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Thesis title: *Essays on Finance and Development*

PhD in *Economics and Finance*

Cycle *XXVII*

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Year of thesis defence *2016*

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Acknowledgements

In writing this thesis, I owe much to many.

My first and greatest thanks goes to my advisor Nicola Gennaioli for guiding me through all the stages of this work. His insights and suggestions have been invaluable, and shaped the way I now think about research. He taught me the importance of self-discipline in this job and how to make choice in my life. Most of all, he has always been honest with me, as a friend.

I owe a lot to Paolo Colla, Stefano Gatti and Hannes Wagner. They have been great advisors during the past 5 years; I learned from them most of what I know about finance and teaching.

I would like to thank Filippo De Marco, Eric Girardin, Ruixue Jia, Robert Owen, Paolo Pinotti and Julien Sauvagnat for their comments and suggestions on the job market paper. In general I would like to thank Bocconi's finance and economics faculty members, they are a group of brilliant scholars and very friendly people, who helped me finding the right data, the right questions and the right way to do research.

Thanks Alexandra, Alexey, Giampaolo, Milad, and Olga for all the time we spent together inside and outside Bocconi. I will remember the nights that we spend together in the Grafton building to fight with all the problem sets, presentations and research questions.

Thanks Francisco and Madina for sharing the office with me and all your help in the job market year. You made my job market year full of good memories through your love and support.

Thanks Michela, Katya, Tony, Kai, Zhiping and all my fellow PhD students at Bocconi. I will miss all of you.

Finally and most importantly, thanks to my parents, Sujuan Li and Longxiang Yan, and to my dear sister, Qian. Without their love and support, this thesis will never be finished.

Abstract

This thesis investigates various aspects of financial market's effect on economic development. In the first chapter I examines the impacts of financial repression on the linkage between financial development and economic growth. Using firm-level and regional-level data from China, I show that stronger financial repression is associated with greater bank lending to state-owned low-productivity firms, and therefore the financial repression can undermine the mechanism by which greater financial development fosters economic growth. In the second chapter I studies the effects of the development of financial markets on project finance. In order to guide the empirical work, I present a simple endogenous growth model and show that the growth rate of infrastructure investment increases when we introduce risky assets in the financial market. The predictions of this model are tested by using a unique database of project finance volumes and proportions in 129 countries from 1990 to 2015. In empirical terms, this chapter finds that the development of financial markets leads to a better risk diversification of project finance, attracts more private sector participation in project finance, and leads to an increase in the amount of infrastructure investment.In the third chapter I study agency conflicts' effects on firms' financing decisions on the financial market. I presents a dynamic contingent claims model in which a firm's financing policies result from a trade-off between tax benefits and the debt-financing cost, as well as agency conflicts. Results show that the manager's financing decisions are significantly affected by the corporate governance mechanism of the firm.

Chapter 1

Financial Repression and the Finance-Growth Nexus; Evidence from China

1.1 Introduction

The important role of the financial sector in the economic growth process has long been recognized in theoretical literature. Theoretical works suggest that financial development, which refers to credit growth or the size expansion of the financial market, fosters gross domestic product (GDP) growth via pooling savings and facilitating credit (McKinnon, 1973; King and Levine, 1993). However, the empirical results of the finance-growth nexus are more difficult to interpret. In some countries, the opposite seems true, as increased financial development appears to be associated with slowdowns in growth (Xu, 2000; Liang and Teng, 2006).

Why might a size-related expansion of the financial market exert a negative impact on GDP growth in certain countries? Political distortions in bank lending offer a possible explanation of the aforementioned intriguing fact. When bank lending is biased toward politically connected but not necessarily productive firms, greater financial development may divert funds to bad investment projects, thereby reducing economic growth. In this sense, political control of the financial market, referred to as ”financial repression”, alters the relationship between finance and growth.

To provide stylized facts supporting this possibility, I examined the finance-growth nexus in 79 countries by splitting the 79 sample countries into two sub-sample groups containing countries with low and high financial repression. The evidence in Table 1 supports the assertion that greater financial development is associated with lower economic growth in countries characterized by high levels of financial repression. In the high financial repression sub-sample countries, the correlation between finance and growth is -0.033, which is significant at the 1% level. However, in the low financial repression sub-sample, the correlation between banking

sector development and real per capita GDP growth is 0.017, which is positive and significant at the 1% level. Moreover, by adding and relating the financial development indicators in each country to their corresponding financial repression index values in Table 2, I found a significantly negative interaction effect between the financial development indicators and financial repression on GDP growth. This finding further implies that the positive association between financial development and GDP growth is considerably weaker, or even negative, in highly financially repressed countries.

[Insert TABLE 1 and 2 here]

The above-mentioned evidence motivated me to closely examine the interaction between financial development and financial repression, and its effects on economic growth, to investigate how financial repression changes the finance-growth nexus. Thus, this paper empirically analyzed these issues by focusing on financial market development, GDP growth, and financial regulation in China, one of the countries characterized by high levels of financial repression [1].

Specifically, I tested the hypothesis that financial repression brings about a political distortion in bank lending and so leads to a GDP growth rate slowdown via the development of the financial system by using disaggregated data from listed firms and regional levels in China. First, I investigated the efficiency of credit allocation in the Chinese economy by regressing all Chinese listed firms' access to external finance on their state-owned share percentages and the interaction terms between their state-owned share percentages and their total factor productivity (hereafter "TFP"). Second, I exploited the geographic variations in the levels of financial repression across 31 regions in China to construct a regional financial repression index for each Chinese region. After relating the financial repression index of each firm's location to that firm's state-owned share percentage and TFP based on the above firm-level regressions, I determined whether credit misallocation to less productive but state-owned firms is associated with financial repression in a regional-level analysis of China.

The results of the empirical analysis are consistent with my hypothesis. I found that (i) the accessibility of external finance for Chinese firms is significantly positively associated with their state ownership but negatively associated with the firms' TFP. One standard deviation increase in firms' state-owned share percentage can be translated into a 0.1276 increase in the accessibility of finance, but one standard deviation increase in a firm's productivity decreases its access to external financing by 0.0839 points. In addition, (ii) the marginal effects of a firm's productivity on its advantages in accessing financial loans decreases with state ownership. Retaining the same TFP, a one-point increase in a firm's state-owned shares percentage eliminates an average of 0.0311 points in the positive effect of the firm's TFP on the generation of financial loans. Moreover, (iii) stronger financial repression is associated with greater bank lending

[1] Using the IMF financial repression database by Abiad (2008), which is an index ranging from 0 to 1, I demonstrate that the average financial repression index in China from 1985 to 2005 was 0.75, while the average financial repression index of all other countries in the same period was 0.53

to state-owned but low-productivity firms. The positive effects of a firm's state ownership on its access to credit increases with the financial repression levels of its location. One standard deviation increase in the financial repression level of a firm's location results in a 0.0845-point increase for one state-owned unit share's marginal positive effect on the firm's financial loans to total asset ratio. Meanwhile, the negative correlation between a firm's productivity and its access to credit is also more obvious in highly financially repressed regions, as the interaction coefficient between the firm's productivity and the financial repression index is -0.0296, which is significant at the 0.1 level.

These findings demonstrate the existence of credit misallocation to less productive state-owned firms in China and provide empirical evidence that the geographic variations in financial repression levels can translate into associated geographic variations in bank lending bias toward less productive state-owned firms, thus forming a positive link between financial repression and credit misallocation. One potential source of endogeneity in the estimates presented thus far is that the observed bank lending bias has been derived from loan demand-side factors. For example, the bank lending bias captures the variations in the borrowing needs of firms with different productivity levels or characteristics. To address this endogeneity problem, I performed a test, described in the robustness check section, to show that the bank lending bias is especially obvious in and serious regarding loans issued by state-owned banks, which implies that the observed bank lending bias is caused by the credit supply-side factors related to the degree of political control over the banks.

Building on the results of the firm-level analysis, I further empirically corroborated the correlation and direction of causality between financial repression, credit misallocation, and GDP growth. To do so, I implemented a Rajan-Zingales methodology that exploits different industries' reliance on external finance. The assumption behind this methodology is that if it is true that financial repression distorts efficient credit allocation and hampers the stimulatory role of financial development in GDP growth, these effects should be especially strong in industries that need more external financing. Therefore, we should observe that after controlling for other regional fundamental economic factors and retaining the same financial development levels, industries with a relatively greater need for external finance grow disproportionately slower in highly financially repressed regions. Based on the aforementioned assumption, I separated all Chinese listed firms into different industries according to their dependence on external finance. Then, I regressed the real value-added growth rate of each industry in each region on $a)$ an interaction term between its dependence on external finance and the corresponding region's financial repression index, and $b)$ a triple interaction term between the sector's dependence on external finance, the region's financial repression, and the financial development level.

Using this Rajan-Zingales methodology, I found that (i) industries that depend more on external finance grow at a relatively slower rate in highly financially repressed regions. The interaction coefficient between financial repression and the sector's dependence on external finance in the sector's growth rate is -0.0268, which is significant at the 5% level. In addition, (ii)

although financial development has a significantly positive interaction effect (0.2618) with external finance dependence on the sector's growth rate, this positive effect on industry growth rate decreases with the industry location's financial repression level. Statistically, a 1% increase in the financial repression index decreases the positive interaction effect of financial development with external finance needs on sector growth by 0.0218%. These findings support the notion that the presence of financial repression can weaken the transaction mechanism through which financial development boosts GDP growth and can even reverse the positive finance-growth nexus in highly financially repressed regions.

Several robustness checks has been carried out in this study. Specifically, I prove that the observed bank lending bias toward state-owned firms with low productivity derives from credit supply-side instead of demand-side factors. Furthermore, I indicate that the links between financial repression, credit misallocation, and GDP growth are not driven by variables omitted at the regional level. Finally, I demonstrate that the result indicating that industries with a relatively greater need for external finance grow disproportionately slower in highly financially repressed regions is not sensitive to industry firm size.

Related Literature:

This paper extends the existing literature in several dimensions. First, by using the perspective of financial repression, I provide a possible explanation for the observed negative relationship between finance and growth in some economies undergoing transformation and provide interpretations of why repressive financial policies hamper GDP growth. Consequently, the research answers some of the unresolved questions in existing literature (e.g., De Gregorio and Guidotti, 1995; [2], Favarra, 2003) [3]) concerning the reasons for financial development slowing GDP growth in some transforming countries .

Second, although empirical literature has emphasized the importance of the development of financial markets for the purpose of GDP growth (e.g., Greenwood and Jovanovic, 1990; Bencivenga and Smith, 1991; and Boyd and Smith, 1998) as well as the inhibitive effect of financial repression on growth (Roubini and Sala-i-Martin, 1992), it has not traced the interaction effect between these three factors. In this paper, I explain what happens when financial sector development, or size expansion, is accompanied by repressive financial policies, and I identify transaction mechanisms through which financial repression may affect the finance-growth nexus. As financial repression is widespread in transforming economies , this study improves our understanding of the development paths of these economies.

Third, this paper sheds light on the relative importance of financial liberalization in trans-

[2]De Gregorio and Guidotti (1995) employ a negative symbol to indicate the empirical relationship between long-term growth and degree of financial development, which was determined using panel data for Latin America. Their findings suggest that the main channel of transmission from financial development to growth is the efficiency of investment rather than its volume.

[3]Favarra (2003) found, using a procedure appropriately designed to estimate long-term relationships between financial development and economic growth in a panel with heterogeneous slope coefficients, that for some specified countries, the relationship is, puzzlingly, negative

forming economies. Several papers regarding financial development address the role of financial liberalization in shaping faster economic growth. For example, Thorne (1993) reports that countries with a higher level of financial liberalization have experienced an improvement in credit allocation and loss minimization, while Bekaert et al. (2005) found that financial liberalization, on average, leads to a 1% increase in annual real economic growth. However, the literature published previously does not address the transmission channel between financial liberalization and economic growth. In contrast, this study provides direct empirical evidence that repressive financial policies hurt GDP growth by interrupting the theoretical mechanism through which financial development boosts GDP growth. Therefore, policy makers in transforming economies should stimulate the financial liberalization process to maintain a sustainable path of economic growth.

The remainder of the paper is organized as follows. In Section 2, repressive financial policies in China and financial repression measures at the regional level in China are described. Section 3 contains a presentation of the data and empirical evidence from the firm-level. Regional-level analyses are provided in Section 4. In Section 5, the research strategy is identified and the empirical results of the Rajan-Zingales methodology are presented, several robustness checks are also included in section 5. Finally, the conclusion is presented in Section 6.

1.2 Financial Repression in China

Before moving on to further empirical analysis, it is necessary to briefly discuss and understand China's current financial regime and its repressive financial policies.

1.2.1 Repressive financial policies in China

As is typical in a transforming economy, China's central and local governments have a long history of intervening in the financial system's operation and credit allocation. Despite three decades having passed since the beginning of its marketization process, the Chinese government still maintains strong political control over the financial sector through the introduction of various laws and regulations.

For example, the People's Bank of China controls interest rates in a way that has led to significant financial repression - low and now negative real return on deposits.[4], which is a typical financial repression policy as argued in McKinnon and Shaw (1973)[5]. Figure 1 shows the benchmark nominal deposit and lending interest rates as well as the official inflation rate in China. It should be noted that the benchmark deposit rate and lending rate are quite low and

[4]It is believed that the interest rate control reduces the cost to the government of sterilized intervention to sustain China's undervalued exchange rate relative to the cost it would face if interest rates were liberalized (e.g., Ferri and Liu, 2010; Dollar and Jones, 2013).

[5]McKinnon and Shaw (1973) argued that financial repression is the distortion of financial prices, including interest rates and foreign-exchange rates.

stable since 2000, while the inflation rate during the same period is much more volatile and sometimes results in a negative real lending rate.

[Insert Figure 1 here]

The far too low lending rate in China has led to excess demand for bank loans and enables the Chinese banks issue loans in a very conservative fashion. The banks understand that they cannot affect deposits supplied and loans demanded since the government fixes the deposit-lending spread, and that they can secure their profits for each dollar they lend out, thanks to the net interest rate spread. Therefore, the banks prefer to guarantee that the debtors will repay their loans on time and hence collateral is usually mandated if a firm wants to borrow from the banks.

At the same time, the government uses executive orders and explicitly backs the repayment capacity of state-owned firms, which creates an unfair competitive environment in the credit market. Compared to private firms, state-owned firms have larger assets and capital, which are backed by the government as collateral. As a result, state-owned firms can obtain money more easily from the official banking system, but private firms are not able to compete with state-owned firms in the credit market because of their lower collateral credit. As Song (2011) showed in their paper, entrepreneurial firms use more productive technologies in China, but due to financial imperfections, they must finance investments through internal savings. State-owned firms have low productivity but survive because of better access to credit markets. The allocation of the limited credit available from the official banking system, due to an interest rate ceiling, is prioritized for state-owned sectors.

Figure 2 depicts the domestic private credit rate in China over the past 30 years. From the figure, it is clear that the proportion of credit going to the private sector [6], which is marked as the red line, is consistently decreasing in China. However, after comparing this time series tendency in China to those of other countries such as the USA, Italy, India, Indonesia, Vietnam, and Korea in Table 3, I did not identify a similar financial development path in the countries.

[Insert Figure 2 and 3 here]

Besides the governmental manipulations of the interest rates, the Chinese government also establishes barriers that prohibit foreign financial institutions from entering the domestic financial market. Prior to the 1990s, foreign banks were initially only allowed to conduct business in the four special economic zones: Shenzhen, Xiamen, Zhuhai, and Shantou. Later, the qualifying areas were gradually extended to coastal cities and central cities, although their business scope was still limited to foreign currency business for mainly foreign enterprises and foreign residents. These restrictions hindered foreign banks' development and so helped to maintain a high level of state control over the domestic Chinese banking system. Using the Bankscope

[6] Which is measured as the private credit to total liquid liability ratio.

dataset on bank supervision and regulation, Figure 4 depicts the current ownership structure of the entire banking system in China. From Figure 4, we can easily observe that the average level of state ownership of the Chinese banking sector, which includes both state-owned banks and policy banks, was over 80% from 1980 to 2012.

[Insert Figure 4 here]

A potential problem raised because of the high degree of continued government ownership and control in Chinese banking system is the political distortion of bank lending behaviors, as has been widely suggested by academics. For example, Sapienza (2002) found that the stronger the political party in the area where the firm is borrowing, the lower the interest rates of state-owned banks charged. Additionally Micco et al. (2007) found that state-owned banks located in developing countries tend to have lower profitability than their private counterparts, and that state-owned banks have ascending NPL ratios in the major election years, indicating that politics do matter for the bad performance of state-owned banks.

The state ownership of the banking system allows the government extensive control over the choice of projects being financed and promotes the government's goals in both "development" and the "political" spheres. In the former, ownership of banks enables the government to collect savings and to direct them toward strategic long-term projects, but in the political sphere, ownership of banks enables the government to channel funds into economically inefficient but politically desirable projects.

The next characteristic of the repressive financial policy in China is the remarkable geographic variations in terms of government control over the financial system among China's regions. The first reason for such geographic variations is the political competition among China's regions. Following the decentralization of fiscal responsibility in the 1990s in China, each province now has to meet certain political targets as well as compete with other provinces on unemployment and taxation. Therefore, the officials in some regions will use financial channels to protect state-owned local enterprises, increase taxation, and decrease the unemployment rate. The different focuses of political targets lead to different financial regulations formulated by different local governments on the local financial system, as well as a variation in financial repression levels among the Chinese regions (Bai, Du, Tao and Tong, 2004; Cao, Qian and Weinstein, 1999; Fan et al., 2007; Yueh, 2010).

On the other hand, the regional variations in financial repression are the result of the different paces of market reforms in China. For example, in the 1990s, the Chinese government authorized specific economic zones to conduct experiments with market reforms under special policies and regulations. The regions that experienced this earlier marketization process have, in general, deeper marketization in their financial system than other regions.

1.2.2 Financial repression index for different Chinese regions

A crucial hypothesis I make throughout the paper is the following: the financial repression leads to political distortion in terms of bank lending to state-owned but low productivity firms and thereby reduces growth. That the financial repression was likely to play a key role in the economic growth has been widely discussed in previous papers (McKinnon (1973), Huang et al(2011)). However, data measurement on the financial repression level, especially in the regional-level, is not available.

To test this assumption, I construct a provincial financial repression index (hereafter, "PFRI") to express and measure the financial repression levels of the 31 Chinese regions. The PFRI is constructed from four financial repression sub-indicators by using a principal component analysis (PCA) approach. Each sub-indicator captures one perspective of the political control in regional financial system. The PCA approach can control for problems of multi-collinearity and over-parameterization, and a uniform index will be derived through a statistical analysis after the collection of the four sub-indicators is completed as follows:

1. The proportion of credit made through direct financing[7] in the total credit issued in one region. The main assumption behind this sub-index is that the government's intervention in the financial system[8] is mainly achieved through the manipulation of lending decisions made by financial intermediaries.[9] Therefore, credit allocated through direct financing is less politically oriented than that made through financial intermediaries. A high frequency on the part of this sub-index implies a more market-oriented financial market and so less government intervention in regional financial markets.

2. The state-owned financial institutions' share of the regional banking sector, which is the state-owned financial institutions' deposits to total deposits ratio. This sub-index reflects the regional banking market's structure, or the financial market's competition level in each province. A high frequency for this sub-index implies a more concentrated banking industry, more financial resources are made through state-owned financial institutions, and hence more frequently government intervention in the region's financial resources allocation.

3. The percentage of local enterprise managers' time spent on personal dealings with governmental officials. This sub-index represents the level of the provincial government's intervention in local business. The hypothesis behind this measure is if local governments can strongly intervene in enterprises' operations, then managers would be willing to spend more time on cooperating with government officials in the interests of gaining additional benefits beyond legitimate market competition. This indicator is positively related to the provincial financial

[7] A method of financing where borrowers borrow funds directly from the financial market without using a financial intermediary, including issuing short-term financing bills, medium-term notes, small and medium enterprises collection of notes and small and medium enterprises private debt.

[8] The financial system matches savers and borrowers through two channels: financial intermediaries and financial markets

[9] Including banks, mutual savings banks, credit unions, financial advisers and pension funds.

repression index.

4. The proportion of the state-owned sector in terms of the number of employed persons. Provided that reducing the unemployment rate is one important political purpose behind the local government facilitating more credit to support state-owned enterprises, this indicator estimates the state-owned sectors' contribution to the regional unemployment rate. If the state-owned sectors contribute more to the local employment rate, then there is a higher probability of the government intervening in the financial markets and supporting state-owned enterprises.

For the above indicators, the data concerning enterprise managers' time spent on personal dealings with government officials and their working hours are collected from a survey conducted in the 31 Chinese provinces between 1997 and 2010. The regional financial data, including the total loans, total deposits of non-state-owned sectors and total amount of credit made through direct financing, for each province is manually collected from the Almanac of China's Finance and Banking. Finally, the data concerning employee numbers in the SOEs of each province is collected from the China Statistical Yearbook. All of the above sub-indices are from 1997 to 2010.

To render the regional financial repression index more easily comparable across regions, the four indicators are transferred from their original values to a relative score that ranges from 0 to 10. The formula used to derive the 0 to 10 rating for the indicator i is:

$$\frac{V_i - V_{min}}{V_{max} - V_{min}} \times 10$$

where V_i is the province's actual value for the component variable, V_{max} is the maximum value for a province in the 1997 base year, and V_{min} is the minimum base year value for the component. This formula is used to derive the ratings for all years. A province's rating will be close to 10 when its value for the component is near the base year maximum. In contrast, the rating will be near 0 when the observation for a province is near the base year minimum.

For some indicators, higher actual values are indicative of less governmental intervention in the financial markets. The proportion of credit made through direct financing provides an example of this. For such a case, the formula used to derive the 0-10 ratings is a reverse of the above formula, namely:

$$\frac{V_{max} - V_i}{V_{max} - V_{min}} \times 10$$

Before applying the PCA method, the correlation of the four indicators is checked in Table 3. The correlations are indeed strong for most pairs of the indicators. The Kaiser-Meyer-Olkin (KMO) test of sampling adequacy is above 0.64, while the statistic of Bartlett's sphericity test is 278.716. Both of these results are much greater than their respective critical values. These results suggest that the principal component analysis approach is appropriate.

[Insert Table 3 here]

A time series analysis of regional financial repression index is performed in figure 5. From figure 5, we can easily realize that the financial repression level in China keeps decreasing, from 11.3 in year 2001 to 4.2 in year 2010. The decreasing tendency shows that China's financial liberalization process is on halfway. At the same time, after separating all of the Chinese regions into three large areas (western, central and eastern), a significant dispersion of the financial repression levels in 31 provinces within China can be observed in Figure 5. While the average financial repression index (the blue line) in the eastern coastal area as of 2010 was 1.3, the average financial repression index in China (the red line) as of 2010 was around 5.2 and the average financial repression index in 2010 in the western inland area (the green line) was around 7.8. The average difference in the financial repression index between the western and eastern provinces was about 3 basis points in 1997 and 6 basis point in 2010.

This finding confirms that a remarkable geographic variations in terms of government control over the financial system exists in China, and such considerable variations could be observed in aspects such as interference with banks' lending decisions, contract enforcement, and local creditor protection (Du et al., 2007).

[Insert Figure 5 here]

1.3 The firm-level analysis

Based on an objective introduction, Section 2 provided a description of the content of China's repressive financial policies, as well as the construction of the regional financial repression index in China. In order to facilitate a better understanding of these issues, the following sections now digs deeper and conducts the firm-level and regional-level analysis in China. In these sections, direct empirical evidence is provided to demonstrate a banks' lending bias towards state-owned but less productive firms in China, its correlation with the financial repressive policies in China, as well as their effects on economic growth. Appendix D is designed to provide a general overview of the main input variables and sequence of tests that you will run in the following sections.

1.3.1 Data

I use three main data sources for the analysis of specific Chinese listed firms (hereafter, "the firm-level analysis"): the WIND database for firms' financial and ownership data; the RESSET accounting database for firms' productivity; and the merged CSMAR bank loan and RESSET bank loan database for loan-level data on credit extended to listing firms. The CSMAR and RESSET Chinese bank loan databases report information about individual loan contracts granted by banks to all the listed firms in China, starting from 1990. For each loan contract, the databases record the amount of credit granted by banks, together with the loan term and the

lending rates charged on the loan contract. This data, reported for the monitoring purposes of the China Securities Regulatory Commission (CSRC), is highly confidential.

The firm sample includes all the Chinese firms listed on the Shanghai and Shenzhen stock exchanges, which constitute over 10% of the GDP of China (shown in Figure 6). In order to eliminate the estimation bias driven by outliers, the following elements are excluded: a) Financial and insurance companies, and firms designated by either stock exchange as special treatment (ST) firms; b) Observations with extreme values, including sales growth, capital intensity ratio, and an ROA that is below the 1st and above the 99th percentile; and c) Individual loan contracts that have a lending rate ¿=14% or ¡= 3%, which are commonly deemed special lending contracts. Lastly, in line with the Industry Classification Guide issued by the CSRC in April 2001, the sample companies are divided into 21 industries. Each sample company's location is determined as the province where the firm's headquarters is based. After basic data cleaning, the final sample consists of 4,047 firm-year observations from 1990, the first year in which the Chinese central government started to disclose detailed financial information about listed firms, to 2010.

[Insert Figure 6 here]

The credit to firms, as mentioned above as our dependent variable in the firm-level analysis, is measured by four variables stemming from both the firm and the financial institution domains. From the firm domain, a firm's access to external finance is measured by its leverage as well as its total proceeds from the bond market. A firm's leverage is calculated as the long-term liabilities to total asset ratio at the end of year, which is a market-based measurement. The firm's proceeds from the bond market is measured as the total cash inflows that the firm generated from the bond market to its total asset ratio. In terms of the financial institution domain, I measure the amount of credit offered by all financial institutions as well as the credit offered by banks to each firm. Considering that a firm's size is an important determinant of the amount of bank loans that firm receives, the aggregated annual amount of financial credit and bank credit acquired by each firm is also normalized by its total assets.

The four variables of credit to firms not only reflect the amount of external finance borrowed by the firms, but also examine the external borrowing sources of the firms. The leverage ratio measures the firm's aggregate amount of external finance, while the proceeds from the bond market refers to the external finance cash flows that the firm generates from the bond market. The total financial loans is the amount of money that the firm borrowed from all financial institutions, including banks, monetary funds and financial firms, while the bank loans ratio measures the lending amount that the firm borrowed from the banking sector alone.

Table 4 shows descriptive statistics of the variables of credit to firms. The unit of observation is the firm-year observation. The average leverage ratio of all sample firms is 28%, and the financial loans to total asset ratio is near 21%, which demonstrate that more than half of the external financing of the firms are financial loans. At the same time, over 90% of financial

loans are bank loans instead of loans issued from other financial institutions, which shows that the Chinese financial system is still very bank-oriented. Different from financial loans ratio, the average number of proceeds from bond market to total asset ratio in sample firms is only about 0.8%, which shows that China's bond market is still much unmatured.

[Insert Table 4 here]

The level of firm state-ownership is determined by the firm's state-owned shares to total shares percentage. This indicator not only reflects the firm's level of state-ownership, but also measures the degree of the firm's political connections to the government. If the government owns more shares in a company, it will have more controlling power to manipulate that company's business. This clearly explains why central and local governments prefer to support the SOEs in which they are the major shareholders.

Table 5 depicts the sample firms' state-ownership time series change tendency, the state-ownership of SOEs in the whole firm sample has decreased from 62.5% to 49% over the past 20 years, contrary to the increasing number of listed companies in the sample. Accordingly, the average state-owned shares percentage of the whole sample has reduced from 26.9% in the 1990s to 7.2% in 2010. This changing tendency is consistent with the privatization process that the Chinese economy has been undergoing since the mid-1990s, and demonstrates that China's marketization process is currently at the midpoint .

[Insert Table 5 here]

Finally, *the firm's productivity* is the firm's total-factor productivity (TFP), which is constructed using the methodology proposed by Olley and Pakes (1996).

1.3.2 Bank lending bias estimation results

Comparisons are made on a regression analysis that links the firms' access to external financing with their state-ownership and their productivity. Analogous estimation results are reported in the regression analysis. After performing a Hausman test on the panel data sample, a fixed effect model is chosen to estimate the relationship. The empirical model is as below:

$$y_{ijst} = \alpha + \beta Stateowned_{ijst} + \theta FC_{ijst} + \mu_t + \eta_i + \varepsilon_{ijst} \tag{1.1}$$

In this model, y_{ijst}, the outcome variables of firm i in industry s located in region j at year t, is regressed on a continuous variable, $Stateowned_{ijst}$, which refers to the state-owned shares percentage of the firm. Therefore, a positive β implies that state-ownership has a positive effect for firms in terms of raising external finance.

A set of firm characteristics has been controlled in this model as FC_{ijst}, which includes the firm's sales growth, liquid ratio, the firm's capital intensity ratio, return of asset (ROA), return

of equity (ROE), firm's age, Tobin's Q ratio and the financial distressed Z score. The year fixed effect variable μ_t, and the firm fixed effect variable η_i have all been included in the model so as to exclude the year specific and firm specific effect.

The OLS estimation results of this model are reported in Table 6. The positive coefficients on $Stateowned_{ijst}$, as seen in regressions (1), (2) and (3), support the hypothesis that firms with stronger connections to the Chinese government have more access to finance and bank loans. Also, the Chinese banking system exhibits positive preferential treatment in lending to state-owned firms, especially when the level of state-ownership is strong (through directly owned stock shares). A one standard deviation increase in a firm's state-owned shares percentage can be translated into a 0.1276 point increase in the firm's financial loans ratio and a 0.1163 point increase in the firm's bank loans ratio. Yet, one interesting finding from Table 6 is that the state-ownership of firms does not produce significant effects on a firm's access to the proceeds from the bond market. This result implies that in comparison with financial institutions, the bond market is less influenced by political factors and so is more market-oriented.

[Insert Table 6 here]

These findings basically confirm the systematic allocation of financial resources in favor of SOEs in the Chinese economy. However, although more credit has been allocated to SOEs, we cannot categorically conclude that a credit misallocation exists in the Chinese economy before comparing the productivity between SOEs and POEs in China. Based on the above empirical results, I further add an interaction term between firm's stateownership and TFP to the previous firm-level regression as an additional explanatory variable, and estimate the regression model as below:

$$y_{ijst} = \alpha + \beta Stateowned_{ijst} + \gamma TFP_{ijst} + \delta Stateowned_{ijst} \times TFP_{ijst} + \theta FC_{ijst} + \mu_t + \eta_i + \varepsilon_{ijst} \tag{1.2}$$

The empirical results of equation (2) are detailed in Table 7. The first observation stemming from Table 7 is that after controlling for the firms' productivity, the level of state-ownership of the firms still has significantly positive impacts on the firms' access to financial and bank loans (β ¿ 0). This finding implies that even at the same productivity level, SOEs are far more likely to access credit than POEs. The second noticeable feature of the empirical results in Table 7 is that the Chinese firms' access to bank loans and financial loans is negatively associated with their TFP. The coefficient of firm productivity on the firm's financial loan ratio is -0.0839 and on the firm's bank loan ratio it is -0.0944. These findings contradict the efficient credit allocation theory and imply that credit in China tends to be allocated to politically connected enterprises rather than to more productive enterprises. The third and most important finding from Table 7 is that the interaction coefficient between firm stateownership and TFP is negative ($\delta < 0$), which is significant at the 0.05 level. The negative interaction coefficient confirms that the firm productivity's marginal effect on firm's advantages in accessing financial loans decreases

with frim's state-ownership, and the negative correlation between and firms'access to financial loans is even more obvious in highly state-owned firms. Statistically, retain the same TFP, a 1% increase in the firm's state-owned shares percentage will eliminate an average 0.03% in firm TFP's positive effect on generating finanical loans.

[Insert Table 7 here]

Similar to Table 7, figure 7 also shows the difference in TFP and the log of capital input between SOEs and POEs in the 31 Chinese regions. The X axis of Figure 7 is the log value of the total capital input to the firms, while the Y axis is the TFP of the firms. The blue circles are the SOEs in the 31 Chinese regions, while the red circles represent the POEs in the corresponding regions. The circle size is determined by the average total assets of the two sectors in these regions. From Figure 7, it can be noted that the POEs have a smaller firm size and a lower capital input than the SOEs in all the regions, although on average the POEs have a higher TFP than the SOEs. This figure also provides empirical evidence of the systematic allocation of financial resources in favor of state-owned but low productivity firms in China.

[Insert Figure 7 here]

1.4 The regional-level analysis

1.4.1 The bank lending bias and financial repression in different Chinese regions

The firm-level analysis above has, in principle, confirmed the notion that the Chinese banking system favors lending to state-owned but less productive firms. However, the correlation between financial repression and the observed bank lending bias has not yet been thoroughly analyzed.

In fact, the preferential treatment towards SOEs on the part of banks may be caused by many reasons that are not necessarily related to financial repression. For example, such preferential treatment could be given on the basis of the long-term lending relationship between banks and the SOEs. Therefore, in order to further elaborate the relationship between financial repression and the observed bank lending bias, this section exploits the cross-regional differences in financial repression within China to corroborate the finding that financial repression is positively associated with the lending bias towards state-owned but less-productive firms.

To do so, in this part, I further interact the firm's state-ownership and productivity with its location's financial repression index in above regressions, in order to check whether the bank lending bias towards state-owned but less productive firms is more obvious in regions characterized by higher financial repression. Or, in other words, whether the geographic variations in

regional financial repression levels translate into corresponding geographic variations in credit misallocation in these regions.

Note that this empirical strategy relies on the assumption that bank lending does not flow freely across the Chinese regions. In fact, some restrictions in the Chinese banking system do significantly reduce the transfer of financial credit across the regions. In order to reduce loan management costs, most banks in China limit their financing branches to carrying out inter-regional lending, and so firms have to take credit from the location where most of their economic activities take place, which is generally the province where the firm's headquarters is located. Such conditions have largely confined local governments' financial repression to within their own districts, and thus enable this paper to build the correlation between financial repression and the banks lending bias in a regional analysis.

Also, the regional economic fundamentals difference is remarkable in China. Regions in the east having higher average growth rates and incomes (average annual growth rate of 9% and average income per capita of 3965 yuan) and higher rates of FDI and openness to the outside world. Meanwhile, regions in the west and central regions of China having lower growth rates and incomes (average annual growth rates of 8% and 7% and income per capita of 2624 and 2721 yuan, respectively) and openness. Therefore, the regional dummy is introduced as an additional term in order to take into account any potential differences in terms of regional economic fundamentals, and control for other important regional factors that contributed to the levels of regional bank lending bias besides geographical variations in financial repression.

After constructing the regional financial repression index, I interact the firms' state-owned shares percentage and their TFP with the PFRI, and then I observe the interaction effects between the three variables. The estimation equation is set as:

$$\begin{aligned} y_{ijst} = \alpha + \beta Stateowned_{ijst} + \delta TFP_{ijst} \\ + \phi(Stateowned_{ijst} \times PFRI_{j,t}) + \varphi(TFP_{ijst} \times PFRI_{j,t}) \\ + \varpi(Stateowned_{ijst} \times TFP_{ijst} \times PFRI_{j,t}) \\ + \theta FC_{ijst} \\ + \mu_t + \psi_j + \varepsilon_{ijst} \end{aligned}$$

Here, y_{ijst} is the outcome variables as introduced in the last section, while $Stateowned_{ijst} \times PFRI_{j,t}$ and $TFP_{ijst} \times PFRI_{j,t}$ are the interaction terms between a firm's state-ownership, its TFP and the financial repression level in the region where the firm is located. A positive interaction coefficient ϕ will demonstrate that the SOEs' benefit derived from access to external financing is increasing with the regional financial repression level. Similarly, a positive interaction coefficient φ will demonstrate that high productivity's resultant benefits in terms of access to credit increases with the regional financial repression level. The control variable set, $FC_{i,j,t}$, includes

all the firms' characteristics variables as included in the firm-level analysis in Section 3. Further, the year fixed effect and region fixed effect are included in this regression model as μ_t and ψ_j.

The estimation results for the above equation are depicted in Table 8. As can be observed from the positive ϕ, which is significant at the 0.01 level, it is confirmed that the SOEs' benefits in terms of the accessibility of bank loans increase as the level of financial repression increases, and that the SOEs located in highly financial repressed regions generally enjoy more benefits in acquiring both financial loans and bank loans. Statistically, with the same state-owned shares percentage, a 1% increase in the financial repression index will result in an average 0.08% increase in the SOEs' financial loans or bank loans to total asset ratio.

In contrast, financial repression produces significantly negative interactive effects with TFP on firms' access to credit, which implies that in highly financial repressed regions, banks tend to lend more to less productive firms. A 1% increase in the financial repression level at a firm's location will result in a decrease by 0.03 points for productivity's marginal benefit on the firm's access to financial loans. These findings further prove that the geographic variations in financial repression levels across the different Chinese regions can translate into a clear pattern of geographic variations in credit misallocation in these regions. Indeed, the bank lending bias towards state-owned but less productive firms is more obvious in higher financially repressed regions. Therefore, a positive correlation between financial repression and credit misallocation that be investigated in the firm-level analysis has been proved.

[Insert Table 8 here]

1.4.2 Financial repression and the finance-growth nexus in different Chinese regions

After validating the positive correlation between financial repression and the degree of bank lending bias, it is necessary to further test their connections with economic growth. If financial repression and credit misallocation in the real economy do impair economic growth, then a negative correlation between financial development and GDP growth should be more easy to observe in highly financially repressed Chinese regions. Following the estimation method detailed above, I conduct similar regressions as the cross-country comparison between the 31 regions (provinces) in China. The regression model is estimated as below:

$$Growth_{jt} = \alpha + \beta PFRI_{jt} + \lambda FD_{jt} + \psi(PFRI_{jt} \times FD_{jt}) + \tau RC_{jt} + \mu_t + \psi_j + \varepsilon_{ijst} \quad (1.3)$$

In equation [3], the dependent variable $Growth_{j,t}$ is the GDP growth rate of the provinces j at year t. The regional GDP growth rate is regressed on the corresponding regional financial repression level $PFRI_{j,t}$, the regional financial development level $FD_{j,t}$, and the interaction

term between financial repression and financial development. A vector of the macroeconomic variables that may also affect local GDP growth is included in the above regression as control variable $RC_{j,t}$, which includes investment to GDP ratio (Inv), trade to GDP ratio (Openness), government expenditure to GDP ratio (Gov), and FDI to GDP ratio (FDI).

Table 9 shows the estimation results of equation [3]. In all of the three estimation models utilized in Table 9, both financial development and financial repression have obviously negative effects on GDP growth. Table 9 includes an interaction term between financial repression and financial development. A negative interaction effect between financial repression and financial development on growth exists in China, and this negative interaction effect keeps increasing with the regional financial repression levels. These findings imply that it is easier to observe a negative finance-growth nexus in highly financial repressed regions, and that a one standard deviation increase in financial repression will transfer to a 0.3% negative effect via financial development on GDP growth.

[Insert Table 9 here]

1.5 Rajan-Zingales Approach

1.5.1 Rajan-Zingales estimation results

It must be remembered, however, that the above-mentioned correlations are not informative regarding the direction of causality between financial repression, the bank lending bias, and GDP growth. Indeed, the above findings could reflect two different sequences of events. First, the repressive financial policy distorts credit allocation from the financial system, therefore the development of the financial system exacerbates the banking lending bias, or credit misallocation, and thus slows down economic growth. Second, the repressive financial policies impede the development of the financial system, therefore the rapid GDP growth cannot efficiently boost the size expansion or credit growth of the financial markets, which produces a negative correlation between finance and growth.

Within the framework of this study, one way to make progress on determining the causality between financial repression and economic growth is to focus on the details of the theoretical mechanisms through which the financial sector affects economic growth, and to then document their working (Rajan and Zingales, 1998; Fisman and Love, 2007). Therefore, following this approach, I propose an estimation approach to check the theoretical mechanisms through which financial repression affects economic growth, and to try to provide some empirical evidence for the direction of causality and the transmission mechanism among financial repression, the bank lending bias and GDP growth.

The assumption behind the estimation approach is that if financial repression impedes economic growth by creating a political distortion of bank lending, then industries that are relatively

more in need of external borrowing should be especially burdened by the financial lending distortion. And therefore, after control for other regional fundamental economic factors and retain the same financial development levels, they should grow disproportionately slower in highly financially repressed regions.

Based on this assumption, I first identify an industry's need for external finance as the difference between the firm's capital expenditure and the cash generated by operating[10]. Then, I separate all the listed firms in China into subsamples of different regions, and then interact each industry's dependence on external finance with the financial development and financial repression index in each sub-sample. After regressing the real growth rate of different industries in each of the Chinese regions on the interaction terms between dependence on external finance and the corresponding region's financial repression index, I estimate the following equation:

$$\begin{aligned} Industrygrowth_{jst} = \alpha &+ \beta External financing_{jst} \\ &+ \delta(External financing_{jst} \times PFRI_{jt}) \\ &+ \kappa(External financing_{jst} \times FD_{jt}) \\ &+ \phi(External financing_{jst} \times PFRI_{jt} \times FD_{jt}) \\ &+ \theta RC_{jt} + \eta_s + \mu_t + \psi_j + \varepsilon_{jst} (4) \end{aligned}$$

In equation [4], the dependent variable $Industrygrowth_{jst}$ is the real value-added growth rate of industry s in province j at year t, which is regressed on the corresponding interaction terms between regional financial repression level $PFRI_{jt}$, regional financial development level FD_{jt}, and the external finance dependence index of industry s in province j at year t. The coefficient ϕ demonstrates the triple interaction effect among financial repression, financial development and external financing needs on sector growth rate. The same vector of macroeconomic variables as used in equation [3] has been included in this estimation equation. η_s, μ_t and ψ_j are the fixed effect terms to control for industry, year and regional specific effects.

The estimation results of equation [4] are presented in Table 10. Table 10 demonstrates that financial repression generates a significantly negative interaction effect with firms' need for external finance on the real growth rate of each industry, and that the interaction coefficient between financial repression and a firm's external finance needs is -0.0268. This empirical result provides data to support our hypothesis that the industries that are relatively more in need of external borrowing grow disproportionately slower in highly financially repressed regions.

At the same time, in regression (2) of Table 10, the financial development indicator generates a positive interaction effect with firms' external finance needs on the real growth rate ($\kappa > 0$). This result shows that without financial repression, financial development itself could

[10] On the assumption that capital markets in China are, particularly for the large listed firms, relatively frictionless, this method allows us to identify an industry's technological demand for external finance

promote economic growth via reducing the external financing cost of firms. Yet, at the same time, a negative triple interaction effect among financial repression, financial development and external financing dependence can be observed in regression (3) ($\phi < 0$). The negative triple interaction coefficient suggests that the presence of financial repression can weaken the positive theoretical mechanism between financial development and real growth. Given that the triple interaction coefficient of the three variables is -0.0218, while the positive coefficient of financial development on the sector growth rate is 0.2618, this result implies that: keeping the financial development level and external finance needs of each industry constant, when the financial repression index increases to above 13, the positive correlation between financial development and GDP growth rate will be reversed to a negative one.

[Insert Table 10 here]

The above findings have proved the theoretical mechanism through which financial repression affects GDP growth, and they also provide empirical evidence to support the notion that the causality between financial repression and GDP growth is from financial repression to economic growth. If the causality between finance and growth were the opposite way around, then a clear pattern between external finance need and financial repression levels on sector growth rate would not be observed in the above analysis.

Final, we conclude with Appendix E to summarize the key relationships that you obtained in the previous estimation tests. Firstly, I document a credit misallocation, which expressed as that more credit has been allocated to state-owned but low productive Chinese firms, exsits in China in the firm-level analysis. Second, I find that the aforementioned credit misallocation is more obvious in highly financial repressed regions. Finally, I establish the correlations among finanical repression, the credit misallocation and economic growth by using a Rajan-Zingales approach: I show that more financially dependent industries grow disproportionately slower in highly financially repressed regions, and financial development's positive effect on industry growth rate decreases with industry location's financial repression level. These results imply that financial repression can weakens the positive finance-growth nexus through creating a credit misallocaiton in the economy.

1.5.2 Robustness Checks

A standard concern with the bank lending bias in terms of more credit has been issued to low productive but state-owned firms is that the results are capturing the different borrowing needs between firms that have different productivity or characteristics, instead of capturing a bank lending bias is raised from the financial repression policies. To check whether the banking lending bias is investigated at the firm-level analysis is caused by the credit supply-side factors, I perform a robustness test by estimating the difference in the bank lending behaviours by two types of banks: state-owned banks and non state-owned banks. If the observed bank lending

bias is caused by the credit supply-side factors which related with political controls over the banks, then the biased lending behavious should be especially obvious and serious with loans issued by state-owned banks.

To test this assumption, I interact a dummy variable, $SOEbank_{kt}$, that equals one if at year t the firm borrows the loan from a bank k which is a state-owned bank with the interaction term between firm state-ownership and productivity in equation (2). The triple interaction coefficient among the three factors measures the impact of borrowing banks' state-ownership on the degrees of bank lending bias. A negative (positive) value means that the state-ownership's negative impact on firm productivity's marginal benefit on accessing to bank loans is even more(less) significant when firms borrow from state-owned banks, which implies that the bank lending bias is more(less) obvious when the lending are issued from the state-owned bank. Also, I include time fixed effects and firm fixed effects as in previous regressions, by including a firm fixed effect, I compare the loan amount issued by the two types of banks to the same company.

Table 11 reports the results of this robustness test. The estimated triple interaction coefficient among firm state-ownership ,productivity and the state-owned dummy of borrowing bank is negative, and significant at the 0.05 level. This result demonstrates that compared with non state-owned banks, the bank lending bias is more obvious when loans are issued from the state-owned bank. And this result supports that the observed bank lending bias is drived from the credit supply-side factors.

[Insert Table 11 here]

Aside from the reverse causality problem, another potential source of endogeneity in the OLS estimates presented so far is given by the unobservable region-level covariates that are correlated with financial development and that might affect economic growth (e.g. the openness of the region or the level of local government effectiveness). To address the omitted variables problem in the regressions, I substitute other region-level variables for the financial repression index in the Rajan - Zingales regressions to check whether these results are driven by region-level omitted variables. Examining the robustness check results in Table 12, I failed to find a similar pattern to the one that emerged from financial repression on the finance-growth nexus. The estimation results show that other regional macro-variables does not explain the geographic variation in the finance-growth nexus across different Chinese regions, as the one that emerged from financial repression on the finance-growth nexus. And therefore show that the links among financial repression, credit misallocation, and GDP growth are not driven by region-level omitted variables.

[Insert Table 12 here]

Final, a robustness check concern firm size's effect on the pattern between firm dependence on external finance and the financial repression level is performed in Table 13. This Table checks

if the link among firm external finance needs, finanical repression level and industry growth rate vary across different firm size. If the negative interaction effect between firm external finance needs and finanical repression level on industry growth rate is especially strong for small size firms, then probably above pattern that we observed in Table 10 is drived by the further demand for bank loans from small firms. The estimation results in table 13 show that a negative triple interaction effect among financial repression, financial development and external financing dependence can be observed in all four regressions, and this negative triple interaction effect is even more significant and stronger for medium and large size firms. These results shows that our estimation results are not drived from the demand side of loan applications. And the presence of financial repression weakens the positive theoretical mechanism between financial development and real growth for both large and small firms.

[Insert Table 13 here]

1.6 Concluding Remarks

Recent studies have highlighted the vital role of financial development in promoting economic growth. However, some of the empirical literature shows a negative relationship between financial development and economic growth in some transforming economies. In this prior finance-growth literature, China has for a long time been recognized as a counterexample of the positive finance-growth path.

This paper empirically assesses whether the repressive financial policies in China obstruct the effective functioning of the financial system in the real economy and consequently produce a negative finance-growth path. To identify these effects, a panel dataset of all the listed companies in China is examined to identify whether SOEs in China have greater access to bank loans. Then, a regional analysis across 31 provinces within China investigates the correlation between financial repression and the bank lending bias in favor of SOEs, as well as financial repression's effects on the finance-growth nexuses in these regions. Finally, I use the Rajan-Zingales approach to address the endogeneity problem in the above findings.

The main conclusion of this paper is as follows. In countries with high levels of financial repression, the repressive financial policies have substantially constrained the operation of the financial system so that it cannot reach its full potential. A bank lending bias in favor of state-owned but low productivity firms can be brought about by a repressed banking system, and this lending bias diminishes the financial system's lending effectiveness as well as its catalytic role in economic growth. As a result, financial repression undermines the positive relationship between financial development and economic growth.

Although the magnitude of the empirical results is focused solely within China, financial repression is indeed a common problem that can be seen in developing countries and transitional economies. The results presented in this paper suggest that financial liberalization can lead

to faster growth and more efficient financial development in transitional economies. Besides promoting financial development, the central governments of developing countries should also consider controlling the degree of financial repression in order to accelerate economic growth. Further, the financial market itself should be allowed to play its role in economic restructuring.

From an empirical perspective, this paper informs on the negative finance-growth nexus that exists in some developing countries. This paper has proved that financial development is positively related to economic growth, so long as the financial repression is not strong enough to impede the financial sector's promotional effects on growth. Otherwise, a highly repressed financial system will hinder economic growth and a negative finance-growth path will be observed in the corresponding country.

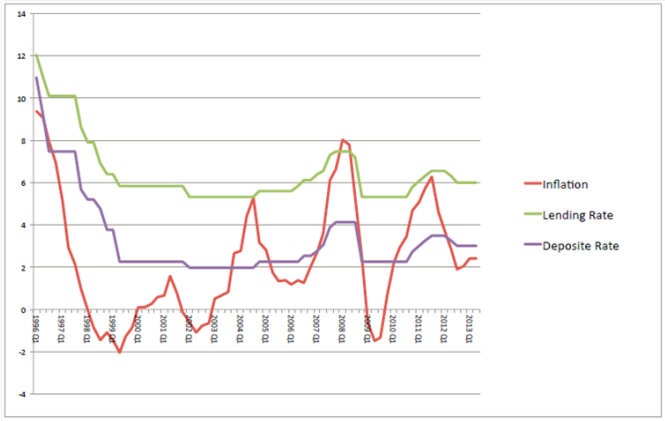

Figure 1: Interest Rates and Inflation In China

Figure 1.1: Interest Rate Spread and Inflation in China, 1996 - 2012

Notes: Data of lending and deposite rates are collected from China Banking Regulatory Commission. Inflation rate is collected from Chinese National Bureau of Statistics. Time series is from year 1996 to 2012. Figure source: Hu(2014)

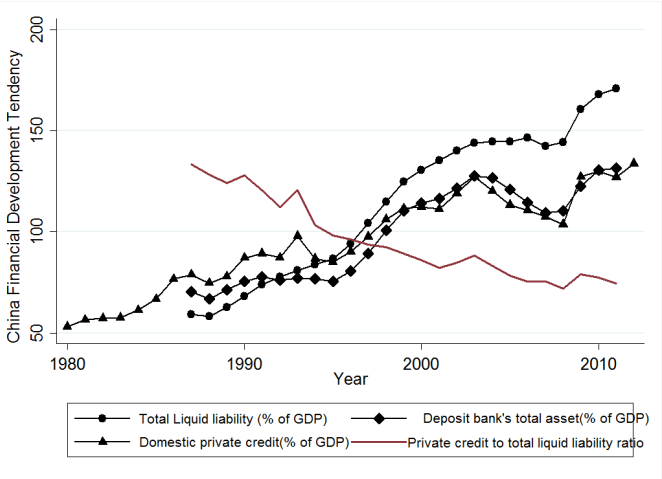

Figure 1.2: China Financial Market Development Tendency, 1980 - 2010

Notes: This figure depicts the financial development tendency in China over the past 30 years. The four financial development indicators show in this figure are total liquid liability to GDP ratio, bank's total deposit to GDP ratio, total domestic private credit issue amount and the credit issued to private sector to total liquid liability ratio. Data of the financial development indicators come from World Bank Global Financial Development Database.

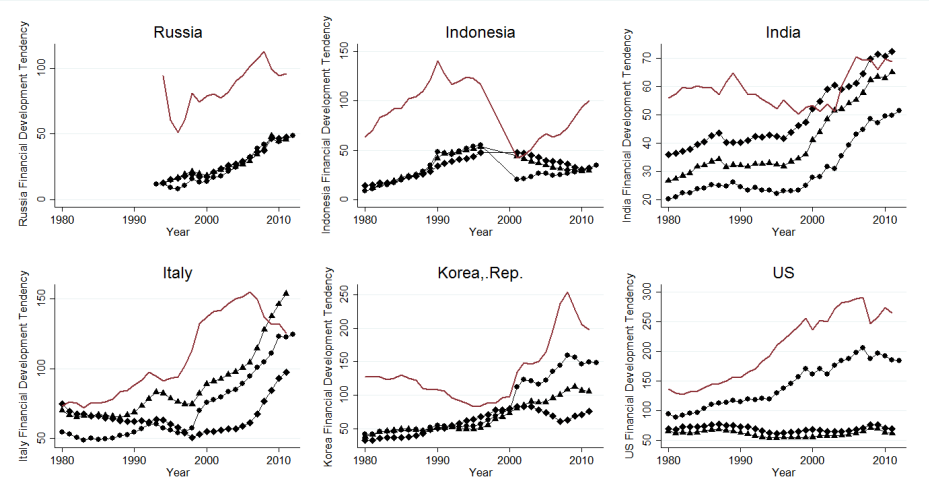

Figure 1.3: Financial Development Path in Russia, Indonesia, India, Italy, Korea and US

Notes: This figure shows the financial development time series tendency in other countries such as the USA, Italy, India, Indonesia, Vietnam and Korea. Data of the financial development indicators come from World Bank Global Financial Development Database.

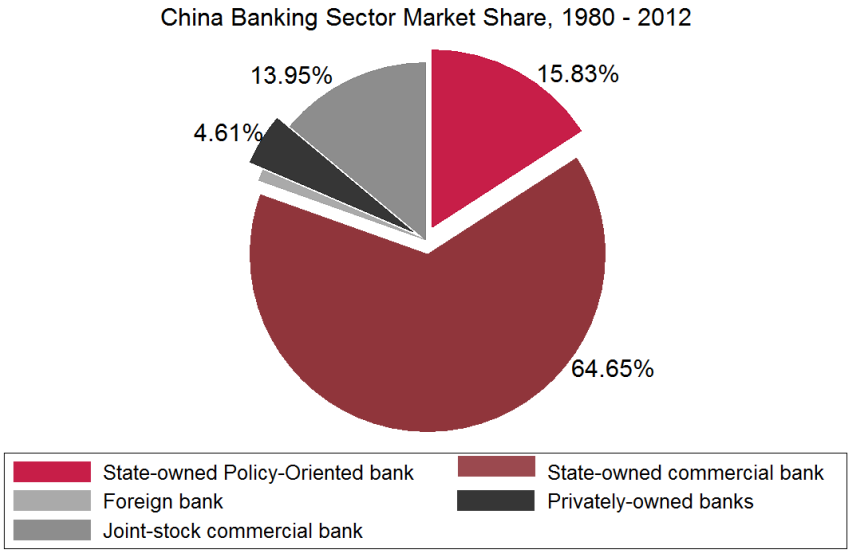

Figure 1.4: Chinese Banking System State-owned Percentage

Notes: This figure shows the ownership structure of the Chinese banking sector from year 1980 to year 2012. Each part of the pie chart shows the average share of banking sector assets held by state-owned, state-owned policy oriented, privately-owned, joint-stock owned and foreign banks between year 1980 to year 2012. Data used to construct the this figure are come from Bankscope database.

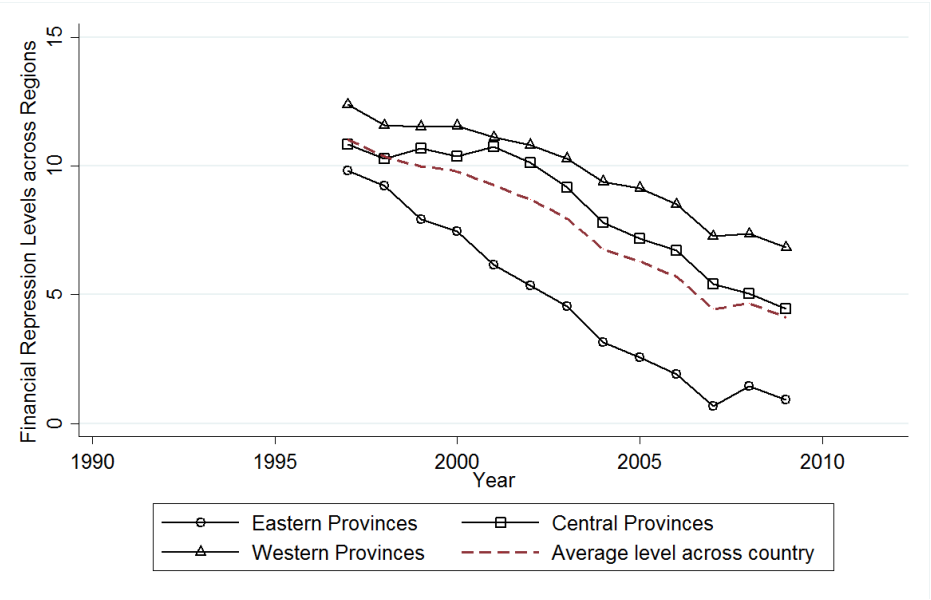

Figure 1.5: Chinese Regional Financial Repression Levels Comparison

Notes: Financial repression levels shown in this figure are the average financial repression index of each Chinese area(Eastern, Central and Western) from year 1997 to 2010. The average financial repression level is the average financial repression index value for the whole country. Data used to construct the financial repression index come from: China Banking Regulatory Commission, China Statistics Yearbook and The Almanac of China's Finance and Banking.

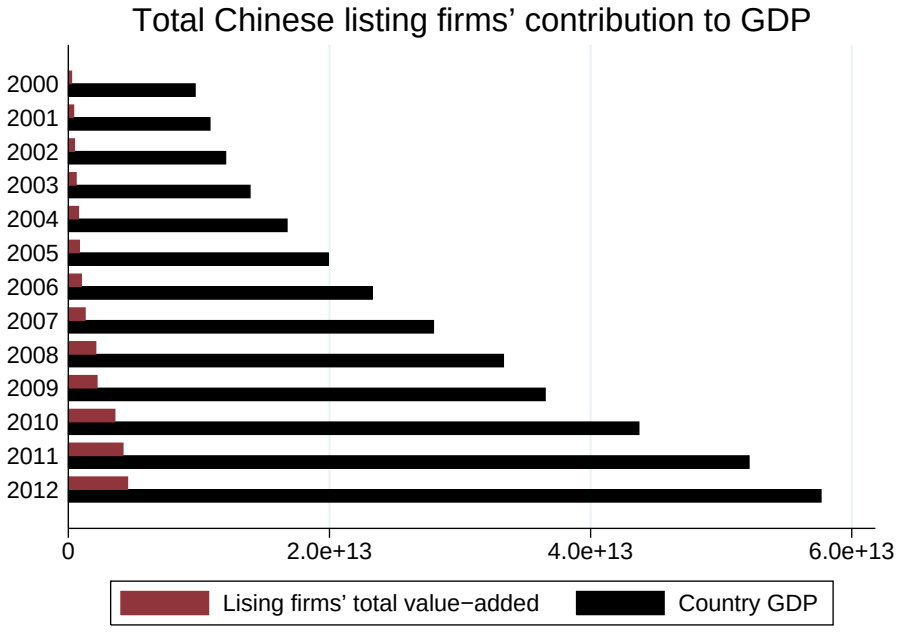

Figure 1.6: Chinese Lising Firms' Proportion to GDP

Notes: This figure demonstrates all Chinese listing firm's aggregated value-added to GDP ratio. Data on firm's value-added come from the WIND, CSMAR and RESSET database and refers to the year.

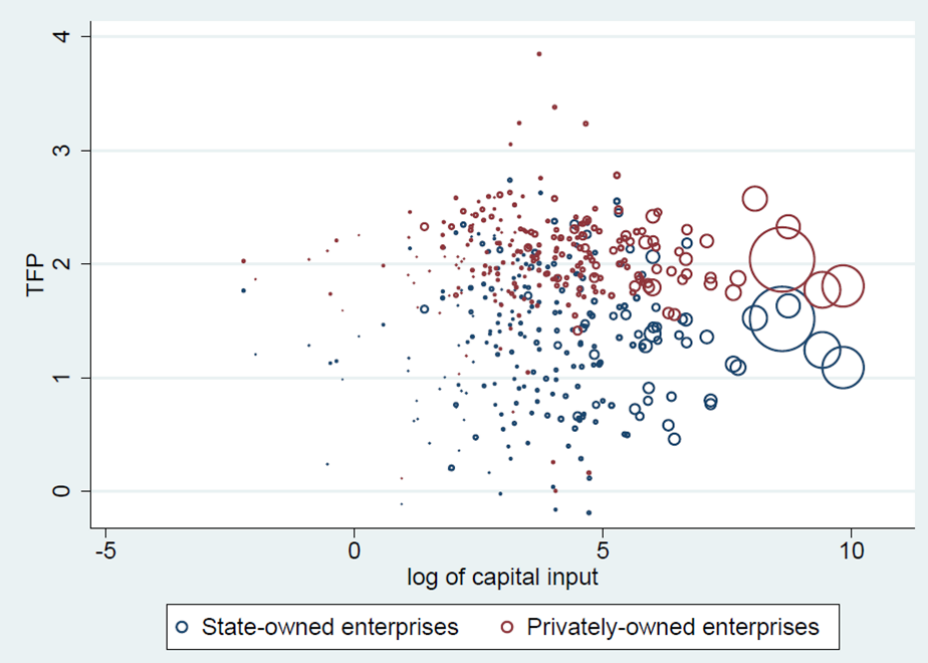

Figure 1.7: TFP comparison between Chinese SOEs and POEs

Notes: This figure shows the difference in TFP and the log of capital input between SOEs and POEs in the 31 Chinese regions between year 1990 to 2010. X axis is the log value of the total capital input to the firms, Y axis is the TFP of the firms. The blue circles are the SOEs in the 31 Chinese regions, the red circles represent the POEs in the corresponding regions. Each circle size demonstrates the average total assets value of the two sectors in these regions. Data used to estimate firm's TFP in a Olley-Pakes method come from RESSET - Chinese Industrial Enterprises Database.

Table 1.1: Growth and Financial Development, 1980 - 2012

[Robust standard errors have been clusted by country and by year]								
	Countries with Low levels of Financial Repression				Countries with High levels of Financial Repression			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LLY	0.008^{***}				-0.015^{***}			
	[0.005]				[0.001]			
BANK		0.017^{***}				-0.033^{***}		
		[0.000]				[0.007]		
PRIVATE			0.024^{**}				0.014	
			[0.041]				[0.651]	
STATE				0.007				-0.032^{*}
				[0.291]				[0.086]
LYO	-0.003	-0.002	-0.001	-0.001	-0.013^{***}	-0.013^{**}	-0.012^{**}	-0.006^{*}
	[0.375]	[0.636]	[0.705]	[0.884]	[0.001]	[0.012]	[0.022]	[0.083]
LSEC	0.003	0.003	0.002	0.001	0.007^{***}	0.010^{***}	0.004	0.011^{***}
	[0.732]	[0.733]	[0.804]	[0.904]	[0.001]	[0.004]	[0.386]	[0.001]
LFIN	-0.010	-0.015^{**}	-0.018^{*}	-0.008	0.011^{**}	0.014^{***}	0.005	0.003
	[0.159]	[0.021]	[0.084]	[0.201]	[0.011]	[0.007]	[0.491]	[0.320]
INV	0.134^{***}	0.125^{***}	0.125^{***}	0.181^{***}	0.152^{***}	0.156^{***}	0.150^{***}	0.137^{***}
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
GOV	-0.043	-0.067^{**}	-0.050	-0.001	-0.046	-0.013	-0.007	-0.001
	[0.238]	[0.043]	[0.167]	[0.984]	[0.173]	[0.267]	[0.879]	[0.986]
Openness	0.001	0.001	0.001	0.003	0.017^{***}	0.023^{***}	0.008	0.027^{***}
	[0.987]	[0.906]	[0.993]	[0.667]	[0.000]	[0.000]	[0.404]	[0.003]
FDI	0.157^{*}	0.187^{*}	0.203^{*}	0.217^{*}	0.497^{***}	0.634^{***}	0.317^{*}	0.461
	[0.094]	[0.075]	[0.078]	[0.061]	[0.003]	[0.007]	[0.079]	[0.627]
Country×Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.17	0.15	0.10	0.23	0.49	0.50	0.57	0.38

Notes: The table shows the estimation results for the finance and growth relationship in 79 countries. Dependent variable is GDP per capita growth rate in country i at year t. The four financial development indicators in this table are total liquid liabilities (LLY); total bank deposit to GDP ratio (BANK); credit issue to private sector (PRIVATE) and state sector (STATE). Control variables are country initial growth rate(LYO), education level(LSEC) and financial development level (LFIN); investment to GDP ratio (INV); government expenditure to GDP ratio (GOV); country openness, which express as the sum of import and export cash flows to GDP ratio and foreign direct investment (FDI). Data come from IMF, WordBank Global Financial Development and World Development Indicators Database. P-value are reported in brackets. Significance level levels: *** p¡0.01, ** p¡0.05, * p¡0.1.

Table 1.2: Growth, Financial Development and Financial Repression, 1980 - 2012

[Robust standard errors have been clusted by country and by year]								
	Countries with Low levels of Financial Repression				Countries with High levels of Financial Repression			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LLY	0.003^{***} [0.007]				0.017 [0.272]			
BANK		0.005^{***} [0.008]				0.022 [0.120]		
PRIVATE			0.008^{**} [0.007]				0.065^{***} [0.000]	
STATE				0.027 [0.293]				0.118^{***} [0.005]
FR	-0.017^{***} [0.000]	-0.016^{***} [0.000]	-0.015^{***} [0.004]	-0.016^{***} [0.005]	-0.018^{***} [0.000]	-0.019^{***} [0.000]	-0.015^{**} [0.014]	-0.017^{***} [0.005]
LLY×FR	-0.004 [0.667]				-0.045^{***} [0.000]			
BANK×FR		-0.002 [0.870]				-0.065^{***} [0.000]		
PRIVATE×FR			0.001 [0.931]				-0.051^{***} [0.000]	
STATE×FR				0.042 [0.320]				-0.167^{***} [0.000]
LYO	-0.003 [0.185]	-0.003 [0.183]	-0.003 [0.120]	-0.002 [0.481]	-0.012^{***} [0.002]	-0.011^{**} [0.011]	-0.012^{***} [0.001]	-0.007^{**} [0.020]
LSEC	0.006 [0.209]	0.006 [0.291]	0.007 [0.141]	0.005 [0.383]	0.008^{***} [0.001]	0.007^{***} [0.000]	0.004^{*} [0.080]	0.005 [0.282]
LFIN	-0.003 [0.432]	-0.004 [0.220]	-0.004 [0.289]	-0.005 [0.118]	0.007 [0.115]	0.007 [0.250]	0.002 [0.835]	0.001 [0.457]
INV	0.147^{***} [0.000]	0.151^{***} [0.000]	0.153^{***} [0.000]	0.164^{***} [0.000]	0.164^{***} [0.000]	0.186^{***} [0.000]	0.155^{***} [0.000]	0.139^{***} [0.001]
GOV	-0.010 [0.802]	-0.023 [0.534]	-0.010 [0.789]	-0.020 [0.491]	-0.028 [0.429]	-0.001 [0.329]	-0.026 [0.459]	-0.056 [0.264]
Openness	0.004 [0.229]	0.004 [0.195]	0.005 [0.199]	0.002 [0.494]	0.012^{***} [0.009]	0.015^{**} [0.010]	0.006 [0.363]	0.004 [0.713]
FDI	0.236^{***} [0.001]	0.253^{***} [0.002]	0.263^{**} [0.016]	0.192^{**} [0.014]	0.588^{***} [0.000]	0.550^{***} [0.001]	0.364^{**} [0.048]	0.201 [0.206]
Country×Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.17	0.16	0.11	0.24	0.51	0.52	0.57	0.40

Notes: The table shows the estimation results for the financial repression level and the finance and growth relationship in 79 countries. FR is the IMF financial repression index in country i at year t.P-value are reported in brackets. Significance level levels: *** p¡0.01, ** p¡0.05, * p¡0.1.

Table 1.3: PCA Components Matrix

Panel A: PCA Components Correlation Matrix				
	Component 1	Component 2	Component 3	Component 4
Component 1	1.0000			
Component 2	0.4260	1.0000		
Component 3	0.6390	0.6110	1.0000	
Component 4	-0.1180	0.0078	0.0018	1.0000
Panel B: Total Variance Explained				
Component	Eigenvalue (% of Variance)	Difference	Proportion	Cumulative (%)
1	20.67	10.05	0.527	0.527
2	10.62	5.675	0.271	0.799
3	4.945	1.997	0.126	0.925
4	2.947	.	0.0752	1

Notes: In this table, component 1 is government intervention indicator, which is the percentage of local enterprise managers' time spent on personal dealing with governmental officials; Component 2 is financial market competition indicator, which is the state-owned financial institutions' deposits to total deposits ratio; Component 3 is the proportion of the state-owned sector in number of employed persons and Component 4 is proportion of credit made through direct financing.

Table 1.4: Credit to Firms, Summary Statistics

Variable	N.	Mean	St.Dev.	Min	Max
Leverage	4,047	0.2876	0.2459	0.0708	1.9487
Probonds/TA	4,047	0.0080	0.0293	0.0000	0.2258
All Financial Loans/TA	4,047	0.2095	0.3330	0.0102	1.4415
Bank Loans/TA	4,047	0.2045	0.3279	0.0102	1.3115

Notes: The table shows summary statistics of credit to firms variables. The unit of observation is the firm-year observations. Data refers to year 1990 - 2010. Source: WIND, CSMAR and RESSET database.

Table 1.5: Percentage Change of State-owned Listed Firms in China

Year	Total sample Firms	State-owned firms percentage (% of the total sample firms)	Average of State-owned shares (%)
1990	8	62.5	26.9
1991	11	72.7	28.4
1992	45	73.3	35.0
1993	146	76.7	39.1
1994	244	74.5	37.4
1995	267	73.0	36.5
1996	450	75.3	37.8
1997	631	76.1	40.2
1998	722	74.1	41.9
1999	800	71.9	42.2
2000	915	68.3	41.8
2001	1006	67.6	41.5
2002	1065	67.2	41.3
2003	1146	66.5	38.9
2004	1236	64.5	36.3
2005	1246	65.1	34.5
2006	1277	63.5	28.5
2007	1365	65.0	23.5
2008	1482	58.8	18.8
2009	1558	56.4	11.1
2010	1878	49.0	7.2

Notes: The table reports the time series change tendency of the numbers of state-owned firms, and the average state-owned shares percentage of all listing firms in China from year 1990 to 2010. State-owned firms percentage is the share of state-owned firms in all listing firms. The state-owned listing firms are the firms that be ultimately controlled by central or local government. The average of state-owned shares are the mean of state-owned shares percentage of all listing firms. Data on listing firm numbers, firm ultimate controller and state-owned shares percentage come from WIND and RESSET database.

Table 1.6: The Effect of Firm State-ownership on Access to Credit

[Standard errors are clustered by year and by firm] Dependent Variables	(1) Leverage	(2) probonds/TA	(3) All Financial Loans/TA	(4) Bank Loans/TA
State Shares Percentage	0.1275**	0.0013	0.1276***	0.1163**
	[2.1586]	[0.2812]	[2.6544]	[2.1637]
Sales Growth	-0.0843	-0.0021**	-0.0096	-0.0076
	[-0.8590]	[-2.5737]	[-0.5739]	[-0.4934]
Liquidity Ratios	-0.0001	0.0003**	-0.0004	-0.0006
	[-0.0347]	[1.9920]	[-0.1616]	[-0.2459]
Capital Intensity	0.0001	-0.0001**	-0.0001	-0.0001
	[-0.4738]	[-2.0672]	[-0.4088]	[-0.6434]
ROA	-0.0070***	0.0004***	-0.0071***	-0.0070***
	[-3.4589]	[2.7670]	[-3.4459]	[-3.6076]
ROE	0.0014	-0.0002	0.0015	0.0014
	[1.3844]	[-0.5768]	[1.4518]	[1.5163]
Firm Age	-0.0035**	0.0003**	-0.0122	-0.0136
	[-2.2857]	[2.5841]	[-1.3088]	[-1.5018]
Tobin's Q	0.011	-0.0005	0.0089	0.0079
	[1.3530]	[-0.9646]	[1.0332]	[0.9195]
Z Score	-0.0026*	-0.0005***	-0.0022	-0.0019
	[-1.6965]	[-3.6612]	[-1.4752]	[-1.2805]
Constant	0.3275***	0.0045**	0.5443***	0.5696***
	[11.7479]	[2.3831]	[2.6260]	[2.8217]
Year Fixed Effect	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes
Observations	4,047	4,047	4,047	4,047
R-squared	0.0923	0.0801	0.0823	0.0826
Adjusted R-squared	0.0895	0.0791	0.0801	0.0804

Notes: The table reports the fixed effect estimates of the coefficients in equation (1). The dependent variable is the credit to firms, computed as the leverage, ratio of the proceeds from bond market, financial institutions, banking sector divided by total asset of the firms. The Data Appendix provides a detailed description of all the variables and their sources. t statistics are reported in brackets. Significance level levels: *** p¡0.01, ** p¡0.05, * p¡0.1.

Table 1.7: The Effect of Firm State-ownership, Productivity on Access to Credit

[Standard errors are clustered by year and by firm]	(1)	(2)	(3)	(4)
Dependent Variables	Leverage	probonds/TA	All Financial Loans/TA	Bank Loans/TA
State Shares Percentage	0.1930**	0.0147	0.1782***	0.1714***
	[2.1767]	[0.1397]	[2.6667]	[2.6749]
Firm total productivity	-0.0481	0.0274***	-0.0839*	-0.0933**
	[-1.2416]	[6.3594]	[-1.9583]	[-2.3449]
(State Shares Percentage	-0.0265**	-0.0048	-0.0331**	-0.0241**
× Firm Total Productivity)	[-2.1221]	[-0.2211]	[-2.1024]	[-2.1230]
Sales Growth	0.0215	-0.0004	0.0219	0.0234
	[0.8019]	[-0.2351]	[0.8062]	[0.8742]
Liquidity Ratios	-0.0043	0.0005***	-0.0048*	-0.0049*
	[-1.4818]	[2.6422]	[-1.6962]	[-1.7079]
Capital Intensity	0.0001	0.0001	0.0002	0.0001
	[0.0571]	[-0.0851]	[0.0644]	[0.0341]
ROA	-0.0074**	0.0006**	-0.0080***	-0.0074***
	[-2.5929]	[2.0241]	[-2.8415]	[-2.8112]
ROE	0.0008	-0.0002	0.0010	0.0010
	[0.6491]	[-1.3534]	[0.7962]	[0.7949]
Firm Age	-0.0051**	0.0001	-0.0051**	-0.0054**
	[-2.3623]	[-0.0469]	[-2.3732]	[-2.4859]
Tobin's Q	-0.0004	0.0013	-0.0017	-0.0043
	[-0.0560]	[1.2724]	[-0.2255]	[-0.6051]
Z Score	0.0008	-0.0004***	0.0013	0.0015
	[0.5277]	[-4.2058]	[0.8224]	[0.9053]
Constant	0.6313***	-0.1282***	0.7595***	0.8223***
	[3.2570]	[-6.1190]	[3.9253]	[4.3319]
Year Fixed Effect	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes
Observations	4,047	4,047	4,047	4,047
R-squared	0.0913	0.0878	0.1053	0.1063

Notes: The table reports the fixed effect estimates of the coefficients in equation (2).Data used to estimate firm's TFP in a Olley-Pakes method come from RESSET and Chinese Industrial Enterprises Database. t statistics are reported in brackets. Significance level levels: *** p¡0.01, ** p¡0.05, * p¡0.1.

Table 1.8: The Effect of Regional Financial Repression on Firm's Access to Credit

Dependent Variables	(1) Leverage	(2) Probonds /TA	(3) All Financial Loans/TA	(4) Bank Loans /TA
State Shares Percentage	0.0581*	0.0116	0.0576*	0.0543*
	[1.6719]	[1.1590]	[1.8031]	[1.7344]
Firm Total Productivity	0.0085	0.0069	0.0016	0.0176
	[0.0841]	[0.4094]	[0.0164]	[0.1772]
Financial Repression Index	0.1381	-0.002	0.1357*	0.1312*
	[0.7421]	[-0.2359]	[1.6919]	[1.6665]
(State Shares Percentage	0.0887**	0.0037	0.0845***	0.0830***
× Financial Repression Index)	[2.5531]	[0.9005]	[2.9267]	[2.8806]
(Firm Total Productivity	-0.0275	0.0005	-0.0276*	-0.0286*
× Financial Repression Index)	[1.5971]	[0.2633]	[-1.7445]	[-1.7186]
(State Shares Percentage	-0.1067**	0.0008	-0.1088**	-0.1042**
×Firm Total Productivity	[-2.1698]	[0.0905]	[-2.1686]	[-2.1338]
×Financial Repression Index)				
Sales Growth	-0.0037	-0.0026	0.0615	0.0652
	[-1.2671]	[-0.9992]	[1.3518]	[1.4330]
Liquidity Ratios	0.0745***	0.0005	-0.0831***	-0.0801***
	[3.4531]	[0.2604]	[-3.2725]	[-3.1717]
Capital Intensity	0.0057***	-0.0003***	0.0032	0.0032
	[2.7241]	[-2.9867]	[0.7968]	[0.7419]
ROA	0.0004	0.0012**	-0.0073*	-0.0072*
	[0.1502]	[2.1629]	[-1.9092]	[-1.9123]
ROE	0.0007	-0.0005*	0.0016	0.0016
	[0.6421]	[-1.9502]	[0.7196]	[0.7098]
Firm Age	0.0036	0.0001	-0.0182***	-0.0182***
	[0.1627]	[0.1744]	[-4.4617]	[-4.4765]
Tobin's Q	0.0044***	0.0017	-0.0171	-0.0177
	[3.3421]	[1.6043]	[-1.1980]	[-1.2361]
Z Score	-0.0283***	-0.0002	0.0145**	0.0139**
	[-3.2875]	[-0.5011]	[2.4511]	[2.3486]
Constant	-1.3781***	-0.1534***	1.4557***	1.4818***
	[-5.9531]	[-3.4918]	[3.9392]	[4.0645]
Regional Control Variables	+	+	+	+
Year Fixed Effect	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes
Region Fixed Effect	Yes	Yes	Yes	Yes
Observations	2,938	2,938	2,938	2,938
R-squared	0.3027	0.1972	0.2318	0.2335
Adjusted R-squared	0.2745	0.1647	0.2007	0.2024

Notes: The table shows the fixed effect estimates of the coefficients in equation (3). Financial repression index is the regional financial repression index (PFRI) contructed by PCA approach. Data on the financial repression index from year 1997 to 2010, sources are: hand collected from China Statistical Yearbook and Almanac of China's Finance and Banking. t statistics are reported in brackets. Significance level levels: *** p¡0.01, ** p¡0.05, * p¡0.1.

Table 1.9: The Finance-Growth Nexus and the Financial Repression Levels across Chinese Regions

Dependent Variable: Regional GDP per capita growth rate [Standard errors are clustered by year]	(1) OLS	(2) OLS	(3) Fixed Effect	(4) Fixed Effect	(5) Random Effect	(6) Random Effect
Financial Development	-0.0388***	-0.0241**	-0.0902***	-0.0730***	-0.0507***	-0.0309***
	[-4.3407]	[-3.1278]	[-8.1201]	[-5.0621]	[-6.4842]	[-2.8933]
Financial Repression	-0.0026***	0.001	-0.0068***	-0.003	-0.0037***	0.0006
	[-3.7633]	[0.7578]	[-6.9239]	[-1.3117]	[-4.5266]	[0.3236]
(Financial Development		-0.0030**		-0.0030*		-0.0034**
×Financial Repression)		[-2.3373]		[-1.8442]		[-2.3316]
Investment/GDP	0.1472***	0.1592***	0.0736***	0.0895***	0.1265***	0.1452***
	[4.5053]	[4.4681]	[3.0109]	[3.4688]	[5.4853]	[6.1637]
Trade volume/GDP	0.0159***	0.0160***	-0.0107	-0.01	0.0124	0.0134
	[3.5943]	[3.4643]	[-0.6485]	[-0.6082]	[1.3288]	[1.4694]
FDI/GDP	-0.0046*	-0.0038*	0.0038	0.0039	-0.0026	-0.0024
	[-2.0682]	[-1.9227]	[0.9179]	[0.9444]	[-0.7568]	[-0.7107]
Government expenditure/GDP	0.0604	0.0486	0.1399*	0.1028	0.1282***	0.0966**
	[0.9109]	[0.7155]	[1.8549]	[1.3228]	[2.6882]	[2.0530]
Constant	0.0989***	0.0755***	0.2092***	0.1846***	0.1181***	0.0868***
	[6.8498]	[4.2063]	[8.3145]	[6.5089]	[7.7098]	[4.5931]
Year Fixed Effect	No	No	Yes	Yes	No	No
Region Fixed Effect	No	No	Yes	Yes	No	No
Observations	249	249	249	249	249	249
R-squared	0.4853	0.4951	0.6551	0.6605	0.4778	0.4901
Adjusted R-squared	0.4725	0.4803	0.6022	0.6066	0.4321	0.4805

Notes: The table reports the OLS, FE and RE estimates of the coefficients in equation (3) in the text. The dependent variable is regional GDP growth rate, expressed as the GDP per capita growth rate in each Chinese region. The independent variable is the regional financial repression index interacted with the regional financial development levels in column 2,4 and 6. The regional financial development level is computed as the total loans to GDP ratio for each region. Data come from Almanac of China's Finance and Banking. t statistics are reported in brackets. Significance level levels: *** p¡0.01, ** p¡0.05, * p¡0.1.

Table 1.10: Pattern of External Financing and Financial Repression across Industries

[Standard errors are clustered by year] Dependent variable	(1) Industry growth rate	(2) Industry growth rate	(3) Industry growth rate
Financial repression index	-0.0005		-0.0015
	[-0.2218]		[-0.2618]
External finance dependence	0.1472	-0.3661*	-0.2627
	[1.5889]	[-1.7712]	[-0.7522]
Financial development index		0.0115	0.0001
		[0.4032]	[0.0013]
(Financial repression index	-0.0268**		0.0012
× External finance dependence)	[-2.0622]		[0.0199]
(Financial development index		0.2618*	0.2672*
× External finance dependence)		[1.8572]	[1.9300]
(Financial development index			0.0011
× Financial repression index)			[0.2135]
(Financial development index			-0.0218**
× External finance dependence			[-2.4082]
× Financial repression index)			
Investment/GDP	-0.0042	-0.001	-0.0046
	[-0.0678]	[-0.0185]	[-0.0710]
Trade/GDP	0.0031	0.0082	0.0055
	[0.0685]	[0.1810]	[0.1063]
FDI/GDP	-0.0007	-0.0005	-0.0005
	[-0.0566]	[-0.0397]	[-0.0376]
Government expenditure/GDP	-0.0942	-0.0729	-0.0423
	[-0.2799]	[-0.2082]	[-0.1132]
Constant	0.1269**	0.1053	0.118
	[2.0901]	[1.4314]	[1.2830]
Year Fixed Effect	Yes	Yes	Yes
Regional Fixed Effect	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes
Observations	491	491	491
R-squared	0.0523	0.0629	0.0834

Notes: The table reports the FE estimates of the coefficients in equation (4) in the text. The dependent variable is the industry growth rate, expressed as the average annual real growth rate of value added in industry s in region j over the period 1990-2010. The independent variable is the external finance needs of each industry interacted with the financial repression level in the firm location in column 1; the external finance needs of each industry interacted with the financial development level in the firm location in column 2; and the triple interaction term among industry external finance needs, financial repression and financial development level in column 3. The regional financial development level is computed as the total loans to GDP ratio for each region. Data come from Almanac of China's Finance and Banking. t statistics are reported in brackets. Significance level levels: *** p¡0.01, ** p¡0.05, * p¡0.1.

Table 1.11: Robustness Check - Demand-Side effect

	Leverage	Probonds/TA	All Financial Loans/TA	Bank Loans/TA
State Shares Percentage	-1.1641	-0.0024	-1.1617	-1.1804
	[-0.9222]	[-0.0218]	[-0.9412]	[-1.0421]
Firm total productivity	-0.0518	0.0220***	-0.0739*	-0.0877**
	[-1.2100]	[4.1626]	[-1.7475]	[-2.1413]
State Shares Percentage×Firm total productivity	0.2381	-0.0012	-0.2393*	-0.2396*
	[0.9508]	[-0.0538]	[-1.9785]	[-1.8654]
SOEbank=1	-0.1323	-0.1362***	0.0039	-0.0284
	[-0.3504]	[-2.8712]	[0.0101]	[-0.0748]
(SOEbank=1) × State Shares Percentage	10.6272**	0.1052	10.5220**	10.6425**
	[2.1786]	[0.2883]	[2.1545]	[2.1713]
(SOEbank=1)×Firm Total Productivity	0.0559	0.0283***	0.0276	0.0342
	[0.7354]	[2.8297]	[0.3511]	[0.4467]
(SOEbank=1)×State Shares Percentage	-2.1021**	-0.0218	-2.0803**	-2.1062**
×Firm Total Productivity	[-2.1778]	[-0.2896]	[-2.1546]	[-2.1774]
Control Variables	yes	yes	yes	yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes
Observations	4,047	4,047	4,047	4,047
R-squared	0.0852	0.0719	0.0876	0.0899

Notes: The table checks if the bank lendings towards state-owned but low productive firms is drived from demand-side instead of supply-side effect. SOEbank is the dummy variable indicate that the bank loan is borrowed from state-owned banks. t statistics are reported in brackets. Significance level levels: *** p¡0.01, ** p¡0.05, * p¡0.1.

Table 1.12: Robustness Check - Omitted Variable Bias

Dependent variable: Industry value-added growth rate	(1) Trade/GDP	(2) FDI/GDP	(3) Government/GDP
Trade×financial development	-0.0071		
	[-0.1495]		
Trade×External finance dependence	-0.2748		
	[-0.6802]		
Trade×External finance dependence	0.2413		
×Financial development index	[0.6709]		
FDI×External finance dependence		0.2040	
		[0.4214]	
FDI×Financial development index		-0.0099	
		[-0.2839]	
FDI×External finance dependence		-0.0350	
×Financial development index		[-0.0859]	
Government expenditure×External finance dependence			1.9289*
			[1.7796]
Government expenditure×Financial development index			-0.2657
			[-0.4084]
Government expenditure × External finance dependence			-2.0628
×Financial development index			[-1.1731]
Control variables	yes	yes	yes
Year Fixed Effect	Yes	Yes	Yes
Regional Fixed Effect	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes
Observations	491	491	491
R-squared	0.0421	0.0425	0.0888

Notes: The table reports the robustness check of the potential threat from omitted variable bias. The omitted variables check in the table include regional openness, FDI and government expenditure. Standard errors are clustered by industry and year. t statistics are reported in brackets. Significance level levels: *** p¡0.01, ** p¡0.05, * p¡0.1.

Table 1.13: Pattern of external financing and growth rate across industries measured by different firm size

[Standard errors are clustered by year] Dependent variable	(1) Industry growth rate (firm size< 25%)	(2) Industry growth rate (25%<firm size<50%)	(3) Industry growth rate (50%<firm size<75%)	(4) Industry growth rate (75%<firm size<100%)
Financial repression index	-0.0038	-0.0064	0.0052	-0.0028
	[-0.2672]	[-0.5008]	[0.4452]	[-0.2786]
External finance dependence	-0.4274	-0.783	-0.3073	0.5641
	[-0.4843]	[-1.0129]	[-0.4792]	[0.8918]
Financial development index	-0.0449	0.0549	0.0527	-0.0581
	[-0.3774]	[0.5099]	[0.5716]	[-0.7039]
(Financial development index	0.3627	0.8937	0.2244	-0.1792
× External finance dependence)	[0.4848]	[1.2819]	[0.3939]	[-0.3541]
(Financial development index	0.0046	0.0052	-0.0103	0.004
×financial repression index)	[0.3687]	[0.4782]	[-0.9434]	[0.4256]
(External finance dependence	0.0679	-0.0033	0.2564**	-0.2696**
×financial repression index)	[0.4760]	[-0.3612]	[2.2608]	[-2.5624]
(Financial development index	-0.0745	-0.3107***	-0.2462**	-0.2115**
×External finance dependence	[-0.5805]	[-2.9508]	[-2.2105]	[2.2088]
×Financial repression index)				
Control variables	yes	yes	yes	yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Regional Fixed Effect	Yes	Yes	Yes	Yes
Industry Fixed Effect	Yes	Yes	Yes	Yes
Observations	406	445	505	608
R-squared	0.0481	0.0404	0.0465	0.0614

Notes: The table reports the robustness check of the potential threat from sample firm size changes on the pattern between firm external finance needs and financial repression. Standard errors are clustered by industry and year, t statistics are reported in brackets. Significance level levels: *** p¡0.01, ** p¡0.05, * p¡0.1.

APPENDIX A
THE FINANCE-GROWTH NEXUS IN A CROSS-COUNTRY STUDY

Panel A: All countries included in cross-countries comparison sample - 79 countries

Albania	Denmark	Jamaica	Philippines	United.Kingdom
Algeria	Ecuador	Japan	Poland	United.States
Argentina	Egypt	Jordan	Portugal	Uruguay
Australia	El Salvador	Kenya	Romania	Vanuatu
Austria	Estonia	Korea,.Rep	Russianna Federation	Venezuela, RB
Azerbaijan	Ethiopia	Madagascar	Senegal	Vietnam
Bangladesh	Finland	Malaysia	Singapore	Zambia
Belarus	France	Mexico	South.Africa	
Belgium	Germany	Morocco	Spain	
Bolivia	Ghana	Nepal	Sri Lanka	
Brazil	Greece	Netherlands	Sweden	
Bulgaria	Guatemala	New.Zealand	Switzerland	
Cameroon	Hungary	Nicaragua	Thailand	
Canada	India	Nigeria	Tunisia	
Chile	Indonesia	Norway	Turkey	
China	Ireland	Pakistan	Uganda	
Colombia	Israel	Paraguay	Ukraine	
Costa.Rica	Italy	Peru	United Arab Emirates	

Panel B: Countries demonstrate negative Finance - Growth paths - 24 countries

Algeria	Chile	Greece	Nigeria	Sri Lanka
Argentina	Ecuador	Madagascar	Philippines	Turkey
Brazil	Egypt	Malaysia	Portugal	Uganda
Cameroon	Ethiopia	Mexico	Romania	Uruguay
China	Ghana	Nepal	Senegal	

APPENDIX B
DESCRIPTION OF VARIABLES FOR FINANCE - GROWTH PATH CROSS-COUNTRY STUDY

Financial Development	
LLY	Liquid liabilities of the financial system divided by GDP, a measure of the size of financial system.
BANK	Total banking assets to GDP ratio, a measure of the size of banking sector.
PRIVATE	Credit to private enterprises divided by GDP, which measures the size of credit provided to private enterprises by financial institutions.
STATE	Credit to state-owned enterprises divided by GDP, which measures the size of credit provided to state-owned sectors by financial institutions.
Financial Repression	
FR	Financial repression index which constructe from IMF's financial reforms database. We revised the IMF financial liberalization index and generate: $Financial\ repression\ index = 1 - financial\ reform\ index$. Our FR index covers 91 countries economies over 1973 - 2005 and ranged from 0 -1. 1 = Fully FinancialRepressed and 0 = Fully Financial Liberalized.
Control Variables	
LYO	Log of the initial income level at the beginning year of each 5-years-interval. i.e. the log of real per capital GDP for 1960 in the 1960-1965 regression, for 1965 in the 1965 - 1970 regression, and so on.
LSEC	Log of the intial human capital in the forms of educational attainment (Male upper-level schooling years) at the beginning year of each 5-years-interval.
LFIN	Log of the intial financial development level at the beginning year of each 5-years-interval, in the forms of domestic credit provide to private enterprises divided by GDP.
GOV	The ratio of government consumption to GDP.
INV	The ratio of real investment to real GDP, which measures the saving rate in the neoclassical growth model.
Openness	The ratio of exports plus imports to GDP, a measure of the extent of international openness.
FDI	Foreign Direct Investment to GDP ratio, a measure of credit inflows that provided by foreign countries.

APPENDIX C
DESCRIPTION OF VARIABLES FOR FIRM-LEVEL EVIDENCE

Variable	Description
Leverage	Book leverage ratios of the firm, total long-term liabilities divided by total asset. $(From\ WIND)$
Proceeds from bond market	Firm's total amount of bond proceeds to total liabilities ratio. $(From\ CSMAR)$
Financial institution loans	Firm′s total borrowings from financial institutions to total liabilities ratio. $(From\ CSMAR)$
Bank loans	Firm's total borrowings from banking sector to total liabilities ratio. $(From\ CSMAR)$
State-owned shares percentage	The percentage of firm's shares outstanding owned by the state. $(From\ CSMAR)$ or local government, otherwise zero. $(From\ CCER\ and\ CSMAR)$
Control Variables	
Sales Growth	A company's annual growth rate of revenues (sales). A measure of firm growth. $(From\ CSMAR)$
Liquidity ratios	The ratio of current assets to current liabilities. Also refers to working capital ratio. $(From\ WIND)$
Firm Age	Firm establish year - year t. $(From\ WIND)$
ROA	Annual return on assets of the company. A measure of firm profitability. $(From\ WIND)$
Tobin's Q	The ratio of the market value of equity to the book value of equity. $(From\ WIND)$
Capital Intensity	The ratio of capital expenditure to net sales. $(From\ WIND)$
Altman's Z score	A score for predicting bankruptcy, which refers to firm's financial soundness. $(From\ WIND)$
Firm location	The province where firm headquartered.
Industry Classification	Industry Classification of Listed Companies defined by China Securities Regulatory Commission $(From\ WIND)$

APPENDIX D
SUMMARY OF THE ANALYTIC METHOD AND REGRESSIONS TESTS IN THE PAPER

Panel A	Main input variables	How measured
	Credit to firms	Credit amount allocated to sample firms in every year
	Firm's state-ownership	Firm state-owned shares/ Total Shares Percentage
	Firm's productivity	Firm's Total productivity calculated from Ollye-Pakes methedology
	Financial Repression levels	Financial repression index
	Financial Development levels	Total Credit/ GDP ratio
	Economic Growth rate	GDP growth rate
	External finance dependence index	(Capital expenditures - operating cash flows)/Capital expenditures
Panel B	Tests	How measured
[1]	Existence of credit misallocation in terms of more credit is allocated to state-owned but relatively lower productive firms.	Regress credit to firms on a) the firm's state-ownership; b) the firm's productivity and c) the interaction term between these two factors. (firm-level analysis)
[2]	The Bank lending bias is associated with financial repression.	Regress credit to firms on a) the interaction term between firm's state-ownership and its location's financial repression index, and b) the interaction term between firm's productivity and its location's financial repression index. (firm-level analysis)
[3]	Financial repression is associated with a weaker finance-growth correlation	Regress the economic growth rate in each Chinese region on the interaction term between the financial development levels and the financial repression levels in the corresponding region. (regional-level analysis)
[4]	The financial repression weakens the positive finance - growth nexus through creating a credit misallocaiton in the economy.	Rajan-Zingales Method: Check if the more financially dependent firms are suffered more from the credit misallocation on their growth rate, which expressed as that retain the same finanical development levels and regional economic fundamentals, the more financially dependent firms grow relatively slower than other industries in highly financial repressed regions.

APPENDIX E
SUMMARY OF THE ESTIMATION RESULTS OF REGRESSION TESTS IN THE PAPER

Panel A	Main input variables	How measured
	Credit to firms	Credit amount allocated to sample firms in every year
	Firm's state-ownership	Firm state-owned shares/ Total Shares Percentage
	Firm's productivity	Firm's Total productivity calculated from Ollye-Pakes methedology
	Financial Repression levels	Financial repression index
	Financial Development levels	Total Credit/ GDP ratio
	Economic Growth rate	GDP growth rate
	External finance dependence index	(Capital expenditures - operating cash flows)/Capital expenditures
Panel B	Tests	Estimation results obtained
[1]	Existence of credit misallocation in terms of more credit is allocated to state-owned but relatively lower productive firms.	Credit to firms is positively correlated with the firm's state-ownership; but negatively correlated with the firm's productivity; and firm productivity's marginal effect on accessing to credit decreases with the firm's state-ownership level.
[2]	The Bank lending bias is associated with financial repression.	Stronger financial repression is associated with greater bank lending to state-owned but low productivity firms.
[3]	Financial repression is associated with a weaker finance-growth correlation	The negative interaction effect between financial repression and financial development on growth keeps increasing with the regional financial repression levels. These findings imply that negative finance-growth nexus is more obvious in highly financial repressed regions.
[4]	The financial repression weakens the positive finance - growth nexus through creating a credit misallocaiton in the economy.	More financially dependent industries grow disproportionately slower in highly financially repressed regions, and financial development's positive effect on industry growth rate decreases with its location's financial repression level.

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Chapter 2

Financial Development, Risk Diversification and Project Finance

2.1 Introduction

As estimated in the McKinsey Global Institute by (lund2013financial), the amount of infrastructure investment needs up to the year 2030 is between USD 57 tillions ("tn") and USD 67 tn. Traditionally, infrastructure projects have been financed by the public sector, but with public finance straitened, governments are unable to make up all of the infrastructure funding needs. Therefore, the World Economic Forum (WEF) reports that close to 2 tn US dollar per annum will be required to meet the infrastructure needs of Europe economies by 2030, and the infrastructure spending gap is expected to be USD 9 tn in China, USD 2.7 tn in India, and USD 2 tn in Russia.

How to fill the huge financing shortfall in infrastructure investment? One solution is shifting infrastructure financing from the public to the private sector, and adopting the funding mode of public-private partnership (PPP). However, with a larger pool of savings need to be intermediated into infrastructure finance, this shifting poses important challenges for several emerging economies' financial markets in mobilizing financial resources to fund infrastructure. As a result, in the context of the present economic downturn, not only it is essential to examine infrastructure investment as a major contributor to a higher economic growth (balesh2012issuance), but also it is critical to study how these investments can be organized and supported by financial mechanism.

This paper provides direct empirical evidences on the potential role of financial markets development, which reflects as financial deepening and innovation, in addressing the corresponding country's infrastructure funding needs. First, we analyze if one country's financial markets tend to deepen during periods of rapid infrastructure investment. Second, we assess if domestic financial sector development changes private investors' participation into infrastructure-related projects.

To guide the empirical analysis, we develop a model corresponds to an economy with endogenous commodity space because the set of traded financial assets is determined in equilibrium. We use the competitive equilibrium concept suggested by (hart 1979)and (makowski 1980) for this type of economy.

The competitive equilibrium is Walrasian conditional on the set of sectors that are open, and the number of open sectors is determined through a free-entry condition. Although all agents are price takers and there are no unexploited gains in any activity, the competitive equilibrium is inefficient and too few projects are undertaken. The underlying problem is that the opening of an additional sector creates a positive pecuniary externality on other open projects since consumers now bear less risk when they buy these securities. At the same time, the government can borrow from private investors on the securities market to fund the infrastructure investment, which affects the productivity of the economy. The model predicts that the probability of infrastructure-related projects can be opened is linearly increase with the number of agents entry to the financial markets.

The model has two main qualitative implications. First, financial deepening, defined by improving domestic financial inclusion and capital market development, help harness the increased saving from rising working - age population, which can be intermediated to finance the infrastructure investment in these economies. Meanwhile, higher financial inclusion could raise financial savings and allow households better access to credit.

Second, financial innovation and integration could improve the allocation of savings and strengthen domestic resilience against external shocks, which leads to a better risk diversification of the economy. With sound prudential frameworks and pricing of risks, financial innovation channel large savings in the aging economies to finance infrastructure gaps in these economies, achieves higher yields in return, and attracts more private investment participate into the infrastructure project finance.

We test the implications of the model by using a sample of 129 countries during year 1990 - 2015, and we establish convincing evidences of positive relationship between financial markets size and project finance volume worldwidely. Our empirical results show that the countries with larger stock market and banking sector size also have higher project finance volume, higher project finance volume to investment ratio, and higher private to total investment ratio in PPP projects. However, we can not find solid evidences that the development of bond market has positive impacts on project finance. One possible explaination is that bond financing accounts for only a small part (10%) of total project finance, and a ”crowding -out” effect between project finance bonds and other asset-class corporate bonds exists on the bond market.

This paper extends current and past literature on several dimensions as follows.

First, this paper relates to the growing literature on capital accumulation and growth (greenwood 1989 , bencivenga 1991, saint 1992, and zilibotti 1995). Our work confirms that capital accumulation is associated with an increase in the volume of intermediation and financial activities as a proportion of the gross domestic product (see the empirical findings of pagano

1993),and (king 1993). But different from previous literatures, our model also shows that better diversification opportunities enable more funds to be allocated to productive projects, and more investors would like to participate into government service projects. In constrat to most existing theories which derive their dynamics from the presence of fixed costs of financial intermediation, our model has no explicit costs of financial relations. Instead, all costs arise endogenously because of the diversification efforts of agents.

Second, this paper relates to the literatures refer to the relationship between infrastructure development and economic growth. (roller 2001) using data for 21 OECD countries for over 20 years, find evidence of a significant positive causal link between telecommunication infrastructure and economic growth. (calderon 2004) find positive and significant output contributions of telecommunications, transport and power in a sample of Latin American countries. Beyond growth, however, there is little analysis of how these improvements in infrastructure are financed, and which part of the financial sector and financial instruments are used in infrastructure financing. Our paper provides a first stab at each of these questions, as well as the issue of growth and infrastructure.

Third, this paper relates to the recent empirical studies concerning the risk allocation in PPP projects. For instances, Li et al. (2005) developed a preferred risk allocation scheme for PPP projects in the United Kingdom based on an opinion survey with 53 suitable responses; Roumboutsos and Anagnostopoulos (2008) conducted a similar survey using the same questionnaire in Greece and compared the findings to those in the UK; Jin and Doloi (2008) gathered data from an industry-wide survey to test the theoretical framework for understanding risk allocation practice in PPP projects. However, this paper aims not only to conduct research on risk allocation and management with regard to PPP projects, but also shows that the development of financial markets will increase the volume of PPP project through improving the risk allocation efficiency in PPP projects.

The rest of the article is organized as follows. Section 2 presents an overview of financing channels that the private sector can invest money in infrastructure projects, and discuss their relationships with financial market development. Section 3 describes our theoretical model and develops our hypotheses. Section 4 introduces data of the financial development and project finance, and provides empirical evidences of the model predictions. Section 5 concludes.

2.2 Infrastructure financing, project finance and financial markets

Infrastructure can be financed using different capital channels. The evolution of capital markets shows that financial innovation develops new financial instruments to attract a larger amount of funds in response to supply and demand. Figure 1 provides an overview of the different alternatives available to private investors. It divides the financial instruments for private investors into

equity and debt. Equity and debt can be listed and traded on an exchange (public) or unlisted and traded over the counter (OTC; private). In the case of listed equity and market-traded debt, we make reference to a traditional investment in listed infrastructure. This is the area where mutual funds and exchange traded funds (ETFs) have developed products to be included in the portfolios of retail investors, high net worth individuals and institutional investor.

[Figure 1 Here]

The most widespread financial technique that financial markets have developed for the participation of private capital in unlisted infrastructure is project finance.

In project finance, equity investors, banks and other lenders invest money on the exclusive basis of a stand-alone valuation of a single infrastructure project. This single project is incorporated in a Special Purpose Vehicle (SPV). On the equity side, the project is financed off balance sheet by industrial developers, public bodies and financial investors (known as project sponsors) while debt is provided on a no- or limited- recourse basis. The assets of the SPV become collateral for the loans although they play a secondary role compared to project cash flows.

At the same time, rights and obligations associated with an investment project are related to the SPV only. The separate incorporation of the project in a specially designed vehicle is justified by the need of investors to enhance the transparency of the valuation process. The existence of a SPV implies that previous liabilities of sponsors do not reduce the credit rights of the lenders of the vehicle and the no- or limited recourse clause excludes the co-insurance effect of a traditional corporate finance transaction. The result is that investors interested in a specific project can focus their valuation only on a given, well ring-fenced transaction. Project finance can be financed using different capital channels:

2.2.1 Project finance loans

Syndicated loans that issued by banking sectors is used worldwide to support project finance. As shown in Figure 2 by using Thomson OneBanker data, in 2008 the global project finance loans market reached a record peak of USD 647 billions(”bn”) but then declined sharply in 2009, and recovered somewhat thereafter,to an amount of USD 604 bn at the end of 2013. But syndicated loans is still the most common form used in project finance, which accounted for approximately 70% percentage of total project finance volume.

[Figure 2 Here]

2.2.2 Project finance bonds

The alternative to syndicated loans is represented by the financing of infrastructure projects on the bond market. In this case, we refer to project bonds, i.e. bonds that are issued on the bond

market and sold to either banks or, more frequently, to other bond investors. The bond can be a straight bond, whose creditworthiness depends on the cash flow performance of the vehicle, or a secured bond assisted by credit enhancement(CE) mechanisms. In the past few years, at least until the outburst of the financial crisis, one of the most used forms of CE was a monoline insurance provided by highly rated monoline institutions.

By looking at the data, project bonds still represent a limited amount of the total debt committed to infrastructure financing, although increasing rapidly. Figure 2 shows that, during the 2007-12 period, the amount issued by SPVs via project bonds bounced between USD 28.5 bn and USD 127 bn. 2013 registered a record amount of USD 49 bn in project bonds issues representing slightly more than 10% of the total debt provided to infrastructure. The strong increase between 2008 and 2010 was in part due to the overall decline of bond yields on all major asset classes and the consequent need for fixed income investors to find other investments with a better risk/return profile than more traditional sovereign and corporate bonds.

2.2.3 Project finance equity

Equity can be contributed by sponsors using a variety of structures: ordinary share capital, shareholder loans, which can provide two advantages, being (1) a tax shield through tax deductible shareholder loan interest and (2) an optimized returns distribution profile, where shareholder loan repayments of interest and principle are not restricted by balance sheet retained earnings. All these equity financing of infrastructure-related projects need to generate credit via stock market.

Similarly to what has been shown for the market of infrastructure debt, in Figure 2, the equity market has also gone through a process of significant transformation in the past few years.

Before the mid-2000s, almost all infrastructure projects received equity financing by industrial sponsors, typically the off taker, the Engineering Procurement and Construction contractor, the suppliers or the operation and maintenance agent. Starting from the mid-2000s, data reported by Probitas Partners (2013) indicate a clear upward trend in global infrastructure fund raising for private equity investments, from USD 2.4 bn in 2003 to the record peak of USD 139.7 bn in 2010, representing 15% of total project finance loans in the same year. After the 2008 crisis, volumes were squeezed and at the end of 2013 they accounted for only slightly more than 10.5% of total project finance loans available.

Although infrastructure can be financed with different capital channels, all above mentioned financing channels require financial markets and intermediaries to play an important role in shaping financial solutions and attracting the highest number of investors. Therefore, it is crucial to study how the development of financial mechanisms affect the infrastructure financing in one economy.

2.3 The Model

2.3.1 The Economic Environment

In this section, we present a simple model to illustrate the effects of financial development, or financial innovation's effects on infrastructure investment in open economies.

Considering an overlapping generations model with competitive markets and non-altruistic agents who live for two periods. The production side of the economy consists of a single final-good sector and a continuum one of intermediate sectors (projects). The final good sector transforms capital and labor into final output. Intermediate sectors transform savings of time t into capital to be used at time $t+1$ without using labor.

There is a continuum of agents with mass a in each living generation, and agents of the same generation are all identical. In their youth, our agents work in a final-sector firm and receive the wage rate of this sector. At the end of their young period, agents make their consumption, saving, and portfolio decisions. Agents' savings can be invested either in risky securities or in a safe asset that has a non-stochastic gross rate of return equal to r

After agents make their investment decisions, the uncertainty unravels, and the security returns and the amount of capital brought forward to the next period are determined. Capital that agents invest in their retirement period is sold to final-sector firms and fully depreciates after use.

2.3.2 Uncertainty

Uncertainty is introduced into our model by using a continuum of equally likely states represented by the unit interval. Intermediate sector $j \epsilon [0,1]$ pays a positive return only in state j and nothing in any other state. Therefore, investing in a sector is equivalent to buy a basic Arrow security that pays in only one state of nature. More formally, an investment of F^j in sector j pays the amount RF^j if state j occurs and $F^j \geqslant M_j$, and nothing otherwise.

The requirement $F^j \geqslant M_j$ implies that all intermediate sectors have linear technologies, but some require a certain minimum size, M_j before being productive. The distribution of minimum size requirements is given by:

$$M_j = max \left\{ 0, \frac{D}{1-\gamma}(j-\gamma) \right\} \tag{2.1}$$

Sectors $j \geqslant \gamma$ have no minimum size requirement, and for the rest of the sectors, the minimum size requirement increases linearly. The results are not dependent on this linear specification, and the ranking of projects from lower to higher size occurs without loss of generality and imposes no timing constraint.

This formalization contains the two features that will drive our results:

(i) risky investments have a higher expected return than the safe asset, and

(ii) different projects are imperfectly correlated so that there is safety in variety.

A convenient implication of this formulation is that if a portfolio consists of an equiproportional investment F in all projects $j \epsilon \overline{J} \subseteq [0,1]$ and the measure of the set $\overline{J}$ is p, then the portfolio pays the return RF^j with probability p and nothing with probability $1-p$.

Note that if the aggregate production set were convex (i.e., $D=0$), the allocation problem of the economy would be trivial: all agents would invest an equal amount in all intermediate goods sectors and diversify all the risks. However, in the presence of nonconvexities, as captured by our minimum size requirements, there is a trade-off between insurance and high productivity.

2.3.3 Households

The preferences of households over final goods are defined in our model as

$$E_t U(c_t^t, c_{t+1}^{t,j}) = log(c_t^t) + \beta \int_0^1 \log(c_{t+1}^{t,j}) dj, \tag{2.2}$$

where j represents the states of nature, which are assumed, as noted above, to be equally likely. c_{t+1}^t is time $t+1$ consumption of an individual born in period t. Each agent discounts the future at the rate β and has a rate of relative risk aversion equal to 1. Although the realization of the state of nature does not influence the productivity of the final-good sector, it affects consumption since it determines how much capital each agent takes into the final-good production stage and the equilibrium price of capital.

Members of the initial old generation are each endowed with k_0 units of physical capital. Individuals in subsequent generations are endowed with one unit of leisure in their youth and h, units of human capital. Human capital is accumulated to the production equation:

$$h_t = H(h_{t-1}, E_{t-1}) \tag{2.3}$$

Where E_{t-1} is the public expenditures on education in period $t-1$, and h_0 is an initial human capital condition.

2.3.4 Firms

In our model, each firm produces final output y at time t according to the technology:

$$y_t = A G_t^{\theta} k_t^{\alpha} (n_t h_t)^{1-\alpha} \tag{2.4}$$

In equation [4], k_t is the amount of capital rented by the firm, $n_t h_t$ is the amount of skill-weighted or effective labor input, and G_t is the aggregate stock of public capital available to all firms at time t. The public factor G_t is a common external input to each firm's production function here. And income is taxed at a uniform rate τ in order to finance the public investment in infrastructure.

To simplify this model, in this section, we consider the following version of the above model: $H(h, E) = 1$, $E = 0$ for all t, i.e., human capital endowments remain the same in each period. And we normalize the labor endowment of each young worker to $1/a.$, since the mass of agents is a and labor supply is inelastic, then we have $n_t h_t = 1$.

The aggregate stock of capital depends on the realization of the state of nature. If the state of nature is j, then $k^j_{t+1} = \int_{\Omega_t}(r\Phi_{i.t} + RF^j_{i,t})di,$, where $F^j_{i,t}$ is the amount of savings invested by agent $i \in \Omega_t$ in sector j. $\Phi_{i.t}$ is the amount invested in the safe asset, and it is the set of young agents at time t. Since both labor and capital trade in competitive markets, equilibrium factor prices in state j are given as

$$W^j_{t+1} = (1-\alpha)AG^{\theta}_{t+1}\left(k^j_{t+1}\right)^{\alpha} \tag{2.5}$$

$$\rho^j_{t+1} = \alpha AG^{\theta}_{t+1}\left(k^j_{t+1}\right)^{\alpha} \tag{2.6}$$

Therefore, the wage earning of a young agent conditional on the realization of state j will be $w^j_{t+1} = W^j_{t+1}/a$.

At the same time, each firm hires capital and effective labor to maximize:

$$\max\ AG^{\theta}_t K^{\alpha}_t (n_t h_t)^{1-\alpha} - w_t n_t h_t - q_t k_t \tag{2.7}$$

where ρ is the rental rate on capital. The technology exhibits constant returns to private factors so that the profits are zero in equilibrium. The accumulation of public capital is:

$$G_{t+1} = I^G_t + (1-\delta_G)G_t \tag{2.8}$$

Where I^G_t is the public investment in period t. We assume that the government's budget is balanced, and the public capital depreciates at the rate δ_G..

2.3.5 Intermediate Goods and Portfolio Decisions

The intermediate sector firms are run by agents who compete to get funds by issuing financial securities and selling them to other agents in the stock market. Each agent can run at most one project, although more than one agent can compete to run the same project (see for generalizations).

Agent decisions are made in two stages. In the first stage, each agent $i \in \Omega_t$ takes the announcements of all other agents as given and announces his plan to run at most one project in the intermediate sector and sell an unlimited quantity of the associated basic Arrow security.

Securities are labeled by the indices of the project to which they are attached. Therefore, one unit of security j entitles its holder to R units of $t+1$ capital in state of nature j. We denote the unit price of security (in terms of savings of time t) by $P_{i,j,t}$ and subscript i implies that this security is issued by agent i. Put differently, agent i is managing investments in project j on

behalf of other agents, and for every unit of savings he collects from others, he invests $\frac{1}{P_{j,i,t}}$and keeps the remaining $\frac{(P_{j,i,t}-1)}{P_{j,i,t}}$ as his commission.

A first-stage strategy for agent i at time t is an announcement $Z_{i,t} = (j, P_{i,j,t}) \in [0,1] \times \mathbb{R}^+$ specifying the project i intends to run and the price at which he sells the corresponding security. If an agent $i^{'}$ decides to run no project, then $Z_{i^{'},t} = \varnothing$. The function $Z_t : \Omega_t \longrightarrow [0,1] \times \mathbb{R}^+$ summarizes the announcements of all agents at time t.

We also denote the subset of all projects that at least one agent proposes to run at time t by $J_t(Z_t) \subseteq [0,1]$; thus $J_t(Z_t) = \{j \in [0,1] | \exists i, s.t. Z_{i,t} = (j, P_{j,i,t})\}$. Finally, we define $P_t(Z_t) : J_t(Z_t) \longrightarrow R^+$ as the function that summarizes the minimum price for each security $j \in J_t(Z_t)$ induced by the set of announcements Z_t. Formally, $P_t(Z_t) = \{P^j(Z_t)\}_{j \in J}$ and $P^j(Z_t) = min_{\{i \, s.t. Z_{i,t} = (j, P_{i,j,t})\}}(P_{i,j,t})$. From now on, the index i will be dropped whenever this will cause no confusion.

In the second stage, all agents behave competitively, take as given the set of securities offered and the price of each security announced in the first period, and announce their savings s_t, their demand for the safe asset Φ_t and their demand for each security j, F_t^j. Therefore, optimal consumption, saving, and portfolio decisions can be characterized by

$$\max_{s_t,\, \phi_t,\, \left\{F_t^j\right\}_{0 \leqslant j \leqslant 1}} \; log(c_t^t) + \beta \int_0^1 \log(c_{t+1}^{t,j}) dj \tag{2.9}$$

$$s.t. \; \phi_t + \int_0^1 P_t^j(Z_t) F_t^j dj = s_t \tag{2.10}$$

$$c_{t+1}^{t,j} = \rho_{t+1}^j (r\phi_t + RF_t^j) \tag{2.11}$$

$$F_t^j = 0 \; \forall j \notin J_t(Z_t) \tag{2.12}$$

$$c_t + s_t \leqslant (1-\tau) w_t + v_t \tag{2.13}$$

where $P_t^j(Z_t)$ is the minimum price at which security j is offered, ρ_{t+1}^j is the price of capital in state j, and v_t is the commission the agent obtains for running a project. For all $i \in \Omega$ such that $Z_{i,t} = \varnothing$, $v_{i,t} = 0$, and for an agent who runs project j,

$$v_{i,t} = \frac{(P_{j,i,t} - 1)}{P_{j,i,t}} \widehat{F}_t^{j,i,t}, \tag{2.14}$$

where $\widehat{F}_t^{j,i,t}$ is the total amount of funds that he raises. In this stage, each agent takes w_t, P_t^j, ρ_{t+1}^j and the set of risky assets $J_t(Z_t)$ as given. (The wage earning of the agent depends on the realization of the state of nature in the previous period. To simplify notation, we suppress this dependence.)

2.3.6 Equilibrium

Definition 1. An equilibrium at time t is a set of first-stage announcements Z_t^*; second-stage saving and portfolio decisions s_t^*, F_t^*, and ϕ_t^*; and factor returns $\left\{W_{t+1}^j\right\}_{j\in[0,1]}$ and $\left\{\rho_{t+1}^j\right\}_{j\in[0,1]}$ such that

(1) given s_t, ϕ_t, and $\left\{F_t^j\right\}_{0\leqslant j\leqslant 1}$, the allocation$(c_t^t, c_{t+1}^{t,j})$ solves the generation t young agent's problem,

(2) given s_t, and ρ_t, the allocation (k_t, n_t, y_t) maximizes the representative firm's profits subject to the production technology.

(3) $k_{t+1}^j = \int_{\Omega_t}(r\Phi_{i.t} + RF_{i,t}^j)di$, $n_t = 1$

(4) $\rho_t = \alpha A G_t^\theta k_t^{\alpha-1}$

(5) $I_t^G + E_t = \tau w_t h_t$

(6) $G_{t+1} = I_t^G + (1-\delta_G)G_t$

The first four conditions are standard, while the fifth condition is our balanced budget assumption and the sixth describes the evolution of public capital and human capital. (Each member of the initial old generation consumes all his wealth.)

We start the characterization of equilibrium with two useful observations. First, because preferences are logarithmic, the following saving rule is obtained irrespective of the risk-return trade-off:

$$s_t^* \equiv s_t^*(w_t) = \frac{\beta}{1+\beta} w_t \tag{2.15}$$

Given this results, an agent's optimization problem can be broken into two parts: First, the amount of savings is determined, and then an optimal portfolio is chosen. Second, free entry into the intermediate good sector implies that $v_{i,t} = 0$ for all t, i.

LEMMA 1. Let Z_t^* be the set of equilibrium announcements at time t.. Then (i) $F_i^{j*} = F_t^{j'*}$ for all $j, j\prime \in J_t(Z_t^*)$, and (ii) $J_t(Z_t^*) = [0, m_t(Z_t^*)]$ for some $m_t(Z_t^*) \in [0,1]$.

Given lemma 1 and (8), the problem of maximizing $\int_0^1 log[\rho_{t+1}^j(RF_t^j + r\phi_t)]dj$ with respect to t and $\{F_t^j\}$ can be written as

$$\max m_t log[\rho_{t+1}^{(q_G)}(RF + r\phi_t)] + (1-m_t)log[\rho_{t+1}^{(q_B)}(r\phi_t)] \tag{2.16}$$

$$s.t.\ \phi_t + m_t F_t = s_t^* \tag{2.17}$$

where m_t and ρ_{t+1}, are taken as parametric by the agent, and s_t^* is given by (10). The term $\rho_{t+1}^{q_B} = \alpha(r\phi_t)^{\alpha-1}$ is the marginal product of capital in the "bad" state, when the realized state is $j > m_t$ and no risky investment pays off; $\rho_{t+1}^{(q_G)} = \alpha(RF + r\phi_t)^{\alpha-1}$applies in the "good state," that is, when the realized state is $j \leqslant m_t$. Simple maximization gives

$$\phi_t^* = \frac{(1-m_t)R}{R-rm_t} s_t^* \tag{2.18}$$

and

$$F_t^{j,*} = \begin{cases} F_t^* \equiv \frac{R-r}{R-rm_t} s_t^* \ \forall j \leq m_t \\ 0 \ \ \forall j > m_t \end{cases} \tag{2.19}$$

As a result, we will have

$$F_t^{j,*} = \begin{cases} F_t^* \equiv \frac{R-r}{R-rm_t} \frac{\beta}{1+\beta}(1-\alpha) A G_t^{\theta} k_t^{\alpha} \ \forall j \leq m_t \\ 0 \ \ \forall j > m_t \end{cases} \tag{2.20}$$

Equation [20] implies that the aggregate demand for each risky asset, aF_t^*, is a function of the proportion of securities that are offered, the volume of infrastructure investment, and the volume of private investment volume.

2.3.7 Investment in infrastructure (Working in progress)

To study the effect of infrastructure investment on long run growth, consider the following version of the above model: $H(h, E) = 1, E = 0$ for all t, i.e., human capital endowments remain the same in each period and the tax revenues are used only to finance public investment in infrastructure (infrastructure investment =taxation). Long-run growth in this model depends on the returns to the augmentable factors, public capital, G, and private capital, k.

Optimization by the representative young agent of generation t yields

$$s_t^t = \beta(1-\tau) w_t / (1+\beta)$$

Profit maximization by firms yield

$$w_t = (1-\alpha) A G_t^{\theta} k_t^{\alpha}$$

$$\rho_t = \alpha A G_t^{\theta} k_t^{\alpha-1}$$

Therefore, solve the equilibrium (if we assume that there is no financial markets), we have:

$$k_{t+1} = \beta(1-\tau)(1-\alpha) A G_t^{\theta} k_t^{\alpha} / (1+\beta)$$

Suppose for simplicity $\delta_G = 1$ and $\delta_k = 0$

$$G_{t+1} = I_t^G + (1-\delta_G) G_t$$

Therefore,

$$G_{t+1}/k_{t+1} = (1+\beta)\tau / \{\beta(1-\alpha)(1-\tau)\}$$

We will assume that $\alpha + \beta = 1$ on the balanced growth path. Then it is easy to see that consumption, private capital, output, and public capital will all grow at the same rate. The growth rate of private capital (without financial market) is given by:

$$\begin{aligned}\gamma = \ln k_{t+1} - \ln k_t &= \ln \beta\theta/(1+\beta) + \ln A + \ln(1-\tau) + \theta \ln(G_t/k_t) \\ &= (1-\theta)\ln \beta\theta/(1+\beta) + \ln A + (1-\theta)\ln(1-\tau) + \theta \ln \tau\end{aligned}$$

The growth rate is concave in z and the growth-maximizing tax rate is $\tau = \theta$, the output elasticity of public capital. In this framework, income tax not only affects the private incentives but also enhances investment in public capital which leads to higher future output.

The dynamics are straightforward: the economy settles on the constant growth path in the initial period. Furthermore, the model delivers predictions similar to those in the endogenous growth literature (see, for instance, Jones and Manuelli, 1990; Rebelo, 1991). If the technology and preference parameters vary across countries, then the long-run growth rates across countries will typically be different. If the underlying parameters were the same across countries, there could still be persistent differences in per capita income levels purely due to differences in initial conditions.

2.4 Empirical Evidences

Based on an objective introduction, Section 3 has described a basic model of the development of financial markets and the Infrastructure investment. In order to have a better comprehension of that, section 4 goes deeper and applies a data analysis on the predictions of the model. In this section, direct empirical evidences of a cross-country study are developed to demonstrate the positive correlation between the development of financial market and infrastructure investment in one country.

2.4.1 Data

All the variables in this analysis are collected from four major databases: Thomson One Project Finance International (PFI) Database, the World Bank's Private Participation in Infrastructure (PPI) database, the World Bank's Financial Sector Development database and the World Bank's World Development Indicators (WDI) database.

Basic project finance data for over 129 countries worldwide are searched from PFI and PPI database, which include: a) the proceeds (volume) of each project finance deal b) deal details, including deal synopsis and purpose, project location, contract duration, target and acquiror c) Types of private participation, private sponsors, and development bank support.

Among the databases above, ThomsonOne PFI database covers over 20,000 project finance deals, including global transactions since 1970. The World Bank's PPI database includes infrastructure projects that meet three criteria: (1) projects are owned or managed by private

companies in low- and middle-income countries; (2) projects directly or indirectly serve the public; and (3) projects reached financial closure after 1983 (the database coverage currently extends to 2014 and is updated annually).

Using the information from PFI and PPI database, we construct three dependent variables of project financ volume. Firstly, we measure the logarithm of aggregate project finance volume in one country (log(PF volume)). This indicator is the sum of proceeds of all project finance deals in country i at year t, which including all the bonds, SPVs(stocks) and syndicated loans that target for project financing. We use this indicator to demonstrate the total project finance volume of each country in every year.

Nevertheless, the increase of the aggregate volume of project finance can be derived by the increase of total investment in the corresponding country. Therefore, we introduce the second dependent variable into our estimation, which is the project finance volume to investment ratio (PF/Inv). In this indicator, the aggregate project finance volume is normalized (divided) by the total investment in country i at year t. By using this normalization, we eliminate the country investment's effects on project finance volume.

Final, we use private investment to total investment percentage in PPI projects as our third dependent variable. This dependent variable be constructed as the private investment to total investment ratio of PPI projects in country i at year t. This indicator shows the private investors' participation into the project finance projects. A high private to total investment ratio in PPI projects implies that the private investors are more willing to participate into the project finance. Compared with previous two dependent variables, the private to total investment ratio in PPI projects not only removes country total investment's influences on project finance volume, but also eliminates the foreign direct investment's effects on it.

Our financial development indictors are collected from World Bank's Global Financial Development (GFD) database. Following Levine (1998), we select three indicators that are frequently studied in past literatures to measure the financial development in one country.

(1) Banking sector size, which is the total deposit banking assets to GDP ratio. This indicator confines the measuring of banking sector size. As an indicator which measures the asset side, it captures the amount of credit allocated through banking sector. And it excludes credit issued by central banks to governments, governmental agencies, and public enterprises.

(2) Bond market size, which is measured by the total asset of bond market to GDP ratio. This indicator measures one country's bond market development level, and the total amount of credit issued via bond market.

(3) Stock market size, which is defined as the total asset of stock market to GDP ratio. Similar to the bond market size measure,this indicator demonstrates the total amount of credit issued via stock market to real economy in one country.

The control variables in our estimation models include: domestic investment to GDP ratio (Investment); inflation rate; GDP per capita growth rate; government expenditure to GDP ratio; the foreign directly investment (FDI) to GDP ratio; country openness, which is the sum of export

and import flows to GDP ratio; and Worldwide Governance Indicators [1]. All above explanatory variables are collected from the World Bank's World Development Indicators (WDI) database.

The whole sample contains all countries in the World Bank database that have essential data from year 1990 to 2015. It covers a broad range of experiences from developed to developing countries. After the basic data cleaning, a sample of 129 countries is obtained and listed in appendix A. The detailed description of variables is shown in appendix B.

2.4.2 Estimation results

Project Finance Volume

Table 1 presents the regression on the project finance volume. Six models have been presented in this table, in which control for year fixed effect and country fixed effect. Regression (1) shows the baseline specification for a sample of 129 countries with the selected control variables which include domestic investment to GDP ratio, inflation, GDP per capita growth rate, government expenditure to GDP ratio, the foreign directly investment (FDI), country openness, and government effectiveness. In line with our first hypothesis, we find a positive relationship between stock market size and project finance volume. And the coefficient is statistically significant at 1% level. One-standard deviation increase in stock market size can be translated into an increase in project finance volume as high as 0.013 point. Therefore, after controlling other variables, the project finance volume of Public-Private Partnerships investment increase when the countries have higher stock market size, consistent with our main hypothesis that PPP arrangements are likely to be positively correlated with stock market size. We find a marginally significant positive relationship between domestic investment to GDP ratio and the project finance volume. This suggests that an increase in investment contributes to a higher project finance volume. Also, we find that higher FDI have higher project finance volume. When the FDI increase by one standard deviation, the log of project finance volume responds by increasing 0.013 points. However, the coefficient on government effectiveness is significantly negative, implying that an increase in government effectiveness will result in a decrease in the project finance volume. In regressions (2) to (6), political stability, regulatory quality, rule of law, control of corruption, and accountability have been added as control variables. Among the five explanatory variables, only the regulatory quality is marginal significant. The positive sign indicates that the improvement in the regulatory quality can help to increase the project finance volume of Public-Private Partnerships investment. Each column displays a positive relationship between stock market size and project finance volume, indicating that the countries with higher stock market size have higher project finance volume.

[1]The Worldwide Governance Indicators (WGI) are a research dataset summarizing the views on the quality of governance provided by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries. The six WGI indicators include in our models are government effectiveness; political stability; regulatory quality; rule of law, control of corruption; voice and accountability

Table 2 shows the results of an OLS estimation of the project finance volume to investment ration on total bond market size and other control variables. All the control variables in these six regressions are the same as that in Table 1. However, we do not find significant relationships between total bond market size and project finance volume for all the regressions. One possible explanation for this results might caused by the fact that the percentage of bond finance in total finance PPP investment is relatively low. Also, others may argue that there is crowding-out effect in the bond market because investors in this market are pursuing bonds with high risks to exploit the risk premiums. But the coefficients on total bond market size are positive, consistent with our predictions. Also, the magnitude of the effect of total bond market size is less than that of stock market size in table 1. In most cases, domestic investment to GDP ratio is significant in explaining the project finance volume. And the positive signs imply that the countries with higher domestic investment to GDP ratio have higher project finance volume. In table 2, all the coefficients on openness are significantly negative, indicating that the countries with more openness have less project finance volume.

Table 3 provides the results of regressions of the project finance on banking sector size and other control variables. All the control variables in these six regressions are the same as that in Table 1 and Table 2. We use the total deposit banking assets to GDP ratio to measure banking sector size. This indicator confines the measuring of size in the banking sector, captures the amount of credit allocated through banking sector, but also excludes the credit issued to governments, governmental agencies, and public enterprises. Consistent with our third hypothesis, each column presents a significant positive relationship between banking sector size and project finance volume, implying that the countries with bigger banking sector size have higher project finance volume. Also, the magnitude of the effect of banking sector size on the project finance volume is twice as high as that of stock market size in Table 1. For instance, in regression (1), an increase in banking sector size can be translated into an increase in project finance volume as high as 0.022 points. Similar to the cases in Table (1) and Table (2), higher domestic investment to GDP ratio and FDI can help to promote the investment in project finance volume, which are consistent with previous literature. For government effectiveness, the results are similar to that in Table 1 and Table 2.

Project Finance Volume to investment ratio

Table 4 presents the regression on the project finance volume to investment ratio. We use this ratio to eliminate the possibility that the increasing of project finance volume is derived by the increasing of total investment in one country. This table include the results for six models, which control for year fixed effect and country fixed effect. Regression (1) shows the baseline specification for a sample of 129 countries with the selected control variables which include domestic investment to GDP ratio, inflation, GDP per capita growth rate, government expenditure to GDP ratio, the foreign directly investment (FDI), country openness, and government effec-

tiveness. Consistent with our hypothesis, we find a significant positive relationship between stock market size and project finance volume. For instance, one-standard deviation increase in stock market size can be translated into an increase in project finance volume to investment ratio as high as 0.092 points. This result suggests that the countries with higher stock market size have higher project finance volume to investment ratio. Compared with the case in Table 1, FDI in this regression is the dominant force. The coefficient is statistically significant at 1% level. When the FDI increase by one standard deviation, the private finance volume to investment ratio responds by increasing 0.713 points. In regressions (2) to (6), we add political stability, regulatory quality, rule of law, control of corruption, and accountability as control variables. In all these cases, FDI remains the dominant force. Also, we find that the countries with higher stock market size have higher project finance volume to investment ratio, and the results are robust regardless of which control variables are used in the regression.

Table 5 provides the results of regressions of the project finance volume to investment ratio on total bond market size. All the control variables in these six regressions are the same as that in Table 4. However, we do not find any evidence that total bond market size is significantly positive correlated with project finance volume to investment ratio. As mentioned in the explanation in Table 2, this phenomenon may be caused by low percentage of bond finance in total finance PPP investment or the crowding-out effect in the bond market. In regressions (2) to (6), political stability, regulatory quality, rule of law, control of corruption, and accountability have been added as control variables. FDI in these regressions are the dominant force. And the positive sign on FDI shows that the countries with high FDI have high project finance volume to the investment ratio. Among the five explanatory variables in Worldwide Governance Indicators, only the government effectiveness is marginal significant. The negative sign indicates that the improvement in the government effectiveness can reduce the project finance volume to investment ratio.

In Table 6, we show the results of OLS estimations of the project finance volume on banking sector size and other control variables, which are the same as that in Table 4 and 5. All the coefficients on the banking sector size are significantly at 1% percent level. The signs on these coefficient are positive, showing that the countries with higher banking sector size have higher project finance volume to investment ratio. For instance, in regression (1), one-standard deviation increase in banking sector size will result in an increase in the project finance volume to investment ratio by 0.533 points. Moreover, among these 6 regressions presented in this table, we find that a significant positive relationship between FDI and our dependent variable. As a result, an increase in FDI help to increase the project finance to investment ratio. Among the five explanatory variables in Worldwide Governance Indicators, both regulatory quality and rule of law estimate are significant. But they have different signs. The positive sign on the coefficients of regulatory quality implies that an improvement in the regulatory quality can increase the project finance volume to investment ratio, while the negative sign on the coefficients of rule of law estimate shows that an improvement of rule of law may reduce the project finance

volume to investment ratio.

PPP projects Private to Total Investment Percentage

Table 7 considers the same determinants, but this time, regressed against the PPP projects private to total investment percentage. Here again the baseline specification for a sample of 129 countries with the selected control variables is presented as a benchmark. In this table, all six models control for year fixed effect and country fixed effect. Also, we include domestic investment to GDP ratio, inflation, GDP per capita growth rate, government expenditure to GDP ratio, the foreign directly investment (FDI), and country openness as control variables in all these six regressions. From regressions (1) to (6), government effectiveness political stability, regulatory quality, rule of law, control of corruption, and accountability have been added as control variables. Consistent with our main hypothesis, each column presents a positive relationship between stock market size and PPP projects private to total investment percentage, implying that the countries with higher stock market size also have higher PPP projects private to total investment percentage. One-standard deviation increase in stock market size can be translated into roughly 0.008 points in private to total investment percentage. Moreover, we find that the coefficients on FDI are positive. And the magnitude of these coefficients provides the evidence that FDI is the dominant factor. Among the five explanatory variables in Worldwide Governance Indicators, both regulatory quality and accountability are significantly positive, indicating that improvements in these two factors help to increase the participation of the private investment in PPP projects.

The regressions of PPP projects Private to Total Investment Percentage on total bond market size have been shown in Table 8. All the control variables in these six regressions are the same as that in previous tables. In the first row of this table, the coefficients on total bond market size are significantly at 1% level. The positive signs provide the evidence that an increase in total bond market size can increase the private to total investment percentage. Also, we find a positive relationship between domestic investment to GDP ratio and private to total investment ratio. In regression (6), the coefficient on control of corruption is significantly negative. Hence, in the countries with high corruption, the private to total investment is low. While an improvement in accountability factor can increase the percentage of private to total investment.

In Table 9, we shows the results of regressions of private to total investment percentage on banking sector size and other control variables. Six models have been used in this table, which include different kauffamn indicators. The explanatory power of the banking sector size for the private to total investment ratio is rather high. As shown in Table 9, the R2 of the regressions are roughly 20%. Consistent with our main hypothesis, we find a statistically significant positive relationship between banking sector size and the percentage of private to total investment in all six regressions. This suggests that rising in banking sector size contributes to a higher percentage of private to total investment, regardless of which control variables are used in the

regressions. For example, in regression (1), one-standard-deviation increase in banking sector size is followed by an increase in the percentage of private to total investment by 0.048 points.

2.5 Conclusion

Over the past decade, governments have started to recognize that they need to reconsider their approach to financing to secure new sources of capital to support infrastructure development. With more governments privative-rising infrastructure assets, a globalization of the infrastructure fund market has occurred. Developed and developing countries are in effect competing to attract institutional investors to infrastructure.

Despite the theoretical ideal match between a large source of capital and an asset class in need of investment, the overall level of investment in infrastructure by institutional investors has been modest and insufficient to overcome the financing gap. Therefore,financial markets and intermediaries are required to play an important role in shaping financial solutions able to attract the highest number of investors.

This paper shows that the evolution of capital markets shows that financial innovation develops new financial tools able to attract a larger amount of funds in response to supply(the infrastructure gap) and demand (the search for asset classes that are suitable for a given asset allocation), and financial deepening tends to occur during periods of infrastructure development, both in terms of bank credit and in terms of securities finance.

Although causality is not clear in these cases, financial deepening also tends to accompany rapid growth, but it does suggest that infrastructure finance can be accommodated within a growing financial system rather than crowding out other sources of finance during a period of significant investment.

These results were supplemented by both theoretical and empirical studies in this paper.

The main empirical insights can be summarized as follows. Using a sample of 129 countries with the selected control variables which include domestic investment to GDP ratio, inflation, GDP per capita growth rate, government expenditure to GDP ratio, the foreign directly investment (FDI), country openness, and Worldwide Governance Indicators, we establish convincing evidence of positive relationship between stock market size and project finance volume. Also, when we use project finance volume to investment ratio or PPP projects private to total investment ratio as dependent variable, the positive relationship remain significant in all the regressions with different control variables. These empirical evidence shows that the countries with higher stock market size have higher project finance volume, higher project finance volume to investment ratio, and higher percentage of private to total investment in PPP projects.

When we use bond market size as a explanatory variable, we do not find solid evidence that an increase in bond market size can translated into an increase in project finance volume in PPP projects. Also, the relationship between bond market size and project finance volume

to investment ratio is not significant. These results might be caused by low percentage of bond finance in total finance PPP investment or the crowding-out effect in the bond market. But when we use the percentage of private to total investment as dependent variable, the coefficients on total bond market size are significantly at 1% level. The positive signs indicates that an increase in total bond market size can increase the percentage of private to total investment in PPP projects.

At last, we use banking sector size to measure the financial depth to investigate whether financial depth help to increase PPP projects investment, we find a positive relationship between financial depth and PPP projects investment, and the results are robust regardless of which measures are used in the regressions. These results imply that the countries with bigger banking sector size have higher project finance volume and higher project finance volume to investment ratio. Moreover, when we consider the percentage of private to total investment as dependent variable, all the coefficients on the banking sector size are significantly at 1% percent level. The positive suggests that rising in banking sector size contributes to a higher percentage of private to total investment in PPP projects.

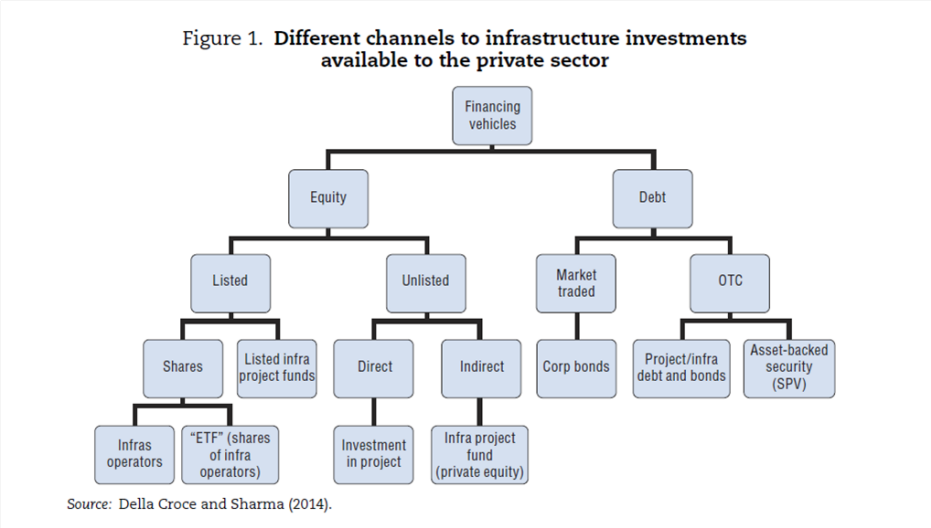

Figure 2.1: **Different Capital Channels Available to Private Investors**

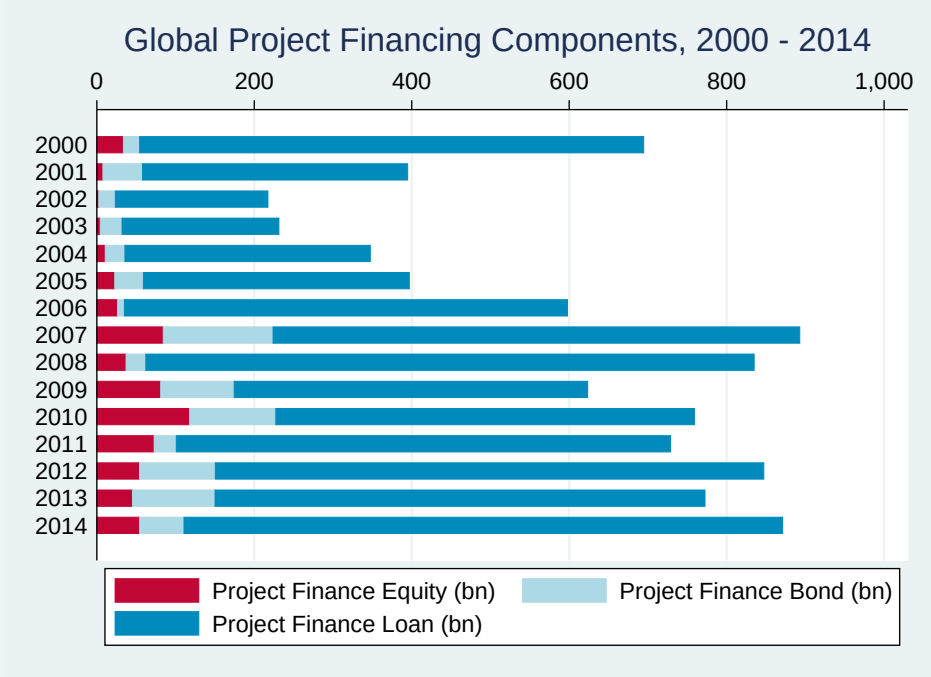

Figure 2.2: **Different Capital Channels Available to Private Investors**

Table 2.1: Project Finance volume and Stock Market Development - Fixed Effect Model

	(1) log(PF Volume)	(2) log(PF Volume)	(3) log(PF Volume)	(4) log(PF Volume)	(5) log(PF Volume)	(6) log(PF Volume)
Stock Market Size	0.0134***	0.0135***	0.0133***	0.0133***	0.0147***	0.0148***
	[3.9519]	[3.9696]	[3.9017]	[3.8829]	[4.1223]	[4.1423]
Investment	0.0385*	0.0390*	0.0367	0.0372	0.0105	0.0105
	[1.6575]	[1.6762]	[1.5629]	[1.5817]	[0.3988]	[0.3997]
Inflation	0.0036	0.0023	0.0026	0.0014	-0.0020	-0.0020
	[0.5597]	[0.3516]	[0.3868]	[0.2072]	[-0.2335]	[-0.2339]
GDP per capita growth	0.0133	0.0154	0.0156	0.0224	0.0294	0.0281
	[0.6776]	[0.7778]	[0.7885]	[1.0857]	[1.3027]	[1.2448]
Government Expenditure	0.0270	0.0230	0.0190	0.0233	-0.0169	-0.0162
	[0.6652]	[0.5632]	[0.4592]	[0.5625]	[-0.3200]	[-0.3063]
FDI	0.0366**	0.0356**	0.0351**	0.0345**	0.0350**	0.0351**
	[2.3684]	[2.2950]	[2.2596]	[2.2221]	[2.1912]	[2.1990]
Openness	-0.0099	-0.0097	-0.0093	-0.0094	-0.0082	-0.0074
	[-1.5667]	[-1.5280]	[-1.4551]	[-1.4712]	[-1.1393]	[-1.0151]
Government Effectiveness	-0.0072**	-0.0114*	-0.0120**	-0.0142**	-0.9450	-0.8727
	[-2.0582]	[-1.9574]	[-2.0331]	[-2.3041]	[-1.6453]	[-1.5068]
Political Stability		0.0836	0.0941	-0.0947	0.0504	-0.0104
		[0.9027]	[1.0014]	[-0.5196]	[0.1777]	[-0.0358]
Regulatory Quality			0.2362	0.2777	1.1428**	1.1197**
			[0.6868]	[0.8037]	[2.1302]	[2.0851]
Rule of Law_Estimate				0.1888	-0.8455	-0.9732
				[1.2087]	[-1.2438]	[-1.4058]
Control of Corruption					0.1749	0.0821
					[0.3531]	[0.1627]
Accountability						0.5161
						[0.9778]
Year Fixed Effect	YES	YES	YES	YES	YES	YES
Country Fixed Effect	YES	YES	YES	YES	YES	YES
Observations	530	530	530	530	486	486
R^2	0.0987	0.1003	0.1013	0.1041	0.1089	0.1109

The Standard errors statistics are in second row brackets. Dependent variable in this table is the logarithm value of total project finance volume Stock market size is measured as the total asset of stock market/GDP ratio. Significance levels: ***p¡0.01, **p¡0.05, *p¡0.1

Table 2.2: Project Finance volume and Bond Market Development - Fixed Effect Model

	(1) log(PF Volume)	(2) log(PF Volume)	(3) log(PF Volume)	(4) log(PF Volume)	(5) log(PF Volume)	(6) log(PF Volume)
Total Bond Market Size	0.0024	0.0031	0.0037	0.0036	0.0048	0.0048
	[0.8657]	[1.1167]	[1.3073]	[1.2486]	[1.4997]	[1.5022]
Investment	0.0872***	0.0835***	0.0746**	0.0743**	0.0522	0.0497
	[2.8075]	[2.6825]	[2.3521]	[2.3282]	[1.4035]	[1.3252]
Inflation	0.0050	-0.0019	-0.0012	-0.0012	0.0173	0.0159
	[0.5572]	[-0.1904]	[-0.1189]	[-0.1172]	[0.6111]	[0.5592]
GDP per capita growth	-0.0023	0.0061	0.0084	0.0094	0.0187	0.0203
	[-0.0864]	[0.2272]	[0.3113]	[0.3276]	[0.5583]	[0.6040]
Government Expenditure	0.1519*	0.1283	0.1212	0.1222	0.0446	0.0350
	[1.9074]	[1.5835]	[1.4946]	[1.4936]	[0.4461]	[0.3451]
FDI	0.0497***	0.0477***	0.0465***	0.0465***	0.0445***	0.0439***
	[3.1589]	[3.0277]	[2.9507]	[2.9472]	[2.7269]	[2.6859]
Openness	-0.0213***	-0.0213***	-0.0210**	-0.0210**	-0.0257***	-0.0262***
	[-2.6138]	[-2.6141]	[-2.5817]	[-2.5762]	[-2.6364]	[-2.6747]
Government Effectiveness	-0.0093**	-0.0176***	-0.0196***	-0.0197***	-1.1465*	-1.2222*
	[-2.4536]	[-2.6236]	[-2.8558]	[-2.8345]	[-1.7428]	[-1.8248]
Political Stability		0.1942	0.2401*	0.2145	0.3283	0.4104
		[1.4957]	[1.7916]	[0.7641]	[0.8707]	[1.0265]
Regulatory Quality			0.5900	0.5943	1.3339*	1.3388*
			[1.3544]	[1.3558]	[1.9542]	[1.9589]
Rule of Law_Estimate				0.0214	-0.4186	-0.2666
				[0.1038]	[-0.4502]	[-0.2771]
Control of Corruption					0.5208	0.5990
					[0.7613]	[0.8602]
Accountability						-0.4801
						[-0.6235]
Year Fixed Effect	YES	YES	YES	YES	YES	YES
Country Fixed Effect	YES	YES	YES	YES	YES	YES
Observations	321	321	321	321	294	294
R^2	0.1122	0.1192	0.1250	0.1250	0.1084	0.1098

The Standard errors statistics are in second row brackets. Dependent variable is the logarithm value of total project finance volume
Bond market size is measured as the total asset of bond market/GDP ratio. Significance levels: ***p¡0.01, **p¡0.05, *p¡0.1

Table 2.3: Project Finance volume and Banking Sector Development - Fixed Effect Model

	(1)	(2)	(3)	(4)	(5)	(6)
	log(PF Volume)	log(PF Volume)	log(PF Volume)	log(PF Volume)	log(PF Volume)	log(PF Volume)
Banking Sector Size	0.0223*	0.0223*	0.0209*	0.0215*	0.0299**	0.0284**
	[1.9164]	[1.9138]	[1.7744]	[1.8153]	[2.1301]	[2.0050]
Investment	0.0454**	0.0461**	0.0442**	0.0445**	0.0175	0.0181
	[2.0819]	[2.1148]	[2.0113]	[2.0248]	[0.7129]	[0.7366]
Inflation	0.0007	-0.0007	-0.0005	-0.0010	-0.0027	-0.0028
	[0.1032]	[-0.0957]	[-0.0747]	[-0.1355]	[-0.2923]	[-0.3014]
GDP per capita growth	0.0297	0.0323	0.0324	0.0350	0.0466*	0.0458*
	[1.3898]	[1.4977]	[1.5033]	[1.5728]	[1.8959]	[1.8624]
Government Expenditure	0.0108	0.0101	0.0066	0.0073	-0.0569	-0.0545
	[0.2282]	[0.2148]	[0.1384]	[0.1531]	[-0.9652]	[-0.9232]
FDI	0.0414***	0.0402**	0.0394**	0.0389**	0.0376**	0.0380**
	[2.6034]	[2.5228]	[2.4682]	[2.4273]	[2.2773]	[2.3003]
Openness	-0.0060	-0.0054	-0.0050	-0.0049	-0.0042	-0.0037
	[-0.9502]	[-0.8572]	[-0.7855]	[-0.7699]	[-0.5841]	[-0.5098]
Government Effectiveness	-0.0073*	-0.0121*	-0.0130**	-0.0139**	-1.0042*	-0.9513
	[-1.9144]	[-1.9451]	[-2.0496]	[-2.0970]	[-1.6799]	[-1.5785]
Political Stability		0.0914	0.1066	0.0258	0.0238	-0.0239
		[0.9715]	[1.1074]	[0.1320]	[0.0788]	[-0.0772]
Regulatory Quality			0.2775	0.2802	1.2558**	1.2546**
			[0.7599]	[0.7665]	[2.2726]	[2.2690]
Rule of Law Estimate				0.0785	-0.9023	-1.0250
				[0.4753]	[-1.2982]	[-1.4316]
Control of Corruption					0.3650	0.2920
					[0.7041]	[0.5526]
Accountability						0.4039
						[0.7205]
Year Fixed Effect	YES	YES	YES	YES	YES	YES
Country Fixed Effect	YES	YES	YES	YES	YES	YES
Observations	516	516	516	516	474	474
R^2	0.0688	0.0708	0.0720	0.0725	0.0788	0.0800

The Standard errors statistics are in second row brackets. Dependent variable is the logarithm value of total project finance volume.
Bond market size is measured as the total asset of deposit banks/GDP ratio. Significance levels: ***p¡0.01, **p¡0.05, *p¡0.1

Table 2.4: Project Finance volume to Investment Ratio and Stock Market Development - Fixed Effect Model

	(1) PF/Investment	(2) PF/Investment	(3) PF/Investment	(4) PF/Investment	(5) PF/Investment	(6) PF/Investment
Stock Market Size	0.0915**	0.0913**	0.0881*	0.0878*	0.1006**	0.1018**
	[2.0302]	[2.0241]	[1.9459]	[1.9381]	[2.0994]	[2.1247]
Investment	-0.2780	-0.2790	-0.3190	-0.3174	-0.6766*	-0.6760*
	[-0.9029]	[-0.9052]	[-1.0245]	[-1.0184]	[-1.9111]	[-1.9100]
Inflation	-0.0232	-0.0203	-0.0160	-0.0204	-0.1517	-0.1517
	[-0.2702]	[-0.2302]	[-0.1818]	[-0.2285]	[-1.2926]	[-1.2936]
GDP per capita growth	0.0380	0.0333	0.0373	0.0621	0.1435	0.1242
	[0.1459]	[0.1267]	[0.1418]	[0.2271]	[0.4732]	[0.4092]
Government Expenditure	0.0184	0.0275	-0.0441	-0.0281	-0.7422	-0.7311
	[0.0342]	[0.0508]	[-0.0806]	[-0.0511]	[-1.0471]	[-1.0317]
FDI	0.7129***	0.7153***	0.7066***	0.7045***	0.6930***	0.6949***
	[3.4788]	[3.4770]	[3.4308]	[3.4155]	[3.2313]	[3.2410]
Openness	-0.0393	-0.0398	-0.0324	-0.0327	-0.0803	-0.0673
	[-0.4671]	[-0.4726]	[-0.3825]	[-0.3862]	[-0.8245]	[-0.6861]
Government Effectiveness	-0.0412	-0.0317	-0.0417	-0.0500	-8.1041	-6.9878
	[-0.8912]	[-0.4111]	[-0.5355]	[-0.6115]	[-1.0498]	[-0.8980]
Political Stability		-0.1895	-0.0043	-0.7000	0.8307	-0.1065
		[-0.1544]	[-0.0035]	[-0.2897]	[0.2180]	[-0.0273]
Regulatory Quality			4.1893	4.3422	17.9839**	17.6274**
			[0.9198]	[0.9477]	[2.4957]	[2.4446]
Rule of Law Estimate				0.6960	-26.4186***	-28.3867***
				[0.3360]	[-2.8919]	[-3.0526]
Control of Corruption					8.0512	6.6163
					[1.2088]	[0.9759]
Accountability						7.9587
						[1.1228]
Year Fixed Effect	YES	YES	YES	YES	YES	YES
Country Fixed Effect	YES	YES	YES	YES	YES	YES
Observations	527	527	527	527	483	483
R^2	0.0462	0.0462	0.0480	0.0482	0.0761	0.0789

The Standard errors statistics are in second row brackets. Dependent variable is the total project finance volume to investment ratio Stock market size is be measured as the total asset of stock market/GDP ratio. Significance levels: ***p¡0.01, **p¡0.05, *p¡0.1

Table 2.5: Project Finance volume to Investment Ratio and Bond Market Development - Fixed Effect Model

	(1) PF/Investment	(2) PF/Investment	(3) PF/Investment	(4) PF/Investment	(5) PF/Investment	(6) PF/Investment
Total Bond Market Size	0.0084	0.0140	0.0165	0.0175	0.0280	0.0281
	[0.3957]	[0.6467]	[0.7539]	[0.7773]	[1.0969]	[1.0983]
Investment	0.0325	0.0037	-0.0355	-0.0310	-0.1150	-0.1296
	[0.1343]	[0.0152]	[-0.1434]	[-0.1245]	[-0.3900]	[-0.4364]
Inflation	0.0137	-0.0391	-0.0358	-0.0361	-0.0156	-0.0236
	[0.1952]	[-0.4967]	[-0.4549]	[-0.4569]	[-0.0693]	[-0.1046]
GDP per capita growth	-0.0675	-0.0037	0.0064	-0.0080	0.0641	0.0733
	[-0.3288]	[-0.0176]	[0.0305]	[-0.0359]	[0.2411]	[0.2747]
Government Expenditure	0.7076	0.5280	0.4963	0.4814	0.1577	0.1024
	[1.1414]	[0.8371]	[0.7845]	[0.7543]	[0.1991]	[0.1275]
FDI	0.4685***	0.4533***	0.4479***	0.4473***	0.4315***	0.4283***
	[3.8277]	[3.6979]	[3.6455]	[3.6332]	[3.3385]	[3.3039]
Openness	-0.0253	-0.0250	-0.0237	-0.0238	-0.0379	-0.0407
	[-0.3981]	[-0.3936]	[-0.3730]	[-0.3738]	[-0.4920]	[-0.5258]
Government Effectiveness	-0.0254	-0.0884*	-0.0973*	-0.0957*	-4.0696	-4.5032
	[-0.8595]	[-1.6918]	[-1.8164]	[-1.7641]	[-0.7808]	[-0.8483]
Political Stability		1.4770	1.6813	2.0574	3.4907	3.9618
		[1.4607]	[1.6075]	[0.9392]	[1.1686]	[1.2502]
Regulatory Quality			2.6266	2.5633	6.5003	6.5285
			[0.7727]	[0.7494]	[1.2020]	[1.2052]
Rule of Law_Estimate				-0.3146	-10.3517	-9.4801
				[-0.1955]	[-1.4051]	[-1.2429]
Control of Corruption					5.4950	5.9434
					[1.0138]	[1.0768]
Accountability						-2.7532
						[-0.4512]
Year Fixed Effect	YES	YES	YES	YES	YES	YES
Country Fixed Effect	YES	YES	YES	YES	YES	YES
Observations	321	321	321	321	294	294
R^2	0.0615	0.0687	0.0707	0.0708	0.0698	0.0706

The Standard errors statistics are in second row brackets. Dependent variable is the total project finance volume to investment ratio Stock market size is be measured as the total asset of bond market/GDP ratio. Significance levels: ***p¡0.01, **p¡0.05, *p¡0.1

Table 2.6: Project Finance volume to Investment Ratio and Banking Sector Development - Fixed Effect Model

	(1)	(2)	(3)	(4)	(5)	(6)
	PF/Investment	PF/Investment	PF/Investment	PF/Investment	PF/Investment	PF/Investment
Banking Sector Size	0.5327***	0.5327***	0.5068***	0.5116***	0.5487***	0.5274***
	[3.5608]	[3.5565]	[3.3451]	[3.3510]	[3.0106]	[2.8637]
Investment	-0.1858	-0.1848	-0.2215	-0.2188	-0.4956	-0.4867
	[-0.6633]	[-0.6586]	[-0.7843]	[-0.7734]	[-1.5562]	[-1.5265]
Inflation	-0.0555	-0.0573	-0.0545	-0.0578	-0.1666	-0.1679
	[-0.6263]	[-0.6324]	[-0.6014]	[-0.6312]	[-1.3653]	[-1.3752]
GDPpc growth	0.1192	0.1225	0.1252	0.1447	0.2725	0.2615
	[0.4335]	[0.4417]	[0.4515]	[0.5049]	[0.8545]	[0.8189]
Government Expenditure	-0.2317	-0.2325	-0.3000	-0.2948	-1.1040	-1.0696
	[-0.3818]	[-0.3827]	[-0.4914]	[-0.4821]	[-1.4424]	[-1.3947]
FDI	0.6524***	0.6509***	0.6364***	0.6325***	0.6375***	0.6437***
	[3.1949]	[3.1749]	[3.0990]	[3.0694]	[2.9751]	[3.0010]
Openness	-0.0394	-0.0386	-0.0304	-0.0297	-0.0658	-0.0582
	[-0.4857]	[-0.4741]	[-0.3717]	[-0.3625]	[-0.7015]	[-0.6177]
Government Effectiveness	-0.0431	-0.0492	-0.0657	-0.0726	-9.1852	-8.4074
	[-0.8733]	[-0.6147]	[-0.8073]	[-0.8516]	[-1.1833]	[-1.0746]
Political Stability		0.1181	0.4051	-0.1948	0.0473	-0.6551
		[0.0976]	[0.3276]	[-0.0776]	[0.0120]	[-0.1629]
Regulatory Quality			5.2536	5.2737	22.7344***	22.7167***
			[1.1196]	[1.1225]	[3.1699]	[3.1661]
Rule of Law Estimate				0.5829	-29.6265***	-31.4309***
				[0.2747]	[-3.2828]	[-3.3814]
Control of Corruption					5.5985	4.5250
					[0.8314]	[0.6593]
Accountability						5.9395
						[0.8164]
Year Fixed Effect	YES	YES	YES	YES	YES	YES
Country Fixed Effect	YES	YES	YES	YES	YES	YES
Observations	513	513	513	513	471	471
R^2	0.0646	0.0647	0.0674	0.0675	0.0966	0.0982

The Standard errors statistics are in second row brackets. Dependent variable is the total project finance volume to investment ratio. Banking sector size is measured as the total asset of deposit banks to GDP ratio. Significance levels: ***p¡0.01, **p¡0.05, *p¡0.1

Table 2.7: PPP Projects Private/Total Investment Percentage and Stock Market Development - Fixed Effect Model

	(1) Private/Total	(2) Private/Total	(3) Private/Total	(4) Private/Total	(5) Private/Total	(6) Private/Total
Stock Market Size	0.0086**	0.0085**	0.0082**	0.0082**	0.0080**	0.0077*
	[2.2326]	[2.1898]	[2.1339]	[2.1196]	[2.0284]	[1.9654]
Investment	0.0539***	0.0529***	0.0523***	0.0536***	0.0501**	0.0431**
	[2.7001]	[2.6346]	[2.6148]	[2.6344]	[2.3573]	[2.0514]
Inflation	-0.0034	-0.0032	-0.0025	-0.0028	-0.0044	-0.0049
	[-0.5383]	[-0.4944]	[-0.4007]	[-0.4366]	[-0.6471]	[-0.7400]
GDP per capita growth	0.0034	0.0027	0.0046	0.0059	0.0146	0.0169
	[0.2035]	[0.1630]	[0.2740]	[0.3442]	[0.8127]	[0.9534]
Government Expenditure	0.0817**	0.0831**	0.0775**	0.0762**	0.0986***	0.0998***
	[2.3249]	[2.3513]	[2.1957]	[2.1436]	[2.6167]	[2.6877]
FDI	0.1248***	0.1268***	0.1217***	0.1202***	0.0970***	0.0925***
	[4.8884]	[4.8885]	[4.6861]	[4.5723]	[3.4995]	[3.3831]
Openness	-0.0023	-0.0023	-0.0018	-0.0020	-0.0035	-0.0024
	[-0.4336]	[-0.4295]	[-0.3484]	[-0.3728]	[-0.6092]	[-0.4331]
Government Effectiveness	-0.0057	-0.0024	-0.0035	-0.0051	-0.3617	-0.0891
	[-1.1048]	[-0.2613]	[-0.3867]	[-0.5074]	[-0.6990]	[-0.1726]
Political Stability		-0.0371	-0.0100	-0.0611	-0.1572	-0.3736*
		[-0.4512]	[-0.1201]	[-0.3718]	[-0.7168]	[-1.6567]
Regulatory Quality			0.5094**	0.5174**	0.8977**	0.9683**
			[1.9760]	[1.9972]	[2.3383]	[2.5574]
Rule of Law Estimate				0.0538	-0.4153	-0.7964*
				[0.3606]	[-0.8809]	[-1.6654]
Control of Corruption					0.2337	-0.0880
					[0.5748]	[-0.2136]
Accountability						1.2039***
						[3.3179]
Year Fixed Effect	YES	YES	YES	YES	YES	YES
Country Fixed Effect	YES	YES	YES	YES	YES	YES
Observations	400	400	400	400	369	369
R^2	0.2014	0.2018	0.2106	0.2109	0.1940	0.2211

The Standard errors statistics are in second row brackets. Dependent variable is the private investment to total investment ratio in PPI project finance volume Bond market size is measured as the total asset of stock market/GDP ratio. Significance levels: ***p¡0.01, **p¡0.05, *p¡0.1

Table 2.8: PPP Projects Private/Total Investment Percentage and Bond Market Development - Fixed Effect Model

	(1) Private/Total	(2) Private/Total	(3) Private/Total	(4) Private/Total	(5) Private/Total	(6) Private/Total
Total Bond Market Size	0.0238***	0.0240***	0.0206***	0.0222***	0.0246***	0.0258***
	[-3.9314]	[-3.8021]	[-3.1205]	[-3.2754]	[-3.3068]	[-3.5631]
Investment	0.0535**	0.0535**	0.0479**	0.0549**	0.0441*	0.0495*
	[2.3455]	[2.3351]	[2.0799]	[2.2870]	[1.6856]	[1.9422]
Inflation	-0.0032	-0.0026	-0.0006	-0.0021	0.0026	0.0090
	[-0.3215]	[-0.2105]	[-0.0519]	[-0.1723]	[0.1657]	[0.5706]
GDP per capita growth	0.0070	0.0072	0.0124	0.0151	0.0207	0.0201
	[0.3521]	[0.3586]	[0.6170]	[0.7441]	[0.8651]	[0.8672]
Government Expenditure	0.0752	0.0773	0.0946	0.0958	0.1637*	0.2070**
	[1.2130]	[1.1744]	[1.4302]	[1.4488]	[1.8495]	[2.3630]
FDI	0.0987*	0.0996*	0.0776	0.0753	0.1210*	0.1258**
	[1.8197]	[1.8020]	[1.3744]	[1.3336]	[1.9624]	[2.1005]
Openness	-0.0016	-0.0017	-0.0013	-0.0021	0.0016	0.0016
	[-0.2561]	[-0.2694]	[-0.2010]	[-0.3286]	[0.2137]	[0.2132]
Government Effectiveness	-0.0119**	-0.0109	-0.0070	-0.0177	0.4209	0.8531
	[-2.1454]	[-0.9554]	[-0.6109]	[-1.1400]	[0.5882]	[1.1934]
Political Stability		-0.0120	-0.0003	-0.1713	-0.2752	-0.6596**
		[-0.0981]	[-0.0027]	[-0.8309]	[-1.0305]	[-2.1986]
Regulatory Quality			0.5123	0.4529	0.5816	0.8158
			[1.6402]	[1.4261]	[1.0908]	[1.5522]
Rule of Law_Estimate				0.1924	0.5193	0.0191
				[1.0260]	[0.8192]	[0.0295]
Control of Corruption					-0.9035	-1.5484**
					[-1.4285]	[-2.3314]
Accountability						1.4243**
						[2.5442]
Year Fixed Effect	YES	YES	YES	YES	YES	YES
Country Fixed Effect	YES	YES	YES	YES	YES	YES
Observations	123	123	123	123	113	113
R^2	0.2731	0.2732	0.2920	0.2994	0.3202	0.3668

The Standard errors statistics are in second row brackets. Dependent variable is the private investment to total investment ratio in PPI project finance volume Bond market size is measured as the total asset of bond market/GDP ratio. Significance levels: ***p¡0.01, **p¡0.05, *p¡0.1

Table 2.9: PPP Projects Private/Total Investment Percentage and Banking Sector Development - Fixed Effect Model

	(1) Private/Total	(2) Private/Total	(3) Private/Total	(4) Private/Total	(5) Private/Total	(6) Private/Total
Banking Sector Size	0.0481***	0.0481***	0.0476***	0.0482***	0.0506***	0.0499***
	[9.6199]	[9.5807]	[9.3977]	[9.3525]	[9.3450]	[9.1826]
Investment	0.0205	0.0205	0.0209	0.0216	0.0163	0.0164
	[1.4621]	[1.4598]	[1.4838]	[1.5283]	[1.1364]	[1.1435]
Inflation	-0.0005	-0.0005	-0.0004	-0.0007	-0.0009	-0.0012
	[-0.0870]	[-0.0879]	[-0.0649]	[-0.1196]	[-0.1545]	[-0.1940]
GDP per capita growth	0.0169	0.0169	0.0171	0.0187	0.0269*	0.0267*
	[1.1602]	[1.1589]	[1.1721]	[1.2668]	[1.7975]	[1.7862]
Government Expenditure	0.0327	0.0327	0.0329	0.0314	0.0383	0.0391
	[1.2458]	[1.2448]	[1.2498]	[1.1875]	[1.4082]	[1.4385]
FDI	0.0158	0.0158	0.0140	0.0121	0.0061	0.0057
	[0.9139]	[0.9106]	[0.8044]	[0.6821]	[0.3409]	[0.3176]
Openness	-0.0023	-0.0023	-0.0022	-0.0024	-0.0011	-0.0008
	[-0.5173]	[-0.5142]	[-0.4960]	[-0.5385]	[-0.2371]	[-0.1795]
Government Effectiveness	-0.0055	-0.0056	-0.0060	-0.0086	-0.5954	-0.5917
	[-1.1065]	[-0.6930]	[-0.7435]	[-0.9522]	[-1.4363]	[-1.4279]
Political Stability		0.0010	0.0109	-0.0722	-0.1414	-0.2173
		[0.0147]	[0.1539]	[-0.4930]	[-0.7947]	[-1.1526]
Regulatory Quality			0.1931	0.2006	0.8851***	0.9012***
			[0.8111]	[0.8414]	[2.7500]	[2.7988]
Rule of Law_Estimate				0.0876	-0.1068	-0.2385
				[0.6492]	[-0.2809]	[-0.6033]
Control of Corruption					-0.4540	-0.5424
					[-1.4106]	[-1.6444]
Accountability						0.3750
						[1.2116]
Year Fixed Effect	YES	YES	YES	YES	YES	YES
Country Fixed Effect	YES	YES	YES	YES	YES	YES
Observations	631	631	631	631	593	593
R^2	0.1991	0.1991	0.2001	0.2007	0.2081	0.2104

The Standard errors statistics are in second row brackets. Dependent variable is the private investment to total investment ratio in PPI project finance volume. Banking Sector size is measured as the total asset of deposit banks/GDP ratio. Significance levels: ***p¡0.01, **p¡0.05, *p¡0.1

2.

Chapter 3

Agency Conflicts and Capital Structure Dynamic

3.1 Introduction

The starting point for this study is a simple but fundamental observation. In a dynamic economy with frictions, the leverage of most firms, most of the time, is likely to deviate from the ”optimal leverage”[1].

One widely accepted explaination of this phenomenon is that firms adjust their leverage by issuing or retiring securities infrequently, only at ”refinancing point”. Consequently, even if firms follow a certain model of financing, a static model may fails to capiture the difference between firm actual and optimal leverage (Strebulaev (2007)). Another explaination of this fact is that companies let leverage ratios drift until the gain from rebalancing outweighs the leverage refinancing cost (Fischer, Heinkel, and Zechner (1989), Leary and Roberts (2005) and Korteweg (2010)). But all the literatures above has unfairly ignored another possible explaination for the leverage deviation phenomenon, which is the firm's agent conflicts.

Since the seminal paper by Jensen and Meckling (1976), widely empirical result show that agency conflicts can have important implications on the capital structure and performance of firms. For example, Yermak (1997) finds that in cross-sectional studies, leverage levels are lower than the optimal one when CEOs do not face pressure from the market for corporate control. Berger, Ofek, and Yermak also find that leverage increases in the aftermath of reducing managerial entrenchment in the firms. Eisdorfer (2008) shows that manager's risk-shifting behaviors in financially distressed firms leads to a significantly higher investment intensity and rising of firm leverage.

In light of this issue, this paper addresses following problems: Whether main principal - agent conflicts, manager entrenchment problem and equityholder risk-shifting problem, will cause firm actual leverage level deviate from the optimal one? How the manager makes his

[1]The leverage ratio which maximizes the firm's value

financing decision when the two agency conflicts co-exist? And how does leverage deviation vary with firm characteristics, particularly corporate governance proxies?

A prerequisite for my analysis is a dynamic trade-off model that emphasizes the role of agency conflicts in shaping financing decisions. The model that considers not only net benefit of leverage and debt refinancing costs, but also agency conflicts effects in shaping financing decisions. The capital structure of a firm should then be determined not only by real market frictions, such as taxes, bankruptcy costs or refinancing costs as in traditional trade-off theory, but also by the degree of agent-principal conflicts.

In the model setting, each firm is run by a partially-entrenched manager who sets the firm's coupon payout and financing policies. Managers act in their own interests to maximize the present value of the cash flows they will take from the firm's operations. At the same time, managers also have risk-shifting incentive to transfer downside risk to debtholders when firms in financial distress situation. we allow for the opportunity to shift risk to occur at some random time after the capital structure is designed, and this risk-shifting setting is different from previous literature. For example, the one-period setup in Green (1984) is assuming that claimholders can always redesign contracts every time a risk-shifting opportunity arises. However, it is not clear why shareholders would accept such a renegotiation if they can actually benefit from shifting risk. We therefore rely on the more realistic assumption that capital structure is designed before the risk-shifting opportunity occurs so that all claimholders agree on their best commitment to avoid asset substitution over a certain time horizon. With this model setting, we introduce opportunistic risk-shifting behavior of manager and investigate its effect on capital structure decision of manager.

Several important predictions follow from this model: First, entrenched managers issue less debt than optimal for shareholders in a dynamic capital structure setting, which may cause firm underleveraged. Secondly, In contrast to the manager entrenchment effect, if manager's risk-shifting incentive arises prior to capital structure decision making, manager may have an incentive to issue more debt than optimal, and this risk-shifting incentive may cause an overleveraged drift of firm leverage. Finally, When these two agency conflicts co-exists, manager's risk-shifting incentive can mitigate the underlevered effct of entrenchment. And the final firm leverage deviation direction is determined by the comprehensive effect of these two agency conflicts. To sum, this model shows that the manager's entrenchment and risk-shifting problem can partially explain the observed firm leverage dispersion in the time series analysis.

Our paper connects with several areas of research:

First, from a modeling perspective, this paper relates to the dynamic trade-off models. Kane, Marcus, and McDonald (1984), who apply option pricing methods to study the extent of the tax advantage of debt.Leland (1994) developed a relatively robust contingent claims model of capital structure, based on the intuition of the static model, and then quantified optimal leverage ratios that firms should choose if they live in the dynamic world described by the trade-off model. But In these literature, conflicts of interest between agent and principal have been

widely ignored.

Secondly, this paper relates to the literature of firm capital structure heterogeneity and deviation. For example, Lemmon et al. (2008) finds that traditional determinants of leverage (such as size, profitability, market-to-book, industry) account for relatively little of the variation in capital structure. Instead they show that the majority of the cross-sectional variation in capital structures is driven by an unexplained firm-specific determinant. My analysis reveals that theheterogeneity in capital structure can be structurally related to a number of corporate governance proxies, providing an economic interpretation for their results. As in prior dynamic capital structure models, my analysis emphasizes the role of external financing costs in affecting the time-series of leverage ratios. Due to capital market frictions, firms are not able to keep their leverage at the target at all times. As a result, leverage is best described not just by a number, the target, but by its entire distribution (including target and refinancing boundaries).

Thirdly, this paper relates to the literature that analyzes the relation between managerial discretion and financing decisions. Zwiebel (1996) builds a dynamic capital structure model in which finaning and payout policies are selected by a partially-entrenched manager. However, in Zwiebel's model, firms are always at their target leverage, while in our dynamic model refinancing costs create inertia and persistence in capital structure.

Finally, this analysis also shed light on measures of manager's incentives and risk-taking as defined in the corporate finance literature, typically under the assumption of agents' risk appetite. Jensen and Meckling (1976) have highlighted the risk-shifting problem for levered fims.Chevalier and Ellison (1997) shows that the manager's risk-taking incentive, as defined in corporate finance, then captures the strength of the (value-maximizing) manager's desire to increase the volatility of her risk exposure relative to some fixed status quo asset allocation.

The remainder of this paper is organized as follows. Section 2 presents the basic dynamic trade-off model. In section 3, I illustrate manager's entrenchment and risk-shifting incentives and their implications for manager financing decisions. Section 4 presents the data estimations of model predictions. Section 5 concludes. Basic proofs are gathered in Appendix.

3.2 The Model

This section considers a dynamic trade-off principal - agent model in which the agent(managers) is the financing decision maker and need to raise capital from the principal (both equityholders and debtholders).

The intuition of the dynamic capital structure model is based on two fundamental properties of the dynamic environment.a) Managers should take into account any expected changes to their future cash flows and opportunity sets when forming their current financial policy. The opportunity to adjust their leverage at a future date is likely to change managers' financial decisions today. b) managers face various refinancing costs (e.g., the transaction costs of raising

external financing), and even though these costs may be small relative to the total amount raised, their effect on optimal policies can be substantial.

3.2.1 Assumptions

Throughout the paper, assets are continuously traded in complete and arbitrage-free markets. The default-free term structure is an after-tax risk-free rate r, at which investors may lend and borrow freely. We consider an economy with a large number of heterogeneous firms, firms are infinitely lived and have monopoly access to a set of assets, which are operated in continuous time. The firm-specific state variable is the cash flow generated by the operation of the firm's assets, denoted by X_{it}. This operating cash flow is independent of capital structure choices and governed, under the risk neutral probability measure, by the process:

$$dX_{it} = \mu_i X_t dt + \sigma_i X_{it} dB_{it}, X_{i0} > 0 \; [1]$$

where $\mu_i < r$ and $\sigma_i > 0$ are constants, and B_{it} is a standard Brownian motion. The cash flows X_{it} from the project are observable only by the agent but not by the principal. The agent makes a report $\{\hat{X}_{it}, t \geq 0\}$ of the realized cash flows to the principal. But the principal does not know whether the agent is lying or telling the truth.

Equation $[1]$ implies that the growth rate of cash flows is normally distributed with mean $\mu_i \Delta t$ and variance $\sigma_i^2 \Delta t$ over the time interval Δt under the risk-neutral probability measure. It also implies that the mean growth rate of cash flows is $m_i \Delta t = (\mu_i + \beta_i \psi)\Delta t$. under the physical probability measure, where β_i is the unlevered cash-flow beta (estimated by CAPM model) and ψ is the market risk premium. Agent and principal are risk-neutral and use the risk-free rate of interest r, as their discount rate. Following Korteweg (2010), we assume that β_i are the same for each SIC2 industry. Cash flow from operations are taxed at a constant corporate tax rate τ. Therefore, debt can be used as tax shield for firms.

Firm debt is callable and issued at par, and the coupon payment of debt is c. The firm's initial debt structure remains fixed without time limit until either the firm goes into default or the firm calls its debt and refinancing with newly issued debt. One financing cycle stops when default or restructing happens. Therefore, firm capital structure change can be parameterized by two boundaries X_U and X_D. If cash flows rise to an upper threshold X_U $(X_U > X_0)$ before default, firm can raise more debt to take more tax sheild benefit and restoring the balance between the costs of distress and the tax benefits of debt. But the new issuance of debt will incure proportional cost λ_i. Default occurs if the cash flow shock falls to a cash flow threshold X_D $(X_D < X_0)$ prior to the calling of debt. When firm cash flow deteriorate sufficiently and reach the default threshold, firm default will lead to liqudation, and a fraction $0 \leq \alpha \leq 1$ in operating cash flows are lost as a deadweight loss. Therefore, the distress cost of leverage can be demonstrate as bankruptcy cost $DC = \alpha \cdot (1 - \tau) \cdot X_D$.We do not consider the reorganization case in default.

In each starting date of financing cycle, the manager need to decide the firm financing policy. In an trade-off capital structure model, managers with limited liability can not decide the refinancing threshold X_U, since the new debt issurance has to be supported by debtholders. Then it is an exogenous variable. But the manager need to select two endogenous state variables: endogeneous default threshold X_D and initial coupon payment c. These features are shared with numerous other capital structure models, including Leland(1998), Goldstein, Ju, and Leland (2001), Hackbarth, Miao, and Morellec (2006), or Strebulaev (2007).

Finally, we denoting $P_U(x)$ and $P_D(x)$ as the present value of cash flow x at the time of refinancing and default decision takes place:

$$P_U(x) = (\tfrac{x}{x_u})^{-\theta} \quad \text{and} \quad P_D(x) = (\tfrac{x}{x_D})^{-\theta}$$

Where parameter $\theta = \frac{m+\chi}{\sigma^2}$,and $m = \sqrt{r - \frac{1}{2}\sigma^2 + 2r\sigma^2}$, $\chi = r - \frac{1}{2}\sigma^2$. Then the tax shield benefit of leverage can be demonstrate as $TB = \tau \centerdot [1 - P_U(x) - P_D(x)] \centerdot \frac{c}{r}, i = U, D$

3.2.2 Optimal Capital Structure

The objective of the shareholders and debtholders is to maximize firm value $V(x_0, c)$, which is achieved by maximizing the expected discounted sum of cash flows to debtholders and equityholders. There are two approaches to write firm value $V(x_0, c)$ after debt has been issued. First, it can be written as the sum of debt value and equity value minus the flotation costs of issuing new debt. Second, it can be written as the sum of all the components that make firm value deviate from the after-tax unlevered asset value: where leveraged firm value equal to the unlevered firm value plus the present value of the tax benefits of debt (TB), and minus the present value of debt costs (DC). Here we follows the first approach, and before formally stating the maximization problem of the manager and firm, I start by carefully describing each of its components.

Firm Equity Valuation

We start by deriving the value of one claim on equity value at time t, denoted by $E(x, c)$ for $X_t = x$.And let $e(x, c)$ denote the present value of the firm's net income over one financing cycle. Then we have:

$$e(x, c) = E^Q[\textstyle\int_t^T e^{-r(s-t)}(1-\tau)(X_s - c)ds | X_t = x] \quad [2]$$

Where $T = \min\{T_{U,}T_D\}\ with\ T_S = inf\{t \geq 0 : X_t = x_s\}$, $s = U, D$. Therefore $e(x, c)$ can be writen as:

$$e(x, c) = (1-\tau)[(\tfrac{x}{r-\mu} - \tfrac{c}{r}) - P_U(x)(\tfrac{x_U}{r-\mu} - \tfrac{c}{r}) - P_D(x)(\tfrac{x_D}{r-\mu} - \tfrac{c}{r})] \quad [3]$$

Where $e(x, c)$ increase with the expected return of cash flows μ, and decrease with refinancing and default threshold x_U and x_D.

The first term in square bracket of above equation reflect that the value of perpetual entitlement to net income, and the following two terms reflect the fact that payments at refinancing or default time.

We show in Appendix A that in the static model in which the firm cannot restructure, the default threshold x_D is linear in c. In addition, the selected coupon rate c is linear in x. This implies that if two firms i and j are identical except that $x_0^i = \Lambda x_0^j$, then the selected coupon rate and default threshold satisfy $c_i = \Lambda c_j$,and $x_D^i = \Lambda x_D^j$, respectively, every claim can be scaled by the same factor Λ. Given the model satisfied the so-called scaling feature, all cost are proportional to the value of the firm or its claim. In other words, at any restructing time, the firm is just a larger replica of itself, we can denote two parameters $\gamma = \frac{x_D}{x_0}$ and $\rho = \frac{x_U}{x_0}$, and then the aggregate value of one claim to shareholders can be written as:

$$E(x, c) = e(x, c) + P_U(x)\rho E(x_0, c) + P_D(x)\gamma E(x_0, c) \quad [4]$$

This equation shows that the value of a claim to the firm's net income over all financing cycles is equal to: the cash flows equityholders receive over one financing cycle plus the value of the cash flows that they get after the restructuring or in default.The total value of a claim to the firm's net income at the initial date are:

$$E(x_0, c) = \frac{e(x_0,c)}{1-P_U(x)\rho-P_D(x)\gamma} \equiv e(x_0, c) * \Lambda(x_0, \rho, \gamma) \; [5]$$

where $\Lambda(x_0, \rho, \gamma) = \frac{1}{1-P_U(x)\rho-P_D(x)\gamma}$

Firm Debt Valuation

The debt of the firm matures in one period and is rolled over every period. This structure of debt is similar to a perpetual bond with a floating rate. The total amount of debt can be increased or decreased over time according to the manager's financing decisions. The current value of corporate debt $D(x, c)$ satisfies at any time $t \geq 0$ is:

$$D(x, c) = b(x, c) + P_U(x)b(x_0, c) \quad [6]$$

Which is equal to the debt value over one financing cycle plus the initial debt value at last restructing time.

And the value of corporate bonds over one refinancing cycle is :

$$b(x, c) = \frac{c}{r}[1 - P_U(x) - P_D(x)] + P_D(x)(1 - \alpha)\frac{(1-\tau)x_D}{r-\mu} \; [7]$$

The first term on the right-hand side of this equation represents the present value of the coupon payments until the firm defaults or restructures, And the second term represents the present value of the cash flow to initial debtholders in default case. We consider the instant of default time is T, therefore the cash flow of firm at default time T will be $X_T = (1-\alpha)X_D$.

The aggregate value of one claim to debtholders is:

$$D(x,c) = b(x,c) + P_U(x)\rho b(x_0,c) + P_D(x)\gamma b(x_0,c)$$

or

$$D(x_0,c) = b(x_0,c) * \Lambda(x_0,\rho,\gamma) \quad [8]$$

With the flotation costs of restructing debt is a function of totally debt value $D(x_0,c)$, we can write the flotation cost as $\lambda_i D(x_0,c)$. Because this flotation costs are incurred at each time the firm adjusts its capital structure, the total value of adjustment costs at time $t=0$ is in turn given by $\lambda_i D(x_0,c) * \Lambda(x_0,\rho,\gamma)$.

Optimization Problem

Now we need to write down the firm value with respect to Modigliani – Miller theorem. In our model, the market value of the firm equal to debt plus equity, miuns the flotation costs of each financing cycle's capital structure:

$$V(x_0,c) = (1-\varphi)E(x_0,c) + D(x_0,c) - \lambda_i D(x_0,c) * \Lambda(x_0,\rho,\gamma)$$

And above equation can be written as:

$$V(x_0,c) = [(1-\varphi)e(x_0,c) + b(x_0,c) - \lambda_i d(x_0,c)] * \Lambda(x_0,\rho,\gamma), i = U,D \quad [9]$$

If we are under the protected debt setting, X_D should be exogenous and be determined by the debtholders. But in our setting, we assume that debt is unprotected, equityholders with limited liability to choose the endogeously default threshold X_D in order to maximize equity value $E(x,c)$ under the smoothing-pasting condition. So here we can view the equity value of firm as a call option, and the default threshold as the option's strike price, then we can calculate endogeously default threshold X_D by sloving the smoothing-pasting condition:

$$\frac{\partial E(x,c)}{\partial x} \mid_{x=x_D} = 0 \quad [10]$$

As calculated in Appendix A, above smoothing pasting condition gives the default threshold expression:

$$x_D = \{1 - \frac{v}{v-1} \cdot \frac{(1-\tau)\cdot[\varphi+\phi(1-\alpha)(1-\varphi)]}{\phi-(1-\tau)[\varphi+\phi(1-\varphi)]}\}^{\frac{1}{v}} \cdot x$$

The optimal capital structure of the firm is expressed by the coupon payment choice c^* that maximize firm value with subject to smoothing-pasting condition:

$$\begin{aligned} &\arg\max_{\{c^*, X_D\}} V(x_0, c) \\ &s.t. \frac{\partial E(x,c)}{\partial x} \mid_{x=x_D} = 0 \end{aligned}$$

Solving above optimization problem, we have firm's optimal coupon payment c^* is:

$$c^* = \frac{(1-\alpha)(\nu-1)r}{v(r-\mu)} \cdot \left[1 - \frac{v}{v-1} \cdot \frac{(1-\tau)\cdot[\varphi+\phi(1-\alpha)(1-\varphi)]}{\phi-(1-\tau)[\varphi+\phi(1-\varphi)]}\right]^{\frac{1}{v}} \cdot x$$

Which demonstrates that the default threshold x_D is linearly increase with coupon payment c, and the optimal coupon payment c is also linearly increase with firm operation cash flow x.

3.3 Agency Conflicts and Manager Financing Decisions

3.3.1 Manager Entrenchment effect

In order to introduce the manager entrenchment problem into our model, we assume that when making financing decision, the manager act in his own interests to maximize the present value of his own rent instead of equityholders' interest. And the partially-entrenched manager can capture a fraction $\varphi \in [0, 1)$ of free cash flow to equity as his private benefits (as in La Porta, Lopez-de Silanes, Shleifer and Vishny (2002)). That is, the unadjusted cash flows to equity are $(1-\tau)(X_{it}-c)$ of which shareholders receive a fraction $(1-\varphi)$ and management appropriates a fraction φ. This cash diversion or tunneling of funds toward socially inefficient usage may take a variety of forms such as excessive salary, transfer pricing, employing relatives and friends who are not qualified for the jobs in the firm, and perquisites. In our model, we take φ as a fixed, exogenous parameter that reflects the severity of manager-shareholder conflicts. When $\varphi = 0$, there is no agency conflict, managers will choose the optimal leverage level and try to maximize the firm value. We also follow Zwiebel (1996), Morellec (2004), and Lambrecht and Myers (2008) by considering that the manager also owns a fraction ω of the firm's equity.

Therefore, manager's rent can be written as:

$$M(x_0, c) = \varphi E(x_0, c) + \omega V(x_0, c)$$

And manager's decision making problem is:

$$\begin{aligned} \arg\max_{\{c^m, X_D\}} M(x_0, c) &= \varphi E(x_0, c) + \omega V(x_0, c) \quad [11] \\ s.t. \frac{\partial E(x,c)}{\partial x} &\mid_{x=x_D} = 0 \end{aligned}$$

Both $V(x_0, c)$ and $E(x_0, c)$ are based on debt issuance c and default threshold X_D, and given equity value $E(x, c)$ decreases with coupon payment c, equation $[11]$ implies that if $\varphi > 0$, solving above optimization problem, we will have $c^m < c^*$,which implies that firms with entrenched manager will underlevered than their flotation cost adjusted optimal leverage level. In particular, the model predicts that debt level c decreases with the severity of manager-equityholder conflicts parameter φ, which implies that φ positively related with firm underlevered drift level. Now, the firm capital structure refects not only the tax advantages of debt less default costs (Modigliani-Miller), but also the agency costs resulting from manager entrenchment effect.

We will see in the next section that under separation of ownership and control, how manager's risk-shifting incentive affect his financing decisions. The next section of our analysis involves both the classical problem of aligning the shareholders and managers objectives and a risk-shifting problem with respect to the firm shareholders and debtholders. This joint problem for a levered firm is an important conceptual difference with respect to the classical dynamic capital structure and corporate governance models.

3.3.2 Manager Risk Shifting Problem

Assumption

Based on the first stage, now we introduce risk-shifting setting into our model in order to show that manager's risk-shifting incentive may cause overleveraged financing decision in financial distress firms. From now on, we have hetergeneous principal (debtholder and equityholder), and the conflict between equityholders and bebtholders also affect firm's leverage level. We assume that manager of a distressed firm can take on high risk projects in order to generate sufficient temporary cash flow to avoid bankruptcy (Eisdorfer,2008). A rise in asset operation risk can increase opportunity to avoid default, but it is also at the expense of debtholders since the increase of asset operation risk induces a high likelihood of default as well. Therefore, when manager decide to do risk-shifting, he has to consider his new risk-taking level.

Now we consider the same firm, run by a risk-neutral manager who is operating a series of asset in place. But the existing assets in place can take two kinds of risk values: with a high value volatility σ_i^H or a low value volatility $\sigma_{i,}$, where $\sigma_i^H = \sigma_i + \zeta_i$, and ζ_i is the risk increment. Therefore, when manager decide to do risk-shifting, he can transfer fraction α of total asset into high risk operation. Then firm asset cash flow after risk-shifting then can be demonstrate as:

$$\begin{aligned} dX_{it}^H &= \mu_i X_t dt + \sigma_i^H X_{it} dB_{it}, X_{i0}^H > 0 \quad \text{With fraction } \alpha \in [0,1] \\ dX_{it} &= \mu_i X_t dt + \sigma_i X_{it} dB_{it}, X_{i0} > 0 \quad \text{With fraction } 1-\alpha \end{aligned}$$

Therefore, the total manager risk-taking level after risk-shifting will be $\alpha \cdot \sigma_i^H + (1-\alpha) \cdot \sigma_i$, and the firm totally cash flow after risk-shifting should be:

$$\alpha \cdot dX_{it}^H + (1-\alpha) \cdot dX_{it}$$

In the static or dynamic case, debtholders who rationally anticipate equityholders' opportunistic risk-shifting behavior will demand a risk premium or a higher coupon payment of their bonds, namely, a high credit spread for bearing the downside risk. Therefore, in order to keep the low financing cost as before, manager has to sign an incentive contract which has contract fee $z(\alpha, c)$ with debtholders, when debtholders believe that there is probability for manager to do risk-shifting at financial distress situation.

Timing

The timing of our model with manager risk-shifting is as follows:

At $t = 0$, Some firms go to financial distress, and the condition of financial distress is parameterized by a cash flow threshold X_R which is:

$$X_D < X_R < X_0 < X_U$$

When some firms reach the financial distress threshold X_R, due to the operation cash flow shortage, firm is in financial distress already but have not reach their bankruptcy threshold X_D. At this time, an increase in asset operation risk can quickly release the firm from financial distress and increase the cash flow from X_R to X_U, then the firms can restruct their capital structure. But excessive risk-taking may also cause earlier default, since higher cash flow volatility also can decrease cash flow from X_R to X_D faster. Therefore, the opportunity perception gives an risk-shifting incentive for the manager to transfer downside risk to debtholder.

At $t = 1$, With predicting that managers will do risk-shifting at financial distress time, in order to avoid manager's possible downside risk transferring behavior, debt holders will require an incentive contract with contract fee $z(\alpha, c)$. After manager raise the asset operation risk, manager has to pay the incentive contract fee to debtholders.

At $t = 2$ The manager chooses the risk-shifting level α,when there is no risk-shifting behavior, $\alpha = 0$. Some of the risk-shifting firms successfully increased their cash flow from X_R to X_U, and then start a new financing cycle. At the same time, some financial distress firms failed to reach X_U and their cash flow keep deteriorating to default threshold X_D.Then these firms go to default. When firm go to default, only bondholders get paid.The firm who reached restructing threshold X_U will start a new financing cycle, and managers need to make his financing decision.

3.3.3 Incentive Contract Fee

At $t = 1$, debt holders will decide the incentive contract fee based on their commonly-held prior belief α about manager's possible risk-shifting level. Where α is debt holders' commonly-held prior belief that based on a manager risk-neutral prospective, such that $\alpha \in [0, 1]$. Therefore,

the debotholders face the following set of managers possible payoff and the corresponding fractions:

$$M(x,c) = \{M(x_0,c), M(x_0^H,c)\}$$
$$F = \{1-\alpha, \alpha\}$$

where $M(x_0^H,c) = \omega V(x_0^H,c) + \varphi E(x_0^H,c)$, and $V(x_0^H,c)$ and $E(x_0^H,c)$ are the firm and equity value with respect to high risk cash flow process.

Therefore, debtholder's expected value of manager's payoff after risk-shifting is:

$$E_R[M(x_0,c)] = \alpha \cdot [M(x_0^H,c)] + (1-\alpha) \cdot [M(x_0,c)] \quad [12]$$

And without risk-shifting opportunity, manager gets payoff $M(x_0,c)$.

Therefore, in order to set up an incentive-compatibility contract to ensure that the risk-shifting asset operation is not chosen by manager, debtholders will accept an incentive contract fee which satisified following incentive condition:

$$E_R[M(x_0,c)] - z(\alpha,c) \leq M(x_0,c)$$

Plug equation $[12]$ into above incentive condition, then we will have:

$$z(\alpha,c) \geq \alpha \cdot [M(x_0^H,c) - M(x_0,c)]$$

Therefore, in order to get a low financing cost, managers has to offer debtholder an contract with contract fee satisifed above incentive-compatibility,and minimizes the expected compensation costs. Therefore, we will have:

$$z(\alpha,c) = \alpha \cdot [M(x_0^H,c) - M(x_0,c)] \quad [13]$$

Since managers' payoff $M(x_0,c)$ is concave in c, insurance fee $z(\alpha,c)$ is decrease with coupon payment c and increase with manager's risk-taking level α. A natural interpretation is that $z(\alpha,c)$ is the totally compensation that managers need to pay to debtholders for increasing assets operation risk with characteristics α

3.3.4 Manager's First Best Risk-taking

We begin by characterizing the first best risk-taking choice of manager. In this situation, we assume that manager's risk-shifting level α is perfectly observed by debtholders and debtholders can set incentive contract fee after perfectly observing α . In this setting, manager will choose the asset risk level α^{FB} maximizes his net expected return, which takes the following simple expression:

$$\arg\max_{\alpha^{FB}} \alpha \cdot M(x_0^H, c) + (1-\alpha)M(x_0, c) - z(\alpha, c) \quad [14]$$

$$s.t. z(\alpha, c) = \alpha \cdot [M(x_0^H, c) - M(x_0, c)]$$

Given $\alpha \in [0, 1]$, it is indifferent for managers to do risk-shifting or not, and it is immediate to see that the first best α is given by

$$\alpha^{FB} = 0$$

In other words, with perfectly observed risk-shifting level α, an incentive contract can efficiently deter managers to take excessive risk. Thus, managers will not do risk shifting, and at this time, firm optimal capital structure is determined by the same optimization problem:

$$\begin{aligned} &\arg\max_{\{c^{FB}, X_D\}} (1-\alpha^{FB}) \cdot [M(x_0, c)] \\ &\quad = \arg\max_{\{c^{FB}, X_D\}} M(x_0, c) \\ &\quad s.t. \frac{\partial E(x,c)}{\partial x} \mid_{x=x_D} = 0 \end{aligned}$$

Which is the same optimization problem as our analysis in manager entrenchment problem. Therefore, we will have $c^{FB} = c^m$, which is the same optimal leverage solution as in first stage. In this case, risk-shifting problem will not affect manager's initial capital structure choice.

3.3.5 Manager's Opportunistic Risk-shifting

Although it is in principle possible to make use of above incentive contract to induce a levered firm manager to choose a non risk-shifting asset operation. It is far from obvious that a levered firm debtholders will use an incentive contract to align the manager risk-taking objectives. There are at least two reasons why we should not expect incentive contract can stop managers' risk-shifting problem: manager's local risk-seeking, and naive bondholders. We explore these below.

Manager's Local Risk-seeking

When firm go to financial distress at threshold X_R, an risk-shifting incentive may arised at there since manager's local risk appetite change. We assume that a global risk-neutral manager may become locally risk-seeking in the financial distress situtation, which caused by the opportunity perception of escaping from default. This assumption is consistent with some empirical finds that decision makers' risk behavior will be risk avoiding in gain situations and risk seeking in loss situations (Sullivan,1993). Under the manager risk-seeking assumption, we will have manager's expected payoff

$$\alpha \cdot M(x_0^H, c) + (1-\alpha)M(x_0, c) - z(\alpha, c) > M(x_0, c)$$

To capture the effects of risk appetitie change of managers, we assume that manager's risk appetite change caused utility function of manager's payoff of high risk asset operation turns to $u(\alpha) = \alpha^2$. Therefore, with the original incentive contract fee $z(\alpha, c)$ which sets under a risk-nuetral perspective, manager's optimal risk-taking problem will turns to:

$$\arg\max_{\alpha}(\alpha)^2 \cdot M(x_0^H, c) + (1-\alpha^2)M(x_0, c) - z(\alpha, c) \quad [14]$$

$$s.t. z(\alpha, c) = \alpha \cdot [M(x_0^H, c) - M(x_0, c)]$$

With the first order condition:

$$\alpha = \tfrac{1}{2}$$

Specifically, the manager's risk appetite change caused the asset risk taking distribution shift, such that managers will select $\alpha > \alpha^{FB}$, which implies that manager will take excessive risk and do risk-shifting.

Naive Bondholders

Until this point, we have considered debtholders who are completely rational and can observe manager's risk-shifting level α. Now consider the case where manager's risk-taking level is unobservable to debtholders. Given the friction that the debtholder can not observe risk directly, it is only in the interest of shareholders to implement α (if they could commit to it), and thus take excess risk. We now suppose that debtholder may be naive and overly optimistic. By naive, we mean that debtholders do not consider the incentives of the manager regarding risk-shifting. By optimistic, we mean that debtholders expect the risk-shifting level to be smaller than manager's actually risk-taking α and then only ask for a low contract fee. But in anycase, the managers

can offer a fixed incentive contract fee $z(\alpha, c)$ to debtholder. At this time, the manager is not sensitive to the incentive fee it pays for debt holders. Denote manager's actual risk-shifting level is $\alpha^N > \alpha$, where α is debtholders' commonly-held prior belief about manager's risk-shifting level. Then the maximization problem of manager's payoff of doing risk-shifting will be:

$$\begin{aligned} \arg\max_{\alpha^N} & \alpha^N \cdot M(x_0^H, c) + (1-\alpha^N) M(x_0, c) - z(\alpha, c) \\ & s.t. z(\alpha, c) = \alpha \cdot [M(x_0^H, c) - M(x_0, c)] \end{aligned}$$

Therefore above problem can be written as:

$$\arg\max_{\alpha^N} M(x_0, c) + (\alpha^N - \alpha)[M(x_0^H, c) - M(x_0, c)] [15]$$

Given $\alpha^N > \alpha$ and $\alpha^N \in [0, 1]$,it is immediate to see that the best α^N is given by:

$$\begin{aligned} \alpha^N = 1 \text{ if } M(x_0^H, c) > M(x_0, c) \\ \alpha^N = 0 \text{ if } M(x_0^H, c) \leq M(x_0, c) \end{aligned}$$

In other words, as long as there is upside (from a risk-neutral manager perspective) there are gains to do maximal risk-shifting and pay the incentive contract fee $z(\alpha, c)$ to debtholders.

In this case, the incentive contract can not align managers' risk-shifting objective since the unobservable risk-taking α. And the incentive constraint of the contract is not binding:

$$E_R^N[M(x_0, c)] = \alpha^N \cdot M(x_0^H, c) + (1-\alpha^N) M(x_0, c) - z(\alpha, c) \geq M(x_0, c)$$

Managers get the risk-shifting opportunity.

3.3.6 Leverage

After managers do risk-shifting, caused by the incentive contract, manager has to pay the incentive contract fee to debtholders, and the optimal capital structure problem which faced by manager is giving by:

$$\begin{aligned} \arg\max_{\{c^{RS}, X_D\}} & \alpha \cdot M(x_0^H, c) + (1-\alpha) M(x_0, c) - z(\alpha, c) \quad [16] \\ & s.t. \frac{\partial E(x,c)}{\partial x} \mid_{x=x_D} = 0 \end{aligned}$$

Since the third term $z(\alpha, c)$ in equation $[16]$ is decrease with coupon payment c, equation $[16]$ implies that if $z(\alpha, c) > 0$,we will have $c^{RS} > c^m$, which implies that manager's opportunistic risk-shifting incentive will increase his leverage selection. This result is consistent with the widely accepted empirical result that asset substitution induced at high levels of leverage, and

equity holders' risk-shifting incentive will mitigate the under-levered problem. Furthermore, this model predicts that in order to keep a constant contract fee payment, debt level choice c^{RS} is increase with debtholders' prior belief of firm manager risk-taking α.Which predict that when managers have risk-shifting opportunity, firm's expected risk-taking level α positively related with manager's leverage selection in financial distress time. This result also predict that when firm faces very high default risk, the risk-shifting incentive of managers may more stronger so as their overlevered behavior.

After inducing risk-shifting into our model, now our optimal capital structure analysis refects both the tax shield benefit, bankruptcy costs, and the agency costs resulting from both manager entrenchment and risk-shifting problem.

If manager entrenchment effect and risk-shifting effect co-exists in firm, the manager's final capital structure choice depends on the comprehensive effect of these two agency problems, and the final firm leverage drift direction depends on which effect is stronger. Given $c^{RS} > c^m$ and $c^m < c^*$, where c^* is firm's optimal leverage, two possible senario may raise at there:

1 $c^m < c^{RS} < c^*$.In this case, the risk-shifting incentive of manager mitigate the under-levered problem caused by the manager entrenchement effect, but the risk-shifting effect is not strong enough to let the firm capital structure reach its optimal level. So firm still performs underleverged.

2 $c^m < c^* < c^{RS}$. In this case, firm have very strong risk-taking incentive,and the strong risk-shifting incentive of manager eliminates entrenchment effect on firm capital structure, the comprehensive effect of these two problem changed the firm from underleveraged to overleveraged.

3.4 Conclusion

Recent dynamice capital structure studies highlight an important feature of firm leverage is that firm leverage does not always stay at their "optimally level", not even on average. These phenomenon raise several questions at the firm level: If in an efficient capital market, the adverse consequences of debt agency are born entirely by equity holders through the increased cost of debt financing and any deviations from firm value-maximizing policies will be reflected in a decline in the value of firm, why firm leverage deviate from their optimal level? whether traditional principal-agency problem will cause firm leverage deviation and how to explain corporate governance mechanism's effect on the firms' financing decisions?

In this paper, we develops a structural model to analysis the magnitude of conflicts of interests between managers, shareholders, and bondholders and their effects on financing decisions. This dynamic contingent claims model assumes that firm financing policy results from a trade-off between tax shields, contracting frictions, and agency conflicts. In the model, each firm is run by a partially-entrenched manager who sets the firm's payout and financing policies, man-

agers act in their own interests to maximize the present value of their rents.

To make the analysis complete, we also examines the effects of shareholder-debtholder conflicts on financing decisions in the same model by assuming that: the entrenched manager also can shift downside risk to debt holders by taking on risky projects in a hope of avoiding bankruptcy in financial distress, which is a risk-shifting incentive. Debtholders of the same firm who rationally anticipate the potential risk shifting problem demand high risk premiums in the form of signing an incentive contract (Gormley, Matsa and Milbourn, JF, 2003). But managers' shifting appetite for risk or debt holders' underestimation of manager risk-taking level still can give manager a risk-shifting opportunity. Because incentive contract fee is chosen by debtholders with risk in mind, simple correlations between contract fee and risky actions can be misleading. With addressing this identification issue, we analyze how managers respond to an risk-shifting chance.

Our analysis demonstrates that entrenched managers issue less debt than optimal for shareholders. And, in contrast, managers' opportunistic risk-shifting incentive will increase his debt issue. we find that this model can partically explained the observed underleverage and overleverage of some firms. This analysis result has a number of significant implications:

First, it suggests that agency conflicts can be one important reason why firm leverage deviate from their optimal leverage level.

Second, our dynamic model provides a unified framework to reconcile two well-known principal-agency problems and analyze their comprehensive effect on manager's financing decision. Different from traditional theoretical framework in which focus on one agency problem, our model gives a more rational analysis about the correlation between agency conflicts and their effect on firm leverage decision. The contrary effect of these two problems on firm leverage demonstrate that the observed leverage deviation is determined by which effect is stronger. Manager risk-shifting incentive can moderate underleverage which caused by manager entrenchment effect.

Finally, our analysis may also shed light on the relation between governance mechanisms and capital structure dynamics. while dynamic capital structure theories that ignore agency conflicts can not reproduce the financing patterns observed in the data, our analysis provide a reasonable qualitative explanation for this issue. Overall the model also suggests that part of the heterogeneity in capital structures documented in Lemmon, Roberts, and Zender (2008) may be driven by the observed variation in the governance structure of firms. 3.