}$ is the number of trading days for stock i in month t.

Table 2.1 presents the summary statistics of variables. Illq is the Amihud illiquidity of individual stocks. Size is the the log of firm's market capitalization. Std is the monthly standard deviation of return for each individual stock. Stdmis the monthly standard deviation of market return. Turnover is the turnover ratio for each stock. Nmargin is a dummy that values one if the stock is not on the official margin trading list. Gem is equal to one if the stock is listed on the GEM (Growth Enterprise Market) and zero otherwise. Panel B presents the market illiquidity by

month. Illq m is obtained by averaging the firm-level Amihud illiquidity. IllqNm is the mean illiquidity of the stocks that are not on the official margin trading list. IllqGem is the average of illiquidity for Growth Enterprise Market.

As shown in figure 2.3, market illiquidity increases after April 2015, when CSRC decides to restrict Off-market margin trading. The change of illiquidity is more evident for GEM stocks and for stocks that are not on the official margin trading list, where the impact of funding liquidity is more pronounced.

2.4 Market Liquidity and Restrictions on Margin Trading

To test the hypothesis that market liquidity is positively associated with the funding liquidity. I develop the following regression:

$$Illq_{i,t} = \alpha + \beta \mathrm{Shock}_t \mathrm{Nmargin}_i + \gamma_1 \mathrm{Shock}_t + \gamma_2 \mathrm{Nmargin}_i + \lambda\, \mathrm{Controls}_{i,t} + \varepsilon_{i,t} \quad (2.1)$$

The dependent variable is the Amihud illiquidity of each stock. Shock_t is equal to 1 if the trading month is May or June.$\mathrm{Nmargin}_i$ is a dummy that values one if the stock is not on the official margin trading list. $\mathrm{Shock}_t \mathrm{Nmargin}_i$ is the interaction term between these two dummies. $\mathrm{Controls}_{i,t}$ are the control variables including the monthly standard deviation of return for each individual stock, the monthly standard deviation of market return, the log of firm's market capitalization and the turnover ratio for each stock.

If the market liquidity of stocks not available on the officially sanctioned margin list experiences a larger decline with the shock, the coefficient of the interaction

term $\text{Shock}_t\text{Nmargin}_i$ should be positive. Table 2.2 presents the regression results. In Model 1, I find a positive association between $\text{Shock}_t\text{Nmargin}_i$ and market illiquidity. Then I calculate the standard deviation of monthly returns for both market and individual stock to control for the effect of volatility. The value of β decreases but remains significant in model 2 and the results are consistent after adding turnover rate and firm size, indicating that the negative shocks to margin debt reduce the market liquidity.

To test hypothesis 2.1, I amend Eq. (2.l) by replacing the treatment group with GEM stocks.

$$Illq_{i,t} = \alpha + \beta\text{Shock}_t\text{Gem}_i + \gamma_1\text{Shock}_t + \gamma_2\text{Gem}_i + \lambda\,\text{Controls}_{i,t} + \varepsilon_{i,t} \quad (2.2)$$

Shock_t equals to 1 if the trading month is May or June. Gem_i equals to one if the stock is listed on the GEM (Growth Enterprise Market) and zero otherwise. $\text{Shock}_t\text{Gem}_i$ is the interaction term between these two dummies. Other control variables are the same as those in Eq. (2.l).

The results are similar to those presented in table 2.2. As shown in table 2.3, β is positive and significant across all the four models, suggesting a causal effect of funding liquidity to market liquidity. To test hypothesis 2.2, I further use the subsample that only contains the stocks that are traded on Growth Enterprise Market (GEM) and verify the impact of funding liquidity within the Growth Enterprise Market. I reran Eq. (2.1) with GEM stocks and the results in table 2.4 are consistent with my hypothesis that even within the GEM, stocks that are not

included in the official margin trading list experience a larger decline in market liquidity.

2.5 Commonality in Stock liquidity

To understand how the exogenous shock to margin debt affects commonality in stock liquidity, I calculate the mean illiquidity of stocks included in the official margin trading list and of those not on the list. Then I estimate the following regressions:

$$Illq_{i,t} = \alpha + \beta \text{Shock}_t Illq\text{Om}_i + \gamma_1 \text{Shock}_t + \gamma_2 Illq\text{Om}_i + \lambda \text{ Controls}_{i,t} + \varepsilon_{i,t} \qquad (2.3)$$

$$Illq_{i,t} = \alpha + \beta \text{Shock}_t Illq\text{Nm}_i + \gamma_1 \text{Shock}_t + \gamma_2 Illq\text{Nm}_i + \lambda \text{ Controls}_{i,t} + \varepsilon_{i,t} \qquad (2.4)$$

The dependent variable is the Amihud illiquidity of each stock. Shock_t is equal to 1 if the trading month is May or June. $Illq\text{Om}_i$ is obtained by averaging the Amihud illiquidity of firms on the official margin trading list. $Illq\text{Nm}_i$ is the mean illiquidity of the stocks that are not on the official margin trading list.$\text{Shock}_t Illq\text{Om}_i$ and $\text{Shock}_t Illq\text{Nm}_i$ are the interaction terms between these two dummies. I use the same control variables as mentioned in Table 2.4.

Table 2.5 presents the impact of funding liquidity shock to Off-market margin trading on commonality in market liquidity. The coefficient of $\text{Shock}_t Illq\text{Nm}_i$ suggests a more evident comovement of liquidity of stocks that are not on the

officially sanctioned margin list during the shock period while the β is insignificant for official margin stocks, which is consistent with my hypothesis.

2.6 Conclusion

In this paper, I examine the impact of funding liquidity on market liquidity. To directly gauge the causal effect of capital shocks, I take advantage of an event in Chinese stock market in April 2015 when CSRC decides to restrict Off-market margin trading and thereby lead to an exogenous decline in funding liquidity.

I find that, after the restriction of Off-market margin trading, the stocks that are not included in the official margin trading list experience larger decline in market liquidity. I find similar results within the Growth Enterprise Market (GEM) which attract most of the positions of investors trading with Off-market margin. To gauge the impact of capital shocks on commonality in market liquidity, I calculate the market-level illiquidity for both Off-market and official margin trading stocks. I find that the restriction of Off-market margin trading also lead to a higher commonality in stock liquidity.

References II

Amihud, Yakov. 2002. “Illiquidity and stock returns: cross-section and time-series effects.”Journal of Financial Markets, 5(1): 31–56.

Amihud, Yakov, Allaudeen Hameed, Wenjin Kang, and Huiping Zhang. 2015. “The illiquidity premium: International evidence.” Journal of Financial Economics.

Amihud, Yakov, and Haim Mendelson. 1986. “Asset pricing and the bid-ask spread.” Journal of Financial Economics, 17(2): 223–249.

Brunnermeier, Markus K, and Lasse Heje Pedersen. 2009. “Market liquidity and funding liquidity.” Review of Financial studies, 22(6): 2201–2238.

Chan, Kalok, Allaudeen Hameed, and Wenjin Kang. 2013. “Stock price synchronicity and liquidity.” Journal of Financial Markets, 16(3): 414–438.

Datar, Vinay T, Narayan Y Naik, and Robert Radcliffe. 1998. “Liquidity and stock returns: An alternative test.” Journal of Financial Markets, 1(2): 203–219.

Hameed, Allaudeen, Wenjin Kang, and Shivesh Viswanathan. 2010. “Stock market declines and liquidity.” The Journal of Finance, 65(1): 257–293.

Ho, Thomas, and Hans R Stoll. 1981. “Optimal dealer pricing under transactions and return uncertainty.” Journal of Financial economics, 9(1): 47–73.

Karolyi, G Andrew, Kuan-Hui Lee, and Mathijs A VanDijk. 2012. “Understanding commonality in liquidity around the world.” Journal of Financial Economics, 105(1): 82–112.

Stoll, Hans R. 1978. “The supply of dealer services in securities markets.” The Journal of Finance, 33(4): 1133–1151.

Stoll, Hans R. 2000. “Friction.” Journal of Finance, 1479–1514

Figure 2.1 Margin Trading and Stock Return in China

This figure demonstrates the trend of official margin trading position and market return in China.

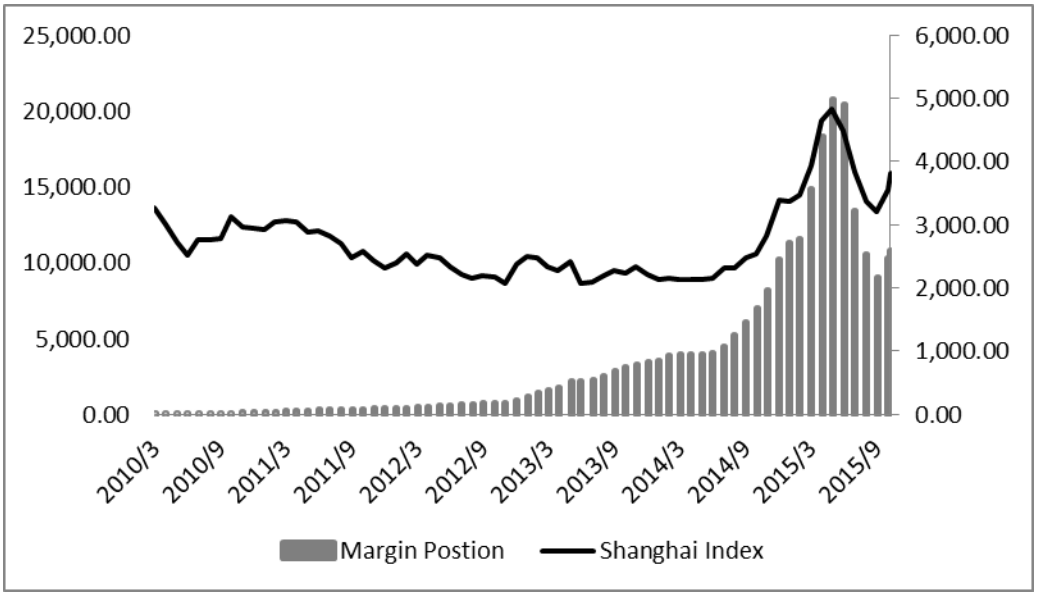

Figure 2.2 GEM(Growth Enterprise Market) in China

This figure presents the market index and trading volume of the GEM(Growth Enterprise Market) in China.

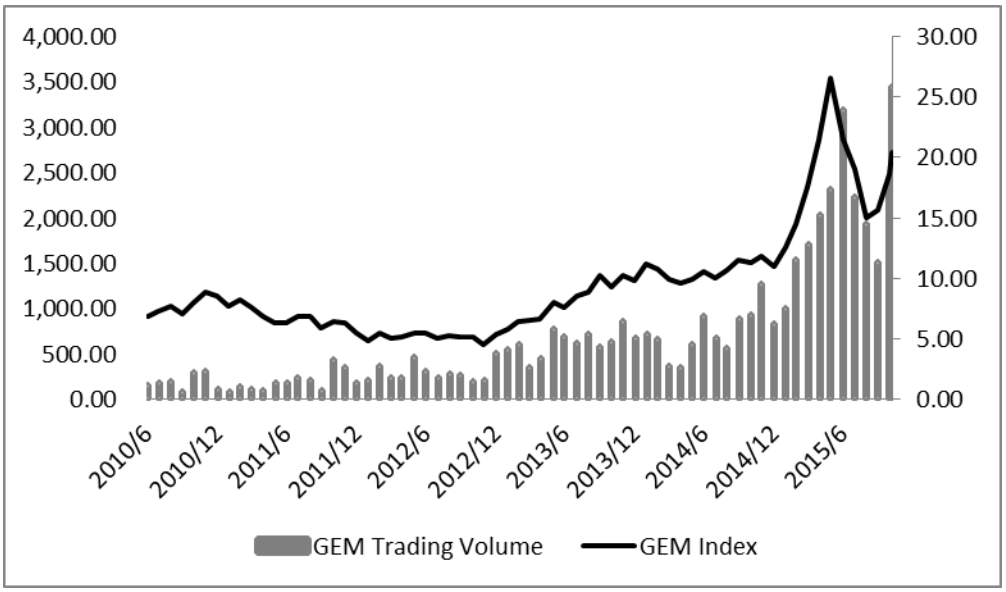

Figure 2.3 Market liquidity and Margin Trading

Illqm is obtained by averaging the firm-level Amihud illiquidity. IllqNm is the mean illiquidity of the stocks that are not on the official margin trading list. IllqGem is the average of illiquidity for Growth Enterprise Market.

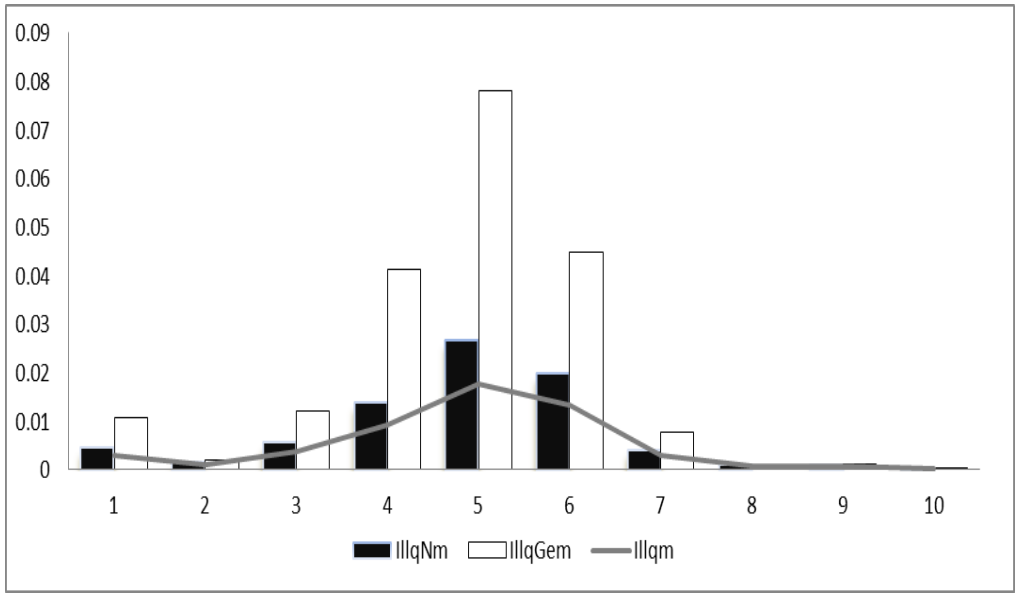

Table 2.1 Summary Statistics

Panel A presents the summary statistics of variables. Panel B presents the market illiquidity by month. Illq is the Amihud illiquidity of individual stocks. Size is the log of firm's market capitalization. Std is the monthly standard deviation of return for each individual stock. Stdm is the monthly standard deviation of market return. Turnover is the turnover ratio for each stock. Nmargin is a dummy that values one if the stock is not on the official margin trading list. Gem is equal to one if the stock is listed on the GEM(Growth Enterprise Market)and zero otherwise. Illqm is obtained by averaging the firm-level Amihud illiquidity. IllqNm is the mean illiquidity of the stocks that are not on the official margin trading list. IllqGem is the average of illiquidity for Growth Enterprise Market.

Panel A: Summary statistics

Variable	OBS	Mean	Std. Dev.	Min	Max
Illq	24300	0.0053614	0.087629	1.21E-06	5.793837
Size	24300	22.95345	0.9425965	20.94381	28.40489
Std	24300	0.0467231	0.0398435	0.0000199	5.287406
Stdm	24300	0.0268858	0.0115857	0.0113862	0.0451215
Turnover	24300	0.0338472	0.0228988	0.000027	0.2560756
Nmargin	24300	0.6565844	0.4748585	0	1
Gem	24300	0.1667078	0.3727225	0	1

Panel B: Market Illiquidity

Month	Illqm	IllqNm	IllqGem
1	0.0030019	0.0045827	0.0108482
2	0.0011138	0.0016657	0.0021619
3	0.0037634	0.0057462	0.0121614
4	0.0091719	0.0139403	0.0412628
5	0.0177241	0.0268042	0.078179
6	0.0132252	0.0199247	0.0448883
7	0.0029675	0.0042284	0.0077669
8	0.0007699	0.0010147	0.0010726
9	0.0008934	0.0011407	0.001147
10	0.0003237	0.0004122	0.0003987

Table 2.2 Market Liquidity and Off-market Margin Trading

The table presents the impact of funding liquidity shock to Off-market margin trading on market liquidity.

$$Illq_{i,t} = \alpha + \beta \text{Shock}_t \text{Nmargin}_i + \gamma_1 \text{Shock}_t + \gamma_2 \text{Nmargin}_i + \lambda \text{ Controls}_{i,t} + \varepsilon_{i,t}$$

The dependent variable is the Amihud illiquidity of each stock. $\text{Shock}_t$is equal to 1 if the trading month is May or June.$\text{Nmargin}_i$is a dummy that values one if the stock is not on the official margin trading list. $\text{Shock}_t\text{Nmargin}_i$ is the interaction term between these two dummies. $\text{Controls}_{i,t}$are the control variables including the monthly standard deviation of return for each individual stock, the monthly standard deviation of market return, the log of firm's market capitalization and the turnover ratio for each stock.

VARIABLES	1	2	3	4
ShockNmargin	0.0191***	0.000302***	0.000315***	0.000312***
	-0.00293	-0.000109	-0.000109	-0.000108
Shock	0.000107	-0.000435***	-0.000412***	-0.000391***
	-0.00238	-0.000099	-0.000099	-0.000098
Nmargin	0.00388***	0.000418***	0.000223***	0.000063
	-0.00132	-0.000052	-0.000061	-0.000063
Std		0.00362*	0.003100	0.0107***
		-0.002010	-0.002010	-0.002130
L.Std		0.00268***	0.00278***	0.00304***
		-0.000552	-0.000552	-0.000551
Stdm		0.0320***	0.0342***	0.0383***
		-0.004280	-0.004290	-0.004290
L.Stdm		-0.0197***	-0.0222***	-0.0313***
		-0.003490	-0.003510	-0.003600
Size			-0.000173***	-0.000291***
			-0.000029	-0.000031
Turnover				-0.0123***
				-0.001160
Constant	0.000226	-0.000369***	0.00376***	0.00675***
	-0.00107	-0.000072	-0.000686	-0.000740
Observations	24,300	20927	20927	20927
R-squared	0.007	0.017	0.019	0.024

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 2.3 Market Liquidity and GEM Margin Trading

The table presents the impact of funding liquidity shock to GEM(Growth Enterprise Market) on market liquidity.

$$Illq_{i,t} = \alpha + \beta \text{Shock}_t \text{Gem}_i + \gamma_1 \text{Shock}_t + \gamma_2 \text{Gem}_i + \lambda \, \text{Controls}_{i,t} + \varepsilon_{i,t}$$

Shock_t equals to 1 if the trading month is May or June. Gem_i equals to one if the stock is listed on the GEM(Growth Enterprise Market) and zero otherwise. $\text{Shock}_t \text{Gem}_i$ is the interaction term between these two dummies. $\text{Controls}_{i,t}$ are the control variables including the monthly standard deviation of return for each individual stock, the monthly standard deviation of market return, the log of firm's market capitalization and the turnover ratio for each stock.

VARIABLES	1	2	3	4
ShockGem	0.0467***	0.00159***	0.00161***	0.00155***
	-0.0037	-0.00014	-0.00014	-0.00014
Shock	0.00475***	-0.000497***	-0.000462***	-0.000443***
	-0.00152	-0.000072	-0.000072	-0.000072
Gem	0.00813***	0.000165**	0.000080	0.000021
	-0.00168	-0.000067	-0.000068	-0.000068
Std		0.00352*	0.001450	0.00854***
		-0.002020	-0.002030	-0.002130
L.Std		0.00262***	0.00268***	0.00290***
		-0.000551	-0.000550	-0.000549
Stdm		0.0321***	0.0370***	0.0407***
		-0.004280	-0.004300	-0.004300
L.Stdm		-0.0195***	-0.0231***	-0.0312***
		-0.003480	-0.003490	-0.003570
Size			-0.000239***	-0.000309***
			-0.000024	-0.000025
Turnover				-0.0116***
				-0.001130
Constant	0.00143**	-0.000125*	0.00543***	0.00724***
	-0.00068	-0.000066	-0.000556	-0.000581
Observations	24,300	20,927	20,927	20,927
R-squared	0.016	0.021	0.026	0.031

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 2.4 Shock to Margin Trading within the Growth Enterprise Market

The table presents the results using the subsample that only include the stocks that are traded on Growth Enterprise Market(GEM).

$$Illq_{i,t} = \alpha + \beta \text{Shock}_t \text{Nmargin}_i + \gamma_1 \text{Shock}_t + \gamma_2 \text{Nmargin}_i + \lambda \text{ Controls}_{i,t} + \varepsilon_{i,t}$$

The dependent variable is the Amihud illiquidity of each stock. $\text{Shock}_t$is equal to 1 if the trading month is May or June.$\text{Nmargin}_i$is a dummy that values one if the stock is not on the official margin trading list. $\text{Shock}_t\text{Nmargin}_i$ is the interaction term between these two dummies. $\text{Controls}_{i,t}$are the control variables including the monthly standard deviation of return for each individual stock, the monthly standard deviation of market return, the log of firm's market capitalization and the turnover ratio for each stock.

VARIABLES	1	2	3	4
ShockNmargin	0.0587**	0.00145**	0.00146**	0.00159**
	-0.0231	-0.00072	-0.00072	-0.00072
Shock	0.000153	-0.00039	-0.00028	-0.00043
	-0.0216	-0.0007	-0.00071	-0.0007
Nmargin	0.0107	0.000275	-0.00019	-0.000809**
	-0.0105	-0.00034	-0.00039	-0.00041
Std		-0.0730***	-0.0693***	-0.0529***
		-0.0091	-0.00922	-0.0096
L.Std		0.124***	0.126***	0.130***
		-0.00665	-0.00671	-0.00672
Stdm		0.0637***	0.0614***	0.0710***
		-0.0184	-0.0185	-0.0184
L.Stdm		-0.120***	-0.127***	-0.149***
		-0.0166	-0.0169	-0.0173
Size			-0.000427**	-0.000768***
			-0.00018	-0.00019
Turnover				-0.0324***
				-0.00557
Constant	0.000192	-0.00064	0.00937**	0.0180***
	-0.00979	-0.00045	-0.0042	-0.00443
Observations	4,051	3,430	3,430	3,430
R-squared	0.014	0.109	0.11	0.119

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 2.5 Commonality in Liquidity and Off-market Margin Trading

The table presents the impact of funding liquidity shock to Off-market margin trading on commonality in market liquidity. I estimate the following regressions to investigate the commonality in liquidity across Off-market and official margin trading stocks.

Model 1 and model 2:

$$Illq_{i,t} = \alpha + \beta \text{Shock}_t Illq\text{Om}_i + \gamma_1 \text{Shock}_t + \gamma_2 Illq\text{Om}_i + \lambda \text{ Controls}_{i,t} + \varepsilon_{i,t}$$

Model 3 and model 4:

$$Illq_{i,t} = \alpha + \beta \text{Shock}_t Illq\text{Nm}_i + \gamma_1 \text{Shock}_t + \gamma_2 Illq\text{Nm}_i + \lambda \text{ Controls}_{i,t} + \varepsilon_{i,t}$$

The dependent variable is the Amihud illiquidity of each stock. Shock_t is equal to 1 if thetrading month is May or June. $Illq\text{Om}_i$ is obtained by averaging the Amihud illiquidityof firms on the official margin trading list. $Illq\text{Nm}_i$ is the mean illiquidity of the stocksthat are not on the official margin trading list. $\text{Shock}_t Illq\text{Om}_i$ and $\text{Shock}_t Illq\text{Nm}_i$ are theinteraction terms between these two dummies. I use the same control variables as mentioned in Table 2.4.

VARIABLES	1	2	3	4
ShockIllqNm			0.0785***	0.0688***
			-0.0233	-0.0233
ShockIllqOm	-0.113	-0.227		
	-0.299	-0.297		
IllqNm			-0.0275*	-0.0346**
			-0.0149	-0.0149
IllqOm	0.459***	0.502***		
	-0.128	-0.128		
Shock	-0.00014	-0.0000949	-0.00172***	-0.00129***
	-0.0000956	-0.000095	-0.0005	-0.0005
Volatility	YES	YES	YES	YES
Size	NO	YES	NO	YES
Turnover	NO	YES	NO	YES
Constant	YES	YES	YES	YES
Observations	7,303	7,303	13,624	13,624
R-squared	0.04	0.054	0.014	0.024

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1