

Essays in Chinese Firm-Bank Switching

by

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Abstract

This thesis consists of three empirical studies that investigate firms' switch behaviour and the change of firm-bank relationship in China's loan market. The first study analyses the duration of firm-bank relationships and examines what drives firms in China to switch from one bank loan provider to another. A semi-parametric approach from survival analysis – Cox proportional hazard model is used to allow for a semiparametric hazard function after parametrically controlling for both time-varying and time-invariant covariates of firm-specific financial factors, industry factors, ownership characteristics, internal management changes, and external macroeconomic factors. Additionally, the thesis explores the impact of the global financial crisis, bank-financial and ownership characteristics. Moreover, the second study identifies the borrowing behaviour of listed firms using a marketing approach, which contributes to the cross-disciplinary literature by testing the applicability of a well-known model of customer purchasing behaviour, the Negative Binomial Distribution – Dirichlet model (or Dirichlet model), to the firm-bank relationship in the loan market. The third empirical study in this thesis examines the role of political connection in the firm-bank relationship.

Matched data of firm-level data to bank loan duration provides a unique panel data set of relationship between China's listed firms and their lending banks consisting of 2,102 firms listed on both the Shanghai Stock Exchange and Shenzhen Stock Exchange in the period of 1996-2016. The estimation results provide evidence that the main drivers of firms' switch behaviour come from their credit needs, characteristics of firms and lending banks, and change of economic environment as well. Small, young and non-SOEs, firms with lower leverage, and multiple bank relationships, and non-politically connected firms are more likely to switch. Besides, a male CEO, long CEO tenure and a CEO switch during the lending relationship increases the likelihood of a switch. Understandably, the likelihood of a switch declined during the financial crisis years of 2008-9. The findings of this thesis imply that in an environment of growing commercialization of relationships the firm-bank relationship between state-owned enterprise (SOE) and state-owned banks (SOB) in China remains super-stable.

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Table of Contents

Abstract.....	ii
Acknowledgements	iii
Table of Contents.....	iv
List of Table	viii
List of Figure	ix
1 Introduction.....	1
1.1 Background and Motivation	1
1.2 Research Questions and Contribution.....	4
1.3 Outline	7
2 General Background.....	9
2.1 Introduction.....	9
2.2 The Role of State-owned Enterprises in China.....	10
2.3 Reform of SOEs and A Rise of The Private Sector	12
2.4 Overview of China’s Banking System.....	17
2.5 Borrowing – Lending Relationship in China	21
2.6 Monetary Policy	25
2.6.1 Interest Rate	25
2.6.2 Reserve Requirements	27
2.6.3 Window Guidance	28
2.7 Conclusion	31
3 What Cause China Listed Firms To Switch? Evidence Based On A Survival Analysis	33
3.1 Introduction.....	33
3.2 Literature Review	34

3.2.1 Asymmetric Information and Switch Behaviour	34
3.2.2 The Determinants of Relationship Duration	35
3.2.3 Relevant Studies About China	38
3.3 Methodology	40
3.3.1 Terminology	41
3.3.2 Model Framework	42
3.3.3 Censoring and Truncation	45
3.3.4 Measurement of A Switch	46
3.3.5 Empirical Model	47
3.3.6 Variable Description	48
3.4 Data and Sample	53
3.4.1 Data Source	53
3.4.2 Details of Matched Firm-Loan-Bank Data	54
3.4.3 Censoring	55
3.4.4 Descriptive Analysis	55
3.5 Empirical Results	60
3.5.1 Non-parametric Analyses	60
3.5.2 Semi-parametric Analysis – Cox Proportional Hazard Model	61
3.5.3 Robustness	68
3.6 Conclusion	71
4 Understanding The Borrowing and Lending Behaviour Using the Dirichlet Benchmarks	72
4.1 Introduction	72
4.2 The Role of State Ownership	75
4.3 Overview of the Dirichlet	80
4.3.1 The Use of the Model	81

4.3.2 Background.....	82
4.3.3 The Application of the Dirichlet Model	83
4.3.4 Main Regularities of Consumer Buying Behaviour Based on Marketing Literature	85
4.4. Methodology	89
4.4.1 Probability Density Functions	89
4.4.2 Brand Performance Measures	91
4.4.3 Likelihood Functions and Model Estimation.....	94
4.4.4 Variables and Sample	96
4.5 Results.....	98
4.5.1 Descriptive Statistics.....	98
4.5.2 Duplication Analysis.....	101
4.5.3 Theoretical BPMs Estimated By the Dirichlet Approach.....	104
4.5.4 Covariates Effects	108
4.6 Discussion and Implications	113
4.7 Conclusion	114
5 Changing Loan Provider: The Role of Political Connection	116
5.1 Introduction.....	116
5.2 Literature Review	118
5.3 Institutional Background.....	121
5.3.1 Connection with Communist Party of China Committee	123
5.3.2 Connection With Central or Local Government.....	124
5.3.3 Connection with State-owned Enterprises	125
5.3.4 Connection with National People’s Congress and Committee of Chinese People’s Political Consultative Conference	127
5.4 Methodology	128

5.4.1 Model Framework and Hypotheses	128
5.4.2 Data and Sample	135
5.5 Results.....	138
5.6 Conclusion	145
6 Conclusion	147
6.1 Summary of Key Findings	147
6.2 Discussion and Policy Implication	149
6.3 Limitations and Further Research.....	151
References.....	153
Appendix.....	163
Appendix A – for Chapter 2	163
Appendix B – for Chapter 3.....	166
Appendix C – for Chapter 4.....	168

List of Table

Table 2.1: Window Guidance Policy Stance	30
Table 3.1: Determinant of Bank-Firm Relationship Duration and Firm Switch.....	38
Table 3.2: Description of The Variables.....	52
Table 3.3: Descriptive Summary	59
Table 3.4: Estimate Results of Cox Proportional Hazard Model	67
Table 3.5: Robustness Tests	70
Table 4.1: Formula For The Dirichlet Theoretical BPMs	94
Table 4.2: Variable Description.....	98
Table 4.3: Brand Performance Measures.....	100
Table 4.4: Duplication Analysis (Externally).....	102
Table 4.5: Duplication Analysis (Internally)	104
Table 4.6: Observed and Theoretical Brand Performance Measures	106
Table 4.7: Estimate Results of The Dirichlet Model	110
Table 4.8: Switching Analysis	112
Table 5.1: Variable descrip tion.....	134
Table 5.2: The Sample	137
Table 5.3: Effect of Political Connection	140
Table 5.4: Estimate Results of The Logistic Regression Model	144

List of Figure

Figure 2.1: Development of the lending rate in China, 1996-2016	26
Figure 2.2: Reserve requirement ratio in China, 1996-2016	28
Figure 2.3: Window guidance stance and the effect on lending growth.....	31
Figure 3.1: Definitions of switchers, inside bank and outside banks	36
Figure 3.2: Censoring and Truncation	46
Figure 3.3: Distribution of loans among different groups	56
Figure 3.4: Total number of firms.....	56
Figure 3.5: Number of firms in different sectors	57
Figure 3.6: Types of lending banks.....	57
Figure 3.7: Mean duration among different sizes or ownership of firms	58
Figure 3.8: Survival and hazard function (Full sample)	60
Figure 3.9: Survival and hazard functions for state and non-state firms	61
Figure 3.10: Survival and hazard functions for large firms and SMEs	61
Figure 3.11: Baseline hazard contributions	62
Figure 3.12: Cox proportional hazard function	63
Figure 4.1: Ultimate control structure of China Railway Group Ltd.....	76
Figure 4.2: Ultimate control structure of Guangxi Guidong Electric Power Ltd...76	
Figure 4.3: Markets shares of major groups of banks.....	79
Figure 4.4: Profit level (ROE) of major groups of banks	80
Figure 4.5: Distribution of switching behaviour.....	112

1 Introduction

1.1 Background and Motivation

Modern banking theory suggests that firms and financial intermediaries are interested in long-term and stable relationships which allocate efficient usage of loans. Increased access to bank loans is frequently attributed to close ties between clients and their bank which reduce asymmetric information. Although a close firm-bank relationship is beneficial to both firm and bank, this strong bank-firm link can also bring negative impacts on firms. A strong bank-firm relationship gives informational monopoly power to the lending bank through multiple interactions, which is detrimental to firms such as getting hold-up problem and informational captured problem. In particular, this monopoly position enables banks to exploit their informational advantage on locking-in their existing customers and extracting higher rents through repeated lending.

In general, firms are more likely to change credit provider when their severe financial constraints cannot be solved by the current bank. Firms may face trade-offs by comparing advantages of maintaining the relationship with their current bank against the potential benefits (e.g., better loan condition) of switching to a new bank (Stephan et al., 2012). As Boot (2000) suggests that private information plays a crucial role in bank-borrower relationships, and the magnitude of private information increase as a bank deals with any given clients over time. Indeed, banks accumulate private information, especially soft information from repeated interactions with firms over time and build up closer relationships with them. Most theories predict that repeated borrowing from a particular bank reveals information about the firm's type and a strong banking relationship can reduce the informational problem. While the rival banks do not have this private information would charge a higher loan rate when firm switches, this could worsen the borrower's financial constraint. There is broad theoretical and empirical agreement on the view that closer and stable firm-bank relationships efficiently build up a unique management structure, it not only alleviate the level of information asymmetry between firm and bank, but also enables firms to access bank credit easily with lower loan rates

and better loan conditions (e.g. Berger and Udell, 1995; Bharath et al, 2011; Boot and Thakor, 1994; Cole, 1998; Elsas and Krahnen, 1998).

However, a long-term and stable bank relationship is not the only choice for firms. The likelihood of switching is higher when firms face financial constraints which cannot be solved by their incumbent bank. A plenty contribution have stressed the inertia effect resulting from information capture problems or from the presence of costs associated with the search for a new bank or their switch behaviour, and argue that this customer relationship allows banks to take their informational advantage over competitors and lock-in their existing borrower, which enables them to charge higher interest rate to earn higher profits as relationship continues (e.g. Sharp, 1990; Rajan, 1992; Boot, 2000; Yin and Wu, 2015). However, the lock-in effect can be alleviated through either reducing the loan amount that borrows from incumbent banks or forming multiple bank relationships (e.g. Hubert and Schafer, 2002; Agostino et al., 2012). The main advantage of having multiple bank relationships is that the probability of liquidity risk and informational lock-in can be effectively diluted, though these multiple bank relationships may induce cost of transaction and monitoring. Literally, firms have considered to terminate the incumbent bank relationship and switch to other banks to overcome the financial distress when their credit needs cannot be fulfilled by the incumbent bank. In addition, a borrower may terminate the incumbent loan relationship and switch whenever sufficiently better loan conditions are provided by other banks. Besides, firm's decision to terminate an incumbent bank relationship or switch to other lender determines by various factors such as firm's characteristics including ownership structure, transparency, external finance requirement, bank's lending decision and economic environment.

This issue is particularly important for the Chinese economy, even though the occurrence of switching behaviour in China is slightly different from those in the Western economies. In a Chinese characteristic economy, switching from one loan provider to another does not necessarily imply a complete relationship termination with its previous loan provider. Hence, using the term “changing” may better reflect the actual meaning of switching under this specific context¹. The rapid development of the Chinese economy has been matched

¹ Both the term “change” and “switch” has been used frequently in this thesis, while a switch in China is clarified slightly differs from the existing literature, which captures the firm-bank relationships in a Chinese characteristic condition.

by the speed of growth of the loan market. While the formal financial sector in China has seen the fast growth of the capital market, it remains dominated by the banking industry. China has a unique banking system and its banking market is large and continues expanding. With concentrated ownership and weak investor protection in emerging markets, the management and boards of directors of some listed state firms become less effective because they are mainly or partially controlled by the state or local governments. In this sense, how bank relations influence the firm's financial policies and loan decision is particularly related in an emerging market. Although many types of banks were begun to emerge locally, the state-owned banks were concerned less about the competition because of the dominance of state ownership and the size of their assets.

According to the National Bureau of Statistics of China, 54% of total financing for Chinese firms were from banks in 2016. Historically, the banking market was dominated by the state-owned banks (SOBs) and the economy was almost exclusively made up of state-owned enterprises (SOEs). These SOBs are also still part of SOEs, even though the recent spate of banking reforms have severed the formal links of the SOBs to the socialist plan (Chang et al., 2014). It is commonly recognized that the SOEs were favoured over non-SOEs in access to bank credit due to government's dual dominance in banking and commerce. SOBs often lend to SOEs for political, employment and taxation purposes rather than maximization of profits, and the state ownership homogeneity and implicit government guarantees result in this lending bias. While non-SOEs were expected to obtain funds less easily and pledge more collaterals with a higher loan rate. Lending from SOBs to SOEs can be considered as political relationship lending, which represents a significant cultural component – “*guanxi*” of bank-firm relationships in China. Generally, “*guanxi*” includes a mixed concept of business relationship management, political party affiliation and personal social networks, this strengthens the traditional concept of “*guanxi*” in Chinese business which cemented the bank-firm relationship between SOEs and SOBs. Firms changing their loan provider in this environment would be expected to be rare.

However, the exclusivity and strength of this relationship, and the lack of opportunity for the SOBs to diversify, has partly been the reason for their historically high non-performing loan (NPL) ratio. With the evolution of SOEs and the reform of the banking industry in the 1990s, the NPL ratio of the SOEs declined gradually from 17.9% in 2003 to 1.75% in 2016.

The growth of the non-SOE sector and the decline in the share of the SOBs in banking has signaled the increased commercialization of firm-bank relationships. The improvement in the performance of Chinese banks also indicates a greater focus on credit quality and repayment ability. The changing environment of greater competition in banking, and increased private sector development is likely to strain traditional firm-bank relationships giving rise to a higher frequency of change between bank loan providers.

As one of the crucial element of “*guanxi*” relationship lending, political connections are shown to have a significant influence on the overall economy and the economic life of individual firms. Public choice literature suggests that rent-seeking, extraction, and protection are the main objectives of government intervention. Companies are not expected to obtain a substantial competitive advantage or preferential treatment from their political connections in countries with a well-functioning legal system. Government officials with the power to influence the decision-making of public companies would face a risk of legal and political costs if they chose to help companies for private reasons rather than for reasons of public interest (Goldman et al., 2009). Generally, this argument seems true, anecdotal stories about the potential impact of political connections in the China market do exist.

1.2 Research Questions and Contribution

In China, it is well-known that firms cultivate multiple bank relationships and therefore switching from one loan provider to another does not necessarily imply a weakening of the firm-bank relationship with the previous provider. Similarly, the literature on switching of banks by firms does not necessarily imply that the firm cannot return to its previous provider at a future date. Rather than terminating a current bank relationship and switch to other banks completely, firms in China may change their bank loan providers frequently, while still maintaining a relationship with their previous banks through loan activities or other business activities. My study interrogates the literature on switching of bank loan provider by firms to develop a methodology to examine the determinants of a change in the loan provider within multiple firm-bank relationships. A number of Chinese scholars have examined the role of firm-bank relationships and Yin and Mathews (2016, 2017) have explicitly modeled the probabilistic causes of a firm-bank switch. These studies ask the

question, what is the probability of a firm switching its main credit provider given initial conditions of the firm, the conditions of the bank, and the economic environment?

My study addresses the time-varying factors that contribute to a change. In other words, it poses the question, what are the determining factors that cause a switch? These factors could be changing conditions of the firm, changing conditions of the bank, changing conditions of the external environment, or simply a change in the CEO, which requires a repositioning of the firm-bank relationship. The answer to this research question provides insights into the commercialization of business relationships that follow from the economic reform process in China. How have firm, bank, and economic circumstances changed over time to warrant a change in firm's bank loan provider? To answer this question, I use a survival analysis (also known as duration analysis) particularly a semiparametric Cox proportional hazard model, which to my best knowledge is a first in the Chinese banking literature. Survival analysis, has been commonly used in studying and modelling problems that include the duration of time before a particular occurrence. The duration models have been used to study the passage of time before a firm changes its existing bank loan provider to another bank. The change from one bank loan provider to another can be described through a *hazard function* $h(t)$, which determines the rate at which a firm-bank relationship termination occurs, conditional on the relationship spell at least until date t . The most important advantage of using a hazard function is that it provides a natural way to interpret the process that generates duration, and regression models for duration data are more easily grasped by observing how covariates affect the hazard rates.

Since it has been recognized that firms in China switch their loan provider, but where do they switch to and what else banks they also borrow? A famous Dirichlet approach that commonly used in marketing research to explain and forecast consumer's buying behaviour has been extended to my study, while focusing on firm's borrowing behaviour and choice of lending banks. The Negative Binomial Distribution–Dirichlet (Dirichlet for short) is a descriptive model that analyse patterns of past behaviour, which has long been applied to investigate the change of buyer behaviour, brand switching, brand loyalty and repeat purchase markets in the marketing literature, and directly or indirectly describe the buying patterns that have been explored for various types of products, and category in many countries based on the frequency of past behaviour – how many consumers buy at all, how

often they buy, what other brands they buy. In addition to using the Dirichlet model to describe firm's borrowing behaviour, I also incorporate the covariates related to the characteristics of firms, executives, banks and economic environment to investigate how these factors influence the borrowing frequency, choice and loyalty of firms, as well as changing the market share of different groups of banks.

“guanxi” is believed to be a significant element in firm-bank relationship. To narrow down the concept of “guanxi”, my study tends to focus only on firm's ownership and political links. Existing studies have examined firms' political connections in various aspects, terms of borrowing, market valuation, long-term performance, bailout events, taxation policy, and government contracts (Faccio, 2006; Goldman et al., 2013; Khwaja and Mian, 2005; Fan et al., 2007; Pan et al., 2009). However, how political connection affects the firm's decision on switching credit provider – an important corporate event for firms to evaluate their bank relationships – has yet not been examined. A standard Logit model is employed to examine the role of CEO's political connection.

It is commonly recognized that firms in China borrow from multiple banks simultaneously and thereby changing from one bank to another does not necessarily mean that weakens the relationship with previous banks or even terminates this current relationship. Forming a new relationship when a past loan deal with firm's current bank is outstanding is also considered as a switch through adding a new bank relationship. Hence, following the definition made by Ioannidou and Ongena (2010) that a *Switch* is defined as a firm obtains loan from a new bank with which it did not have a lending relationship during the previous 12 months, firm's switch behaviour in the China market could be defined by either moving to other banks (terminating current relationship) or adding a new bank relationship in or after a current deal with its incumbent bank.

The study on firm's switching behaviour, duration of firm-bank relationships, firm's borrowing choices and the role of political ties is quite a handful, which leaves these fields unexplored. My thesis seeks to fill these gaps by conducting the research using both listed state-owned and non-state-owned enterprises (non-SOEs) in China. The main objective of my thesis is to provide empirical evidence and fill literature gap for these unexplored fields, also improve the understanding of the bank-firm relationship as well as the drivers of firm's

decision on switching. The main contribution of this study is that I firstly use a survival analysis to analyse the firm-bank relationship in China, which has been widely used for this topic in Norwegian, Portuguese, Greek and French markets (see e.g., Ongena and Smith, 2001; Farinha and Santos, 2002; Mavri and Ioannou, 2008; Bouchellal and Castro, 2016). In addition, my thesis contributes to the cross-disciplinary literature by testing the applicability of a well-known model of customer purchasing behaviour, the NBD–Dirichlet model, to loan activity between listed companies and banks. Applying and extending this marketing approach to analyse the borrowing patterns of listed firms is also a first in the literature of China’s loan market. Apart from applying these new measurement techniques, my thesis also incorporates various time-varying covariates and investigate whether changing the condition of firms, management, banks, and the external environment would affect firms’ borrowing choices and their switching bank behaviour. Moreover, complementary to a descriptive marketing approach to describe the borrowing behaviour in the loan market for the past twenty years, I extend this approach by incorporating characteristics of various sets of covariates to help understand borrowing choice made by firms, not just the quantity or frequency of selections the firms decide to make. Furthermore, management factors are considered in my thesis that includes characteristics of executives such as age, gender, tenure, and their political ties, which emphasizes the role of managerial characteristics and provide a comprehensive measurement of political connection that fits China condition more.

1.3 Outline

This thesis consists of six chapters, the second chapter provides a general background of state and non-state enterprises operating in China, emphasizes the evolution of state-owned enterprises and a rise in the private sector. Next, it gives an introduction of China banking system and discusses the lending relationship has changed in recent years.

The third chapter applies a survival analysis and examines the duration of bank-firm relationship for different groups of firms (including state-owned, non-state-owned firms, large, and small and medium-sized firms) and main drivers to cause these relationship changed by using a sample of matched data on bank-firm lending that consists 2,102 China listed firms over the period 1996-2016. Besides, it describes the methodology and gives a

brief description of how these duration data collected and matched to create a unique firm-bank relationship dataset. Moreover, it investigates the factors that alter the duration of the firm-bank relationship in China.

The fourth chapter extends the switching behaviour of listed firms observed from the third chapter, proposes a new methodology – Dirichlet approach to analyze listed firms' borrowing behaviour. In particular, this chapter breaks the sample period into 2 periods in order to differentiate the borrowing patterns prior and post-financial crisis in 2008 and examine how these patterns change by the financial crisis. Apart from this, performances of major bank types operating in China will be presented to help understand the firm's choice of choosing their lending banks.

The fifth chapter explores the role of the firm's political connection and complements to existing literature on the effect of political connection by using the data of CEO's political background. This chapter firstly introduces the major types of political connection in China, and it describes measurement and develops the hypothesis. Estimate results and discussion will then be presented.

Finally, the last chapter concludes this thesis by summarizing findings from each chapter and provides discussion, policy implications and suggestions for further research.

2 General Background

2.1 Introduction

The economic growth in China over the past four decades is unprecedented in global economic history. Over the period, the character of China's economic management has evolved from being strictly centrally planned, export-oriented and state driven to one that is more market driven and oriented towards domestic consumption. China's GDP level has achieved an average annual growth rate of 10 percent in the past 40 years (National Bureau of Statistics of China, 2017). Today, China is the world's largest economy on a purchasing power parity basis. It is the world's largest manufacturer, exporter and holder of foreign exchange reserves. All of these impressive achievements are attributed to the persistence and far-reaching changes in China's economy and society. The Chinese government has also committed to reforms in banking, securities and insurance. These included diversifying banks' equity structures and transforming state-owned banks into joint-stock banks. Another key element of reform is allowing more foreign participation in China's capital markets. China's "reform and opening" efforts have also allowed it to enter an era of new economic growth.

China improved its economic growth during the global financial crisis through a massive stimulus program, financed almost entirely by an increase in bank lending. However, the credit-driven growth in recent years has been criticized in two aspects. First, although the stimulus program allowed China to achieve growth averaging well above 9 percent in 2009-11, growth since has dropped under 8 percent, even as credit has continually expanded, which implies that credit has been misallocated (National Bureau of Statistics of China, 2017). Second, the scale of credit increases in China have frequently been a harbinger of financial crises in other economies, typically caused by a sudden stop in credit growth or the collapse of an asset bubble (Lardy, 2015)

The remainder of this chapter is organized as follows. Section 2 introduces the general background about the Chinese enterprises from different perspectives and the role of the state-owned enterprise. Section 3 outlines the reform of state-owned enterprises and dramatic growth in China's private sector in recent years. Section 4 provides an overview

of China's banking system, outlines the role and characteristics of different types of banks, their history and development during the past few decades. Section 5 demonstrates borrowing-lending relationships and emphasizes the change of these relationships. Section 6 concludes this chapter.

2.2 The Role of State-owned Enterprises in China

Before China's economic reform in the late 1970s, private economy activity and the role of the market were severely constrained and the role of state and state-owned enterprises was pervasive. State Planning Commission target output level for major products, which in the situation of industrial goods were produced almost wholly by state-owned firms, and organized for the supplies of raw material and intermediate goods needed to achieve these production targets. Almost all prices were set by the State Price Commission, including agricultural products, investment goods, and retail commodities. The Ministry of Finance provided funding for investment in most of these state firms through government budgeting. In general, more than a third of total output was allocated by the unified state budget, a considerably large share for a low-income economy with minimal transfer payments to its citizens.

The non-agricultural sector was largely dominated by state-owned firms in China, a legacy of the system of central economic planning launched in the mid-1950s. In industry, the state-owned enterprise accounted for only about one-quarter of all firms in 1978, but the balance of firms was collectively owned, which almost invariably implies a certain degree of ownership that control by provincial or local governments. Apart from this, four-fifths of industrial output produced by state-owned enterprises and seven-tenths of industrial employment provided by state-owned enterprises, also the state-owned firms dominate the lion's share of industrial fixed assets. Moreover, state-owned units also controlled most constituents of the tertiary sector, even though in some cases collective, quasi-governmental units had a considerable presence as well.

In the 1980s, most SOEs were assigned a compulsory plan for input, output and employment. Until the end of that decade, some SOEs had additional capacity available for production of above-plan and were allocated to exchange a small amount of goods in the

market. The surpluses of government-controlled firms became the main source of government revenue. Due to the distorted price system in the centrally-planned economy, SOEs became highly profitable, even though they were not very efficient, and they served as a “cash cow” for the government and even for the whole economy in China (Naughton, 2007). At that period, SOEs were seen as the pillar and the core of the whole economy.

Most of the state enterprises that are nominally “state-owned” are not actually controlled by the central government. Central SOEs are defined as SOEs that controlled by ministries of central government such as State-owned Asset Supervision and Administration Commission of the State Council (SASAC, which manages more than 100 Central SOEs), Ministry of Finance and China Banking Regulatory Commission. The central government decides only to keep control of large SOEs and to release more autonomy to small-sized SOEs after the development of small enterprises in the mid-1990s, therefore the central government will not be able to manage effective oversight of assets of all types of SOEs. Apart from central government, the local government obtain the power to participate decision making and supervision of local SOEs and exert an effect on financing and production materials. Similarly, local SASACs were launched at the provincial and municipal level during 2004 and 2005, the authority to supervise local SOEs was delegated to local government especially local SASAC. Local SOEs were seen as the core of the local economy, which ensures that they could access more financial and political support from governments than private enterprises.

China’s economy has been characterized by a remarkable extent of provincial economy autarky due to local protection combined with weak institutional and physical infrastructure to facilitate interprovincial trade (Young, 2000). Consequently, this argument indicates China had around 30 semiautonomous provincial-level markets rather than an integrated national market. Hence, lacking regional economic integration increases the possibility that state enterprises in some industries, in some localities could execute market power also increase their prices above competitive levels in spite of a comparatively large number of state and private enterprises on a national basis.

It is commonly recognized that state-owned firms in China have substantial market power in many sectors, which allows them to control prices and obtain above-normal profits. Competition is restrained either completely by state regulations discouraging the private

firms enter into these sectors or by a lack of accessibility to bank credit and other sources of funding by private competitors, which efficiently preserve incumbent state-owned firms, especially in more capital-intensive industries. Although the share on the output produced by state firms in the most sector has reduced remarkably, today's SOEs are more powerful than ever, even if fewer in number. Indeed, there was only one Chinese enterprise included in the Fortune Global 500 in 1990, but 115 Chinese enterprises made the list by the end of 2017, three of them were even made it into the top five according to their revenues, which are State Grid, China National Petroleum and Sinopec Group. More than 80% of these firms were state enterprises or enterprises that under the control of the administration of the State-owned Assets Supervision and Administration Commission of the State Council.

Even in sectors closely related to heavy industry, where one might expect a minority of very large state firms to dominate, the opposite is true. For example, until 2015 there were 937 state-controlled firms in coal mining, 389 in steel production, 263 in nonferrous metal ores mining and processing, 152 in ferrous metal ore mining and processing, and so on (National Bureau of Statistics of China, 2016). It is difficult to picture that these firms can execute extensive market power given that a large number of state participants in most sectors. Although it had the possibility that such many state-controlled firms to collude to limit production output and increase prices or there were a central government authority or party unit implement this function, there is an even larger number of private firms across these industries. For instance, there were 3,229 private firms in coal mining industry in 2015, 6,243 in steel, 915 in nonferrous metal ores and 1,730 in ferrous metal ores (National Bureau of Statistics of China, 2016).

2.3 Reform of SOEs and A Rise of The Private Sector

Due to a number of reasons, state-owned firms' profits dropped steadily in the 1980s and well into the 1990s. Firstly, easing off government's monopoly over a wide scale of industry brought startup for a large number of new firms, and most private firms entered profitable segments of the industrial sector, in which enhancing competition and eroding the profits of the incumbent state-owned firms (Naughton, 2007). Moreover, state-owned firms commit oneself to an increasing share of their revenues to providing benefits to their workers, that including everything from health care and pension to subsidize housing,

which is known as the “Five Social Insurance and One Housing Fund”. Though these developments put downward pressure on the profitability of state enterprises, before that about a fifth of all state-owned firms were suffering financial losses in the early 1980s.

Besides, the average debt to equity ratio of state enterprises increased steadily over 100 percent in 1989 and reaching 300 percent by 1994, which could be viewed as another indicator confirmed the increasingly precarious financial condition of state-owned firms. Eighty-five percent of the liabilities of these firms was bank debt. Due to the fact that state-owned enterprises were heavily indebted with low profitability that can cover only a little more than half of the interest payable on their bank debt by 1994, many state-owned firms continuously enlarge their bank loan cover operating losses and/or to finance capital investment that obtains returns to amortize the loans.

The leaders of Chinese SOEs act as both managers and government officials and tend to give priority to their political career, requiring that they ensure the security of state assets or social stability or duly perform assigned by administrative tasks, while the firm could be more profitable if it operated uninhibited in the market (Li and Xia 2008). In other words, many SOEs either operate in public sectors where profit maximization is a less important object to start with. In addition, institutional arrangements, include weak incentive mechanisms and government interference in corporate decision making are also viewed as reasons for poor performance of some SOEs (Park et al., 2006).

An effort had been made to restructure the SOEs started in the 1990s. China’s government offered more freedom and autonomy to its SOEs since the implementation of the new Company Law in 1994 which provided a union legal framework for ownership reform. From the mid-1990s, the government began allowing SOEs to go bankrupt or be sold to private companies if they had lost their competitiveness, in this sense, the state gives up all of its shares. Therefore, it becomes unsurprising that the privilege of privatization at that time. Not only the state-owned enterprises but also the sectors dominated by SOEs such as textile and coal industry had been restructured during this period. As a result, a large number of SOEs left the market. In 2003, a new organization, the State-owned Assets Supervision and Administration Commission (SASAC) was established through the consolidation of various other industry-specific ministries to take over the control of large SOEs, which is responsible for managing the remaining SOEs, including approving

exchanges of stock or assets and appointing top managers, assessing and monitoring firm performance, exercising ownership rights of the central government, as well as designing legislation related to SOEs.

The motivation for SOEs reform came not only from economic but also from political perspectives, such as the ambition to give a greater role to market forces in domestic demand through improved enterprise autonomy, and central government policies to promote large businesses with a view to the nation's strategic integration with the world economy. Hence, the establishment of modern, flexible, and efficient corporations is the crucial prerequisite to moving to a higher level of the market economy. Although past SOE reforms have already brought some achievements in terms of average firm performance, detrimental effects from the ownership of state enterprises remain an issue in many areas. In spite of reforms, it is still widely believed that China's SOEs tend to have lower performance than private or foreign enterprise in the market. At the same time, their role in the market is artificially enhanced by preferential policies and unfair competitions supported by both central and local governments (Sheng and Zhao 2012).

The limited success of the early efforts to improve productivity and profitability in state-owned firms by increasing enterprise autonomy turned China to the next stage of economic reform that focused on the market economy in 1993. Following the idea of "*Grasping the large and releasing the small*", a number of market-supporting institutions had been created, such as fiscal federalism, stressed the separation of state-owned enterprises from the government, and most importantly, for the first time introduced the privatization of smaller state-owned firms. Privatization of small state-owned firms basically took the form of sale of shares to employees, where the sale price of the firm was always equal to the value of outstanding bank loans plus other debt. Hence, these firms were transformed from state-owned companies into stock cooperative companies, and many later converted to limited liability companies after the Company law made it possible in 1994. As money-losing firms went bankrupt, were merged with profitable firms or were privatized, the number of state-owned industrial firms dropped from 127,600 in 1996 to 61,301 in 1999, 19,273 in 2015 (National Bureau of Statistics of China, 2016).

Meanwhile, the government implemented a reform of large state-owned enterprises. This "*Grasping the large*" element of economic reform concentrated on corporatization, which

was designed to give manager more authority to ensure the interest of managers and government owners can be met, and to allow diversification of ownership, sometimes through a public listing. Corporatization restructures firm's internal corporate governance and decreasing state shares while preserving state ownership. This corporate forms of ownership included transforming traditional state-owned companies into joint stock companies (which is also known as shareholding limited companies) or limited liability companies. When these firms are listed, the state typically keeps control, as only a small portion of the firm's shares are sold. As early as 1999, more than 10,000 traditional state-owned industrial enterprises, about a fifth of the total were corporatized. These corporatized firms on average were much larger than the remaining traditional state-owned industrial firms as they produced about two-fifths of industrial output. The corporatization extended beyond the industrial sector. There were 442,000 traditional state-owned enterprises in 1996, three-quarters of them outside of the industrial sector. By 2003 this number was dropped to 370,000 and continually dropped to only 132,373 by 2015 (National Bureau Statistics of China, 2016). This remarkable reduction reflects the transformation of about 100,000 of these companies into state-controlled limited liability and shareholding limited companies, the bankruptcy and exit of small, loss-making industrial firms, and the widespread privatization of traditional state-owned firms in some components of the service sector.

Even though "Grasping the large and releasing the small" considerably enhance the role of the private sector in many segments of the economy, the state is still the major or dominant shareholder for state companies (whether traditional ones or limited liability firms and shareholding limited companies) in several domains. Specifically, state firms continue to retain a monopoly or close monopoly position in telecommunication services, financial services, oil and gas extraction, tobacco and public utilities such as water and electricity supply. In short, although the number of state firms has reduced dramatically, the remaining firms are much larger with higher market power.

On the other side, the private sector grew extraordinary rapid throughout the reform era even though government policies that limited their development initially, which now becomes the main driver of China's economic growth, employment, and exports and even started to contribute to the increase in China's outbound foreign direct investment in current years. In addition to this, an improvement of private enterprises' access to bank credit made

them continue to outperform state-owned enterprises by a wide margin both during and after the financial crisis.

Due to the fact that China always has hybrid forms or ownership, containing collectives, cooperatives, and joint ownership that neither belong to state nor private category, it is not easy to separate industry, construction and services sectors into state and private domains. The private sector plays an important role in generating output, employment and exports in the last decades, the definition of private here is the sum of registered private firms and individual business. There was a rise in private enterprises and a decline in the role of state enterprises, the share of industrial output produced by state firms (including both traditional state-owned firms and firms in other registration categories where the state is the majority of dominant shareholder) dropped from 78 percent in 1978 to only 21 percent by 2015 (National Bureau of Statistic of China, 2016). Therefore, understanding the transforming ownership arrangements in industries is important to investigate the evolving relative roles of state and non-state firms in the Chinese economy.

State firms retreated in Chinese industry has been across nearly all product lines and the industrial output produced by state enterprises declined substantially. For example, there were only 6 of 40 branches of industry where state firms produced more than 50% of output by 2012. Two of them, electric power and water are natural monopolies in which state dominant is common in many market economies. Moreover, the state also monopolizes the oil and gas extraction industry, perhaps for strategic reasons, thus three largest national oil companies (China National Petroleum, China Petrochemical Corporation and China National Offshore Oil Corporation) continue to control over 90% of oil and gas extraction, while the one-time dominance of these enterprises in some downstream activities has been considerably reduced. In particular, their monopoly position in refining has gradually eroded and accounted for less than 80% of refined petroleum by 2015, because the share of refining had been split into private and foreign enterprises. In the same way, with the collapse of collective construction enterprises and the rapid growth of private sector, non-state enterprises now controlled this industry, they accounted for about three-quarters of employment and two-thirds of the value of construction (National Bureau of Statistic of China, 2015).

However, unlike in agriculture, industry and construction, there was no change in ownership in large swaths of China's service sector. It has been recognizing that state-owned and state-controlled firms still completely dominant several key components of services sector: finance, which includes banking, insurance, securities, and asset management; telecommunications; and some forms transportation (airlines, rail, and ocean shipping), which frequently but not always are privately run in a market economy. In addition, other services such as education, health, social welfare are mainly dominated by the state even in a market economy. Besides, the state also plays a significant role in journalism and publishing, broadcasting and movies, culture and art, and sports, a pattern typical in one-party, authoritarian political systems. On the other side, there was a significant ownership transformation in retail, wholesale and catering industry. The private retailers, wholesale and catering enterprises accounted for two-thirds of all enterprises in these industries and accounted for four-fifths of employment and nearly two-thirds of revenue by 2008 ((National Bureau of Statistic of China, 2009).

Basically, this shift can be explained by the evolution of government policy toward the private sector and the greater efficiency of private firms. The policy environment in the early era of reform was hostile for private non-agricultural sectors, but this gradually changed, encourage the emergence of an improving robust private sector, which also became the major source of output across wide swaths of the economy.

2.4 Overview of China's Banking System

Chinese banks play a vital role in enabling steady economic growth, in fulfilling firms' huge financial needs, and in accomplishing strategic or policy lending activities. The banking sector has experienced a reform since 1978, transiting from a sector operated under the orders from social plan to an open and modern competitive industry. The Chinese banking system was established in the late 1940s and followed a mono-banking system, which was entirely dominated by the central bank and combines the roles of central and commercial banking. However, this has been changed after the banking system reform. Banking institutions in China include: the state-owned commercial banks (SOBs), policy banks (PBs), other commercial banks such as joint-stock commercial banks (JSCBs) and city commercial banks (CCBs), the rural banks and foreign banks.

The reform of the banking industry began in 1978, which establish a two-tier system with setting the People's Bank of China (PBoC) as the central bank. During the early reform stage, the 'Big Four' state-owned banks were established or re-established between 1978 and 1984, they are Industrial and Commercial Bank of China (ICBC), Agricultural Bank of China (ABC), Bank of China (BOC), and China Construction Bank (CCB). The four state-owned banks were initially referred to "specialized banks" as they were limited to serve only their designed sectors of the economy, but they were allowed to operate in all domains of the financial market since 1985. There was a high degree of concentration and lack of competition in the banking industry before the 1990s, because the four largest state-owned commercial banks take a dominant position in China's banking system and served as policy-orient lending from the government. However, this changed by the establishment of a plenty of new banks and the gradual expansion of the scope of business of existing specialized banks in the 1990s. These state-owned banks have become public listed firms now and they are in partnership with strategic foreign investors, which indicates their operation becomes more and more commercialized.

The state delegated the establishment of about a dozen new national joint stock banks between the mid-1980s and 1990s, the first three of them are China Citic Bank, Shenzhen Development Bank and China Merchants Bank. In addition to this, the state started to license urban credit cooperatives in 1986, these urban credit cooperatives merged to form urban cooperative banks in most cities networks at the beginning of the mid-1990s. Subsequently, these institutions became city commercial banks and rural commercial banks, the best known of which are Bank of Beijing and Bank of Shanghai. Besides, three policy banks were established in 1995 to take over the policy-orient lending activities from the big four banks, they are China Development Bank, Export-Import Bank of China, and Agricultural Development Bank of China. They are mainly responsible for supporting the state planed or invested projects in various domains. Meanwhile, the implementation of Commercial Bank Law of China in 1994 officially defined the largest four state-owned banks as commercial banks and stimulate them to be more commercialized. Up until 2015, China had more than 500 banks, which includes 5 large-scale state-owned commercial banks (includes Bank of Communication and known as 'Big5')², 3 policy banks, 12 joint-stock commercial banks, 145 city commercial banks, 468 rural commercial banks, 190 rural

² Bank of Communication (BOCOM) was restructured in 1987 and became the first national state-owned joint-stock commercial bank, after that it became one of the largest commercial banks owned by the state.

cooperative banks. Apart from this, more than 40 foreign banks had been set up as legal entities in China that with 253 branches and subsidiaries (China Banking Society, 2015).

With the entrance to WTO in 2001, the five years opening up commitment pressured the policymakers to modernize China's financial system and improve the competitiveness. In 2003, the establishment of the China Banking Regulatory Commission (CBRC) took over the role of regulating the banking market and should the responsibly of reform and opening up. Generally, high non-performing loans (NPLs) is the most glaring issue of the banking sector, most of which are accumulated in the Big Four state-owned banks from poor lending decisions to state-owned enterprises (SOEs). After the Asian Financial crisis in 1997, China's financial sector reform started to focus on state-owned banks with the purpose of improving their efficiency (i.e. SOBs have been restructured and commercialized into market-oriented profit entities and lowering the level of NPLs). As a result of concerted effort of government and sustained economic growth, the level of non-performing loans of commercial banks on average was declining steadily to 1.75% in 2016, which is much lower than 10% in fifteen years ago. The table of NPL ratios for different types of banks in the last ten years has been attached in Appendix A – Table A1.

Before the Asian financial crisis, China's financial industry is in the midst of a reform to establish and complete the system, including the central bank's independence, the recovery of major banks and insurance companies and commercialization reform, the establishment and development of joint-stock commercial Banks, small and medium-sized financial institutions and the establishment of the capital market and securities companies, etc. During this period, China's financial sector played a crucial role to promote economic reform, social stability. In particular, the banking sector has made significant contributions to the development of the national economy and social stability as well as it was responsible for the cost of enterprise and social transformation. More than a decade after the Asian financial crisis in 1997, the Chinese government has greatly accelerated the reform of the financial sector, including closing large number of small and medium-sized financial institutions with financial problem, the restructuring of financial institutions, to speed up the joint-stock reform of large state-owned banks, insurance companies, promote the reform of rural credit cooperatives, to promote the reform of management system of interest rate and exchange rate, and promote external financial legal system, accounting system, financial regulation, financial markets and the reform of the financial ecological aspects.

More specifically, under the national financial support, by spinning off non-performing loans, inject capital, public listing, the state-owned commercial banks taken on a new look, gradually improve their corporate governance, risk control ability and profitability, market position and strength also increased significantly, as well as the increasing efficiency and ability of serving the national economy and social development, which has laid a good foundation for the smooth running of national economy and financial stability.

Due to the historical reasons, major state-owned commercial banks (Big5) dominate the banking sector and held nearly 90% of banking assets before the 1990s. Although the share of the asset of these banks slipped gradually in recent years and have relatively low growth rate on their assets, this group of bank still accounts for the largest share of bank asset today. On the other side, the asset growth rate of other types of the bank increased steadily. The second largest bank group is the 12 joint-stock commercial banks, and their total assets grow to 474,732 billion RMB in 2016, which are usually considered as having higher efficiency and better services than large commercial banks. The city and rural commercial banks have the largest number of banks in China. These banks usually have relatively small size and focus mainly on the supply of financial services in their local regions. Although they are small compared to large commercial banks or joint-stock commercial banks, their asset growth rates are extremely high and now becomes the third largest group of the bank in China, which presumably implies that small banks also have the competitive power based on their local networks (relationship with local enterprises). To the contrary, foreign banks remains the smallest market share in the past few years, this may due to they lack a relationship network and accumulation of information in the local market, and they lack branches because their business mainly focuses on large cities in China, which makes them difficult to attract new customers thus limit their services. Besides, since policy banks serve the policy-oriented financial projects, their market share remains relatively stable in the last decade.

With the growth of other types of banks and competition in this industry, the share of bank assets was held by what the Chinese government classifies as the five largest commercial banks have gradually declined and are now just less than half. At the same time, joint-stock commercial banks, city commercial banks and foreign banks began to take market shares from the largest five state commercial banks in recent years. For example, the market share of large five commercial banks, joint-stock commercial banks, city commercial banks, rural

commercial banks in 2016 is 37.29%, 18.72%, 12.16%, 8.73%, respectively, and the rest of market share 18.96% that accounted by policy banks, foreign banks and Postal Saving Bank (China Banking Regulatory Commission, 2017).

2.5 Borrowing – Lending Relationship in China

China has its own characteristics of bank-firm relationship which are different from those relationships in other countries. Although China's Commercial Banking Law has been adopted in 1995 to commercialize the operations of the largest four state-owned banks and emphasizes that Chinese commercial banks cannot hold equity of publicly listed firms, all the major Chinese banks and most of the listed firms are directly or indirectly owned by the Chinese government. The major of lending relations was driven by the government in the 1990s, from state-owned banks to state-owned enterprises (SOEs). Since the China government completely or partially control banks and some listed firms, the bank would decrease the incentive of monitoring loans during the lending duration. Hence, it was not surprised that this poor lending practice and corporate governance brought higher non-performing loans and poor financial performance of state-owned banks during that time.

In a state-controlled banking system like China, banks have long been commanded by the government. Therefore, there are naturally close political connections between state banks and state-owned enterprises, this natural close relationship between state-owned banks and state-owned enterprises can be seen as “*guanxi*” relationship lending, which represents a significant cultural component of bank-firm relationships in China. It is postulated that the central and local governments can influence the loan activities of these banks. The state-owned banks' decision to grant loans was usually based on unofficial assessment criteria. Severe papers provide evidence of SOEs were favoured over non-SOEs in accessing these bank loans³, because state-owned banks often lending to SOEs mainly for the purposes of political, employment and taxation rather than maximization of profits. Put it differently, these banks made a rational lending decision to bias their loans against non-SOEs on the basis of higher risks, higher transaction and evaluation costs. Since the Chinese government has ownership in both the state-owned commercial banks and state-owned enterprises, its

³ See Wei and Wang (1997); Cull and Xu (2003).

paternalistic behaviour may force the state-owned commercial banks are obliged to grant loans to the state-owned enterprises. In other words, lending by state-owned commercial banks to state-owned enterprises is mainly due to political pressure (from either the central or local government). Hence, it is usual to observe that the government directly or indirectly control banks to provide financial support to state-owned enterprises in many ways, even financing heavily to those poor performances or loss-making firms. This is also known as a soft budget constraint, firms do not concern too much about financial risk and they always wait for the bailout (Lu, et al., 2005).

The private sector in China had little access to credit in the early years of the reform era, especially the private non-agricultural business. They were fully funded by household savings, borrowing from family and friends and other informal sources of finance such as rotating credit associations rather than by borrowing from a formal financial system. Banks everywhere were extremely unwilling to extend credit to small start-up firms with little or no collateral. Until the Company Law came in to effect in 1994, the private sector began to develop rapidly, as well as the rapid growth of short-term credit to private firms beginning in the mid-1990s. In addition, small enterprises' "too expensive for financing" problem is commonly observed in China. Due to the fact that a large number of small-medium sized enterprises are young, small, weak and risky in China, their profit margin, stability, information credibility are very low, and they have little sense of credit, commercial banks would require a relatively higher level of collaterals to protect themselves against firm's default. The direct financing method from an external source of formal financing has been constrained by the low capacity of the capital market, sizes of SMEs and lack of information disclosure, while it is suggested that relationship lending seems like an effective mechanism to mitigate the credit financing constraint and solve the financing problem of SMEs in China⁴. Under the risk and profitability consideration, banks may prefer to lend to large firms (Zhou and Li, 2005). In this sense, informal financing seems like an effective way of obtaining external funds for this group of firms, which is the borrowing that occurs outside the formal financial system that includes loans from family members, friends, suppliers, moneylenders ("loan sharks") and informal banks. The main benefit of informal finance is that the information asymmetries between informal lenders and their borrowers are less acute because of informal finance relies on

⁴ See Ge and Tong (2012); Zhang et al. (2013); Zhao and Tan (2012).

relationships and reputation, therefore the loan application soften and the requirement of collateral easier to fulfil. In addition, to some extent, informal financiers are better positioned to effectively monitor and enforce repayment when legal enforcement is difficult and time-consuming as in the situation of China's fast moving economy (Degryse et al., 2013). On the other side, formal finance may offer a cheaper source of financing in China compare to the expensive loan cost from informal financing. Unlike informal financiers, for instance, large commercial banks operate in a widespread geographic footprint, face fewer limitations in attracting deposits, and beneficial from the protections of deposit insurance.

Not only the evolution of government policy but also the institutional transformation in the financial sector facilitate this increased flow of credit loans to the private sector. Initially, state-owned banks have complete domination of the financial sector at the start of reform years, so that all loans to the private sector came from state-owned banks. But in the 1980s and the early years of the 1990s, these institutions were not appropriate to lend to small private firms or individual business, thus state-owned banks then lent money mainly to large state-owned enterprises. Two reasons that can explain this lending preferential towards the state-owned enterprises, one is that these firms have massive assets that could serve as collateral and the other is because lending to these enterprises was either implicitly or explicitly guaranteed by the state. Indeed, a large share of the lending of state-owned banks was "policy lending" conducted at the direction of the state planning projects (Lardy, 2014).

However, the situation began to change with the growth of urban credit cooperatives when they had been formally authorized in the mid-1980s. Though the four largest state-owned banks had a vast network of offices that covered every city in 1994, urban credit cooperatives were able to compete with the existing network of state bank branches by providing better services to depositors, mainly non-state enterprises and individuals. These urban credit cooperatives were merged to form city commercial banks since the promulgation of "Regulation on Urban Cooperative Banks" in 1995, and their share of the assets elevated steadily in the 2000s, and they channelled an increasing volume of credit loans to the private sector. In addition to this, legal developments also stimulate a rising flow of bank loans to small enterprises, mostly private and family business. For example, the promulgation of the Property Rights Law in 2007 allowing that moveable assets, such

as machinery and equipment and inventories of raw materials, semi-finished goods, and finished goods could be used as collateral for bank loans, which increases the accessibility of bank loans and thus led to a rise in bank lending to small and private enterprises.

Using the data on bank lending to enterprises released by the central bank in 2012 that base on the nature of the firm's majority or dominant shareholder and shows that new lending flowing to private firms were responsible for an average of 52% of new loans between 2010 and 2012, while the share of state firms averaged only 32% in the same period⁵. Moreover, the share of outstanding loans of state firms was 56%, more than twice the 26% share of private firms in 2009. While the share of outstanding loans of private firms had increased by 10% and a fall in the share of state firms in 2012⁶. In short, though the large share of loans going to state enterprises in the last few decades, these statistics taken together clearly show that privately-controlled firms' ability to access bank loans significantly increased starting in 2010, or even earlier. Chinese private firms now enjoy better access to credit than in any previous period in the reform era.

In the same way, the creditworthiness of private sector elevates gradually in the last two decades. The interest coverage ratio is commonly used to measure the creditworthiness in market economies, which is the ratio of firm's earnings before interest and taxed to its interest expenses. The private enterprises have been consistently more creditworthy than the entire of state-owned and state-controlled enterprises in the mid-1990s, but this differential was essentially eliminated for a few years resulting from the improvement of state enterprises' financial performance after their far-reaching reforms in the mid-1990s, while private and state enterprises diverged dramatically in the last few years⁷. Overall, the interest coverage ratio of private industrial firms was more than twice higher than the state-owned enterprises in industrial sector by 2012. Hence, it is not surprising that the private sector became an ever more attractive lending market for loan providers particularly those profit-oriented financial institutions.

⁵ see Appendix A–Figure A1.

⁶ see Appendix A–Figure A2.

⁷ see Appendix A–Figure A3.

2.6 Monetary Policy

China's monetary policy has been in change in recent years. To guide liquidity levels, the central bank – People's Bank of China (PBoC) implement adjustments in its monetary framework to pave the way for establishing a short-term PBoC policy rate like that used in advanced economies. In China, the PBoC takes large control and influence over Chinese interest rates and financial market. The three main responsibilities of PBoC are to implement monetary policy, eliminate financial risk and maintain financial stability. The PBoC controls China's monetary policy mechanism currently, which includes benchmark interest rates, reserve requirement ratio and open market operations (OMO). Hence, changes in these policy instruments could bring crucial macro effects on lending and borrowing among banks and firms.

2.6.1 Interest Rate

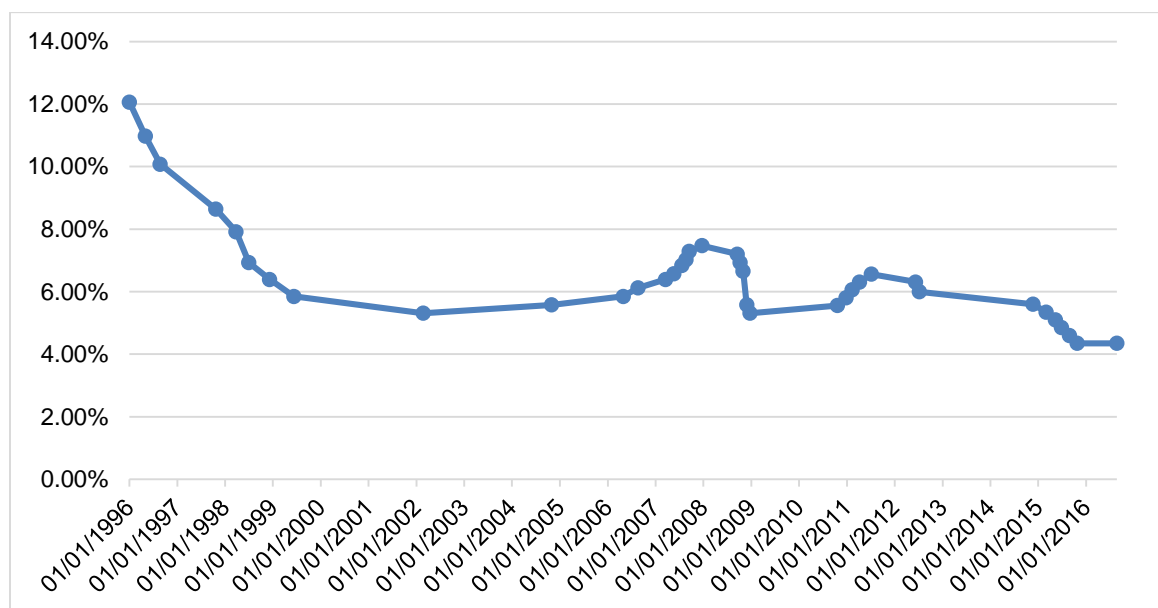
The financial system is crucial to the economy and the interest rate plays a key role in effective resources allocation in the financial system. In China, the PBoC sets the benchmark deposit and lending rates for all financial institutions. Different from other central banks, which only set the overnight rate, the PBoC sets rates for multiple maturities and extend from overnight to five years. The PBoC does not have a regularly published calendar of rate-setting dates and instead adjust rates at its discretion. Generally, banks were obliged to apply these rates to all deposits and loans, while this may bring large distortions. Since banks may prefer to lend to low risk, government-connected entities while depositors favoured large low-risk banks. To eliminate this issue and allow some flexibility to price credit risks, the PBoC allowed banks to offer a range of borrowing and lending rates within a narrow band. The PBoC lending rate provides the commercial banks a certain degree in setting their interest rates according to their assessment. For the lending rates, the ceiling and floor were widened several times before being fully removed in 2013, which effectively completely liberalizing bank lending. Hence, commercial banks had been free to set lending rates since 2013 and they choose benchmark lending rates were only guidelines. On the other side, though the floor of deposit rates has been removed, a quite restrictive ceiling still remains until October 2015. Overall, even though the liberalizations of deposit and lending rates since 2004 demonstrate progress towards market-determined

interest rates, the central bank still control interest rate in reality. Furthering interest rate liberalization is necessary for optimizing the allocation of financial resources.

Although banks' newfound flexibility to price loans above and below the PBoC benchmark rate, nearly 90% of all loans are still priced very close to the benchmark because banks hardly to ascertain a suitable market-determined reference rate. In the same way, most of the deposits are currently priced around the ceiling of deposit rates. These imply that a conflict between weak bank pricing power and a desire to remain net interest margins.

The development of the PBoC lending rate displayed in Figure 2.1 shows that the PBoC lending rate had a sharp decline during two financial crisis periods, then kept stable between 1999 and 2005. The development of the PBoC lending rate in 2006 points to an improved ability to fine-tune this instrument from the side of the PBoC. Two slight increases of the PBoC lending rates followed each other very shortly in that year. Similarly, six and five slight increases of the PBoC lending rates in 2007 and 2010, respectively.

Figure 2.1: Development of the lending rate in China, 1996-2016



Source: People's Bank of China (2017).

Although the lending rates have been liberalized, banks can still obtain excess profits because of the low deposit rates. Due to the fact that state-owned banks could obtain funds at a comparatively low cost, they lacked the incentive to enhance fund service efficiency and thus favoured to provide loans to large state-owned enterprises, rather than to private

and small enterprises. Though implementing targeted credit expansion could relax the pressure on funds shortage in the agriculture sector and micro, small and medium enterprise to some extent, it still unable to radically improve the allocation efficiency of credit resources in the long run. In a nutshell, interest rate liberalization was an inevitable challenge which China must overcome in order to develop financial market better.

2.6.2 Reserve Requirements

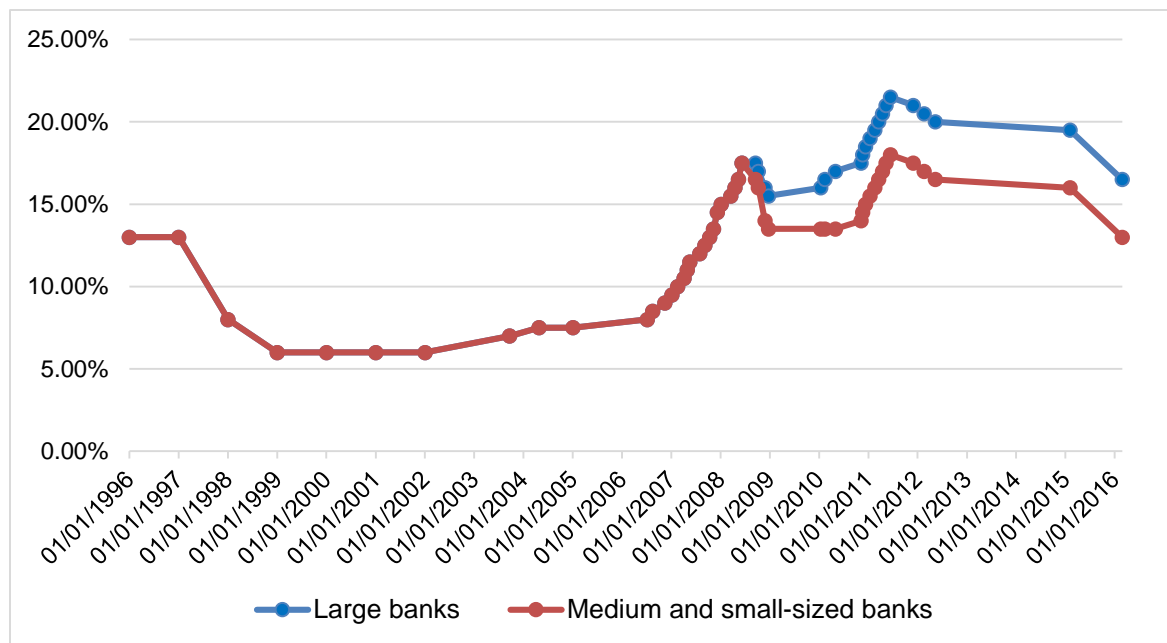
In order to control the financial sector liquidity, the PBoC introduced minimum reserve requirement in 1984, which specifies the percentage of customer deposits that must be placed with the central bank. The PBoC frequently adjusts its reserve requirement ratio (RRR) for commercial banks as a tool to stabilize economic fluctuations. These adjustments not only influence the overall credit supply but also bring reallocation of credit and capital. In the beginning, the PBoC set different reserve obligations for different deposits according to their origin and the institution. For example, four state-owned banks had to hold 20 percent on deposits of companies as well as 40 percent on saving deposits of urban and 25 percent of rural origin. In 1985, the PBoC combined all different reserve requirements and set one minimum reserve requirement at 10 percent. In April 2004, the PBoC formally introduced a policy of “differentiated required reserve ratio for different financial institutions”, which implies that the required reserve ratios for different types of financial institutions subject to the differentiated regime. More specifically, to identify the importance and unique risks of smaller, rural banks, the PBoC established a separate RRR for these banks. Currently, the PBoC has favoured targeted rather than general movements in the ratio to tactically affect particular types of banks and regions⁸.

Figure 2.2 presents the development of the reserve requirement ratio (RRR) between 1996 and 2016. Since 2006, the PBoC has changed its RRR more than 40 times and these changes have been substantial. As can be seen from this figure, the reserve requirements raised dramatically from 8.5% to 21.5% during tightening cycles from 2006 to 2011. Through the frequent adjustments, the PBoC had made clear that the ability to adjust reserve

⁸ In addition to domestic RR, the CBRC adopted the core principles of Basle I and II capital adequacy requirements in February 2004. The capital adequacy ratios of the five largest state-owned commercial banks were all above 11% since 2009. Similarly, the levels of capital adequacy of the other main joint-stock commercial banks were all above 10.5% since 2009, meeting the requirements of Basel III and CBRC regulations (*Sources: The banks' annual reports in 2009, 2010 and 2011*).

requirements provides an additional and comprehensive policy instrument to the current monetary policy tool.

Figure 2.2: Reserve requirement ratio in China, 1996-2016



Source: People's Bank of China (2017).

2.6.3 Window Guidance

The PBoC engaged in a crucial relaxing of its policy settings to support flagging economic growth recently. For example, cutting the PBoC's interest rates as a part of a relaxing cycle that started one year before October 2015, bring the one-year benchmark deposit and lending rates down to the record lows of 1.5% and 4.35%, respectively. In addition, the PBoC also repeated reduced the reserve requirement ratio for bank deposits during 2015-2016, the reserve requirement ratio for large lending institutions dropped from 20% to 16.5% in 2016. Even so, the real economy failed to respond to these relaxing moves, the real GDP growth decelerated to 6.7% in 2016 (National Bureau of Statistics of China, 2017). The effectiveness of China monetary policy framework recently has been weakened by the emerging shadow banking sector. The importance of commercial bank lending also has been reduced as the financial liberalization and innovation has driven the development of new instruments such as wealth-management products, which also bring a significant share of lending coming from non-bank sources, including trust loans and peer-to-peer lending platforms.

Apart from the price-based monetary policy instrument, PBoC also exerts influence through non-standard quantitative monetary policy tool such as guidance, loan quotas and targets for the M2 money supply. The use of quantitative tools has long been the norm in implementing monetary policy in China as its monetary policy has always been predominantly quantitative in nature. Hence, the PBoC's has relied on lending quotas known as "window guidance" which introduced in 1998 to affect bank behaviour and pump money into the economy. It relies on moral suasion rather than strict rules to stress banks to adjust the volume and pace of credit supply until a credit growth target is met. In addition, it also can be used to optimize the credit structure by moderating banks' credit allocation to sectors and regions consistent with policy targets. Since China is recently transitioning to a price-based monetary policy, the role of quantity-based monetary tools remains complex.

Following a working paper from Hong Kong Institute for Monetary Research written by Chen et al. (2017), the step-by-step development of PBoC's window guidance policy can be summarized according to the corresponding economic circumstance at that period. This study uses the information they summarized from quarterly *China Monetary Policy Report* (CMPR) from 2001 onward and form an indicator to measure the window guidance policy stance. Referring to Chen et al. (2017)'s paper, the PBoC's window guidance policy generally can be grouped into five stances, which are strongly discouraging, weakly discouraging, no specific direction, weakly encouraging and strongly encouraging. The definitions of indicators corresponding to five different stances of window guidance have been displayed in Table 2.1⁹.

⁹ See Chen et al. (2017) for more details on the timeline of the window guidance policy stance.

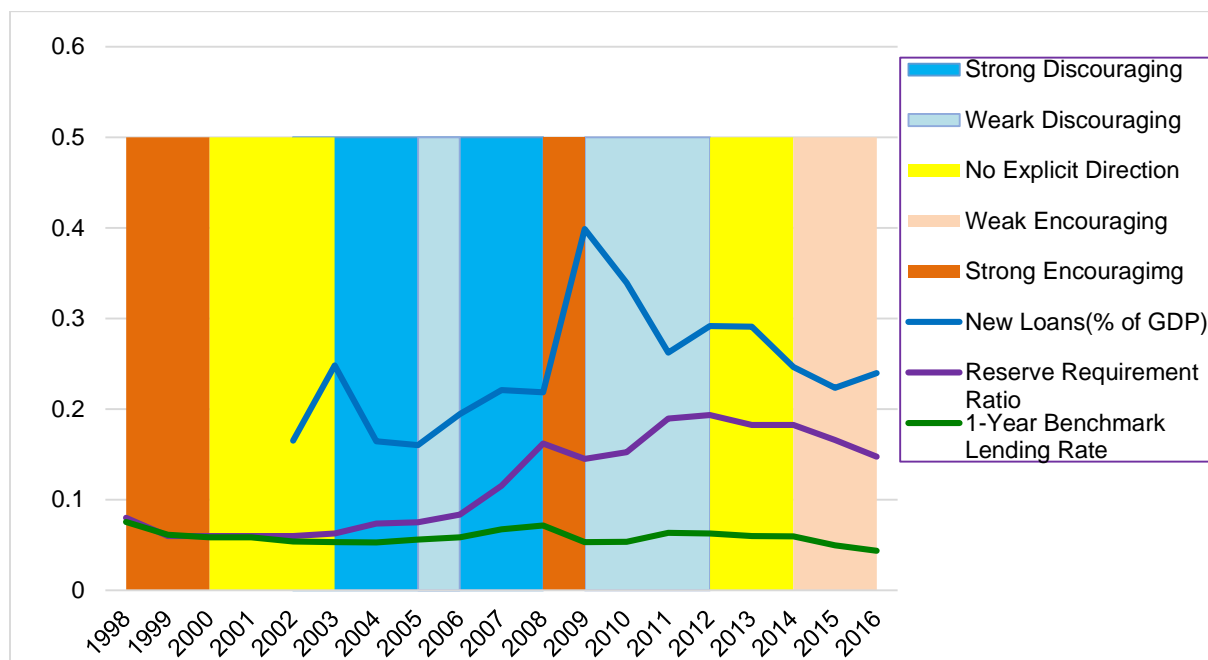
Table 2.1: Window Guidance Policy Stance

Indicator	Stance	Period	Definition
-2	Strongly discouraging	2003Q1-2004Q4 2006Q2-2008Q2 2009Q2-2010Q1	CMPR explicitly discourage growth of total credit
-1	Weakly discouraging	2005Q1-2006Q1 2010Q1-2012Q2	CMPR states the target of optimizing credit structure, provides risk warning, and/or mentions that banks should control the pace of credit growth
0	No explicit direction	2001Q1-2002Q4 2012Q3-2014Q2	CMPR only mentions the target of optimizing credit structure and separately listing the sectors that should be both discouraging and encouraging (differentiated approach to credit guidance) or no explicit direction of credit growth
1	Weakly encouraging	2014Q3-Present	CMPR only lists sectors that to be encouraged for the target of optimizing credit structure
2	Strongly encouraging	1998Q1-2000Q4 2008Q3-2009Q1	CMPR explicitly encourages the growth of total credit

Source: Quarterly China Monetary Policy Report, and Chen et al. (2017).

To some extent, the influence of window guidance on loan growth is crucial as its target is adjusting the quantity and the pace of lending. Applying the classification of window guidance stance made by Chen et al. (2017), new loans to GDP ratio, PBoC's base rate and reserve ratio displayed in Figure 2.3 may offer clues on the relationship between window guidance policy and loan growth. It is clear to see that relaxing the PBoC's benchmark lending rate and reserve requirement ratio during periods of encouraging window guidance gave rise to a significant growth of lending particularly in strongly encouraging period, while the supply of new loans show sharp declines during periods of strongly discouraging or stabilizes at a low level during periods of weakly discouraging window guidance as interest rate and reserve ratio increased.

Figure 2.3: Window guidance stance and the effect on lending growth



Source: People's Bank of China (2017); *Quarterly China Monetary Policy Report*, and Chen et al. (2017).

2.7 Conclusion

To summarize, this chapter describes the context of the China market, and provides background information of Chinese enterprises with a different type of ownership, introduces Chinese banking system and discusses the borrowing and lending relationship in China. The analysis and discussion in this chapter suggest three main backgrounds for the following research. Firstly, it is commonly known that many SOEs either operate in public sectors where profit maximization is a less important object to achieve. Although the SOEs could be more profitable if they operated unconstrained in the market, the leaders of Chinese SOEs act as both managers and government officials and tend to give priority to their political career, which requires that they ensure the security of state assets or social stability or duly perform assigned by administrative tasks. In addition to this, institutional arrangements, including weak incentive mechanisms and government interference in corporate decision explain the reasons for SOEs' poor performance.

Secondly, although the private sector in China had an extraordinary growth in the 1990s, the state or SOEs still have the monopoly power in particular domains. While there were relatively low barriers to enter some contestable sectors of the economy, thus privately registered and privately controlled enterprises have largely displaced state enterprises especially in manufacturing and mining as well as construction, retailing, wholesaling and catering. While there are barriers to entry into some sectors (banking, supply of natural utility, education and heavy industry) due to a natural monopoly, high capital requirement or government regulation, even though state firms eroded a little bit due to their reform, they can still enjoy the dominant position in most senses.

Third, SOEs and SOBs have a close and stable relationship due to historical factor. The early lending relations was driven by the government that from SOB to SOE. However, this lending relation and bank-firm relationships have been changed by the recent banking reform and the growth of private enterprises, the distribution of loans to private enterprise and their access of credit improved considerably in 2009, or even earlier. State enterprises' greater access to bank loans implies not only a residual bias on the part of banks or small private enterprises' lack of collateral but also state policies that systematically exclude private enterprise from entering some of the most capital-intensive sectors in China's economy. In other words, it shows that the state and political connection play crucial roles in the firm-bank relationship, as well as in the entire economy in China.

3 What Cause China Listed Firms To Switch? Evidence Based On A Survival Analysis

3.1 Introduction

A strong firm-bank relationship is generally accepted as fundamental to smooth access to credit at favourable terms. The extant theory suggests that while there is a positive impact of relationship banking on easing the credit constraints for firms, it also suggests that relationship banking creates the conditions for informational capture and lock-in, that may result in unfavourable terms and condition in the loan contract (see e.g., Boot, 2000). The incumbent bank may exploit this informational advantage to lock-in the existing borrowers and extract higher rent through repeated lending.

With the fast development of the Chinese economy, the loan market has expanded quickly as well. Although the formal financial sector in China constitutes banking market and capital market (include bond market and stock market), it is mainly dominated by banking industry. According to the National Bureau of Statistics of China, bank loans is the most popular funding source in China's loan market, 54% of total financing for Chinese firms were from banks in 2016. It is commonly observed that the state-owned enterprises (SOEs) were favoured over non-state-owned enterprises (non-SOEs) in accessing bank loans because of government's dual ownership on state-owned banks and state-owned enterprises. This can be considered as a "*guanxi*" relationship lending from SOBs to SOEs.

The non-performing loan ratio of these government banks remained very high in the 2000s due to lending bias towards state-owned enterprises, especially those poor performances, less efficient or loss-making SOEs. However, the improvement of the overall performance of Chinese commercial banks since the reform process indicates that they are moving towards a more commercial sector. Under the condition of asymmetric information and likelihood of switch, the duration of the bank-firm relationship and the determinants of firms switching are worthy for further exploration. Using a semiparametric Cox proportional hazard model from survival analysis and incorporating several sets of both time-invariant and time-varying covariates, this chapter analyses the duration of firm-bank

relationships and examines the main driver of Chinese firms switch their loan provider. The advantage of the semiparametric model, over the parametric probit/logit model, is that it allows for a nonparametric hazard function without imposing any functional-form restriction, while controlling for changes of those factors when a change happens in a parametric way. The assumption of the flexibility of the hazard function identifies two interesting features of the switching behaviour with respect to loan duration, which is periodicity and a declining trend.

The remainder of this chapter is organized as follows: Section 2 reviews the relevant theoretical foundation and empirical studies that relate to asymmetric information. Section 3 demonstrates the methodology, the measurement issue, the empirical set-up based on survival analysis. Section 4 describes the data, and details of creating a matched firm-bank (loan) relationship set. Section 5 discusses the estimated results, and Section 6 concludes.

3.2 Literature Review

3.2.1 Asymmetric Information and Switch Behaviour

Private information plays a key role in bank-borrower relationships, and it is argued that banks accumulate private information, from closer relationships and repeated interactions with firms. Rival banks that do not have this private information may charge higher loan rates if a firm switches from its existing provider. There is broad agreement that closer relationships increase credit availability and reduce the cost of bank loans¹⁰. But it is also argued that a close firm-bank relationship increases loan cost through information capture or from the presence of search costs for new loan providers resulting in rent extraction as the relationship matures¹¹. However, the lock-in effect can be diluted through a reduction in loan size or the initiation of multiple bank relationships¹². Maintaining multiple bank relationships provides liquidity insurance to firms and enables them to meet liquidity problem (Elsas et al., 2005). Moreover, Jimenez and Saurina (2004) suggest that firms borrowing from multiple banks may reduce the informational rents of the incumbent bank.

¹⁰ For example Berger and Udell (1995); Boot and Thakor (1994); Cole (1998); Elsas and Krahnen (1998)

¹¹ See Sharpe (1990); Rajan (1992); Boot (2000); Yin et al. (2015)

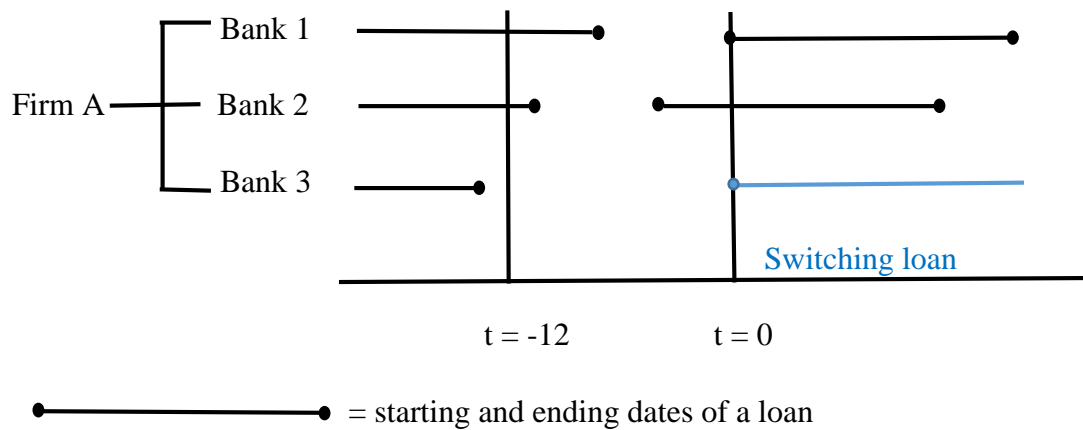
¹² See Hubert and Schafer (2002); Agostino et al. (2012)

The extant literature focusses on the main factors that prompt a firm to switch lenders. Firms with an asymmetric information problem are more likely to enter into new banking relationships with different types of banks with the objective of meeting their changing needs and improve their information quality (Hadlock and James, 2002). The borrower-lender relationship is also under threat from rival lenders that may provide a superior product or lower cost, therefore a borrower may terminate the relationship with the incumbent bank whenever sufficiently better loan conditions are offered by competing bank (Petersen and Rajan, 1995). As firms' borrowing needs increase which cannot be met by their incumbent banks, they will switch to other banks, firms may also switch banks due to a change in the existing relationship bank such as mergers, or restructuring (Gopalan, et al., 2011).

3.2.2 The Determinants of Relationship Duration

Turning now to the application of duration analysis in modelling switching behaviour, Ioannidou and Ongena (2010) employ a unique data set of Bolivian loans during the period of 1999 to 2003 to investigate the loan conditions and bank behaviour when firms switch to other lenders. They define the switching firm as one that is granted a new loan from a bank with which it did not have a lending relationship in the previous 12 months. Banks are categorized into two types, 'inside' and 'outside' banks. The former is the incumbent bank that had lending relation in the prior year, while the latter refers to the bank that did not lend to the firm in the previous year. Figure 1 illustrates the definition of a switcher, inside and outside banks. Firm A is the switcher and Bank 3 is the outside bank for firm A, because Bank 3 lent to other firms but not firm A in the prior year. Bank 1 and 2 are the switcher's inside bank as they had a lending relationship in the previous 12 months. Their study focuses on the "time for a change" and they find that the main purpose of firms switch to new banks is to obtain a lower rate on their loans, but they also find that the new bank will charge higher rates once the firm is informationally locked in by the new bank.

Figure 3.1: Definitions of switchers, inside bank and outside banks



Source: Ioannidou and Ongena (2010)

The duration analysis has been prevailing used in medical and engineering fields for a long time, also it has been rapidly spread out to other sciences. In economics, it started to be adopted in labour economics to identify the duration of unemployment also it has been widely used in the analysis of the duration of business cycle phrases. The duration of bank-firm relationship and the impact of firm-specific characteristics on the likelihood of terminating bank relationships or switching from single to multiple relationships was also studied by Ongena and Smith (2001), Farinha and Santos (2002) and Bouchellal and Castro (2016). A basic Weibull model has been employed in their studies in order to find the duration dependence of these relationships, i.e. whether the likelihood of relationship ending is increasing or decreasing (or stable) over time.

Using a panel data set of the banking relationships of Norwegian firms, Ongena and Smith (2001) find that the likelihood of a firm terminating a bank relationship increased with the length of the relationship, suggesting that the benefits from relationship decays with time. Using both the parametric (Weibull and Exponential) and semi-parametric (Cox) duration model that include firm-specific variables, they show that small and young, profitable, highly leveraged “growth” firms, and firms that with more than one bank relationship tend to maintain shorter relationships. Apart from this, their study documents a positive duration dependence in bank relationships, which implies the likelihood of ending a bank relationship increase over time. Moreover, Farinha and Santos (2002) use a parametric duration model to model the switch from a single to a multiple bank relationship. Their

results provide evidence that firms with more growth opportunities, greater leverage, less liquidity, lower profitability and delinquent bank loans are more likely to maintain shorter relationships and initial multiple relationships. Similarly, Bouchellal and Castro (2016) use a parametric continuous-time Weibull duration model to explore examine the determinants of a relationship closure between 1,185 firms and an important French bank. For each relationship spell they control for information on the firm-level characteristics, bank market power, pricing conditions, specific bank-firm relationship variables and the economic environment. Their findings are consistent with those of Ongena and Smith (2001) that confirms older firms, and the firms with higher turnover, default probability and profits tend to keep a long relationship with the bank. They also find that the lower the banking competition, the higher the likelihood of the bank-firm relationship terminate.

Apart from the duration analysis on bank-firm relationship duration and choice of single or multiple banking relationships, some studies attempt to investigate the determinants of a firm's switching behaviour. According to the results from Stephan et al. (2012)'s study, large and highly leveraged firms are more likely to switch their main bank in Ukraine. They emphasize that the power of the main bank (measured by equity holdings) is the main driver of firm switching behaviour. In addition to this, they also find firms have lower performance after switching their main bank because of higher loan rates charged by the new bank. A study examines that why firms switch to new banks has been conducted by Gopalan et al. (2011), their findings suggest that transparent firms and firms do not have an existing relationship with large banks are more likely to form new banking relationships. Moreover, they find that firms obtain larger loan amounts when they switch and form a new banking relationship to overcome borrowing constraint. They also highlight that firms may benefit from their switching behaviour with an improvement in sales growth, capital expenditure, leverage, analyst coverage, and public issuance. These literatures have been summarized in Table 3.1, including their methodology, sample data and key results.

Table 3.1: Determinant of Bank-Firm Relationship Duration and Firm Switch

Paper	OS(2001)	FS(2002)	STT(2012)	GUY(2011)	BC(2016)
Country	Norway	Portugal	Ukraine	U.S.	France
Observation	383	1,577	8,514	12,806	1185
Sample period	1979-1995	1980-1996	2002-2006	1995-2006	2008-2013
Model	Survival	Survival	TEM FE	Logit	Survival
Dependent variable	Hazard of a relationship terminates	Duration of single relationship	Probability of switching	Probability of new relationship	Hazard of a relationship ending
Firm characteristics					
Firm age	---			?	--
Firm size	---	---	+++	+++	++
Firm leverage	+++		+++	?	
Profitability	+++	+++		++	--
Sales growth		---			
Liquidity		+++			
Transparency		?	+++	---	?
Default prob.				?	--
Indebtedness					---
Bank characteristics					
Bank size		?	---	---	+++
Main bank power			+++		
Bank leverage			-		
Bank profit		?			
Bank liquidity		?			
Competition					+++
Lending relations					
Duration					
Number of relationship	+++				?
Times of switch		---			
Prev. large banks				---	

Note: +++, ++, + denote positive and significant at 1%, 5%, 10% level, respectively. ---, --, - denote negative and significant at 1%, 5%, 10% level, respectively. ? means unclear effect, which is shown as insignificant in regression. OS, Ongena and Smith (2001); FS, Farinha and Santos (2002); STT, Stephan, Taspın and Talavera (2009); GUY, Gopalan, Udell and Yerramilli (2011); BC, Bouchellal and Castro (2016). *TEM*, treatment effect model. *Main bank power* measured by the share of firm's equity held by its main bank. *Times of switch*, number of times firms switch banks. *Prev. large bank* is a dummy variable that identifies whether the borrowing firm's relationship bank is large bank or not. The *hazard function* determines the probability of a firm-bank relationship terminates.

3.2.3 Relevant Studies About China

Several Chinese studies have examined the effect of bank-firm relationship on cost and availability of loans and confirm that a strong and close tie between firm and bank reduces

the screening and monitoring costs of lenders and therefore reduce firms' loan costs and enhance their accessibility to bank credit. Zhou and Li (2005) use data on 83 SME firms in Guangdong province and document that the average duration of the bank-firm relationship is 7 years and 11 years for contracts of upper bound and lower bound interest rate loans, respectively. In addition, they find a negative relation between the length of relationship and the loan cost and collateral requirement, which implies that longer duration of bank-firm relationship will reduce the cost of loan and the level of collateral requirement but improve the access of loans for these firms¹³.

A few studies have focussed on the firm-bank relationship in the case of SMEs. Using survey data from the World Bank, He and Wang (2009) conduct an empirical research on bank-firm relationship and loan cost for 394 firms in 18 cities in China. They use three indicators to measure the relationship between banks and firms, which are the length of duration, the scope (or the number of bank relation) and depth of the relationship. They show that both the length and depth of the relationship influences the loan cost negatively, while the scope of the relationship positively affects the loan cost for SMEs. To put it differently, SMEs that have longer and stronger relationship with a single bank will have lower loan cost. In contrast, Wu (2005) reports a significantly positive impact on the cost of borrowing in the local market using a small sample of SMEs in Jiangsu province. Firms with a longer lender relationship duration face a higher cost of borrowing.

A recent study by He (2013) shows that SMEs with a single banking relationship face lower collateral conditions in the loan contract. Although a long and close relationship with the bank enables the SME to access bank credit more easily, these firms are more likely to suffer the "hold-up" problem that would lead to higher cost of the loan for SMEs. Higher loan costs result from private information being captured by the incumbent bank. However, in a city focused study, Yin et al. (2015) discover how relationship lending and bank competition influences the loan cost for SMEs. Their results show that firms can benefit from a less close relationship with the bank and stronger banking competition, which result in a significantly lower cost of credit for SMEs. Most importantly, they highlight that it is crucial to promote the financial ecological environment development and improve the competition mechanism particular for the SMEs credit market in order to reduce the cost of the loan and overcome the "too expensive for financing" problem for SMEs.

¹³ Similar findings are reported in Luo et al. (2011).

Furthermore, a most recent study conducted by Yin and Matthews (2018) determine the drivers of firms switching in China and suggest that switch behaviour is mainly come from firm's credit needs, characteristics of both firm and bank have a significant influence on firms switching behaviour. Besides, they also find that firms are more likely to switch to small banks or lower profitability banks, their great study is the first to extend the switch literature to a China's loan market and widen the Chinese literature in this field.

However, much of the empirical literature on the firm-bank relationship in China focus only on a specific geographical area or city in China, and especially the borrowing activity of SMEs. My study differs in its geographic coverage and firm size and industry. The data used covers 75% of listed firms during 1996-2016 and is more comprehensive and thus fills a gap in the literature.

3.3 Methodology

This section develops the econometric methodology used in analysing the duration of firm-bank relationship. Survival analysis, also called duration analysis, has been commonly used in studying and modelling problems that include the duration of time before a particular occurrence. It originates in statistics, analysing the topics such as death in medical diseases and failure in mechanical systems, now has been widely spread to economic phenomena. For example, the study of duration data has been applied in the labour economics literature to the length of strikes, the duration of unemployment, and employment and the time before wage goes up. Various scholars (Ongena and Smith, 2001; Farinha and Santos, 2002; and Bouchellal and Castro, 2016), have applied survival analysis to examine the duration or termination of firm-bank relationships. Following their methodology, this paper employs duration models to study the passage of time before a firm changes its existing bank loan provider to another bank. Furthermore it investigates the factors that alter the duration of the firm-bank relationship in China. The common terminology and general aspects of a survival analysis are introduced first in this section, followed by the description of hazard function estimators constructed by different approaches that include basic non-parametric, parametric and semi-parametric methods.

3.3.1 Terminology

The main object of survival analysis in this chapter is the duration of the relationship between firms and banks and firm's switching behaviour, which is a random variable due to the uncertainty of various covariates may cause this relationship changes. The passage of time is referred to as a *spell*, and the spell length is represented by the duration variable T . The duration variable T is a non-negative variable denoting the time to a relationship termination event for a bank relationship duration, which is defined as the number of periods (consecutive months or years) a firm-bank relationship lasts, then t_1, t_2, \dots, t_n represent its observed duration of relationship between firms and banks, where the given date in the time line $t \in [0, +\infty]$.

The time line could be discrete or continuous, depending on whether the time line is infinitely divisible or not. In discrete time, the time line is classified into several periods of same length. The time line is discrete due to either (i) the time line is inherently discrete, or (ii) failure event occurs in continuous time but duration is only observed in discrete intervals. The firm-bank relationship duration data in this study is the second case, since the firm could terminate a bank relationship and switch any time within a period, but this event can only be observed in a monthly interval. The first observation of a relationship duration is recorded at $t = 0$, a period is nominated by the end date of that period. For example, the 1st period means $(0,1]$, the 2nd period means $(1,2]$, and the n^{th} period means $(n-1, n]$. Note that the time here means *analysis time*, rather than *calendar time*.

Survivor function is a simple way to demonstrate the behaviour of a spell T . The probability distribution of the spell T can be specified by the cumulative distribution function, $F(t) = Pr(T < t)$, indicates the probability of a firm ends its relationship with the bank before time t . Thus, the survival function $S(t) = 1 - F(t) = Pr(T \geq t)$, yields the probability that the relationship spell T lasts at least to date t . In other words, it is the surviving probability of a firm continues to cooperate with the incumbent bank beyond date t .

Alternatively, the switch from one bank loan provider to another can be described through a *hazard function* $h(t)$, which determines the rate at which a firm-bank relationship termination occurs, conditional on the relationship spell at least until date t , and is defined by:

$$h(t) = \lim_{\Delta t \rightarrow 0} \frac{Pr(t \leq T \leq t + \Delta t | T \geq t)}{\Delta t} = \frac{f(t)}{1-F(t)} = \frac{f(t)}{S(t)} \quad (1)$$

where $f(t)$ is the density function associated with the distribution of relationship spells. From the hazard function, the *cumulative hazard function* up to date t can be defined: $H(t) = \int_0^t h(\tau) d\tau$, which measures the accumulative risk for firm switch during the period $(0, t]$. The hazard function $h(t)$, also called hazard rate, describes a conditional probability, which is opposite to the unconditional probability function $f(t)$. The condition here means that the relationship between firm and bank successfully survives up to t . The most important advantage of using a hazard function is that it provides a natural way to interpret the process that generates duration, and regression models for duration data are more easily grasped by observing how covariates affect the hazard rates.

3.3.2 Model Framework

Three common techniques have been widely used to analyse the duration data, which includes the non-parametric method, parametric method and semi-parametric method. **Non-parametric method** simply follows the intuition of letting the data speak for itself without making any assumptions about the function form of the distribution. Therefore, the effects of covariates are ignored. The most popular non-parametric methods are Kaplan-Meier estimate of survival function $S(t)$ and Nelson-Aalen estimate of hazard function $H(t)$.

The Kaplan-Meier estimator is also known as the “product limit estimator” that estimates the survival function from survival time data. A plot of the Kaplan-Meier survival function is a series of horizontal steps of decreasing trend which approaches to the true survival function for that population when a large enough sample is taken. A crucial feature of Kaplan-Meier estimator is that it takes “censored” data into account and assumes that all the censored subjects do not fail when censoring occurs. The Kaplan-Meier estimate of survival function is given by:

$$\hat{S}(t) = \prod_{j|t_j \leq t} \left(\frac{n_j - d_j}{n_j} \right) = \frac{n_1 - d_1}{n_1} \times \frac{n_2 - d_2}{n_2} \times \dots \times \frac{n_N - d_N}{n_N} \quad (2)$$

Where n_j is the number of firm-bank relationship at risk (i.e. survive or not censored) just or prior to time t_j , d_j is the number of observed relationship failures (a switch occurs)

during the subsequent period, the product is over all observed failure times less than or equal to time t , and $t_1 \leq t_2 \leq \dots \leq t_N$ is the analysis time when either failure or censoring occurs.

The Nelson-Aalen estimator is used to estimate the cumulative hazard function from censored survival data. The Nelson-Aalen estimate for the cumulative hazard function takes the following form:

$$\hat{H}(t) = \sum_{j|t_j \leq t} \frac{d_j}{n_j} \quad (3)$$

The sum is over all distinct failure times less than or equal to t . Hence, the Nelson-Aalen estimator is an increasing right continuous step function with increments d_j/n_j at the observed failure times.

Parametric method, on the other side, explicitly uses covariates to estimate hazard rate in a function form, while **Semi-parametric method** lies in the middle of the non-parametric and parametric method, which does not make any assumption on the function form of baseline hazard rate. Different parametric duration models can measure the degree of duration dependence and the effect of other variables on the likelihood of a relationship ending, the most popular used functional form of the hazard function is the *proportional hazard model* (PHM). This chapter employs both parametric and semi-parametric approaches to investigate the impact of covariates on the duration of firm-bank relationship within the context of proportional hazard model. The proportional hazard model assumes that the hazard rate function can be written as:

$$h(t) = h_0(t)\exp(\boldsymbol{\beta}'\mathbf{X}) \quad (4)$$

where $h_0(t)$ is the *Baseline Hazard Function* that captures the data dependence of duration and determines the shape of the hazard function with respect to time. The name of “proportional hazard” comes from the feature that the hazard function $h(t)$ is proportional to $\exp(\boldsymbol{\beta}'\mathbf{x})$, with the baseline hazard function $h_0(t)$ common to all observations. \mathbf{X} is a vector of covariates, could be time-invariant or time-varying explanatory variables, $\boldsymbol{\beta}$ is the coefficient vector for \mathbf{X} . Exponential individual coefficients have the interpretation of the ratio of the hazards for a one-unit change in the corresponding covariate. The hazard ratio

is less than 1 if the coefficient is negative, but greater than 1 if the coefficient is positive. The sign of estimated coefficient suggests the direction of the effect of the covariate on the hazard of switching.

In parametric analysis, a particular functional form has to be assumed for the baseline hazard $h_0(t)$, which could be *Weibull*, *Exponential*, *Log-logistic*, *Lognormal*, *Gompertz* or other distributions. This chapter uses Weibull and Exponential distributions to specify the shape of relationship spells. The Weibull hazard function is:

$$h_0(t) = \lambda \alpha t^{\alpha-1} \quad (5)$$

A significant feature of Weibull distribution allows for duration dependence, the presence of duration dependence in the bank-firm relationship can be tested by estimating the parameter α . λ is a constant, and $\lambda > 0$, $t > 0$. When $\alpha > 1$ ($\alpha < 1$), the Weibull hazard function has positive (negative) duration dependence, which indicates that the conditional probability of firm switching to other lenders increase (decrease) as the time goes by. In addition to this, the exponential distribution has a constant duration dependence, which is nested in the Weibull as the case $\alpha = 1$ and shows the testable restriction that the likelihood of firm switch is independent of time.

On the other hand, the proportional hazard can be estimated without imposing any specific restrictions on the baseline hazard function through the semiparametric analysis. For example, Cox (1972) model is the counterpart of the proportional model in the parametric analysis. Instead of imposing a specific function form for $h_0(t)$, it is left unspecified in the Cox model, while covariates are still explicitly estimated. One significant property of the Cox model is that the baseline hazard function $h_0(t)$ does not influence the estimate of β , hence it is often referred as a “semi-parametric” model. Since it is not estimating the full model, the advantage of using the Cox model is that it can avoid the biases problem caused by specifying an inappropriate baseline hazard function. The detailed formulae can be found in many statistics textbooks, such as Greene (2003), Jenkins (2004) and Cleves et al. (2008).

Overall, non-parametric method has been considered as too naive to generate reasonable results because it does not control for covariates. However, parametric analysis is too limited due to its inflexibility in assuming $h_0(t)$. Hence, semi-parametric method has the

advantage of both, and is expected to generate the most reliable conclusions. This chapter will mainly focus on estimating results from semi-parametric approach, while the nonparametric analysis will still be performed at the start of estimation.

3.3.3 Censoring and Truncation

In fact, termination of the firm-bank relationship or firm's switch behaviour may have not yet occurred by the end of the observation period, or the relationship duration may also have lasted for a while before entering the observation. In these cases, there are incomplete observations over time. A *subject* is defined as the process being studied, which is the duration of firm-bank relationship in our case. The subject is said to be in *observation period* after it enters and before it leaves the study. A *failure* is referred to as an event to end the duration, implying switch behaviour occurs in this case. Censoring is defined as when the failure (switch in this case) occurs and the subject is not under observation, which is a partial ignorance about the duration and can be categorized into three types:

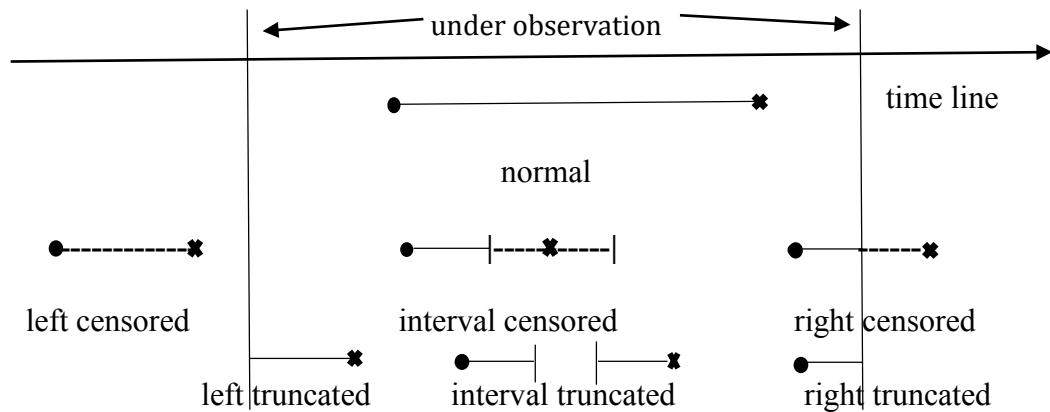
- i. Right Censoring: the subject participates in the study for a time, but it is not under observation when failure occurs.
- ii. Left Censoring: the failure occurs at some time before the subject entering the observation.
- iii. Interval Censoring: rather than observing the exact time of failure, all one knows is that failure occurs between two known time points – perhaps a short or long interval.

On the other hand, truncation refers to complete ignorance about the subject over a truncated period. Contrasting from censoring emphasizes the information of failure time, truncated subjects are not even observed during the truncation period, and it stresses a complete ignorance of a subject. There are also three types of truncation:

- i. Right truncation: the subject is under observation for a time, but it leaves the study before it fails (indistinguishable from right censoring).
- ii. Left Truncation: the subject has been on risk prior to entering the study, which can be viewed as a late entry, often confused with left censoring.
- iii. Interval Truncation: the subject is observed at first, but it disappears for a while then reports back to the study after truncation period, which is a variation of left truncation.

As Jenkins (2004) has provided a detailed statistical presentation for dealing with censoring and truncation in an intuitive graph below, the solid line is the relationship duration under observation, with a start (circle) and an end (cross). The dashed part means censoring, whereas the blank part means truncation.

Figure 3.2: Censoring and Truncation



3.3.4 Measurement of A Switch

This section introduces the duration variables and the definition of an ‘event’ based on survival. I use the language of the ‘switching’ literature as applied to firm-bank relationships, while the meaning of switching in China’s firm-bank relationship differs slightly from the existing literature on switching behaviour. In China, switching from one loan provider to another does not necessarily imply a weakened relationship or even a termination of the relationship with its previous loan provider. The duration variable (*Duration*) is defined as the length (in months) a firm-bank (or loan) relationship lasts. Firms that have repeat borrowing from an incumbent bank may have a longer relationship duration, the repeat borrowing is defined as a firm that continues to borrow from an incumbent bank within twelve months, while borrowing from an existing relationship bank after twelve months or even a longer gap will be counted as a new relationship in this study¹⁴. The event or failure in this study implies a change of loan-provider or switch behaviour (*Switch*) of the firm. Using the definition made by Ioannidou and Ongena (2010), a new loan is defined as a switch when a firm obtains a new loan from a bank with which it did not have a lending relationship during the past 12 months, while this firm may still

¹⁴ In short, if a previous firm-bank relationship has been ended a long time ago (say, 12 months), it takes as much effort to collect both hard and soft-information of firm and re-established the new relationship.

maintain relationship with its previous lender. Following them, a switching behaviour in this study can be summarized as two types:

1) *Firm A* borrows from the incumbent *Bank A* in DD/MM/YY with n year loan maturity, but *Firm A* borrows from a new bank (say *Bank B*) during this period or after the current loan relationship ends with *Bank A*, then a switch occurs for *Firm A*.

2) *Firm A* borrows from the incumbent *Bank A* in DD/MM/YY with n year loan maturity. After repaying the loan by the end of the maturity date, there was no loan activity in the following 12 months or even a longer period, but *Firm A* borrows from *Bank A* again after 12 months or a longer gap, a switch occurs for *Firm A* because this could be viewed as a new relationship.

Hence, firms “move” to other banks or “add” a new bank relationship during a relationship time period or after a period that longer than 12 months is considered as a switch. Firms in China may establish a new banking relationship either because they want to maintain multiple banking relationships or because they want to switch to a new bank entirely by terminating its relationships with its incumbent bank. Coding the failure variable (*Switch*) equal to 1 if the firm has never borrowed from any of the banks of the current deal, as well as those re-borrowings from current bank longer than one-year gap, and 0 for repeated borrowing from current banks or termination of current bank relationship without observable new bank relationship under analyse period.

3.3.5 Empirical Model

Base on the theoretical backgrounds mentioned above, the empirical model for estimating the hazard of firms’ switch to other lenders using the Cox proportional hazard model can be stated as:

$$h(t|x) = h_0(t) \cdot \exp(\beta_1 \cdot \mathbf{F} + \beta_2 \cdot \mathbf{M} + \beta_3 \cdot \mathbf{B} + \beta_4 \cdot \mathbf{E} + \text{interactive}) \quad (6)$$

where $h_0(t)$ is the baseline hazard function that captures the data dependence of duration and determines the shape of the hazard function with respect to duration of relationship. This study uses time-invariant and time-varying covariates and controls for firm characteristics, management characteristics, bank characteristics as well as the economic environment that is expected to be correlated with the hazard of the firm’s behaviour

regarding a change in its loan provider. In addition to this, the interactive terms are also included to examine the cross effects between ownership of firms or banks and internal or external changes.

Alternatively, Equation 6 can also be transformed into a Logit model that represents the hazard ratio:

$$\frac{h(t|x)}{h_0(t)} = \exp(\beta_1 \cdot \mathbf{F} + \beta_2 \cdot \mathbf{M} + \beta_3 \cdot \mathbf{B} + \beta_4 \cdot \mathbf{E} + \text{interactive}) \quad (7)$$

3.3.6 Variable Description

I use the existing literature as a signpost for the four sets of variables relevant to the firm's attributes that may determine its decision to terminate an existing bank relationship and switch to other banks, details of variable definition can be found in Table 3.2. The first group of firm's specific characteristics relate to firm's size, age, growth opportunity, profitability, leverage, liquidity, ability to pledge collateral, and opacity of ownership status as well as industrial effect.

Early studies show that the age of the firm is closely linked to the duration of its relationship with a bank but its influence remains ambiguous (i.e. Petersen and Rajan, 1995, Sakai et al., 2010). In addition, large firms are assumed to be more transparent and have less dependence on bank financing which enables them to initiate a new bank relationship more easily. It is also assumed that they have higher bargaining power to negotiate with the bank for better loan conditions (Berger et al., 2005). In contrast, Diamond (1984), and Rajan (1992) state that small and young firms are more likely to be involved in the information-capture problem, and thus, bank financing is important to them. Holding the level of internal financing constant, firms with more growth opportunities should have greater external financing needs, and thus be more reliant on bank financing. Hence, the growth opportunity is measured by the sales growth and is expected to have negative impact on the likelihood of switching.

I also consider the firm's performance and risk level proxied by its profitability, leverage, and liquidity. The firm's profitability (*Profit*) measured by return on asset, indicates a firm's ability to generate resources and to repay its loans, which allow firms with higher

profitability to improve their pricing condition. Therefore, a positive relationship between firm's profitability and its conditional hazard of switching is expected. Since bank credit is still the main source for firm financing in China, the leverage level (*Leverage*) indicates the firm's ability meet its long-term financial obligations. Highly leveraged firms will be more dependent on banks than firms with lower debt levels, and thus less likely leave their current bank relationship. However, they would consider to form multiple bank relationship or switch if their credit needs cannot be fulfilled by their current banks. Cash flows (*Cash flows*) is an indicator that identifies the liquidity risk of the firm which could affect their repayment ability, as well as future investment and borrowing. Firms that have higher cash flows are less likely to end an existing relationship so it is expected to have negative effect on the hazard of switching to other banks.

Since in general small firms are less transparent and rely heavily on bank credit in China, this study uses the ratio of the firm's tangible assets to its debt as a measure of its ability to pledge collateral (*Collateral*), and the ratio of intangibles assets to total assets as a measure of opaqueness (*Opaqueness*). Therefore, we expect that firms with less capacity to pledge collateral and lower degree of transparency are more likely to maintain the current bank relationship because it might be difficult to secure a loan from an 'outside' lender.

Other variables in this group are the classification indicators that relate to firm's heterogeneity such as ownership structure, sector dummy and size dummy. As state-owned banks still dominate the banking industry in China, it is postulated that the central and local governments can influence the loan activities of these banks in the loan market. Generally, the equity of the largest state-owned enterprises are held by state or local government agencies¹⁵. Hence, "guanxi" lending represents an important cultural component of the bank-firm relationship in China (see Yin and Matthews, 2017). A dummy variable *SOE* is employed to identify whether a firm is an SOE, coded 1 if the ultimate shareholders of the firm include central or local government, state bureaucrats, state-owned legal entities, and 0 for those non-state-owned enterprises (i.e. private, foreign, or other ownership enterprises). A *Large* dummy is included to identify whether the probability of switch is higher for large-sized firms or not. The classification of large and SMEs are based on the Statistical Definitions of Large, Medium-sized and Small Enterprises from the *National*

¹⁵ Such as State-owned Assets Supervision and Administration Commission (SASAC), the Ministry of Finance, the local Bureau of Finance, and Central Huijin Investment Ltd.

Bureau of Statistics of China, which described in Appendix B – Table B1. To control for potential industrial effects, I aggregates the firms into eight industries according to the Industry Classifying Index Code of listed companies released by *China Securities Regulatory Commission (CSRC)*¹⁶.

The second group of variables relates to the characteristics of management. Faccio et al. (2016), find that female CEO tend to avoid riskier investment and financing opportunities, also firms run by female CEOs have lower leverage, less volatile earnings, and a higher chance of survival than firms run by male CEOs. Following their study, I control for the gender of the CEO (*Gender*) and identify whether it would increase the hazard of making a change decision. Other management characteristics include the executive's age (*CEOage*) and length of tenure (*Tenure*).

A number of China studies have confirmed that CEO turnover has negative effects on private firms' performance¹⁷. A change of CEO can influence the strategic direction of a firm's operation and a firm's relationship with its existing loan provider. An indicator variable (*Change*) has been used to capture the effect of CEO change on firm's hazard of changing loan provider. Generally, a change in CEO can be expected to lower the hazard of a firm switching, because CEO turnover brings management instability and increase firm's uncertainty. Conversely, in the context of China, it could be the case that a new CEO brings with it established relationships forged by '*guanxi*' in a previous position, thus increasing the likelihood of a change in loan provider¹⁸.

The third group of covariates relate to the characteristics of banks. Due to the non-availability of financial data for some lending banks, particularly for those relatively small banks or banks' sub-branches in small cities or less developed area, I use the ownership of banks to characterize the impact of bank variables on the hazard of firm switching. The lending banks have been classified into six subgroups according to their ownership structure, which are five large-scale state-owned commercial banks (*SOB*, also known as Big5), policy banks (*Policy*), joint-stock commercial banks (*JSCB*), city commercial banks (*CCB*), foreign banks (*Foreign*), other banks include rural commercial banks, urban or rural

¹⁶ These are: agriculture (*Agri*), mining (*Min*), manufacturing (*Manuf*), construction (*Constr*), transportation (*Transp*), energy (*Energy*), real estate (*RE*) and services (*Serv*). Coded 1 for each particular industry classification (agriculture, mining, manufacturing, construction, real estate, services), 0 otherwise.

¹⁷ For example, Yu and Xu (2016); and Yin (2017).

¹⁸ Where CEO data is unavailable I use information on the Chairman.

credit cooperatives, and financial institutions (*OB*). To emphasize the effect of bank ownership, a variable *nonSOB* combines all the types of lending banks except the five large SOBs.

Lastly, the fourth set of covariates relate to the macroeconomic environment, which include monetary policy instrument and crisis dummy variables. China's monetary policy has frequently changed in recent years, existing literature do not provide evidence that monetary policy effect on changing lending and borrowing relationship or firm's switch behaviour. It is worth to examine this effect by incorporating monetary policy instruments. The PBoC frequently adjusts reserve requirements and the benchmark deposit and lending rates to stabilize economic fluctuations. Three instruments which including two price-based (*Lending rate* and *Reserve*) and an informal quantitative-based (*Guidance*) monetary tools have been employed to measure the effect of changing the stance of monetary policy on firm's switch behaviour. Because this study focuses on lending and borrowing relationships, the interest rate is denoted by the RMB one-year benchmark lending rate rather than RMB 1-year benchmark deposit rate. The reserve requirement denoted by the reserve ratio for large and small financial institution. In addition, following Chen et al. (2017), five dummy variables have been used to proxy five stances of non-standard monetary policy tool window guidance, definitions of each stances has been shown in Appendix B–Table B2.

On the other side, in response to the financial crisis, the central government launched a stimulus package of 4 trillion RMB that included policies to loosen control on banks so they can expand credit in late 2008. The stimulus plan was mainly targeted in key areas such as rural infrastructure and transportation that are dominated by SOEs that can be traced to state control over its banking system and corporate sector. It is found that the effectiveness of China's stimulus plan stems from the contribution of the SOEs. During the recession period, SOEs expanded their borrowing, investment and production capacity and generated a rapid recovery of aggregate demand with credit provided by the SOBs. This study includes a crisis dummy (*Crisis*) as well as several interactive terms that capture the cross effects between crisis dummy and ownership of firms or banks, also the cross effects between CEO turnover and ownership of firms or banks.

Table 3.2: Description of The Variables

Variables	Description	Unit	Sign
<i>Switch</i>	Dummy variable that takes value 1 if the firm switches its loan provider, 0 otherwise.	-	
<i>Duration</i>	Duration of a firm-bank relationship lasts.	Month	
<i>Age</i>	Age of the firm when the firm switches.	Month	+/-
<i>Size</i>	Natural logarithm of year-ended total asset deflated by the Chinese GDP deflator.	CNY	+
<i>SOE</i>	Dummy variable that takes value 1 when the firm is state-owned enterprise, 0 otherwise.	-	-
<i>Profitability</i>	Ratio of net profit on total assets.	%	+
<i>Leverage</i>	Ratio of long-term debt to total assets.	%	+/-
<i>Cash flows</i>	Ratio of cash and cash equivalents to total assets.	%	-
<i>Growth</i>	Ratio of sales growth.		-
<i>Collateral</i>	Ratio of tangible assets to total debt.	%	+
<i>Opaqueness</i>	Ratio of intangible assets to total assets.	%	-
<i>Industry</i>	Eight sector dummies that takes value 1 when the firm is operating in the sector of Agriculture /Mining /Manufacture /Construction /Energy /Transport /Real estate /Service, 0 otherwise.	-	+/-
<i>CEOage</i>	Age of CEO when the firm switches.	Year	+/-
<i>Gender</i>	Dummy variable that takes value 1 when the firm is run by a male CEO, 0 otherwise.	-	+
<i>Tenure</i>	Tenure of CEO when the firm switches.	Month	-
<i>Change</i>	Dummy variable takes value 1 if there is a change in CEO in a current relationship, 0 otherwise.		-
<i>SOB</i>	Dummy variable that takes value 1 if the lending bank is the five large state-owned commercial banks (also known as Big5), 0 otherwise.	-	+/-
<i>JSCB</i>	Dummy variable that takes value 1 if the lending bank is joint-stock commercial bank, 0 otherwise.	-	+/-
<i>CCB</i>	Dummy variable that takes value 1 if the lending bank is city commercial bank, 0 otherwise.	-	+/-
<i>nonSOB</i>	Dummy variable that takes value 1 if the lending bank is not the largest state commercial banks (Big5).	-	+
<i>Lending rate</i>	PBoC's one-year benchmark lending rate.	%	+
<i>Reserve</i>	PBoC's reserve requirement ratio.	%	+
<i>Guidance</i>	Five dummy variables represent five stances of window guidance policy that take value -2 for strongly discouraging period, -1 for weakly discouraging period, 0 for no explicit direction, 1 for weakly encouraging period and 2 for strongly encouraging period, 0 otherwise.	%	+
<i>Crisis</i>	Dummy variable that takes value 1 if the year of switching in crisis year 2008 and 2009, 0 otherwise.	-	-
<i>Change*Firm(or Bank)</i>	Cross effect of CEO change dummy and different types of firm or bank.	-	+/-
<i>Crisis*Firm(or Bank)</i>	Cross effect of crisis dummy and different types of firm or bank	-	+/-

3.4 Data and Sample

3.4.1 Data Source

The data used in this study is mainly accessed from the *China Stock Market and Accounting Research* (CSMAR) database of Shenzhen GTA Data Technology Co., Ltd. GTA CSMAR is a unique, comprehensive database of China stock returns, covering all companies listed on the Shanghai Stock Exchange and the Shenzhen Stock Exchange and provides the most accurate, reliable and useful financial data that includes the data on China stock markets, bank loan, financial statements and corporate governance.

My study uses the data of listed companies which include state and non-state-owned companies. Due to the complex ownership policy, structure and penetration of the state, SOEs are often less isolated from the legal framework applicable to other companies. It is also argued that SOEs focus more on social outcomes and aim at non-commercial goals rather than maximization of firm value or profit. To avoid this bias, this study employs the data of listed firms¹⁹. An advantage of using listed firms is that they have to provide a high degree of transparency and disclosure of information due to the legal structure of stock exchanges, which ensures their financial data more reliable than that of non-listed SOEs.

I collect data on four categories from *China Listed Firms Research Series data*: Bank loan, Financial Statements, Corporate Governance and Equity Nature. The loan data describes the relationship between borrower (firms) and bank is annually collected from Bank Loan category that includes the name of the lending bank, loan duration, borrowing amount, starting and ending date of loan relation. In addition, the data of firm-specific variables is collected from Balance Sheet Statement, Income Statement and Statement of Cash Flows from the Financial Statement categories. As regards the industry and ownership classification indicator, the data is collected from the Sector and Equity Nature categories. Moreover, the data of CEO's characteristics are collected from the Executive information from the Corporate Governance category²⁰. As regards the monetary policy instruments,

¹⁹ In order to be a listed firm, a SOE must be restructured into a stock company through the sale of shares to other companies, legal entities or its employees firstly. Next, the SOE sells a part of shares (usually 1/3) to the general public. Hence, shares of SOE have been split into two parts: non-tradable shares of state or state-owned legal entity, and tradable shares of individual investors or private enterprises. Once firms become publicly listed, they have to focus on the interest of shareholders.

²⁰ Apart from using the CSMAR database, the 20 years data of GDP deflator and exchange rates (USD, BGP, EUR, AUD, HKD AND JPY) are collected from the World Bank.

the 1-year benchmark lending rate and reserve requirement ratios can be accessed from the website of the *People's Bank of China* (PBoC), the step-by-step development of PBoC's non-standard window guidance policy can be found from the quarterly *China Monetary Policy Report* and the indicators of five guidance stances can be referred from the definitions made by Chen et al. (2017). To distinguish different sizes of firms in my sample, I base on the definition of Large, Medium-sized and Small Enterprises made by *National Bureau of Statistics of China*, which uses both of the operating income and number of employee as indicators and specify the correspondent value for different groups of size for firms that operating in different industries.

3.4.2 Details of Matched Firm-Loan-Bank Data

To perform a survival analysis, the data must be converted into duration format that includes the start and end date of a relationship duration. Firstly, using MATLAB program to deal with the firm-level data and matching these data to the loan (lending – borrowing) data. The loan data shows that the bank loans could be obtained either from a single or multiple lenders. In addition, this loan data consist the information of the stock code of sample listed firms, name of lending banks, lending deals, and starting and ending date of loan relation. However, the information on this time span of lending relationship is not complete, as well as other deal indicators. For example, some of the observations have one missing loan indicator, but some of the observations have two or more missing loan indicators. Besides, some observations have missed the starting or ending date of loan relationship or even both of this duration information. For this loan data, the announcement date (date of loan announcement listed company released on the publication specified by the stock exchange) is about two to ten days prior to the start date of loan borrowing. For those observations missing the ending date of the loan, these could be calculated by using the starting date plus loan contract period.

Secondly, the data for firm's specific characteristics and other variables such as deflator and exchange rates collected from the CSMAR database and World-Bank across the sample period from 1996 to 2016 has been matched to the loan data through MATLAB program. Concatenating the firm's ID (stock code) and the starting year of loan borrowing, the corresponding firm's characteristics in a specific year for a specific sample listed firm have been matched to firm's loan data at the start of loan relationship. One thing should be

pointed out here is that the firm's switching behaviour cannot be identified without the information of lending bank, therefore this study drops those observations that without information of lending banks, the financial firms are excluded as well. As a firm-bank relationship has been counted as one observation, a firm with multiple bank relationships enters as two or more observations. Due to some lending deals indicator and firm's specific variables data are not available for particular firms in some periods, finally, there is an unbalanced panel matched dataset with 18,233 relationships including 2,102 Chinese listed firms.

After matching all the firm-level variables for each firm to the loan data, a clean dataset that contains matched firm-bank information of loan relations and firm-specific characteristics have been created. Next, I use STATA program to analyse this clean dataset and perform the survival analysis as well as the analyses in the following two chapters.

3.4.3 Censoring

Not knowing when a firm-bank (or loan) relationship starts, or when it ends, or both, implies that it is unable to observe the true duration of the relationship for these observations. There is not necessary to adjust left censoring in our data because all these relationships start in or after 1996. However, without the adjustment of right censoring, the estimation of the proportional hazard models produces biased and inconsistent estimates of model parameters. Some relationships do not end within the sample period, or some firms' switch behaviour of changing loan provider do not occur by the end of my observation period, thus I adjust right censoring when I generate the duration of these firm and bank relationships.

3.4.4 Descriptive Analysis

In my sample, 69% of these loan relationships with large firms, 31% with small and medium firms, and 44% with state-owned firms while 56% with non-state-owned firms. This complete matched dataset include 1,326 large firms and 776 medium and small sized firms, more than half of the sample listed firms come from private sector or controlled by foreign firms. The distribution of loans among different groups and summary of sample listed firms by ownership and size have been shown in Figure 3.3 and Figure 3.4, respectively.

Figure 3.3: Distribution of loans among different groups

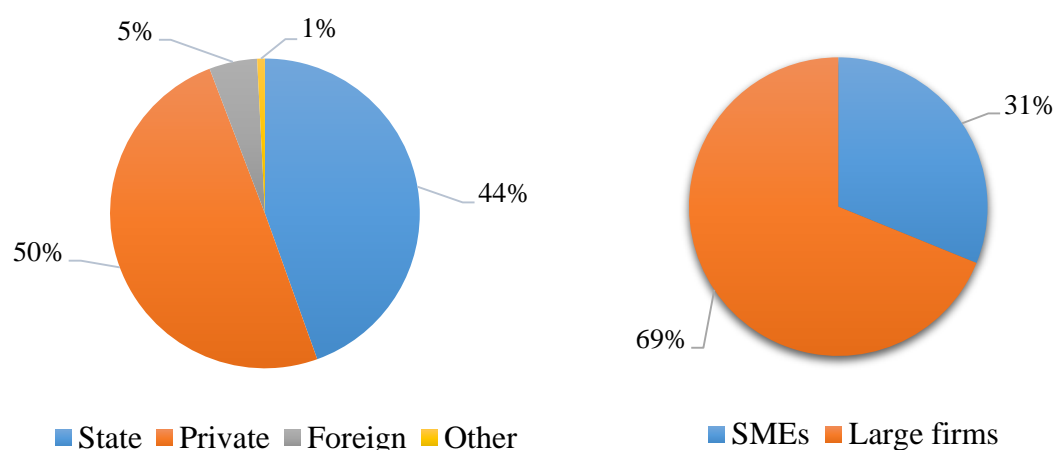
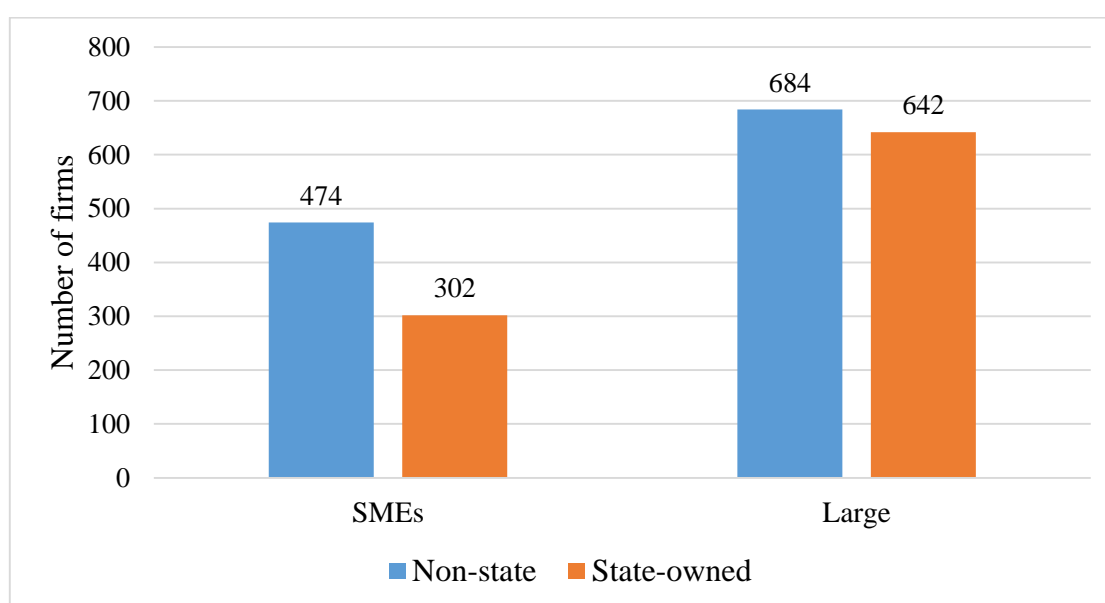


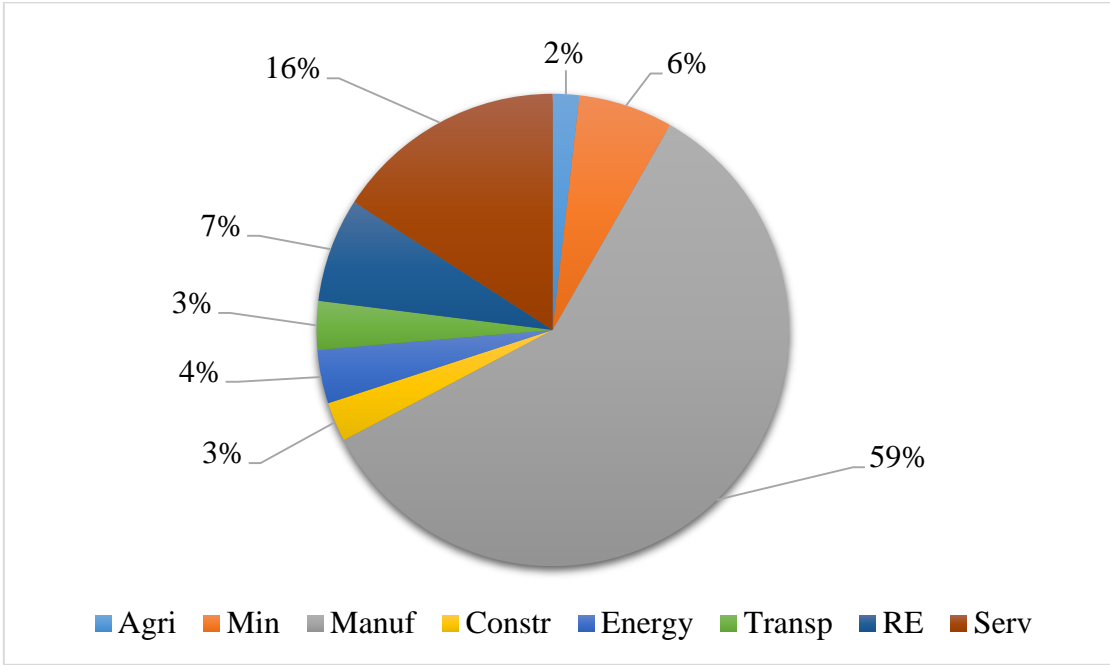
Figure 3.4: Total number of firms



With respect to the sector, more than half of the sample listed firms running in manufacturing sector that accounts for 59% of these firm-bank relationships. The second and third largest groups of sectors are the service and real estate sector, which account for 16% and 7% of these relationships, respectively. Despite the largest three groups of sectors, the number of firms that running in other sectors such as mining, energy, transport, construction and agriculture have been summarized in Figure 3.5. Moreover, lending banks measured by ownership has been displayed in Figure 3.6, borrowing from the five large state-owned commercial banks (SOBs or Big5) or joint-stock commercial banks (JSCBs) account for one third of these borrowing -lending relationships, the third largest type of lending bank is city commercial banks (CCB) with 16.94% lending relationships. Due to the borrowing relationships with foreign banks, policy banks and other banks account for

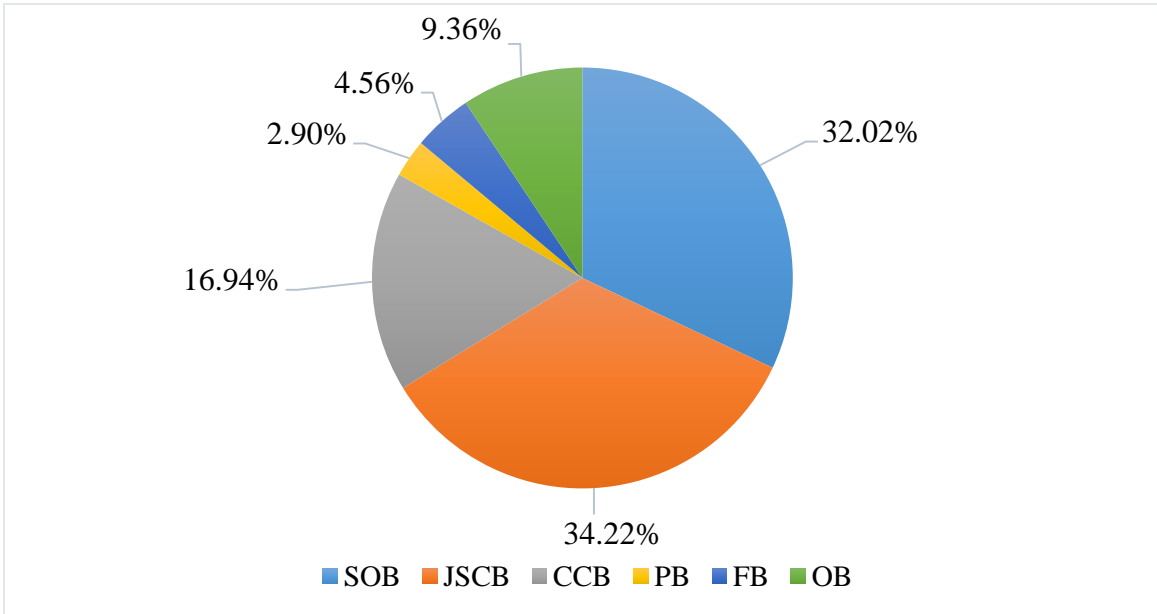
quite small proportions, I only include the largest three types of Chinese banks in the survival analysis.

Figure 3.5: Number of firms in different sectors



Note: *Agri* denotes Agriculture sector; *Min* indicates Mining sector; *Manuf* denotes Manufacturing sector; *Constr* denotes Construction sector; *Energy* denotes Energy sector; *Transp* denotes Transportation sector; *RE* denotes Real Estate sector; *Serv* denotes Service sector.

Figure 3.6: Types of lending banks



Note: *SOB* denotes five large State-owned Commercial Banks; *JSCB* denotes Joint-stock Commercial Banks; *CCB* denotes City Commercial Banks; *PB* denotes Policy Banks; *FB* denotes Foreign Banks; *OB* denotes other banks includes Rural Commercial Banks, Rural Cooperative Banks, Rural Credit Cooperatives, and other financial institutions.

By organizing the duration data in spells, where a spell describes the number of months of a firm-bank relationship, it can be seen in Figure 3.7, that the mean duration of these bank-firm relationships is 27.38 months, but they last longer in the group of large firms (about 28.33 months) than in the small and medium firms (around 25.33 months, on average). In addition, these relationships last on average 30.97 months in the group of state-owned firms, which is relatively longer than non-state-owned firms that is 23.55 months. The survival analysis shows that the likelihood of switching over the subsequent year after surviving one year is 75%, after three years 50%, after eight years 25%. A benchmark model will be estimated by including all sets of covariates as well as interactive terms. Due to the fact that SOEs access to preferential lending while small firms are less easily to obtain funds relative to other firms, separate regressions for different groups will be considered in this study, which includes subsamples of SOEs, non-SOEs, large, and medium and small firms (SMEs). Furthermore, robustness test will be performed by adding the number of bank relationships (*Number*) and geographical effects, and separate regressions that without or with the additional sets of variable.

Figure 3.7: Mean duration among different sizes or ownership of firms

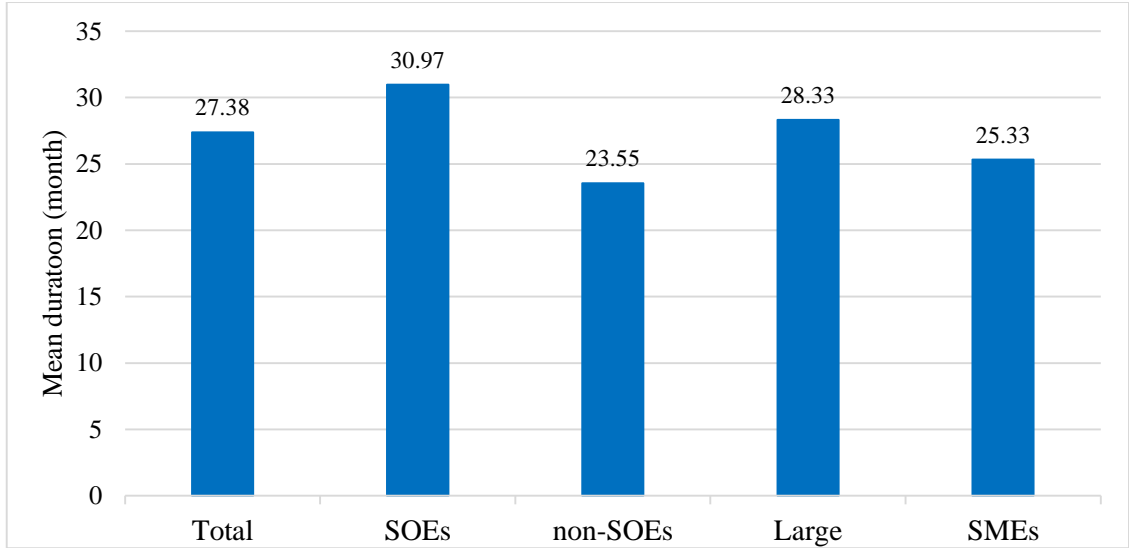


Table 3.3 presents summary statistics on duration, lending, and firm-characteristic variables. The average relationship duration is 2 years, the shortest duration is 3 months and the longest duration is 30 years. The average loan value is 305000000 CNY, the highest loan value is 1250000000000 CNY and the lowest is 10000 CNY. The largest total asset is 640000000000 CNY, while the smallest total asset 91600000 CNY. To smooth the data

and reduce the probability of getting heterogeneous problem, the natural logarithm of total asset has been taken in this study, which could be viewed as a proxy of size of firm. The average firm is 14 years old, with youngest firm that less than one 1 year and oldest firm that 33 years when they switch. With respect to the characteristics of executives, 95% of the sample of firms are running by male CEOs and the average duration of a CEO's tenure is 3 years. Most firms remain multiple bank relationships during the sample period, 48.16% of the listed firms changed their lender after their previous borrowing. The main reason for the high incidence of switching and multiple bank relationships is that adding a new bank relationship during a relationship time period or after a period that longer than 12 months is considered as a switch.

Table 3.3: Descriptive Summary

Variable	Obs.	Mean	Std. Dev	Min	Max
Duration (month)	12,620	27.378	27.583	0.033	396.263
Loan (CNY)	14,494	305000000	2060000000	10000	125000000000
SOE	17,132	0.445	0.497	0.000	1.000
Large	18,233	0.677	0.468	0.000	1.000
Age (month)	18,232	171.656	68.119	9.904	398.466
Size (log)	18,130	22.143	1.165	18.333	27.185
Profit (%)	18,169	2.339	16.269	-677.605	66.419
Leverage (%)	16,286	6.687	9.292	0.500	84.477
Cash flows (%)	18,168	9.845	9.738	2.332	94.655
Growth (%)	17,842	0.714	21.199	-0.984	1880.750
Collateral (%)	17,376	1982.171	25934.310	33.607	2622215
Opaqueness (%)	17,717	4.981	6.683	0.000	82.987
CEO age (year)	14,052	48.194	6.458	28.000	74.000
Gender	14,058	0.950	0.218	0.000	1.000
Tenure (month)	14,035	40.157	36.419	1.000	216.000
Change	12,702	0.290	0.454	0.000	1.000
Crisis	18,233	0.092	0.289	0.000	1.000

3.5 Empirical Results

Turning to the empirical results, estimation is conducted in a series of stages. This section firstly show the results of nonparametric analysis by plotting the Kaplan-Meier survival function and Nelson-Aalen Cumulative hazard function, then it plots the baseline hazard function for different ownership enterprises, next it present the estimated coefficient results from Cox proportional hazard model and lastly it shows the robustness check.

3.5.1 Non-parametric Analyses

Without making assumptions about the functional form of survival and cumulative hazard function, and the effects of covariates, the Kaplan-Meier survival estimate and Nelson-Aalen cumulated hazard estimate for the overall sample of listed firms, state and non-state groups, large, medium and small groups have been plotted in Figure 3.8–3.10. These results confirm that state-owned firms and large firms' bank relationships have a longer duration and a better survival experience than non-state-owned firms and medium and small-sized firms. Alternatively, the hazard of switching is correspondently higher for non-SOEs and SMEs.

Figure 3.8: Survival and hazard function (Full sample)

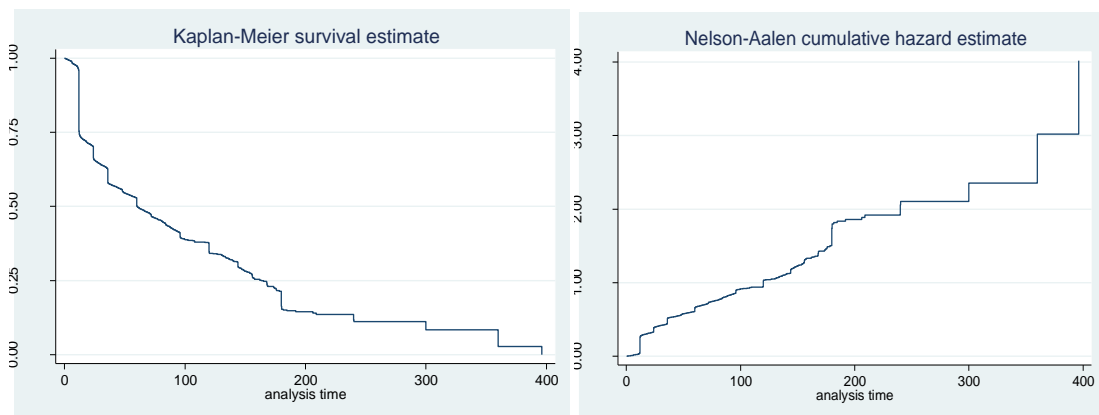


Figure 3.9: Survival and hazard functions for state and non-state firms²¹

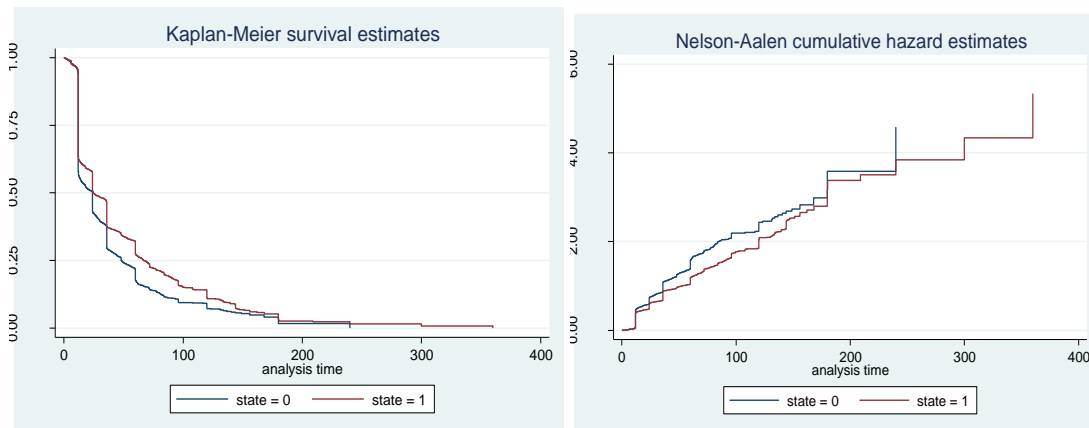
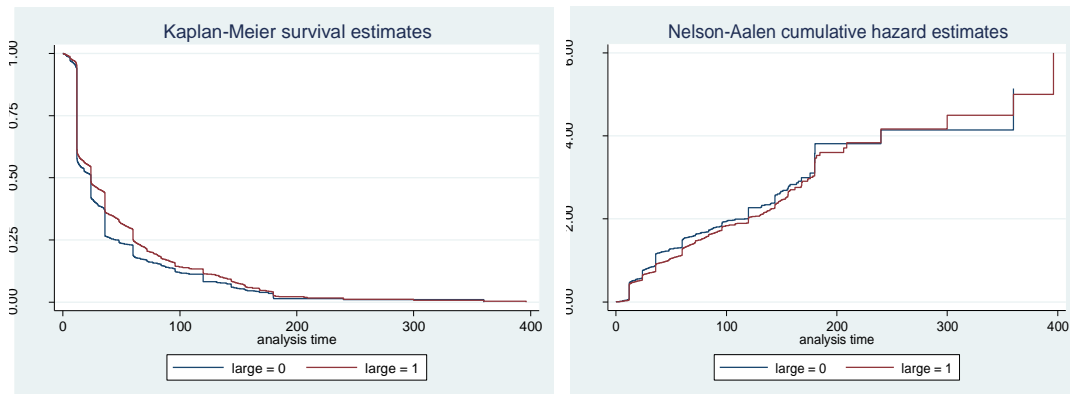


Figure 3.10: Survival and hazard functions for large firms and SMEs²²



3.5.2 Semi-parametric Analysis – Cox Proportional Hazard Model

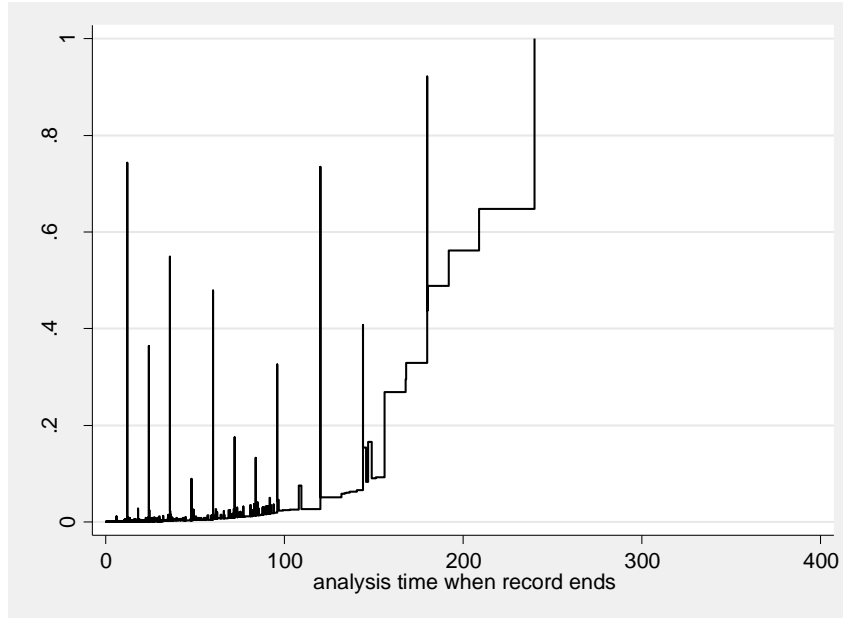
For the baseline hazards, the baseline hazard contribution from semiparametric Cox model have been shown in Figure 3.11. The term baseline generally means that these are the functions when all covariates are set to zero, the baseline hazard function describes the conditional probability of switching purely due to the duration of firm-bank relationship. A baseline hazard contribution is defined at every analytical time t at which a switch (or failure) occurs and is undefined at other times. The hazard contribution shows the effect of one switch occurs on the hazard rate, though baseline hazard rate have some spikes at some

²¹ state = 1 indicates SOEs, state = 0 indicates non-SOEs.

²² large = 1 indicates large firms, large = 0 indicates SME firms.

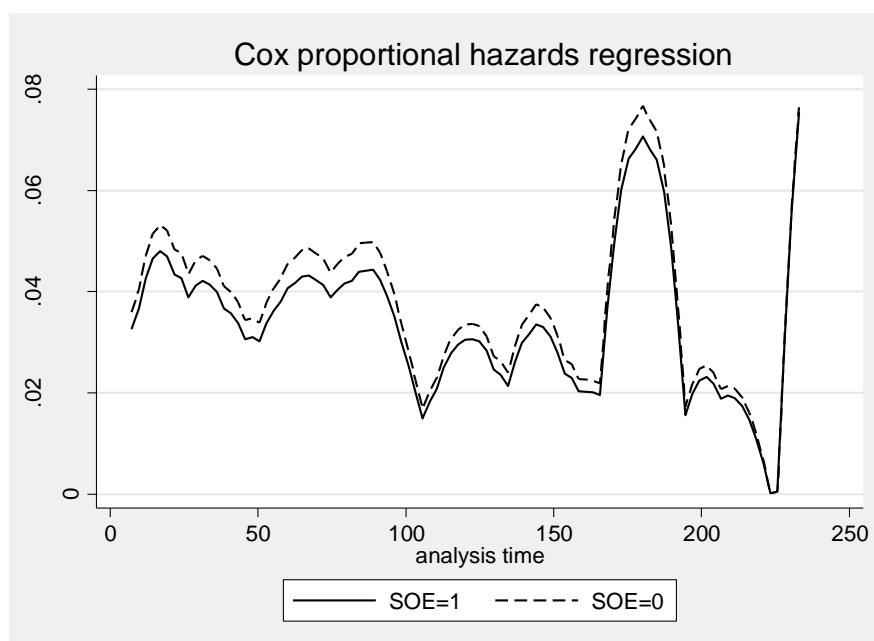
period, it is monotonically increasing and reaches to 1 by the end of analysis time, because all firms have switched at the end under this censored data.

Figure 3.11: Baseline hazard contributions



After obtaining the baseline hazard contributions, a smoothing operation is performed and the estimated hazard function for SOEs and non-SOEs is shown in Figure 3.12. Under a Cox model, all failure times contribute to the estimate of the baseline hazard, not just those of which $SOE=1$, and the baseline hazard may in turn be converted to be the hazard for any covariate pattern using proportionality assumption. Generally, the Cox model shows that the probability of SOEs changing their loan provider (switch) is relatively lower than non-SOEs. Two features of changing firm-bank relationship have been captured by the hazard function, one is a downward trend in the Cox proportional hazard function that indicates the probability of a firm switching its credit provider is declining over time. And the other is a periodicity pattern which suggests that the hazard of a firm switching is higher at the specific periods such as in one year or end of analysis period.

Figure 3.12: Cox proportional hazard function²³



Using the Cox proportional hazard model to estimate the effect of the firm-specific characteristics and other covariates on the conditional probability of a switch to other lenders, the estimation results are reported in Table 3.4. Instead of reporting the hazard ratios generated from the survival analysis, the estimated coefficients will be reported because it gives the immediate direction of covariate effects. Exponential coefficients can be interpreted as the ratio of the hazards for one-unit change in the corresponding covariate. There are two ways to interpret the signs on the coefficient estimates represented by β in the empirical model. First, each coefficient estimate indicates the partial impact of a covariate on the hazard of firm changes its lender, holding duration constant. Second, due to the hazard rate being inversely related to the duration, a positive (negative) coefficient estimate implies a shorter (longer) relationship duration.

Column (1) shows the results for the benchmark model which including all sets of covariates. The results from the benchmark model demonstrate that only the coefficients on *Age*, *Size*, *SOE*, *Leverage*, *Tenure*, *Change*, *SOBs*, *CCBs*, *Lending rate*, *Reserve* and *Crisis* are statistically significant. From the signs of the estimated coefficients, this chapter can infer that, young and small firms, firms with a longer CEO tenure, and also firms that experience a new CEO are more likely to change bank loan provider (switch). However,

²³ SOE = 1 indicates SOEs, SOE = 0 indicates non-SOEs.

by controlling for the ownership and size of firms, the results indicate that both SOEs firms and large firms are less likely to switch but tend to keep stronger and longer lasting relationships with the banks, which proves that the observed difference in the mean duration of firm-bank relationships between state and non-state firms, and also between large, medium and small firms observed in the descriptive statistics, is statistically significant. The coefficients of *SOE* show that the hazard of changing loan provider is 9.79% lower if it is a state-owned firms²⁴, this effect is stronger for subsample of large firms.

Additionally, the conditional likelihood of a change (switch) is significantly lower for firms with a higher level of leverage and, it seems that those less risky firms benefit from better loan conditions than smaller and less profitable firms, and therefore suffer less from the information monopoly of the banks. This could also be the result of mutual interest of these firms and the banks to maintain their relationships. However, the cash flows becomes insignificant when additional sets of regressors are added in the benchmark model (see Colum (3), (5) and (7) in the robustness test result in Table 3.5 for significant coefficient). Similarly, the proxies for the firm's profitability, growth opportunity, ability of collateral, and degree of transparency, are not significant although correctly signed.

Regarding the managerial characteristics of firms, it is seen that while there is a positive and significant impact of CEO's tenure on the hazard of switching, the quantitative effect is very small, a 1-year increase in CEO's tenure increase the hazard of switching by only 0.1% and therefore can be considered as statistically significant but economically insignificant. However, a CEO change implies that the firm that experiences a change in the CEO during a current bank relationship has an increased hazard of changing loan provider. An arriving CEO may bring with it the baggage of previous relationships with banks developed in their previous position. It is likely that firms that have a new CEO, especially those with political connections, are more able to use their connections to access better credit conditions, increasing the probability of a switch. The insignificant coefficients of age and gender of firm's CEO show no evidence that firms run by male

²⁴ Given the Cox proportional hazard function $h(t) = h_0(t)\exp(\beta'x)$, then hazard ratio $\frac{h(t|x)}{h_0(t)} = \exp(\beta \text{ SOE})$. For example, if the exponential coefficients generates the hazard ratio <1 means that 1 unit change of a particular covariate would lower the hazard of switching by (1-hazard ratio)*100 percent, while if the hazard ratio >1 means the covariate would increase the hazard of switching by (hazard ratio-1)*100 %. The signs of the estimated coefficients directly indicates a positive or negative effect of particular covariate on the hazard of changing loan provider.

CEOs have a higher probability of changing their loan provider than firms run by female CEOs in China in survival approach.

When ownership of the bank is considered, the coefficients on the *SOB* and *CCB* are statistically significant, with a negative and positive sign, respectively. It is easy to understand that firms borrowing from the five large SOBs (also called Big5) are more likely to maintain long and stable relationships. The hazard of changing loan provider for firms' that are SOBs is 32.83% lower than those firms that do not borrow from SOBs, and this effect is stronger for the subsample of non-SOEs. The implication is that having bank relationships with the five large SOBs make these non-SOEs less likely to change their credit. However, firms that borrow from city commercial banks (CCBs) have a hazard of switching 16.88% higher than firms that do not borrow from CCBs. The reason for a switch not only depends on firms, but also on banks. From the bank's perspective, CCBs may not be willing to continue with the loan-relationship. This may be due to several possibilities. A firm's performance may have deteriorated during the lending relationship period, which may give a negative signal to the incumbent bank, resulting in an unsuccessful loan renewal. Alternatively, the bank may react strategically and build up stable relationships with particular types of firms or particular sectors.

Turning to the external effect of the economic environment, the results show that changes in PBoC's benchmark lending rate and reserve ratio have a significant impact on the hazard of changing a loan provider. The higher the lending rate or reserve ratio, the higher the likelihood of firm switching, in particular this macro impacts is more significant for non-SOEs' switch behaviour. Moreover, the influence of changing lending rate on firms switch probability is greater than changing the reserve requirements, which is 8.33% and 1.61% respectively. Nevertheless, the results from survival analysis shows that there is no significant impact of informal window guidance on firm's switch behaviour or duration of firm-bank relationship. Moreover, the crisis dummy variable coefficient shows a negatively significant effect on a firm's probability to switch for all types of firms (see Colum (1)-(6)). Not surprisingly firms are less likely to switch during the financial crisis period between 2008 and 2009. One surprising finding is that the interaction terms shows that if there is CEO turnover and firm's lending banks are large SOBs, the likelihood of switching

tends to be higher, and this effect is particularly significant in state-owned firms group²⁵. This higher switch probability could possibly be the case of a SOE-SOBs relationship changing to another large SOB through the political connection or cultural “guanxi” route.

Column (2) shows the variable ‘*nonSOB*’ to control for ownership which covers policy banks (PB), joint-stock commercial banks (JSCB), city commercial banks (CCB), foreign banks (FB) and other types of lending banks (OB)²⁶. A positive and significant coefficient of *nonSOB* confirms that if a firm’s existing lending bank is a non-SOB, they are more likely to change loan provider banks. In addition, Columns (3) to (6) present the results for the groups of ‘SOEs’, ‘non-SOEs’, ‘large’, ‘medium and SMEs’, respectively. Some differences are observed. It can be seen that the age of the firm is only significant in the subsample of large firms. In other words, younger large firms are less likely to switch compared to medium and small firms. This lower hazard of switching loan provider is not found in state or non-state groups, because the age of firms does not significant in terms of ownership, but it does matters in terms of size. Consistent with the benchmark result, the higher a firms’ leverage and previous borrowing from the SOB, the lower the hazard of changing loan provider for the four groups of enterprise, and they were all less likely to switch during the crisis period.

While change in CEO and borrowing from CCBs increases the likelihood of a change in loan provider (switch) for these groups, this effect is not significant for SMEs. In addition, the coefficient on the SOE dummy shows that state ownership lowers the hazard of large firms switching, but no similar effect is found in SMEs. These implies that the switch behaviour of SMEs are not determined by their ownership structure, whether they have a CEO change or relationships with non-SOBs. Interestingly, the coefficient of *Opaqueness* (or degree of transparency) is statistically positive and significant in the non-SOEs and SMEs groups, implying that the opacity associated with non-SOEs or SMEs, increases the hazard of switching, which contradicts the expectation that less transparent firms are more likely to stay with their incumbent relationship because it might be difficult for them to access loan from ‘outside’ bank²⁷.

²⁵ Furthermore, the coefficient of most interactive terms are not significant in this study, only ‘*Change*SOB*’ shows significant result.

²⁶ The analysis in this column combines all types of lending banks as non-SOBs except for the five large SOB (or Big5).

²⁷ This could be a bank ‘push’ effect than a firm ‘switch’ effect in that the bank may encourage the firm to look elsewhere for the renewal of a loan.

Table 3.4: Estimate Results of Cox Proportional Hazard Model

Variable	(1) Benchmark	(2) nonSOBs	(3) SOEs	(4) non-SOEs	(5) Large	(6) SMEs
Firm						
Age	-0.001**	-0.000	-0.000	-0.000	-0.001**	-0.000
Size	-0.072***	-0.074***	-0.067**	-0.074***		
SOE	-0.103***	-0.105***			-0.126**	-0.100
Profit	0.004	0.004	-0.003	0.008**	0.003	0.004
Leverage	-0.008***	-0.008***	-0.007**	-0.011***	-0.012***	-0.006**
Cash flows	-0.003	-0.003	-0.007	-0.001	-0.003	-0.001
Growth	-0.000	-0.000	0.007	-0.000	-0.001	0.001
Collateral	-0.000	-0.000	0.000	-0.000	-0.000	0.000
Opaqueness	0.001	0.001	-0.002	0.005**	-0.001	0.004***
Industry	Yes	Yes	Yes	Yes	Yes	Yes
Management						
CEOage	0.000	-0.000	-0.001	-0.000	0.001	-0.002
Gender	-0.036	-0.040	-0.044	-0.022	-0.067	-0.053
Tenure	0.001***	0.001**	0.001	0.001***	0.002***	-0.000
Change	0.225***	0.221***	0.174**	0.265***	0.337***	0.041
Bank						
SOB	-0.398***		-0.361***	-0.439***	-0.398***	- 0.320***
JSCB	0.026		0.103	-0.039	0.018	0.125
CCB	0.156***		0.157**	0.147**	0.201**	0.155
nonSOB		0.460***				
Environment						
Lending rate	0.080***	0.079***	0.051	0.115***	0.091***	0.112**
Reserve	0.016**	0.016**	0.012	0.017	0.015	0.004
Guidance	0.010	0.009	0.008	0.015	0.005	0.023
Crisis	-0.396***	-0.394***	-0.324***	-0.465***	-0.379***	-0.365**
Change*SOB	0.243***		0.214**	0.094	0.148	0.111
Obs.	7,570	7,570	3,140	4,430	5,150	2,420
Mean duration	27.38	27.38	30.97	23.55	28.33	25.33

Note: ***, **, * denote significance level at 1%, 5%, and 10% level, respectively. Column (1) presents the results of the benchmark model using semiparametric Cox model; Column (2) re-estimate the benchmark model while uses a new variable '*nonSOB*' to denote the ownership of lending banks which includes all types of banks except the five large SOBs (Big5); Columns (3) and (4) present separate results for the group of 'state-owned' firms and 'non-state owned' firms, respectively; Columns (5) and (6) shows separate results for the group of 'large' firms and 'SMEs' firms. The results of adding different sets of regressors have been displayed in Table 3.5.

3.5.3 Robustness

To check the robustness, I control for the city effects and the number of bank relationship and use the Cox proportional hazard model to analyse the effects of these covariates. This allow for the possibility that economic development policy, and financial environment varies across cities and provinces in China by controlling for a city effect on firm-bank relationship and firms switching behaviour. According to the geographical location of firms, this study uses four location dummies to examine whether firms located in the most developed areas in China are more likely to switch lenders, as they are assumed to be granted loans more easily in these areas.

As Elsas (2005) suggests, exclusivity gives rise to a lower degree of direct competition between banks, which allows for unique access to valuable information and eases the realization of the economic benefits associated with relationship lending, for example, efficient renegotiation of loan contract. It is argued that there is a negative correlation between the number of banks in a multiple bank relationship and the incidence of relationship lending or repeated lending. Hence, a variable *Number* has been employed to measure the number of bank relationship to examine its effect on Chinese firms' switch behaviour.

The results of robustness test are shown in Table 3.5²⁸. Column (1) replicates the results of benchmark model from Table 3.3 – Column (1). Column (2) shows the results of robustness check by adding the variable '*Number*' and four city dummies, they are '*Beijing*', '*Shanghai*', '*Guangzhou*' and '*Shenzhen*'. Columns (3) to (8) show the estimated coefficients for adding additional sets of covariate. As can be seen from this table, the main results are maintained. Firms that have multiple bank relationships are more likely to switch, the more relationship they have, the higher the likelihood of switching. It is not hard to understand because more bank relationships implies a firm is less loyal to its main bank, thus the likelihood to have multiple bank relationships or switch lender is higher. In addition, firms located in Shanghai has lower hazard of switching, this could be interpreted as firms located in the international financial centre of China may enjoy more stable bank

²⁸ In addition to the semiparametric analysis, I also estimated the hazard function by parametric methods. The results using both Weibull and Exponential specification are almost in line with the results from using semiparametric analysis – Cox proportional hazard model. The results are available on request.

relationships and they are less likely to suffer financial difficulty. As suggested by Ogloblina (2012), financial centres are the locations where important financial institutions are gathered and where there is considerable mobilization and redistribution of financial resources. International Financial Centres (i.e. London, New York, Hong Kong) are characterized by liquid markets and provide a wide range of financial services. Many international banks and important financial supervision institutions place their headquarters within these financial centres. These IFCs provide investors various opportunities and benefits such as low transaction costs, low risks and easy access to the capital (ŞİT and KARADAĞ, 2018). Allowing for these location advantage, a lower probability of changing loan provider in Shanghai indicates that firms located in the financial centre of China enjoy a better financial environment and their credit needs can always be fulfilled by their current credit provider to maintain their high liquidity levels.

Although the signs of other three city dummies are positive these effects are insignificant. Overall, the results of adding and dropping different regressors are almost in line with the results from benchmark model for some covariates, but some of the coefficients vary slightly. For example, adding additional regressors increases the effect of firm size and CEO change, while reduces the effect of state ownership and leverage. Nevertheless, using these four location dummies indicates the limitation of this robustness test because the number firms from these four cities only accounts for one-third of the sample. Hence, the city effects are tenuous.

Table 3.5: Robustness Tests

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Benchmark	Robustness		Robustness		Robustness		Robustness
Firm								
Age	-0.001**	-0.000	0.000	0.000	0.000	0.000	-0.000	-0.000
Size	-0.072***	-0.078***	-0.054***	-0.064***	-0.061***	-0.075***	-0.069***	-0.077***
SOE	-0.103***	-0.097**	-0.167***	-0.164***	-0.146***	-0.139***	-0.122***	-0.115***
Profit	0.004	0.005	0.001	0.001	0.003	0.003	0.003	0.004
Leverage	-0.008***	-0.008***	-0.011***	-0.011***	-0.009***	-0.009***	-0.009***	-0.009***
Cash flows	-0.003	-0.003	-0.006***	-0.006***	-0.005**	-0.005**	-0.006***	-0.006***
Growth	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Collateral	-0.000	-0.000	0.000	0.000	-0.000	-0.000	-0.000	-0.000
Opaqueness	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Management								
CEO age	0.000	0.000			0.001	0.001	0.001	0.001
Gender	-0.036	-0.060			0.015	-0.011	-0.013	-0.036
Tenure	0.001**	0.001*			0.002***	0.002***	0.002***	0.002***
Change	0.225***	0.200***			0.218***	0.240***	0.232***	0.245***
Bank								
SOB	-0.398***	-0.399***					-0.431***	-0.433***
JSCB	0.026	0.016					0.005	-0.006
CCB	0.156***	0.141***					0.142***	0.126**
Environment								
Lending rate	0.080**	0.085**						
Reserve	0.016*	0.015*						
Guidance	0.010							
Crisis	-0.396***	-0.397***						
Change*SOB	0.243***							
Robustness								
Number		0.023***		0.027***		0.025***		0.025***
Beijing		0.091		0.101*		0.144**		0.075
Shanghai		-0.305***		-0.195**		-0.313***		-0.300***
Guangzhou		0.112		0.165		0.170		0.147
Shenzhen		0.029		0.014		0.023		0.004
Obs.	7,570	7,570	9,753	9,753	7,570	7,570	7,570	7,570

Note: ***, **, * denote significance level at 1%, 5%, and 10% level, respectively. Column (1) replicates the results of benchmark model from Table 3.4; Column (2) shows the results of robustness check by adding the ‘number of bank relationships’ and ‘city dummies’ (Beijing, Shanghai, Guangzhou and Shenzhen); Columns (3) to (8) present the results of adding different sets of variables (firms’ characteristics, managerial characteristics, bank characteristics, crisis dummy and interaction terms) additionally. More specifically, Columns (3), (5) and (7) presents the results prior to the robustness test, while Columns (4), (6) and (8) are performed to check the robustness.

3.6 Conclusion

Using 18,233 firm-bank loan relationship matched data during 1996-2016, this paper has used survival analysis to investigate the causes of the changes to firm-bank relationship and the hazard of a firm changing its bank loan provider which we define as a 'switch'. A switch is defined as a firm borrows from a bank that it did not have a loan relationship in the prior 12 months. The estimated results provide evidence that the main drivers of firms' switching behaviour are a mixture of their credit needs, the attributes of firms and bank ownership-type, as well as the macro-economic environmental factor.

Controlling for time-varying and time-invariant covariates related to firm's characteristics, management characteristics, bank characteristics and the external factor, this chapter finds small and young firms, and less leveraged firms are more likely to terminate an incumbent bank relationships and switch to other banks, which opposite to the finding of Ongena and Smith (2001). Controlling for industry, firms operating in the real estate sector have a relatively higher hazard of switch banks, compared to other sectors. In addition, this chapter finds that the characteristic of executives have significant positive effects on the hazard of firms switching. For example, the hazard of firms switch will be higher if firm's CEO changes during a relationship time, also their tenure will increase the likelihood of switching banks. In particular, the impact of changing CEO on the hazard of switching is greater for non-SOEs and large enterprises, compared to SOEs or SMEs.

Moreover, borrowing from City Commercial Banks (CCBs) increases firm's hazard of switching, while having loan relationship with the five large-scale state-owned commercial banks (SOBs or Bigg5) make firms more likely to maintain longer and stable bank relationship thereby less likely to switch. Besides, all these firms are found to be less likely to switch lender during the financial crisis period between 2008-2009, because the negative effect and uncertainty caused them not easy to change lender, particular for SMEs. SOBs and SOEs have super stable firm-bank relationships, as for the rest; small, young and non-SOEs, firms with lower leverage, and multiple bank relationships, and operating in the real estate sector are more likely to switch. Firms that borrow from non-SOBs are also more likely to switch. Significantly, a long CEO tenure and a CEO switch during the lending relationship increases the likelihood of a switch.

4 Understanding The Borrowing and Lending Behaviour Using the Dirichlet Benchmarks

4.1 Introduction

The failure of the US investment banking giant Lehman Brothers September 2008 brought about an episode of the financial crisis that led to the hardest economic recession since the 1930s Great Depression. To stabilize financial systems and to stimulate economic recovery the governments had to step in with a variety of acute measures. Regulatory action during the crisis emphasized the active state involvement in the financial sector can have positive influence, even though it is also recognized that there may be negative consequences of government ownership in the longer-term. Therefore, finding a balanced role for the state in finance has become a crucial issue in the post-crisis era, which has raised academic and policy debate. The state-ownership plays a major role in China, alongside non-state domestic and foreign banks, which provide a good context to study. Against this background, this chapter aims to contribute to the debate by investigating how ownership features affect bank share and borrowers' borrowing choice.

In September 2008, after the outbreak of the global financial crisis, China's economic growth rate drop rapidly, exports experienced negative growth, a large number of migrant workers returned to their hometowns, and the economy faced a risk of a hard landing. In response to this crisis, the Chinese government introduced ten measures to further expand domestic demand and promote steady and rapid economic growth in November 2008, which is also known as "A four trillion stimulus package plan". Initially, the implementation of these ten measures will require an investment of 4 trillion RMB by the end of 2010. The Chinese government has continuously improved and enriched the policies and measures to respond to the global financial crisis over time, and gradually formed a package plan against the global financial crisis. One of these ten measures is to increase financial support for economic growth, for example, to remove restrictions on commercial banks' credit scale, expand the scale of credit, increase the support for key projects, and small and medium-sized enterprises.

Specifically, for the purpose of increasing the money supply, maintain the adequate liquidity of the banking system, the Chinese government quickly responded by adopting a series of response measures including multiple reductions in deposit and lending benchmark interest rates and deposit reserves (from September 2008, the central bank lowered the deposit and loan benchmark interest rates five times, and lowered reserve requirements four times), reduced the refinancing rate and rediscount rate of financial institutions twice, as well as the promotion of the renminbi (RMB) credit, increase the amount of loans. The measures are conducive to improving the enthusiasm of banks for issuing loans, particularly state or government projects and state-owned enterprises will thus be more likely to obtain capital, and then invest the funds in projects that will help stimulate economic activities. Meanwhile, the adjustment of monetary policy eased the SMEs' financing problem.

Changes in lending and borrowing relationship between firms and banks, and firms' switch behaviour are important for analyzing firms' borrowing behaviour and patterns. Base on the evidence form the survival analysis in the previous chapter, there are nearly half (48.16%) of the listed firms switch their credit provider during their existing loan relationship or after terminating the relationship with their incumbent banks. Monitoring and analysis of firms' borrowing behaviour are crucial for investigating firms' borrowing patterns such as borrowing frequency, size of borrowing, choice preference, loyal borrower etc. and enable banks to identify highly switch firms thereby target them.

Marketing theories used to interpret buying behaviour have been successfully applied to other consumer behaviours. Various types of marketers have developed multiple forms of evidence that describe the role of marketing theory can have in assisting to understand consumer buying behaviour and social change. Examples involve retail store choice, brand switch, brand loyalty, and physical activity behaviour (Graham et al., 2012; Huang et al., 2007; Sharp et al., 2002; Mayer-Waarden and Benavent, 2006; Wilson et al., 2017). However, these marketing literature focused on specific types of goods market, category and products, few have applied to other markets such as the loan market.

A commonly used model in commercial marketing known as the Negative Binomial Distribution – Dirichlet model, describes the regularities of consumer behaviour and

predict brand choice through analysing a series of measurements of purchase behaviour. The NBD-Dirichlet (also called “Dirichlet”) approach has mainly been applied to demonstrate and identify patterns of consumer purchase behaviour in previous literature (Ehrenberg, 1972; Graham et al., 2012; McCabe et al., 2013; Sharp, 2010). The fit of the NBD-Dirichlet to consumer purchase data provides significant implications for understanding consumer behaviour and appropriate marketing strategies. Due to the consistent fit of the model across different brands, countries and time period, the NBD-Dirichlet model is also known as an empirical generalisation, which has also been extended to issues not relevant to purchasing, such as engagement in leisure-time activity (Hand and Dall’Omo Riley, 2016; Scriven et al., 2015) and health-related behaviours (Gruneklee et al., 2016; Wilson et al., 2017). However, to the best of my knowledge, there is no research that has applied the Dirichlet analysis to borrowing and lending behaviour or firm’s switching lender behaviour.

To fill this gap, this chapter tends to extend the scope of the Dirichlet benchmark to a new context of borrowing and lending behaviour between firms and banks, particularly firms’ switch behaviours in China. The purpose of this chapter is to widen the scope of the Dirichlet approach through its application to borrowing and lending activity, describe and analyse Chinese listed firms’ borrowing frequency and provide evidence to possibly help banks to recognize potential firms switch then target them in order to avoid customer loss. Fitting the NBD-Dirichlet model to loan data of firm-bank relationship provides a novel approach to investigate borrowing and lending behaviour. In addition, applying the NBD to loan activity data will describe (1) whether the NBD model is efficient to describe and forecast firms’ borrowing patterns in loan activity behaviours on the basis of previous behaviour and (2) whether the Dirichlet pattern is evident for firms’ borrowing behaviours.

This chapter proceeds as follows. Section 2 emphasizes the role of state ownership in the banking and corporate sectors in China. Section 3 presents a brief overview of the Dirichlet benchmark, discusses the underlying principles of this model, reviews this methodology through its application from various marketing literature and describes the main regularities of consumer buying behaviour. Section 4 describes how the Dirichlet approach and its core assumptions can be replicated and extended to a novel context of borrowing and lending behaviour, the dataset and standard metrics used in the analysis along with an overview of

the fitting procedure will be shown in this section. Section 5 discusses patterns observed from the loan data of listed companies and presents the estimation results of covariates effects. Section 6 discusses the implications for lending banks, for lending strategy and for theory development. Section 7 concludes.

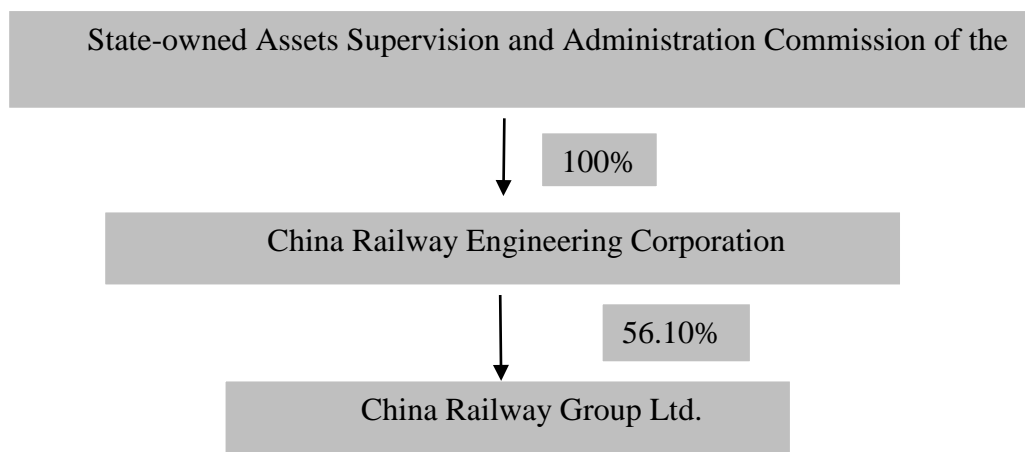
4.2 The Role of State Ownership

The influence of ownership impacts on miscellaneous dimensions of bank behaviour has been a key concern for both researchers and policymakers. A plenty of studies have examined various issues including the link between bank ownership and performance (Bonin et al., 2005; Jiang et al., 2013); economic growth (La Porta et al., 2002); lending behaviour (Jia, 2009); and loan rates (Sapienza, 2004).

The reform of economic and banking sector started in 1978 which aimed at stimulating development by transforming from a planned economy to a market economy. In particular, the reform in the second stage focus on government retreated from direct enterprise control by combining a socialist market with a modern corporate system. Making the transition from a planned economy to a market economy, the primary task for Chinese enterprise reform is to split SOEs from the government. To promote this separation, many large and medium-sized SOEs were transformed into publicly listed firms through two Stock Exchanges. Nevertheless, there were more than 70% of China's listed companies remained ultimately owned by the State and controlled by the controlled by central or local governments through the shareholding chain in 2004. Rather than being involved in day-to-day affairs, the State now serves as the owner. *State-owned Assets Supervision and Administration Commission of the State Council (SASAC)* at the central and local levels were established to supervise firm operation and represent the State's interest. These SASACs control directly or indirectly the shares of listed companies through SOEs. Figures 4.1 and 4.2 illustrate two typical examples of the ultimate control structure for listed firms from sample data.

Figure 4.1: Ultimate control structure of China Railway Group Ltd.

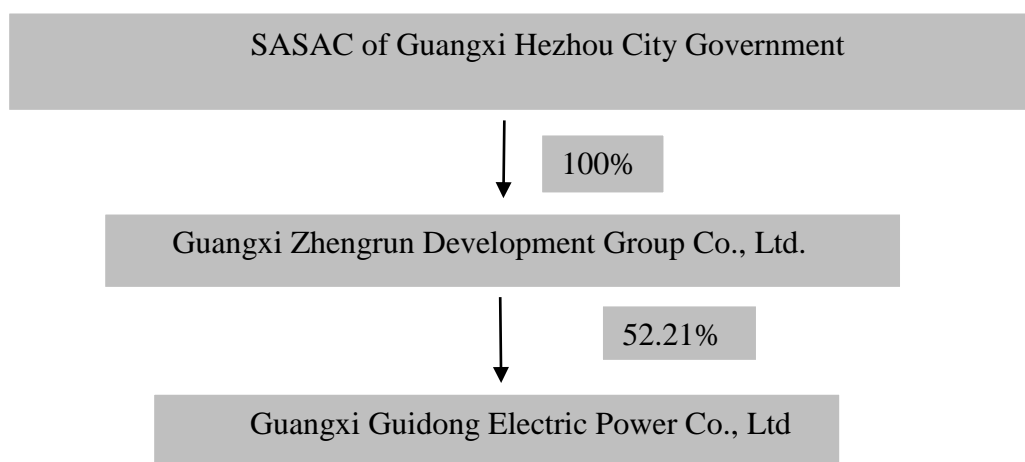
China Railway Group Ltd. (601390) is a state-owned listed company that is ultimately controlled by the central SASAC, which reports to the State Council. This SASAC controls the listed company through an SOE – China Railway Engineering Corporation.



Source: China Railway Group Limited Annual Report (2012)

Figure 4.2: Ultimate control structure of Guangxi Guidong Electric Power Co., Ltd.

Guangxi Guidong Electric Power Co., Ltd. (600310) is a state-owned listed company that is ultimately controlled by the local SASAC of Guangxi Hezhou City Government. This local State Asset Management Bureaus controls the listed company through an SOE – Guangxi Zhengrun Development Group Co., Ltd



Source: Guangxi Guidong Electric Power Co., Ltd Annual Report (2012)

Since the State is the ultimate ownership of most SOEs is prevailing in China, the relationship between ownership structure and firm value becomes even more complicated. The interest of the State may conflict with firm profitability as it also plays the role of regulator. For example, Fan et al. (2012) investigate that a local government that is

burdened by poor fiscal policy conditions or running in a region with a high level of unemployment may require local government-owned enterprise to subsidize public expenditure or improved employment, but neither action of which is a profit-maximization objective. Apart from this, to some extent, it is politicians rather than professional managers who represent the government and who ultimate control firms. Such politicians are not chosen and promoted for their management experience or specific industry knowledge, but rather because of their commitment to the government (Wang and Xiao, 2009). Hence, splitting business operations from government control could reduce political costs because decentralization provides more autonomy to firms' decision-making.

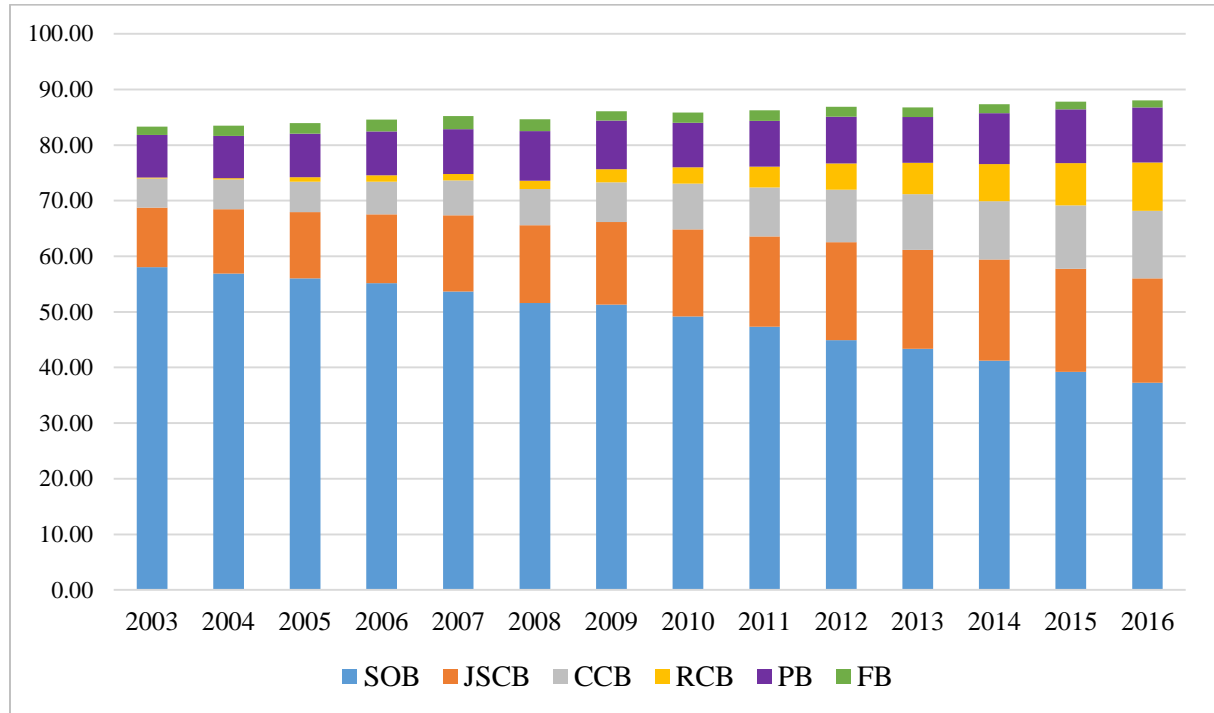
The banking system in China is the major and the most important external financing source for enterprises because non-bank financings are comparatively rare due to the immature capital market. The banking system is dominated by the government and served as a policy tool for addressing national and social priorities. In particular, existing scholars argue that large and state-owned enterprises have priority to access to bank loan as credit access may be determined by political considerations and connections rather than on a commercial basis. Monetary policy and bank loan supply are frequently implemented to stimulate economic growth in emerging economies. Following an expansionary monetary policy during the financial crisis period, a substantial increase in bank loan supply between 2009 and 2010.

The intuition behind the view of supply-side effect can be summarized from previous literature as follows. First, due to the asymmetric information problem, some firms are constrained to the public debt market and thus have to rely on bank lending. This impaired access to capital and bank-dependent firms are usually small or unrated firms (Kahle and Stulz, 2013), which also considered to be unable to substitute bank lending to other external financing sources. In contrast, large firms and firms with higher credit ratings are not sensitive to bank loan supply because they can access external funds much more easily if bank loan supply is not available. However, the bank-dependent firms in China also include large firms and state-owned firms, because state-owned banks have preferential treatment on state-owned enterprises.

The market share and profit level of the major six types of bank in China have been shown in Figure 4.3 and 4.4 respectively. The large state-owned commercial banks (SOB or Big5)

group takes the dominant role with the largest market share among six main types of banks in China's banking system. However, with the rapid development of other types of banks and market competition, the share of the SOBs declines from 58.03% in 2003 to 37.29% in 2016. As the second and third largest group banks, the joint-stock commercial banks (JSCB) and city commercial banks (CCB) accounts for 18.72% and 12.16% in 2016, respectively, with average annual market share growth rate of 4.44% and 6.67%, respectively. In particular, the share of rural commercial banks (RCB) grows dramatically since 2003, with an average annual growth rate of 50.42% and accounts for 8.73% share of the market. On the other hand, the share of policy banks (PB) drops from third to fourth largest group of banks in 2016, as well as the smallest foreign banks (FB) group, remained as the least competitive bank group in China. Since policy banks mainly serve the government-oriented financial projects, their market share is quite stable over the last fifteen years. Foreign banks experienced challenges facing the new market and a decline in market share under the rapid growth and competition of Chinese local peer banks in the last two decades. Following the issuance of the Regulation of the People's Republic of China on the Administration of Foreign-funded banks in 2007, foreign banks are allowed to submit an application to restructure their branches into incorporative bank registered in China and has equal treatment as their Chinese peers. Although the asset scale of foreign banks undergoing rapid expansion, capital share of these banks decreased due to the global financial crisis and the fast development of local banks.

Figure 4.3: Markets shares of major groups of banks



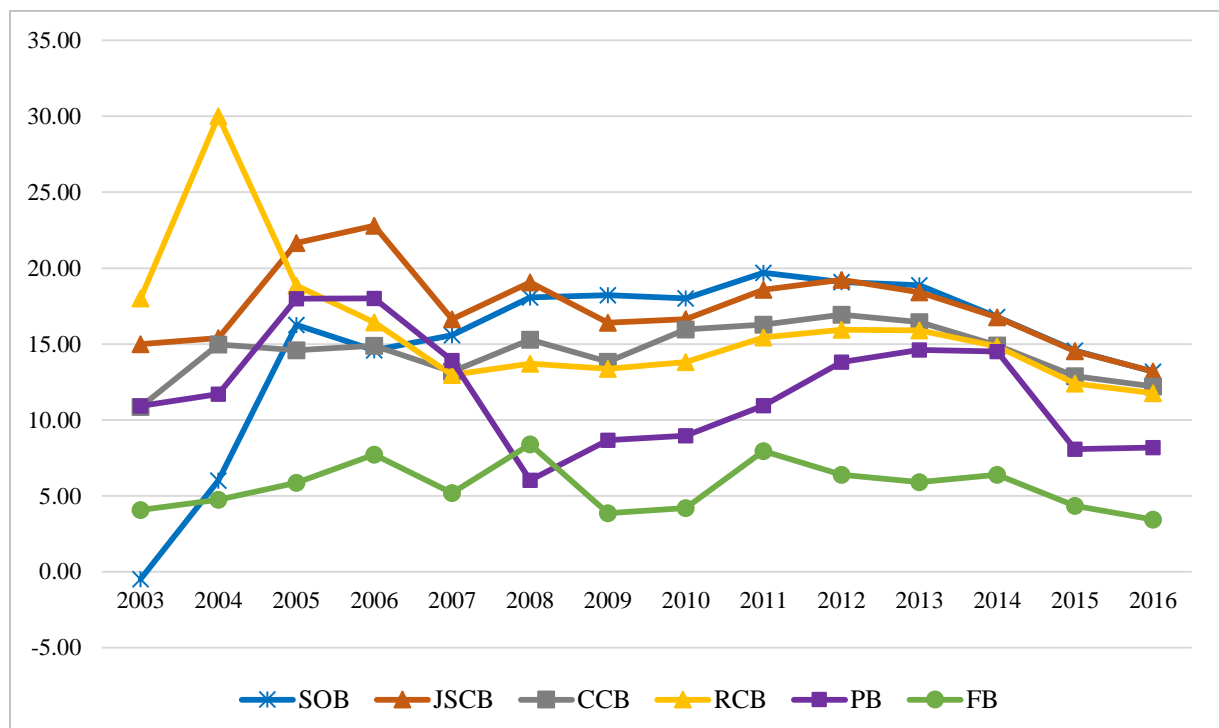
Note: *SOB* indicates five largest State-owned commercial banks (Big5); *JSCB* indicates Joint-stock commercial banks; *CCB* indicates City commercial banks; *RCB* indicates Rural commercial banks; *PB* indicates Policy banks; *FB* indicates foreign banks.

Source: China Banking Regulatory Commission Annual Report (2007, 2017). Data in details attached in Appendix C – Table C1.

As regards the profitability (measured by return on equity) of these six types of banks shown, joint-stock commercial banks and large state-owned commercial banks are the most profitable banks in China, with very similar return on equity ratios of 13.21% and 13.17% in 2016, respectively. Although the large state-owned commercial banks were considered as less profitable SOEs due to their poor performance and low efficiency before the reform decade, the banking reform in 2000 made them become more profitably and efficiently. For example, the government has divested approximately 1.98 trillion RMB of large commercial banks' non-performing loans, help them to restructure their ownership structure and brought in strategic foreign investors. In addition, all of the five large SOBs have listed themselves on stock exchange, which forced them to operate on a more commercialized basis. Moreover, city and rural commercial banks have close profit trend with ROEs of 12.21% and 11.77%, respectively, which shows that local or small banks are still able to compete with large banks. However, foreign banks group is the least profitable

bank group in China, with a profit level of around 5%. Overall, these figures presumably describe that although the five large SOBs are still dominated the banking system with largest market shares and high profitability, other bank groups are continually developing and expanding, particularly the local and small banks. These banks become more and more competitive based on their local networks (i.e. close relationship with local enterprises), provision of good customer service and efficient operation.

Figure 4.4: Profit level (ROE) of major groups of banks



Note: *SOB* indicates five largest State-owned commercial banks (Big5); *JSCB* indicates Joint-stock commercial banks; *CCB* indicates City commercial banks; *RCB* indicates Rural commercial banks; *PB* indicates Policy banks; *FB* indicates foreign banks.

Source: Calculate from the data in *China Banking Regulatory Commission Annual Report (2007, 2017)*. Data in details attached in Appendix C – Table C2.

4.3 Overview of the Dirichlet

This section reviews a very famous Dirichlet approach that commonly used by marketer and academic marketing researcher, summarises the general patterns of consumer buying behaviours based on last few decades' empirical evidence, then describes basic assumptions of this model and the way it applies.

4.3.1 The Use of the Model

The patterns of consumer behaviour can be described by a single statistical model – the NBD – Dirichlet (Dirichlet for short) model. Many marketers and academics literature have employed data on repeat purchase in many countries from consumer and business panels, developed a range of commonly used, time-based, repeat purchase statistics, which includes market share, penetration, average purchase frequency, share of category requirement (total category purchases), sole loyal (100% loyal) buyers, repeat purchasing rate etc. to compare both brand performance and characteristics of product categories. The Dirichlet model also emphasises the importance of non- and light buyers (consumers who have not purchased the brand, or have purchased it infrequently in the given time period), relative to heavy buyers (consumers who purchase the brand many times in the time period), while the Dirichlet model shows that actually most consumers are non- or light buyers with only a few heavy buyers (Romaniuk, 2011).

Beyond that, Dirichlet norms have been used as benchmarks in exploring many other marketing issues, such as cannibalization (Lomax et al., 1996), price sensitivities (Ehrenberg et al., 1997b; Scriven and Ehrenberg, 1995), consumer loyalty programs (Sharp and Sharp, 1997) and subscription markets (Sharp et al., 2002). In addition, these can also be used for diagnostic purposes, to investigate whether a brand is operating the way it should be, or was budgeted to, and to assess the effect of marketing interventions.

In addition, the Dirichlet approach provides norms for stationary markets and help interpreting change in the market. Without having to match the results against an empirical “control sample”, theoretical norms for the stationary market also offer a baseline for interpreting change (i.e. non-stationary situations). Examples in the early papers documented that questions like whether an increase in sales came from attracting more buyers or from existing buyers buying more.

Moreover, the Dirichlet model can also help with decision making and understanding the nature of markets. The generalized empirical knowledge summarized by the Dirichlet model also provides a better understanding of the nature of consumer goods markets. Examples are including even though the number of customers which a brand has differs dramatically, it is still predictable with the length of time-period analyse; brand loyalty exists but is low and not exclusive; aspects of loyalty such as repeat-buying and multi-

brand buying are directly related; competitive marketing inputs (pricing, advertising, etc) only show up in the brand's market shares and there is no significant segmentation in most branded goods markets. In a word, the Dirichlet methodology – the empirical patterns, the mathematical model, and the fundamental theory also has wider implications for the understanding of consumers, brands, differentiation and positioning, advertising, sales promotion, etc.

4.3.2 Background

Generally, the patterns of consumer behaviour can be unsurprisingly described by a single statistical model – the Negative Beta Distribution-Dirichlet model, which is a simple model that comprises just a few well-based assumptions. Different from the NBD model that is used on a single product or brand, the NBD-Dirichlet (Dirichlet hereafter) is a more comprehensive stochastic preference model and is used to predict brand shares and purchase frequencies, which not only captures purchase incidence as described by the NBD, but also brand choice (Ehrenberg et al., 2004). Basically, the Dirichlet describes stochastically when a purchase of the product-class is made and which brand is chosen. These regularities of choice are well described by a single model of choice behaviour using the Dirichlet Distribution. The theory and application were firstly described in Goodhardt et al. (1984)'s paper read to the Royal Statistical Society. The crucial feature of the Dirichlet model is that it can describe the various observed brand performance patterns, and in that sense, it also helps interpret and forecast them. Researchers and marketers have used the results from the Dirichlet model as benchmarks or norms for consumer repeat buying measures. Hence, the role of Dirichlet has gained increasing space in early and recent discussions of consumer behaviour models as a convenient extension of the univariate beta-distribution (Goodhardt et al., 1984).

A good fit of the model indicates that regularities of purchasing behaviour are consistent over time and future regularity can be predicted based on past regularities of behaviour. The consistent fit of the Dirichlet model across plenty marketing contexts involving buying of goods and services (Ehrenberg et al., 2004; Graham et al., 2012; Huang et al., 2007), use of gambling service (Lam and Mizeurski, 2009), phone subscription (Lee, 2009), attendance at sporting and cultural events (Trinh and Lam, 2016), and emphasizes the role of habits and repeated routines in physical activities behaviour (Wilson et al., 2017).

4.3.3 The Application of the Dirichlet Model

The Dirichlet is a theoretical statistical model that has been widely used and replicated for modelling purchase incidence and consumer choice, which is a simple model that comprises just a few well-based assumptions. It simply assumes that each customer has a certain propensity – a probability in the model – to buy a given brand. This probability is postulated to be steady for the time being but varying across heterogeneous consumers. The model is defined for steady state and non-partitioned markets where market shares are stationary and there is no clustering of particular brands. The model proposes only to demonstrate what markets are like when they are approximate steady and non-partitioned. Though where the market is not quite steady, or where there is some clustering, the Dirichlet mostly still holds and it gives useful benchmarks.

4.3.3.1 Basic assumptions

Dirichlet model is a zero-order static stochastic model which contains four probability distributions that can be used to specify individual purchasing structures. One concerns consumers and the other concerns brands. First, the zero-order process reflected by NBD-Dirichlet assumes that brand purchase decisions are *as if random*, that means each decision is assumed to be independent of the last purchase decision (Goodhardt et al., 1984). The brand choice at each purchase occasion can be determined as a probability based on past behaviour. Secondly, the model assumes a stationary market, that is, stable over time. This stationarity assumption enables benchmarking of population-level consumer behaviour and assessment of marketing activity and predictions about future patterns of behaviour (Ehrenberg et al., 2004).

Specifically, consumers are considered as highly experienced, so they are hardly affected by a further purchase or seeing yet another advert. Therefore, consumers they can behave as if they have, for the time being, stable habitual personal purchase propensities, that implies they have stochastic probabilities for when they buy and what brands they choose on different occasions. One important feature pointed out by this model is that a consumer's probability of buying a specific brand would not be influenced by what other brands the consumer is also purchasing. On the other hand, brands are featured in the model by their purchase probabilities and thus their market shares. Apart from that, the model does not specify whether brands are functionally differentiated or not, or differently marketed, this

is all involved in the model's steady-state purchase probabilities. These notations are captured in the theoretical model by five specific distributional assumptions: two assumptions concern consumer heterogeneity for purchase frequency and for brand choice, two concern the probabilistic incidence of particular purchase of the product and of a brand, and the last one concerns the statistical independence of these two aspects. According to Goodhardt et al. (1984), the five key theoretical assumptions can be summarized as follows:

- For purchase incidence
 - i. The individual household purchasing incidence over time follows a Poisson distribution with mean λ_i for the i th consumer;
 - ii. The purchase frequency vary between consumers follows a Gamma distribution.
- For brand choice
 - iii. The brand choice over a sequence of purchases for the i th consumer among the available brands follow a multinomial distribution;
 - iv. These heterogeneous consumers' brand choice probabilities follow a multivariate beta distribution (also called the Dirichlet distribution) across consumers;
 - v. Purchase incidence (i & ii) and brand choice (iii & iv) are independent of each other.

In addition to these assumptions, the model assumes the market is stationary or approximately stationary and without partition. A stationary market implies that consumers' buying propensities remain approximately stable from one period to another. The commonly used measures to parameterize the Dirichlet model are market share and the penetration. A non-partitioned (or non-segmented) market indicates that the proportion of particular buyer's purchases accounted for any one supplier is not relevant to how the buyer allocates their purchases among the remaining suppliers (subject to the mathematical constraint that the individual choice probabilities must sum to one) (Goodhardt, et al., 1984). Put it differently, non-partitioned market can be viewed as no special clustering of particular suppliers within the product category, which can be observed through the duplication of purchases between particular suppliers, i.e. the proportion of buyers of Supplier *A* who also purchase from Supplier *B*. If any of the assumptions are violated through the extension of the time periods observed, then the model estimation result will

no longer fit the data and a boundary condition will have to be considered. The Dirichlet is dependent upon an assumption of fixed consumer choice propensities “*for the time being*” which can be viewed as fixed probabilities within a given time-frame.

4.3.3.2 How to apply the model

To apply the model, it has to be calibrated for the chosen product category and brand. Each of the suppliers (in this case it is the loan provider) is used to generate the model parameters, and the individual supplier parameters are then combined as a weighted average based on market share. The model requires only a few numerical inputs, typically the penetrations and the average purchase frequencies of the category and of one particular brand. Brand's market shares have also necessary to be inputted when estimating any brand's performance. To simultaneously model the number of purchases for each branding a category over a fixed time, the Dirichlet combines these assumptions in two probability density functions, one is the negative binomial distribution (NBD) describing purchase incidence, and the other is Dirichlet multinomial distribution (DMD) for brand choice. The method of fitting the model follows the procedures in Goodhardt et al. (1984) and Ehrenberg (1988).

After fitting the NBD-Dirichlet model, it is used to predict a series of metrics for the time period of analysis with different lengths. These metric predictions can then be compared to the observed measures. Typical predicted measures include penetration of purchasers, average number of purchases from the supplier per buyer, share of category requirements, percentage of sole buyers, duplication of purchase, etc. (Ehrenberg et al., 2004).

Having derived the set of supplier's performance measures, it is necessary to test whether the model is valid, i.e. the predicted values estimating from the Dirichlet model are indeed a good match to the observed values.

4.3.4 Main Regularities of Consumer Buying Behaviour Based on Marketing Literature

Stochastic theories of consumer choice have been used to describe, model and explain regular patterns of buyer behaviour, which have been observed across a wide variety of consumer markets, from packaged goods to durables (see Uncles et al., 1995). In addition

to this, the Dirichlet model not only summarizes various aspects of buying behaviour and also provide interpretative norms in practice for both stationary and non-stationary markets.

The Dirichlet successfully provides theoretical measures of market performance which closely match those observed in practice in a wide range of consumer markets throughout the world. Bhattacharya (1997) examines the factors that relate to the deviations of brand's actual loyalty levels from theoretical norm in packaged good market. The Dirichlet model provides a robust, parsimonious approach to forecasting repeat purchase behaviour. Referring to the paper by Goodhard et al. (1984), the model is based on a set of five key assumptions regarding purchase incidence and brand choice. Besides, Huang et al. (2007) extend traditional NBD-Dirichlet model and incorporates explanatory variables to investigate what they choose, how often and why they choose these three issues simultaneously in Chinese goods market, hence the borrowing behaviour of firms can be fully reflected. In regard to repeat purchase and loyalty analyses, Meyer-Waarden and Benavent (2006) use the NBD-Dirichlet model to test the impacts of loyalty programmes on repeat purchase indicators, which has contributed to elaborating and outlining certain empirical regularities using the theory of repeat buying, such as penetration and average purchase frequency per brand and per category can be used to predict various aspects of loyalty behaviour.

The Dirichlet also provides a technique for expounding market structure and differentials between repertoire markets (high incidence of split loyalty, few sole buyers, less independence) and subscription markets (low incidence of split loyalty, many sole buyers and more independence). Comparing relationships in markets structured by high independence with those of low independence provides insights into the nature of interdependence and the multidimensionality of buyer-seller relationships²⁹. Although most brands have only temporary gains and losses in share from the long-term data, they may gain customers one year and lose them the next, the customers themselves have not changed in their buying propensities. Using the shampoo category as an example, Bennett and Graham (2011) find that repeat buying for brands was very stable over both long and short term which closely related to the market shares of the brands, though there are also some exceptions, mostly small. In addition, although they did not provide evidence of any permanent brand growth or decline, they find that both the short and long-term measures

²⁹ See Sharp, et al.(2002); Zerbini and Castaldo (2007).

of repeat purchasing are very similar, this may be due to the growth or decline of brand share is accounted for by gain and loss of customers, not changes in their loyalty (repeat buying rates). Overall, the underlying structure of brand purchase can be captured both by short and long-term purchasing data, both of which implies that brand loyalty and switching are mainly driven by how big the brand is, which could possibly be interpreted as choice for a particular consumer mostly between what seems to him or her to be close substitutes, otherwise there would be a choice issue.

The fundamental finding in regard to individual consumers' varied buying behaviour is that whichever way the data are aggregated, they reflect regular patterns. These patterns gradually came to identify over the years, followed by various replications across different products, years, and countries to develop their generalizability. The key brand performance metrics that underpin in the model can be broadly categorized into two groups. These are penetration, which is how many people buy the brand in the time period and loyalty, which is the weight or frequency of purchase in the same time period. The main brand metrics produced by the Dirichlet model capture how many people buy each brand, how often they do so, and which other brands they also buy (Goodhardt et al., 1984). The basic pattern observed is that all brand performance measures differ together based on brand size, which is reflected in loyalty measures such as repeat buying and brand switching that are depending on market share rather than specific brand or customer attribute. Various replication studies of consumer behaviour patterns in over fifty years of research have led to empirical generalisations of marketing science, these recurring patterns are documented in routine panel data metrics such as brand performance and purchase frequency, and in loyalty measures such as repeat purchase and share of category requirement. In fact, most brand performance measures are just about normal most of the time, but it helps to better understand the main recurring patterns (Graham, et al., 2012). For example,

- *Brand share is constrained by the Law of Double Jeopardy.* This means that small brands have fewer buyers and these buyers buy the brand slightly less often relative to bigger brands. Although the market shares and penetrations of competing brands differ significantly across categories they are closely correlated. On the other side, purchase frequency tends to be similar across competing brands, even though slightly lower for smaller brands (Ehrenberge et al., 1990). This implies that the

brand size determined by the penetration (number of customers that a brand has), far more than by how loyal those customers are.

- *Your buyers are the buyers of other brands who occasionally buy you.* The pattern of polygamous loyalty has also been observed in various categories in the data around the world. A majority of customers are experienced category buyers and purchase habitually from a portfolio of brands with which they are familiar over time. Rival brands are viewed as highly substitutable, thus loyalty becomes polygamous and in aggregate, any brands' customers buy rival brands more often in a period. The average portfolio size reflects both the competitiveness of the category and the loyalty of the purchasing. The duplication of brand purchase is consistent with its penetration. Generally, brand switching decreases consistent with brand penetrations, larger brands attract more potential switching buyers. This pattern is captured in the Duplication of Purchase Law and expressed as:

$$b_{Y|X} = Db_Y$$

where $b_{Y|X}$ is the proportion of brand X buyers who also bought Y in the observed period, b_Y is the penetration of Y in the same period and D is a duplication coefficient which is approximately constant across all the brands in the category. This law describes that brands are undifferentiated and substitutable and the incidence of purchase is relevant only to the number of buyers rather than any particular positioning derived from a close segmentation and targeting strategy (Bennett and Graham, 2011).

- *Hard-core loyalty exists, but mostly among light buyers.* Generally, loyalty is usually split between brands and thereby not specific to any particular brand, instead, normally brands of similar size in any category attract similar loyalty. Most consumers choose from a portfolio of brands over a range of purchases, favouring one over other but buying each regularly if infrequently. Sometimes they may switch from a particular brand, add a new one, or downgrade a former favourite, whereas relatively rare customers are sole-brand buyers (100% loyal) and those that tend to be the lightest category buyers. Existing marketing literature provides evidence for the existence of hard-core loyalty, mainly among light buyers. In any

period the number of sole loyal consumers is comparatively low but they buy infrequently. They are likely to be loyal simply due to they don't buy much and thereby have few opportunities to switch. However, the proportion of hard-core loyal buying for each brand may increase with the longer observation period, but this would be expected as the result of increasing incidence of very light buyers, rather than exceptional loyalty (Ehrenberg, 1972).

- *Duplication is consistent with brand penetration.* Brands share customers predictably consistent with penetration. More of any brand's consumers buy larger competitors and fewer buy the smaller competitors in any period. Besides, due to the fact that households purchase habitually, these regularities hold over time and are difficult to change permanently (Graham, et al., 2012)

4.4. Methodology

Given the model's past success of explaining consumer behaviour and referring to the Dirichlet framework developed in Goodhart et al. (1984), this chapter tends to replicate and extend this approach to the borrowing behaviour of listed companies in China's loan market through incorporating a set of covariates. In particular, questions like "Is the reason for choosing a particular bank consistent with the reason for firms are loyal to banks? What else banks they also borrow from? What factors would affect firm's bank-choice and their repeat borrowing?" can be addressed by the estimation through the Dirichlet approach. If borrowing and lending activity between firms and banks do fit the NBD-Dirichlet patterns, then it would suggest a more predictable behaviour of repeat borrowing and switch to other lenders. Uses of this model can benchmark borrowing behaviour and evaluate the successes of loan approval, and loan management.

4.4.1 Probability density functions

As mentioned above, the Dirichlet model combines two probability density functions. First, the frequency of borrowing for the overall loan product category K is assumed to follow a Negative binomial distribution (NBD). Second, borrowing from individual banks R_1, R_2, \dots, R_h is assumed to follow a Dirichlet multinomial distribution (DMD) conditional

on the number of borrowing for loan category, K , having a specific value k . The NBD and DMD distributions are assumed to be otherwise independent.

This chapter firstly apply the NBD model to firms' borrowing frequencies over a time period, that means borrowing frequency k of a given listed firm in successive time periods follow a Poisson-distribution with the parameter λ :

$$f(k) = \frac{e^{-(\lambda)} \lambda^k}{k!} \quad \text{with mean } E[k] = \lambda \quad (1)$$

The mean borrowing frequency λ of different firms vary in the long run and their distribution is a Gamma-distribution with density function:

$$f(\lambda; \gamma, \beta) = \lambda^{\gamma-1} \frac{e^{(-\frac{\lambda}{\beta})}}{\beta^\gamma \Gamma(\gamma)} \quad (2)$$

where γ and β are the shape and scale parameters of the gamma distribution, respectively. The shape parameter is a heterogeneity parameter which describes the variation in borrowing of the category across consumers.

Combining Equation 1 and 2 yields the probability density function for the NBD:

$$f_{\gamma, \beta}(k) = \frac{\Gamma(\gamma+k)}{\Gamma(\gamma)k!} \frac{\beta^k}{(1+\beta)^{(\gamma+k)}} \quad \text{for } k = 0, 1, 2, \dots \quad (3)$$

Next, the NBD-Dirichlet model is applied to the frequency of borrowing from multiple lenders over a time period, which means that the total borrowing of all firms follow the Negative binomial distribution (NBD) and the loan choice among different lending banks follows the Dirichlet multinomial distribution (DMD). The probability density function of the NBD is as in (3), where k is the loan borrowing frequency.

Let there be h types of lending bank, thus the DMD has h parameters, one for each bank group. These parameters are $\alpha_1, \alpha_2, \dots, \alpha_h$ where each is positive. Over the listed firms let the borrowing from each bank group be a set of random variables r_1, r_2, \dots, r_h . Then the sum of these borrowing frequencies is the overall bank loan borrowing frequency: $r_1 + r_2 + \dots + r_h = K$. The Dirichlet model assumes that the borrowing from each bank group, conditional on the bank loan category borrowing frequency, follow a Dirichlet multinomial distribution; i.e. r_1, r_2, \dots, r_h conditional on K has a DMD. The probability density function of DMD is:

$$\begin{aligned}
& f_{\alpha_1, \alpha_2, \dots, \alpha_h}(r_1, r_2, \dots, r_h | r_1 + r_2 + \dots + r_h = k) \\
&= \frac{\Gamma(\sum_{j=1}^h \alpha_j) k!}{\Gamma(\sum_{j=1}^h \alpha_j + k)} \prod_{j=1}^h \frac{\Gamma(\alpha_j + r_j)}{r_j! \Gamma(\alpha_j)}
\end{aligned} \tag{4}$$

where h is the number of lending bank groups, which are six types of lending bank in this study, r_j is listed firm's borrowing frequency for j th group of lending bank, α_j is the parameter of the DMD distribution, the sum of the α parameters $S = \sum \alpha$ is a heterogeneity parameter that describes the variations in the preference for lending banks across firms.

Combining these two probability density functions from Equation 3 and 4 to create a single probability density function that specifies the borrowings of all bank brands in a bank loan product category over a period of time. The Dirichlet model is a probability density function for the borrowings of all lending banks in a product category over a period of time. Hence, the probability density function of the NBD-Dirichlet (or Dirichlet) model is:

$$\begin{aligned}
& f_{\gamma, \beta, \alpha_1, \alpha_2, \dots, \alpha_h}(r_1, r_2, \dots, r_h) \\
&= f_{\gamma, \beta}(k) f_{\alpha_1, \alpha_2, \dots, \alpha_h}(r_1, r_2, \dots, r_h | r_1 + r_2 + \dots + r_h = k) \\
&= \frac{\Gamma(\gamma + k)}{\Gamma(\gamma) k!} \frac{\beta^k}{(1 + \beta)^{(\gamma + k)}} \frac{\Gamma(\sum_{j=1}^h \alpha_j) k!}{\Gamma(\sum_{j=1}^h \alpha_j + k)} \prod_{j=1}^h \frac{\Gamma(\alpha_j + r_j)}{r_j! \Gamma(\alpha_j)}
\end{aligned} \tag{5}$$

There are $h+2$ parameters: $\gamma, \beta, \alpha_1, \alpha_2, \dots, \alpha_h$. Together with market share, the sum of α parameters overall bank brands, the S parameter determines the level of loyalty.

4.4.2 Brand Performance Measures

For each brand performance measures (BPMs), this chapter distinguishes the observed sample statistic (calculated directly from a dataset) and the underlying population parameter (which cannot be directly observed but is a component of the statistical distributions for the population). Basically, the mean of a random variable X is \bar{x} is the observed average of the sample.

The formula for calculating each BPM sample statistic from data is easily determined from the definitions. However, the precise functional form for the underlying parameter of each BPM, and most significantly the relationships between the functional forms of different

BPMs have not been examined in the borrowing and lending literature. A significant contribution of this chapter is reviewing these functional forms and their relationships with different BPMs, which is important because it makes possible the statistical analysis of the influence of borrower characteristics on the parameters of the functional forms, and thereby on the BPMs.

The precise notation needs to be used to proceed. Due to a large number of different lending banks in my sample, I classify the banks into six groups and examine the performance of these groups of banks rather than examining the performance of a single bank. There are h brands in the bank loan category (there are six groups of banks, they are large state-owned banks, joint-stock commercial banks, city commercial banks, policy banks, foreign bank, and other banks). This chapter analyses a fixed period that from 1996 to 2016. Over the sample listed companies, let there be h random variables, R_1, R_2, \dots, R_h , are the proportion of borrowings, by each listed company, from each bank group. Over these sample listed companies, the total borrowings of the bank loan category by each firm is another random variable, the sum of borrowings over all bank groups ($K = \sum_{j=1}^h R_j$). All these random variables, R and K , are counts and therefore are non-negative integers. The precise definition of BPMs have been described by the following, which includes brand size (market share, penetration), borrow frequency and loyalty-related measures (SCR, 100% loyal and repeat borrow):

- *Borrowers* (here are sample listed firms) – This is the unit for which the loan borrowing data is recorded. Due to the availability of loan data from CSMAR database, this study considers about 75% China listed companies who are potential borrowers, regardless of whether or not they borrow.
- *Bank loan category borrower and bank brand borrower* – A bank loan category borrower is a firm who makes at least one borrowing for the loan product category over the observation period. A borrower of a particular bank brand (say bank group j) is a firm who makes at least one borrowing from that bank group. By definition, a borrower of a bank group j is a borrower of the bank loan category, while a borrower of a bank group j may or may not be a borrower of another bank group.
- *Market share for bank group j* – Total borrowings of bank group j as a proportion of the total borrowings of the bank loan category.

- *Penetration for bank group j* – The proportion of firms who are borrowers of bank group j . In particular, it is the proportion of borrowing from bank group j at least once in a given period, it increases with the analysis period T .
- *Borrowing frequency for the bank loan category* – the number of borrowings by the listed companies over a specified time period. Each company has a separate borrowing frequency for each bank group. The borrower's loan category borrowing frequency is the sum of firm's number of loan borrowing from six groups of bank. For listed firm i , borrowing time from each individual bank group are: $r_{i,1}, r_{i,2}, \dots, r_{i,h}$, and loan category borrowing time is k_i . Hence, the number of bank group borrowings are: R_1, R_2, \dots, R_h and overall bank loan category is K , where $K = \sum_{j=1}^h R_j$.
- *Average borrowing ratio for bank group j* – The borrowings of bank group j averaged over all borrowers.
- *Borrowing frequency for bank group j* – The average borrow frequency of bank group j among borrowers of that group, it also increases with T , but generally more slowly than the penetration.
- *Sole borrower (100% loyal) for bank group j* – The proportion of borrowers of bank group j who borrow only from that bank group (including firms who only borrow once).
- *Share of category requirements (SCR) for bank group j* – SCR is defined as:

$$\frac{\text{Total borrowings of bank group } j}{\text{Total borrowings of the bank loan category by borrowers of all bank groups}}$$

- *Repeat rate for bank group j* – The proportion of borrowers of bank group j at the last borrow occasion who re-borrow from the same group of banks at the next borrow occasion.

The parameters for the brand performance measures (i.e. the theoretical estimates of the BPMs as functions of $\gamma, \beta, \alpha_1, \alpha_2, \dots, \alpha_h$) can be derived on the basis of the assumptions of the NBD and DMD in the Dirichlet model. The observed and theoretical values will be presented in the following section, and Mean Absolute Deviations (MAD) were used to determine the fit of the model. The observed BPMs are simply calculated using the BPMs' definitions, while the theoretical BPMs are calculated using the Dirichlet predicted formulas and a set of values for Dirichlet model parameters. The formulas for the Dirichlet

theoretical BPMs are shown in Table 4.1. In general, according to the Dirichlet approach modelling by Goodhardt et al. (1984), deviations are considered as significant if they are above +/- 3% for penetration, +/- 0.3 for purchase frequency, and +/- 3% for share of category requirement. A low value of S (<0.2) means low proportion of switching and high levels of sole loyalty; higher values of S means more split loyalty purchase behaviour (Li et al., 2009).

Table 4.1: Formulas of the Dirichlet Theoretical BPMs

Brand Performance Measures	Formula
Market share for bank group j	$\frac{\alpha_j}{S}$
Penetration for bank group j	$\sum_{k=1}^{\infty} f_{\gamma,\beta}(k) \left(1 - \frac{\Gamma(S)\Gamma(S - \alpha_j + k)}{\Gamma(S + k)\Gamma(S - \alpha_j)} \right)$
Average borrowing ratio for bank group j	$\frac{\alpha_j \gamma \beta}{S}$
Borrowing frequency for bank group j	$\frac{\text{Average borrowing ratio for bank group } j}{\text{Penetration for bank group } j}$
Sole borrower (100% loyal) for bank group j	$\frac{\sum_{k=1}^{\infty} f_{\gamma,\beta}(k) \left(\frac{\Gamma(S)\Gamma(\alpha_j + k)}{\Gamma(S + k)\Gamma(\alpha_j)} \right)}{\text{Penetration for bank group } j}$
Share of category requirements (SCR) for bank group j	$\frac{\text{Average borrow frequency for bank group } j}{\sum_{k=1}^{\infty} f_{\gamma,\beta}(k) k \left(1 - \frac{\Gamma(S)\Gamma(S - \alpha_j + k)}{\Gamma(S + k)\Gamma(S - \alpha_j)} \right)}$
Repeat rate for bank group j	$\frac{\alpha_j + 1}{S + 1}$

4.4.3 Likelihood Functions and Model Estimation

Let there be a sample of n firms, let $x_{1,i}, x_{2,i}, \dots, x_{h,i}$ be the borrowing of firm i and let k_i be the sum of these borrowings over h bank groups. Then Equation 3 and 4 can lead to the likelihood functions in the following Equation 6 and 7.

Log-likelihood function for the NBD:

$$LL_{\gamma,\beta} = \sum_{i=1}^n \{ \ln[\Gamma(\gamma + k_i)] - \ln[\Gamma(k_i + 1)] - \ln[\Gamma(\gamma)] + k_i \ln(\beta) - (\gamma + k_i) \ln(1 + \beta) \} \quad (6)$$

Log-likelihood function for the DMD:

$$LL_{\alpha_1, \alpha_2, \dots, \alpha_h} = \sum_{i=1}^n \left\{ \ln \left[\Gamma \left(\sum_j \alpha_j \right) \right] + \ln[\Gamma(k_i + 1)] - \ln \left[\Gamma \left(\sum_j \alpha_j + k_i \right) \right] + \sum_{j=1}^h \ln[\Gamma(\alpha_j + x_{i,j})] - \ln[\Gamma(x_{i,j} + 1)] - \ln[\Gamma(\alpha_j)] \right\} \quad (7)$$

As in equation (5), the joint probability density function is the product of the two separate density functions for the NBD and DMD. Likewise, the joint log-likelihood function is the sum of two separate log-likelihoods, i.e. $LL_{\gamma,\beta} + LL_{\alpha_1, \alpha_2, \dots, \alpha_h}$. For a given data set the parameter estimates are those values that maximize the joint log-likelihoods. However, each log-likelihood can be maximized separately because there are no parameters in common to both log-likelihood functions. Hence, the distribution parameters γ, β can be estimated from Equation 6 and α_j for $j = 1, 2, \dots, h$ from Equation 7.

In addition, this chapter extends the Dirichlet model to include covariates to estimate the correlates of a set of characteristics, such as ownership, firm attributes and whether they have a CEO change. The Dirichlet distribution is a multivariate generalization of the beta distribution and is appropriate for estimating the correlates of a set of proportions that each lie between zero and one, and sum to one. Imposing these restrictions on the joint model makes the estimates more efficient than a series of separate OLS or Logit regression. Incorporating covariates to the probability density function of Dirichlet is:

$$f(y_1, \dots, y_h) = \frac{\Gamma(\sum_{j=1}^h \alpha_j(X))}{\prod_{j=1}^h \Gamma(\alpha_j(X))} \prod_{j=1}^h y_j^{\alpha_j(X)-1} \quad (8)$$

where y_1 through y_h denote vectors of proportions, for example, the proportion of borrowings from SOBs and other groups of banks (in which case h equals six). X is a vector

of covariates, Γ is the gamma function. Taking the log and summing over observations gives the log-likelihood function:

$$LL = \sum_{i=1}^N \ln \left(\sum_{j=1}^h \alpha_j(X) \right) - \sum_{j=1}^h \Gamma(\alpha_j(X)) + \sum_{j=1}^h \alpha_j(X) \ln y_{ij} \quad (9)$$

where N is the number of observations in the dataset. Alpha in this model as a multinomial logit function of the covariates X :

$$\alpha_j(X) = \frac{\exp(\beta_j X)}{1 + \sum_{j=1}^h \exp(\beta_j X)} \varphi \quad (10)$$

where φ is an ancillary scale parameter.

The main variable of this study includes dummies for state ownership, CEO change, and firm-level characteristics). The estimated proportions are therefore modeled as a function of log firm's age, size, profit, leverage, cash flows, and a set of dummy variables indicating state ownership and CEO change.

Following an Excel workbook created by Rungie (2003), I fit the Dirichlet model to a dataset and the estimate the parameters of NBD and DMD using likelihood theory through Excel. "Solver" is an important function in Excel which will estimate the parameter values which maximize log-likelihood. Adding a "Solver" in Excel to firstly calculate log-likelihood function in Excel for a particular set of parameter values and then differ the parameters to find the maximum for the log-likelihood function. Obtaining the parameter values of $\gamma, \beta, \alpha_1, \alpha_2, \dots, \alpha_h, S$ for different sample periods, the theoretical BPMs can be calculated using these parameter values and formulas of Dirichlet BPM defined in Table 4.1. In addition, Stata program will be used when extending the Dirichlet approach through incorporating the covariates³⁰.

4.4.4 Variables and Sample

The modelling framework described above develop a substantial filed of marketing analysis. Broadly speaking, a brand might obtain sales through a large number of the

³⁰ This chapter uses the "dirifit" command in Stata, with the alternative parametrization recommended by Buis et al. (2010) in the presence of covariates.

customer choosing it occasionally or through a small concentration of customers choosing it very frequently and consistently (Sharp, 2010). This chapter can compare brand performance measures that capture contrasting option including growing penetration, average borrow frequency, or share of category requirement.

Using the bank loan data, financial data, ownership structure and executive data of listed companies from the CSMAR database, which records 2,102 listed firms' borrowing behaviour during 1996-2016 in China. In addition to a full sample that under this long analysis period, two sub-periods based on the financial crisis in the year of 2008 are considered in order to verify changes in firms' borrowing behaviour and their relationships with banks. Finally, there are 825 and 1,948 listed firms in the subsamples of pre-crisis and post-crisis, respectively. The variable description has been presented in Table 4.2. The information is typical of the revealed preference data that capture the borrowing patterns of listed firms and the performance of banks in China. For illustrative purpose this chapter categorizes the banking sector into six types of bank based on their ownership structure, which are the five large-scaled State-owned banks (SOB/Big5), Joint-Stock Commercial Bank (JSCB), City Commercial Bank (CCB), Policy Bank (PB), Foreign Bank (FB), and Other Banks (OB)³¹. Moreover, firms internally switch behaviour brings a deeper within-group analysis for the five largest SOBs (Big5). Besides, the occurrence of the financial crisis has a significant influence on the economy, this study also uses two subsamples to identify the covariates effects pre and post the financial crisis.

³¹ The remaining banks are classified into a bank group labelled "OB", which include Postal Saving Bank, Rural Commercial Banks, Rural Cooperative Bank, Rural Credit Cooperatives, asset companies, and other financial institutions.

Table 4.2: Variable Description

Variables	Description	Unit
<i>Switch</i>	Dummy variable that takes value 1 if the firm switches its loan provider, 0 otherwise.	-
<i>Age</i>	Age of the firm when the firm switches.	Month
<i>Size</i>	Natural logarithm of year-ended total asset deflated by the Chinese GDP deflator.	CNY
<i>SOE</i>	Dummy variable that takes value 1 when the firm is state-owned enterprise, 0 otherwise.	-
<i>Profit</i>	Ratio of net profit on total assets.	%
<i>Leverage</i>	Ratio of long-term debt to total assets.	%
<i>Cash flows</i>	Ratio of cash and cash equivalents to total assets.	%
<i>CEOage</i>	Age of CEO when the firm switches.	Year
<i>Gender</i>	Dummy variable that takes value 1 when the firm is run by a male CEO, 0 otherwise.	-
<i>Tenure</i>	Tenure of CEO when the firm switches.	Month
<i>Change</i>	Dummy variable takes value 1 if there is a change in CEO in a current relationship, 0 otherwise.	-
<i>Number</i>	The number of CEO change.	-
<i>SOB</i>	Dummy variable that takes value 1 if the lending bank is the five large state-owned commercial banks (also known as Big5), 0 otherwise.	-
<i>JSCB</i>	Dummy variable that takes value 1 if the lending bank is joint-stock commercial bank, 0 otherwise.	-
<i>CCB</i>	Dummy variable that takes value 1 if the lending bank is city commercial bank, 0 otherwise.	-
<i>PB</i>	Dummy variable that takes value 1 if the lending bank is policy bank, 0 otherwise.	-
<i>FB</i>	Dummy variable that takes value 1 if the lending bank is foreign bank, 0 otherwise.	-
<i>OB</i>	Dummy variable that takes value 1 if the lending bank is other banks, 0 otherwise.	-

4.5 Results

4.5.1 Descriptive Statistics

Table 4.3 compares a dozen performance measures across six groups of banks in bank loan category and show several apparent patterns. Firstly, market shares and penetrations decline greatly from State-owned banks (SOB) to Foreign banks (FB). To the contrast, the loyalty measure either remain broadly the same from bank group to group or decline far less. In general, these statistics indicate that smaller bank group not only have far fewer

borrowers than the larger bank group but also show somewhat lower average borrow frequencies (i.e. lower repeat borrowing). This tendency reflects “double jeopardy” (DJ) effect in this analysis. In addition, the borrowers (here the listed companies) are very heterogeneous. On average, two in six of bank group’s borrower borrowed it five or more times, which implies DJ effect again: smaller bank groups have even less heavy borrowers. Moreover, the average SCR of a bank group over three sample period is quite low; e.g., about 16.7%, this implies that any bank group’s borrower mostly borrows from other bank group showing these listed firms’ multibank borrowing behaviour.

As regards bank loyalty, there are only 4% of a bank group’s customers were 100% loyal for the full sample, with even fewer for small bank groups such as Policy Bank and Foreign Bank (DJ effect again), though the proportion of sole loyal firm is relatively higher in the period of pre-crisis subsample. In fact, sole loyal or 100% loyal borrower is the light borrower in bank loan category, because they do not have many chances to be disloyal. This could possibly be interpreted either by these firms credit needs always can be fulfilled by their incumbent bank or it is difficult for these firms to switch their lender at current moment due to the banking environment prior the crisis. Furthermore, the length of the analysis period could affect the bank’s penetration and the level of loyalty of their borrowers. In general, a bank’s penetration being much higher in a long period than in a short period is less than pro rata due to the occurrence of repeat-borrowing. To the contrary, loyalty-related measures are much lower in a longer period. Table 4.3 clearly shows that the proportions of sole loyal borrowers of each bank group in full sample analysis are smaller than subsamples of either pre or post-financial crisis period. For example, the sole loyal borrowers of SOB reduces from 30.1% to only 11.1%, this is because the analysis period of full sample is longer than Pre08 subsample.

Table 4.3: Brand Performance Measures

Bank group	Market Share			Penetration			Borrowing			5+			SCR			100% loyal			Repeat rate		
	(%)			(%)			Frequency			(%)			(%)			(%)			(%)		
	Pre08	Post08	Full	Pre08	Post08	Full	Pre08	Post08	Full	Pre08	Post08	Full	Pre08	Post08	Full	Pre08	Post08	Full	Pre08	Post08	Full
SOB	46.8	45.5	45.6	77.1	77.3	80.5	3.1	6.0	6.8	34.2	36.1	38.5	57.7	38.8	41.2	30.1	10.4	11.1	47.6	51.2	64.9
JSCB	16.6	22.5	21.8	52.7	69.5	71.1	1.5	5.0	5.2	8.4	30.4	31.2	27.4	32.3	31.7	10.8	6.1	5.5	29.7	53.7	55.3
CCB	8.3	9.8	9.6	23.7	47.6	47.3	0.4	2.1	2.1	0.1	12.6	12.7	8.1	13.6	13.0	2.9	4.1	1.1	8.6	32.4	32.4
PB	20.9	10.0	11.4	9.6	18	18.3	0.1	0.5	0.5	0.1	2.7	3.1	2.8	3.2	3.2	1.9	1.0	0.8	3.3	10.0	10.1
FB	0.8	2.0	1.8	4.7	16.9	16.7	0.1	0.5	0.5	0.1	2.9	2.9	1.3	3.4	3.2	0.2	0.5	0.4	1.3	9.2	8.9
OB	6.7	10.2	9.8	10.1	36.2	35.1	0.2	1.3	1.3	0.4	8.0	7.9	3.1	8.4	7.8	2.1	4.3	2.9	3.6	21.5	19.6
Average	16.7	16.7	16.7	29.7	44.3	44.8	0.9	2.6	2.8	7.2	15.2	16	16.7	16.6	16.7	8	4.4	3.6	15.7	29.7	31.9

Note: *SOB* indicates five large State-owned commercial banks (Big5); *JSCB* indicates Joint-stock commercial banks; *CCB* indicates City commercial banks; *PB* indicates Policy banks; *FB* indicates foreign banks; *OB* indicates other banks include Postal Saving Bank, Rural commercial banks, Rural cooperative bank, Rural credit cooperatives, asset management companies, and other financial institutions; *Pre08* indicates the analysis period prior financial crisis (1996-2008); *Post08* indicates analysis period post-financial crisis (2009-2016); *Full* indicates analysis period between 1996-2016; *5+* indicates firms borrow more than five times; *SCR* indicates share of category requirement.

4.5.2 Duplication Analysis

What else banks they also borrow from? Most borrowers of a bank also borrow from some others, such as two or more other lending banks. As noted early in Table 4.3, overall about 1 in 25 firms of a bank group were 100% loyal and the average share of a bank group's category requirement was about 17%. For banks, the corresponding multi-bank borrowing, which is similar to consumer's multi-brand purchasing has traditionally been modeled by the 'Duplication of Purchase Law'. The following duplication Table 4.4 shows that how many borrowers of bank group *X* also borrow from bank group *Y*. This pattern has now found to hold also for differential groups of banks, irrespective of the banks' attributes. The attribute effects seem to be captured by banks' market share and penetration, consistent with the similar flat market share-driven loyalty patterns earlier. The rows of the duplication table show that how many firms also borrow from other types of banks (outflow), and the columns show the proportion of other bank group's borrower also borrow from it (inflow).

The penetration shows that 80.5% of sample listed companies borrowing from the five SOBs (Big5) at least once over the sample period, and over 80.5% of the borrowers from any other bank group also borrow from the Big5 (SOB) in the full sample (85.5% or so). At the same extreme, 16.7% in all borrow from the group of foreign banks (FB), and again a similar proportion (21% or so) of the other bank groups' borrower also borrow from foreign banks. Similarly, the duplication level for other bank groups: JSCB, CCB, PB, FB and OB are 81.7%, 54%, 24.2%, 21% and 38.3%, respectively. In addition, the duplication patterns for two subsamples are consistent with the patterns in full sample, though the duplication level of borrowing is relatively lower in the subsample of pre-crisis, this may possibly due to firm's switch probabilities are lower, fewer sample firms and loan relationships compared to post-crisis period. Generally, firms are more likely to borrow from the Big5 (SOB) not only because of their massive assets and high penetration but also because of the lending market still significantly dominant by these banks.

Table 4.4: Duplication Analysis (Externally)

% of borrowers of...	% who also borrow from...					
	SOB	JSCB	CCB	PB	FB	OB
Panel A: Full sample						
SOB	-	72.4	46.9	19.4	16.2	33.0
JSCB	82.1	-	51.6	19.2	18.0	33.7
CCB	85.7	83.0	-	21.8	21.5	38.2
PB	87.3	76.1	53.7	-	29.5	43.4
FB	89.1	87.3	64.9	36.2	-	43.1
OB	83.3	89.9	52.9	24.4	19.7	-
Average duplication	85.5	81.7	54.0	24.2	21.0	38.3
Penetration	80.5	71.1	47.3	18.3	16.7	35.1
Panel B: Pre-Crisis						
SOB	-	45.8	20.5	7.8	4.6	7.6
JSCB	68.2	-	26.7	8.3	4.1	8.1
CCB	67.5	61.9	-	5.2	4.6	12.4
PB	64.0	46.7	10.7	-	9.3	16.0
FB	74.4	48.7	23.1	17.9	-	20.5
OB	63.2	40.8	31.6	15.8	10.5	-
Average duplication	67.4	48.8	22.5	11	6.6	12.9
Penetration	77.1	52.7	23.7	9.6	4.7	10.1
Panel C: Post-Crisis						
SOB	-	73.5	48.6	20.1	17.1	34.2
JSCB	81.2	-	51.8	19.4	18.5	34.4
CCB	83.5	84.4	-	22.9	22.5	38.2
PB	86.1	76.8	36.1	-	29.5	42.7
FB	88.3	86.7	64.8	34.8	-	42.2
OB	79.1	71.8	50.9	22.5	18.8	-
Average duplication	83.6	78.6	50.5	23.9	21.3	38.4
Penetration	77.3	69.5	47.6	18.0	16.9	36.2

Note: *SOB* indicates five largest State-owned commercial banks (Big5); *JSCB* indicates Joint-stock commercial banks; *CCB* indicates City commercial banks; *PB* indicates Policy banks; *FB* indicates foreign banks; *OB* indicates other banks include Postal Saving Bank, Rural commercial banks, Rural cooperative bank, Rural credit cooperatives, asset management companies and other financial institutions.

Apart from firm switches from one type of bank to another, it could be possible that firms would consider switching internally within a group of bank. For example, the nature and close relationship between Chinese SOEs and SOBs suggest that an SOE may switch from one SOB to another SOB through political “*guanxi*” connection route. Therefore, for illustrative purpose, another duplication analysis is performed to examine the level of duplication borrowing for internally switching, which has been reported in Table 4.5. Although the economic reform and market transition improve competition and commercialization of financial market gradually in the last few decades, the banking sector still dominant by the five large-scale state-owned commercials banks (SOB/Big5). Hence, it is unsurprising that the market share of five SOBs still accounts the largest share of the market. Many firms have been observed that switch internally to other banks within the same group. Ranking these banks according to their market shares and penetration, about 58% of borrowers from other SOBs also borrow from the Bank of China. The duplication matrix demonstrates that 51.3% of Bank of China (BOC) customers also borrow from Industrial and Commercial Bank (ICBC), and 44.6% also borrow from Agricultural Bank of China (ABC). The level of duplication borrowing is consistent with these banks’ penetration level, and this duplication patterns are also consistent in both pre and post-crisis period. The duplication level is higher in the post-crisis period because the size of the sample and number of borrowing and lending relationship are larger than the pre-crisis period, as well as a higher probability of switching in this period. Overall, high duplication of borrowing and choices among these five SOBs are very similar because they are historically the most powerful banks even on today’s china banking market, while Bank of Communication and Agricultural Bank of China are less attractive due to their lower penetration and limit services.

Table 4.5: Duplication Analysis (Internally)

% of borrowers of...	% who also borrow from...				
	BOC	ICBC	CCB	BOCOM	ABC
Panel A: Full sample					
BOC	-	51.3	48	47.4	44.6
ICBC	57.3	-	52.7	48.0	45.4
CCB	57.6	56.6	-	50.3	47.7
BOCOM	56.5	55.5	52.7	-	48.4
ABC	62.1	56.6	55.3	52.2	-
Average	58.4	55.0	52.2	49.5	46.5
Penetration	56.4	52.4	47.9	43.4	40.9
Panel B: Pre-Crisis					
BOC	-	40.1	37.8	30	29
ICBC	33.3	-	34.1	24.5	25.3
CCB	37.6	40.8	-	26.6	30.3
BOCOM	39.9	39.3	35.6	-	29.4
ABC	37.1	38.2	38.8	28.2	-
Average	36.9	39.6	36.6	27.3	28.5
Penetration	37.1	45.4	36.8	27.9	29.5
Panel C: Post-Crisis					
BOC	-	48.2	45.2	27.2	43.3
ICBC	59.7	-	52.2	48.7	46.3
CCB	57.9	54.0	-	50.2	46.4
BOCOM	59.4	51.7	51.5	-	47.0
ABC	62.9	54.3	52.7	52.0	-
Average	60.0	52.0	50.4	44.5	45.7
Penetration	49.0	39.6	38.3	37.3	33.7

Note: **BOC** indicates Bank of China; **ICBC** indicates Industrial and Commercial Bank of China; **CCB** indicates China Construction Bank; **BOCOM** indicates Bank of Communications; **ABC** indicates Agricultural Bank of China.

4.5.3 Theoretical BPMs Estimated By the Dirichlet Approach

There are only four numerical inputs are required, typically the penetrations and the borrow frequencies of the bank loan category and particular bank group. While other variables such as inputs of listed firm attributes do not have to be explicitly specified when estimating the theoretical values of BPMs. This is due to the model is for the stationary market which

assumes these effects will usually already have been included in the bank's market shares, which in turn influence the bank's other performance measures. Alternatively, they will present as deviations in the model predictions, which then need to be explained. Market shares and the five BPMs of interest are presented in Table 4.6, together with Dirichlet theoretical values. Bank groups are ranked by market share, which enables to see that penetrations are lower for brands with smaller market shares, as are SCRs (in line with the double jeopardy effect).

Table 4.6 summarises the fitting of the Dirichlet model to borrowing behaviour from multiple bank groups, comparing observed (O) and theoretical (T) values of brand performance measures in the loan product category for three samples and it clearly shows the fit of the Dirichlet model to frequency of borrowing average across six groups of lending banks. The observed BPMs for each bank group is firstly using the definitions mentioned earlier in this chapter, which has been reported in Table 4.3. The theoretical prediction values are then estimated by the Dirichlet BPMs' formulas using an Excel Workbook. The model fits well overall, being mainly unbiased (observed and theoretical means are roughly identical), which implies that the Dirichlet model can be used as a basic framework for understanding listed firms loan borrowing behaviour in Chinese lending market. The observed values and the theoretical values of most performance measures are almost identical. Deviations from the Dirichlet-predicted theoretical norms are fairly rare, mostly small and irregular. However, there is some significant deviation still presented. Generally, the fitting was good for the dataset, as the theoretical predictions for some BPMs are closely matched the "observed" values for the full sample and two subsamples, also the mean absolute deviation (MAD) is very small for BPMs except share of category requirement and repeat rate. However, there is still no clear guidelines for interpreting the deviation of loyalty measures, hence these considerably large bias in SCR and repeat rate do not sufficiently mean that the Dirichlet model cannot describe the loyalty of borrowers.

Table 4.6: Observed and Theoretical Brand Performance Measures

Bank group	Brand size measures					Loyalty-related measures					
	Market share	Penetration		Borrowing frequency		SCR	100% loyal (Sole loyal)			Repeat rate	
	(%)	(%)				(%)	(%)			(%)	
Panel A:											
Full sample											
		O	T	O	T	O	T	O	T	O	T
SOB	45.6	80.5	79.6	6.8	6.9	41.2	45.7	11.1	6.9	64.9	50.3
JSCB	21.8	71.1	73.6	5.2	5.1	31.7	34.8	5.5	4.7	55.3	40.8
CCB	9.6	47.3	49.9	2.1	2.1	13	18.6	1.1	2.3	32.4	25.3
PB	11.4	18.3	19	0.5	0.6	3.2	11.9	0.8	1.5	10.1	17.3
FB	1.8	16.7	17.2	0.5	0.5	3.2	11.7	0.4	1.4	8.9	17
OB	9.8	35.1	36.4	1.3	1.3	7.8	14.9	2.9	1.8	19.6	21.1
MAD		1.4		0.0		6.2*		1.5		8.9	
Panel B:											
Pre-Crisis											
SOB	46.8	77.1	73.5	3.1	2.9	57.7	60.7	30.1	24.5	47.6	63.1
JSCB	16.6	52.7	53.6	1.5	1.5	27.4	38.0	10.8	11.4	29.7	40.9
CCB	8.3	23.7	23.4	0.4	0.5	8.1	24.9	2.9	6.6	8.6	25.3
PB	20.9	9.6	9.7	0.1	0.2	2.8	21.6	1.9	5.6	3.3	20.7
FB	0.8	4.7	4.8	0.1	0.1	1.3	20.7	0.2	5.3	1.3	19.3
OB	6.7	10.1	10.2	0.2	0.2	3.1	21.8	2.1	5.6	3.6	20.9
MAD		0.9		0.0		14.6*		3.7		16	
Panel C:											
Post-Crisis											
SOB	45.5	77.3	77.4	6.0	6.2	38.8	43.6	10.4	10.8	51.2	48.7
JSCB	22.5	69.5	72.5	5.0	4.9	32.3	35.5	6.1	5.1	53.7	41.6
CCB	9.8	47.6	50.0	2.1	2.1	13.6	19.8	4.1	2.6	32.4	26.7
PB	10.0	18.0	18.6	0.5	0.6	3.2	12.6	1.0	1.6	10.0	18.1
FB	2.0	16.9	17.6	0.5	0.5	3.4	12.5	0.5	1.6	9.2	18.0
OB	10.2	36.2	37.4	1.3	1.3	8.4	16.1	4.3	2.1	21.5	22.5
MAD		1.3		0.1		6.7*		1.2		6.4	

Note: **O** indicates observed values as in Table 4.3; **T** indicates the theoretical Dirichlet model estimate values, **MAD** indicates mean absolute deviation; * indicates a significant deviation based on Goodhardt et al. (1984) and Li et al. (2009); **SCR** indicates share of category requirement; **SOB** indicates five largest State-owned commercial banks (Big5); **JSCB** indicates Joint-stock commercial banks; **CCB** indicates City commercial banks; **PB** indicates Policy banks; **FB** indicates foreign banks; **OB** indicates other banks include Postal Saving Bank, Rural commercial banks, Rural cooperative bank, Rural credit cooperatives, asset management companies, and other financial institutions.

The five largest SOBs (Big5), still takes the dominant position with a 45.6% share, they also have the highest borrowing frequency, at 6.8 this is typically high, both as observed and as predicted by the model in full sample and subsamples. In addition, Table 4.6 also show this predictable relationship with market share for three other commonly used loyalty-related measures, which includes the share of category requirement (SCR), the incidence of 100%-loyal borrowers of the variant and the incidence of repeat-borrowing. In all cases, the five SOBs also have the highest loyalty levels, both as observed and predicted by the model. In addition, the result shows that a group's share of category requirements is less than 50%, implying that its borrowers mostly borrow from other bank groups, except the case of SOBs in the subsample of pre-crisis period. Moreover, in a shorter period such as two subsample period, some loyalty-related measures (borrow frequency and repeat borrowing) are considerably lower than in a longer period – full sample period, while more 100%-loyal borrower and higher SCR in the pre-crisis period. The model typically responds well to there being less chance in the shorter period for switching loan provider at all but also higher opportunity of being loyal. The model closely predicts for both the lower and higher loyalty measures for a specific analysis period, the relationship of loyalty with market share is therefore rather robust.

This theoretical prediction describes the general fit of the model by presenting how it occurs under many different circumstances, always following the same simple high-to-low observed and high-to-low theoretical patterns. The double jeopardy relationship seen in observed data was clearly captured in the model, as penetration decreased with market share. Small bank groups suffered twice as expected, having fewer borrowers, who borrowed from those groups of banks less often. The mean absolute deviation for share of requirement and repeat rate is high for all samples, these relative large MADs were driven by the large deviation between observed data and theoretical predictions. The model over-predict or under-predict some of these performance measures in three sample periods, although some significant deviation has been observed from loyalty-related measures (SCR and repeat rate), the Dirichlet model appears to be able to describe the borrowing patterns of listed firms in China.

The fit of the Dirichlet model to firms borrowing from multiple groups of lending banks suggests that the well-known double jeopardy pattern observed in consumer-packaged goods can be extended to borrowing and lending relationships. The double jeopardy

patterns indicate that brands (here is bank group) vary more in terms of penetration than loyalty. The results in this study also show this effect, there is a greater variation in the number of borrowers (penetration) across six bank groups than in the frequency of borrowing (loyalty).

4.5.4 Covariates Effects

Eight covariates are considered, two of them are dummies of state ownership (SOE) and whether there is a CEO change, which coded as 1 if a listed firm is SOE and has CEO change during a current relationship period, the remaining covariates regarding to firm-level characteristics that include firm size, age, profitability, leverage, liquidity and the number of CEO. Potentially, all these covariates might influence firm's borrowing choice and switch behaviour. When firms borrow more and frequently from particular types of lending banks may be because they are SOEs which implicitly and explicitly guaranteed by the government, they are mature firms with large asset served as collateral or could be small and young firms with the relatively lower level of profitability and liquidity.

I fit the Dirichlet model to the data using the Stata. The iterative process for maximizing the log-likelihood functions described above gives a log-likelihood value for the unconstrained model with all covariates. In addition, the model also examines how the BPMs change as the covariates vary from its mean value to the mean plus one standard deviation. Table 4.7 shows the covariate impacts on market share of six types of lending banks. The estimated Dirichlet model shows the effects of covariates on the distribution of market share. As can be seen from these estimated results, the state ownership increases the likelihood of choosing five large SOBs, but decreases the likelihood of choosing JSCBs and CCBs, this implies if the firm is an SOE, then the switch is biased towards SOB and away from JSCB and CCB. For example, the reported marginal effect indicates that state-owned firms have a 3.4 percentage points higher than non-SOEs to choose SOB as their lending bank, while 3.8 and 1.4 percentage points lower than non-SOEs for choosing JSCB and CCB, respectively. It is unsurprising that state-owned enterprises' borrowing choices favour to SOBs due to historical reason and their naturally close relationships.

Apparently, the size of listed firms has a significant impact on firms' choices of their loan providers, though the direction of this effect varies across six types of lending bank. Large firms are more likely to borrow from CCBs, policy banks, foreign banks and other banks, though this effect is very small, while small firms prefer to choose five SOBs and JSCBs to borrow. Specifically, a 1% decline in the share of SOBs is associated with a 3 percentage point increase in the size of the firm, while a 1% increase in the share of CCB is associated with a 0.6 percentage points increase in firm size. Apart from this, although the age of the firm shows a slightly significant effect on the share of SOBs and other banks, these effects are very little which could be ignored. Moreover, the five SOBs and JSCBs are more likely to be chosen by highly leveraged and low leverage listed firms, respectively. On the other side, a CEO change, number of CEO, firm's profitability, and cash flows do not show significant impact on the firm's borrowing choice and preference. Consistent with the finding from Chapter 3, these significant result shows that firm's borrowing pattern and choice determined by firm's attributes as well as its ownership structure, which also implies that firms' behaviour of switching to other loan provider determined by these factors.

Splitting the full sample into two subsamples based on the occurrence of the financial crisis in 2008, the Dirichlet model estimation also generates some new findings. First, the state ownership, size of firm and leverage have significant influence on listed companies' preference of their lending banks during the post-crisis period, and the signs of these effects are consistent with the analysis for full sample, but this effect is less or not significant in the pre-crisis period. Moreover, the age of firm matters firm's choice of switch before the crisis, but it becomes insignificant after the crisis, even though this effect is too little to consider.

Table 4.7: Estimate Results of The Dirichlet Model

	State-owned Bank (Big5)	Joint-Stock Commercial Bank	City Commercial Bank	Policy Bank	Foreign Bank	Other Banks
Panel A: Full sample						
SOE	0.034**	-0.038***	-0.014**	0.005	0.001	0.010
CEO change	-0.011	0.007	0.002	0.003	-0.004	0.002
Firm size	-0.030***	-0.003*	0.006***	0.008***	0.006***	0.013***
Firm age	-0.000*	0.000	0.000	0.000	0.000	0.000**
Profit	0.000	0.000	0.000	0.000	0.000	0.000
Leverage	0.001*	-0.002***	0.000	0.000	0.000	0.001
Cash flows	0.001	-0.001	0.001	0.000	0.000	0.000
CEO number	0.000	0.006	0.005	-0.007	-0.002	-0.001
N	1117					
Panel B: Pre-Crisis						
SOE	-0.018	0.015	-0.006	0.006	-0.002	0.005
CEO change	0.023	-0.006	-0.008	0.002	-0.004	-0.008
Firm size	-0.016	-0.01	0.005	0.008	0.003	0.009*
Firm age	0.000*	0.000*	0.000*	0.000	0.000	0.000
Profit	-0.003	0.002	0.000	0.000	0.000	0.000
Leverage	0.000	0.001	0.000	0.000	0.000	0.000
Cash flows	-0.001	0.000	0.001	0.000	0.000	0.000
CEO number	-0.008	0.021	0.006	-0.010	-0.005	-0.004
N	448					
Panel C: Post-Crisis						
SOE	0.024	-0.041***	-0.010	0.006	0.002	0.019
CEO change	0.007	-0.001	0.001	-0.002	0.000	-0.004
Firm size	-0.016**	-0.004	0.003*	0.005**	0.005**	0.007**
Firm age	0.000	0.000	0.000	0.000	0.000	0.000
Profit	0.001	0.000	0.000	0.000	0.000	0.000
Leverage	0.001	-0.002***	0.000	0.000	0.000	0.001
Cash flows	0.000	-0.001	0.001	0.000	0.000	-0.001
CEO number	-0.011	0.004	0.003	-0.001	-0.003	0.008
N	980					

Note: ***, **, * indicates a 1%, 5% and 10% significance level, marginal effects are reported.

On the other hand, this chapter attempts to investigate the internally switch among the five largest state-owned commercial banks (SOB or Big5). From the firm's loan data, firms are not only observed to switch externally to other bank groups but also switch internally within an existing bank group. Using the share of five largest state-owned commercial banks (SOB/Big5), I also explore the impact of firm characteristics on the firm's borrowing

choice among the Big5. Though the covariate effects in six bank groups' analysis are not significantly found in the analysis of internally switching within the five large SOBs, this analysis still provides two interesting findings. First, large firms prefer to borrow from Industrial and Commercial Bank of China (ICBC) and Bank of Communications (BOCOM), though this effect is only significant in the full sample analysis. Second, firms experience a CEO change in an existing bank relationship are more likely to choose Bank of Communications (BOCOM), but less likely to choose China Construction Bank (CCB) during the post-crisis period, this could possibly due to executives' political background or personal connection with these banks. Due to the shares of these five largest SOBs are very similar to each other, it is difficult to explain the effect of change a new CEO for firms choice of lending banks within Big5. Estimate results of internally switching analysis are shown in Appendix C – Table C3.

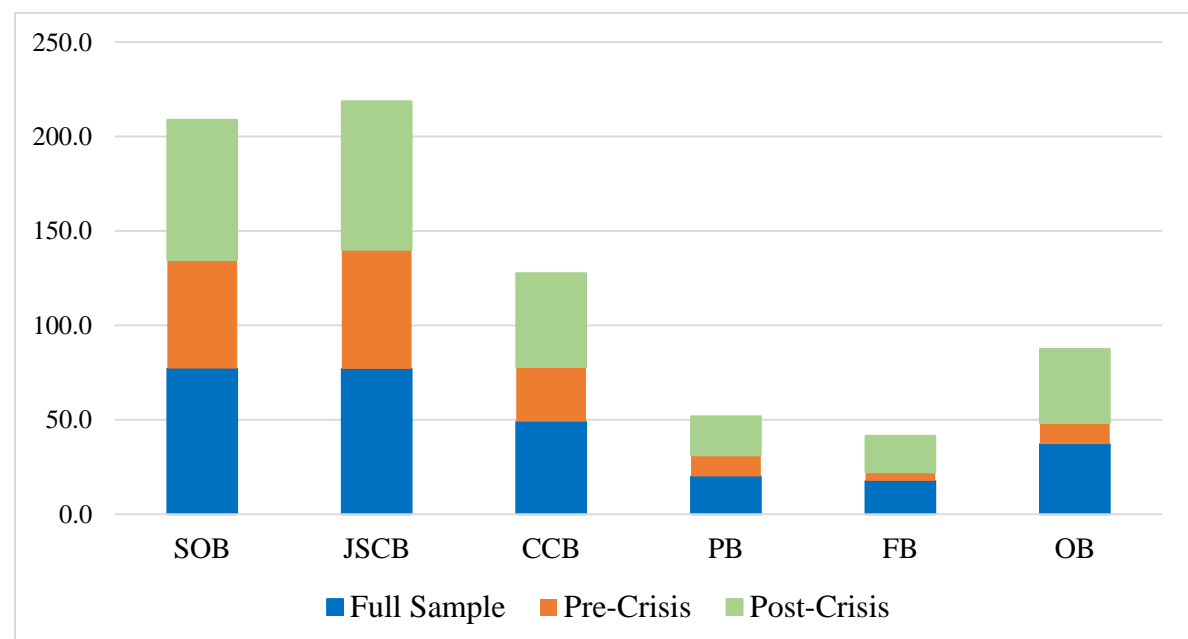
Having investigated the firms switch probability and identified firms borrowing patterns, an interesting question would ask where do they switch to? By what percentage? In fact, it is very hard to answer these question in this study for the following reasons. Firstly, most firms in China are maintaining multiple bank relationships simultaneously in a specific period or even over the whole sample period, when firms switch they would switch not only to single but also multiple lenders simultaneously, without terminating current bank relationships, which brings challenges to define a complete switch properly, as well as the proportion or weight of relationships that reflects where they switch from and where they switch to. Nevertheless, this chapter summarises the switching statistics in Table 4.8, as well as a distribution of switch in Figure 4.5, which describes the customer flowing out to other bank groups. These statistics generated only from the first switch occurs, without considering issues like whether the firm ends its previous bank relationship, or whether the firm switches to single or multiple banks, or whether a firm returns to the previous bank after switching. In line with the bank group's market share, firms are more likely to switch to five SOBs than other bank groups, and less likely to switch to foreign banks, this pattern is also consistent in the subsamples of both pre and post-crisis period, though the proportions of switch are relatively lower in the subsample of pre-crisis, particularly there was only 4.6% firms switch to foreign banks, this may because foreign banks are less competitive and have fewer branches which mainly based in coastal areas before the financial crisis thus limits their business. Although the switching table and figure provide

only an outflow of borrowers without knowing where they come from, it gives a general picture of the listed firms' switch behaviour in terms of flowing.

Table 4.8: Switching Analysis

	% switch to...					
	State-owned bank	Joint-stock commercial bank	City commercial bank	Foreign bank	Policy bank	Other Banks
Full sample	77.2	76.9	49.0	17.7	20.0	37.1
Pre-Crisis	57.5	63.1	28.9	4.6	11.1	11.3
Post-Crisis	74.2	78.6	49.7	19.3	20.7	39.0

Figure 4.5: Distribution of switching behaviour



Note: SOB indicates five large state-owned banks (Big5); JSCB indicates joint-stock commercial banks; CCB indicates city commercial banks; PB indicates policy banks; FB indicates foreign banks; OB indicates other banks include Postal Saving Bank, Rural commercial banks, Rural cooperative bank, Rural credit cooperatives, asset management companies and other financial institutions.

4.6 Discussion and Implications

Firms' loan borrowing behaviours are different from decision-making of consumer buying or attendance of social events which undertake consciously. Loan suppliers need to understand the true prevalence of frequent and infrequent borrowers, which enables them to understand whether these borrowers vary in terms of motivation, barriers, or whether all borrowers can benefit from creating more reminders and support for firms to engage in loan activity in a range of context. Executives in the banking industry should implement their strategies and policies by changing the attitudes and perceived behavioural control of their target firms. In order to increase revenue from supplying loan, marketing of loan supplying should focus not only on keeping relationships with existing well-performing firms, but also those previously non-or irregular firms. Although the irregular firms only borrow loans occasionally, they are important to banks, and the previous non-borrower are even more important especially those firms with good credit quality, high profitability and growth opportunities, as they are the potential borrower for banks enable them to build up a strong and stable relationship with their customers. Further, it is important that the loan suppliers broaden their focus from firms' performance, attitudes and behaviour, to also consider less rational drivers of behaviour, also loan lending marketers should not ignore these non-borrowers when communicating their marketing activity as in the future they become important in contributing to loan revenue.

The central government only responsible for one-fourth of stimulus plan, while the remaining balance is mainly from bank loans. It must be pointed out that most of the 4 trillion stimulus economic plans are headed by state-owned enterprises (e.g. it is reported that the two large state-owned enterprises China National Railways and China Railway Construction, have occupied the main part of the 6000 billion RMB railway infrastructure investment), whereas the share of private enterprises has been very small. These lending activities were mainly conducted by the five large state-owned commercial banks (Big5) due to the historical reason that a natural and close relationship between SOEs and SOBs, this helps to explain Big5 has relative high borrow frequency by listed firms during the post-crisis periods, as well as their high levels of duplication borrowing.

Finally, the fit of the NBD-Dirichlet model to loan borrowing activity behaviour recommends that the NBD-Dirichlet model may apply to other context and data, for example, other financial activity behaviours – mergers and acquisitions, public listings, bond issuance etc.

4.7 Conclusion

This chapter adopts a behavioural paradigm to describe borrowing patterns and choice of listed firms and shows that stochastic preference models can describe borrowing behaviour and preference of credit suppliers in both single bank group and loan category level. All dimensions of the Dirichlet approach can be applied to loan activity provide a better understanding of borrowing and lending relationship in China. Using loan data across the last twenty years, the model describes the widely observed patterns of near-steady state borrowing behaviour and provides empirical evidence that the NBD patterns are evident in listed firms' borrowing behaviour. Apart from this, this chapter offers important suggestions for the measurement and reporting of borrowing behaviours. Moreover, the moderate fit of the Dirichlet model described in this study shows that listed firms borrowing behaviour can be well described and predicted, which implies that previous borrowing behaviours and preference seem to play an important role in firms' borrowing choices and their switching.

In this, the model consistently predicts fairly complex patterns and BPMs from simple and limit inputs. In addition, it also helps to explain the patterns, namely, that under approximate steady-state conditions, traditional loyalty-related measures for competitive banks are unaffected by other marketing-mix inputs, other than directly through changes in the bank's market share. The fit of the Dirichlet model to listed companies' loan borrowing from multiple bank groups suggests that the well-known "double jeopardy" pattern observed in consumer-packaged goods can be extended to borrowing and lending relationship in China's loan market. Bank groups with large market share (i.e. large SOBs, JSCBs, and CCBs), their borrowers are more loyal to them with higher borrow frequency, compare to the borrowers of smaller groups of bank (i.e. policy banks, foreign banks, and other banks), whose customers are less loyal and borrow less frequently. The results of double jeopardy pattern demonstrate that bank groups vary more in terms of penetration

than loyalty that implies there is a greater variation in the number of listed companies (penetration) across the lending banks and lending activities than in the frequency of borrowing (loyalty). Apparently, the borrowing frequency is higher while the loyalty-related measures are lower in the post-crisis period compared to the pre-crisis period in both observed and theoretical values because low probability of switching in pre-crisis period indicates there may be less opportunity to change lender (or being unloyal) in the that period.

In addition, this chapter generalises the Dirichlet model by incorporating the characteristics of firms. In so doing the model is substantially expanded to provide an output on how firm-specific characteristics are related to market shares of lending banks. The model estimation results show several findings. First, state-owned enterprise and firms prefer to borrow from large state-owned commercial banks (SOBs or Big5), which implies a super stable relationship between SOBs and SOEs. In other words, it also reflects the lending preference of Big5 that they are more likely to lend to state-owned enterprises, relative to non-SOEs. Second, apart from the ownership effect, the size, age, and leverage also have significant impact on firms' choice on choosing their loan provider, though these covariates effects vary little among full sample and two subsamples of the pre and post financial crisis periods. While the level of profitability, liquidity, number of CEO and a dummy indicates that whether there is CEO change did not show significant effect in this analysis. Third, the duplication and switching analysis show that the level of duplication borrowing of large five SOBs is the highest, following with the second and third largest groups of the bank, joint-stock banks, and city commercial banks. The preference of firm switch lenders also follows this pattern. This tells that the largest three groups of bank always take the best position in the loan market, particularly the five large SOBs, even though their shares declining gradually in the last decades, they are still the most powerful and competitive banks in the banking sector. Fourth, duplication and covariate analysis for firms internally switching within the SOB group suggest that firms borrowing choice among five SOBs (Big5) are not determined by firms' attributes at any time of borrowing, also their preferences of borrowing from SOB is similar from one to another, though there is an exception for choice of Bank of Communications and China Construction Bank related to firms executive change, which need to be further investigated.

5 Changing Loan Provider: The Role of Political Connection

5.1 Introduction

The incentive for corporations to become politically connected has been recognized among economists for many years and has become a more controversial issue of borrowing and lending relationships among firms and banks. As various studies have noted, the benefits of being a political connected corporation takes various forms, including preferential treatment by government-owned enterprises such as banks (Backman, 1999; Chan et al., 2012; Cull and Xu, 2005; Khwaja and Mian, 2005), preferential treatment of government bailout (Faccio et al., 2006), lighter taxation (Pan et al., 2009), preferential treatment in competition for government contracts, relaxed regulatory oversight of the corporation in question, or stiffer regulatory oversight of its competitors (De Soto, 1989), and many other forms.

It has been widely suggested that politically connected firms have preferential access to debt financing, at least in some countries, and these politically connected (but publicly traded) firms have higher leverage ratios than their non-connected peers (e.g. Cull and Cu, 2005; Faccio, 2006; Johnson and Mitton, 2003; and Khwaja and Mian, 2005). The possible reasons for what makes lenders more willing to extend credit to politically connected firms could be that lenders obtain direct economic support from the governments to which the firms are connected. Or it could be that lenders are compelled to provide economically questionable loans to politicians' friends. Or, it could be that lenders rely on an implicit government guarantee that politically connected borrowers or lenders will be bailed out should they suffer financial distress (Faccio et al., 2006). However, there are conflicts of interest between shareholders and bureaucrats when monitoring the firm, with the latter likely pursuing social objectives or private gains at the firm's expense, which would further reduce firm value (Shleifer and Vishny, 1994).

Under the background of economic transition with particular fiscal decentralization and performance evaluation system for local officials in China, some firms, on the one hand enlarge the scale of investment at all costs in order to meet ambitions of local government, on the other hand, they try to build close relationship with the government to form a “political connection” and rely on such informal alternative mechanism to obtain sufficient external funding and to overcome the problem of financing constraints.

This chapter examines the role of government in China’s listed companies and provides a comprehensive look at corporate political connections in China. Due to the property rights remain weak and the product and financial markets are far from liberalized, theory predicts that government intervention significantly affects the performance and governance quality of firms. Complementary to previous studies that capture political connections using the CEO’s past experience in central government, local government or military, my study also include connections with National People’s Congress and Chinese People’s Political Consultative Conference, such history is a positive signal of a CEO’s deeper connection to the policymakers. This chapter uses the CEO’s political connection as a proxy for government intervention in the firm, which is defined as a current or former government bureaucrat – that is, current or former government officials, a former CEO/chairman of SOEs, representative of the Communist Party of China, current or former deputy of NPC or member of CPPCC.

Since Krueger (1974) firstly stated that entrepreneurs spend time and money building relationships with government officials bring benefits to firms, both theoretical and empirical studies on the influence of political connection are continually growing, most of these studies focus on the links between political connection and firm value or corporate behaviour, which leaves the field political effects on the firm’s switching behaviour unexplored. This study contributes to the broad literature on Chinese executive characteristics and corporate governance, as well as CEO political connections.

The remainder of the chapter proceeds as follows. Section 2 reviews the role and effects of political connection. Section 3 discusses the institutional background in China and introduces various types of political connection. Section 4 describes the model framework, develops the hypotheses and describe the data and sample. Section 5

addresses the influences of the CEO's political connections on listed firms switch behaviour. Section 6 concludes.

5.2 Literature Review

Allen et al. (2005) argue that inadequate institutional support, underdeveloped investor protection legislation, overarching government intervention and control, and weak implementation of contracts and property rights bring numerous challenges for Chinese business. Hence, establishing close ties to the government often become an effective strategic mechanism for businesses to overcome market failures (Li et al., 2008).

Political connection refers to the links between the business and all levels of government departments and auxiliary support authorities. Faccio (2006) provides a precise identification of politically connected firms and summarized political connections in two forms. Firstly, definition of a company is identified as being directly connected with a politician if at least one of its large shareholders (anyone controlling at least 10 percent of voting shares) or one of its top officers (CEO, president, vice-president, chairman, or secretary is: (a) a member of parliament (MP), (b) a minister, or the head of state, or (c) closely related to a top politician or party. Secondly, indirect connections can also be observed in several ways: (a) if a relative with the same last name as a head of state or minister is a top officer or a large shareholder, as defined above, and (b) if a top executive or a large shareholder has been described by *The Economist*, *Forbes* or *Fortune* as having a "friendship" with a head of state, government minister, or a member of parliament.

Different from the political intervention that government's intervention in the enterprise (especially the SOEs) to achieve public goals or social goals, or government officials' private interests through various ways (Shleifer and Vishny, 1994, 1998), the political connection is that the enterprise actively seeks to establish a relationship with the government, judicial organisations, and other political institutions in order to seek certain interests or for other purposes (Zhao and Ma, 2011). Political intervention's initiator is the government while the initiator of political connection is the enterprise.

Political connections do not necessarily lead to political interference, but political connections between companies and governments may bring political intervention more likely.

The effect of political connection is theoretically ambiguous. Benefits come from faster information transmission while costs may be incurred by rent-seeking. Various studies have shown that firms with political connection have preferential access to debt financing. For example, Johnson and Mitton (2003) find that politically connected firms in Malaysia have greater access to debt financing, Khwaja and Mian (2005) shows similar findings even though these politically connected firms exhibit significantly higher default probability, but pay interest rates no higher than other non-connected borrowers; and Cull and Xu (2005) document that Chinese firms that make informal payments to government officials borrow more from banks. A lot of empirical evidence relevant to the China context show that politically connected firms easily access more loan with longer duration but less external finance constraints, and political links is particularly important for private enterprises also significant in the region that lack of legal system and with lower level of financial development³².

To complement these studies of the behaviour of lenders toward politically connected borrowers, Faccio et al. (2006) investigate a particular form of government support for politically connected firms: corporate bailouts, and show that political connections lead to preferential corporate bailouts. Their evidence indicates that politically connected firms borrow more and are more likely to be bailed out than non-connected firms. Due to connected firms' higher frequency of bailout implies a lower expectation of loan loss, this pattern is consistent with connected firms experiencing more favourable loan conditions such as lower loan requirement and interest rates. The implication of being a politically connected firm is that shareholders gain because their firms are able to borrow at below-market rates, and lenders can also benefit when their borrowers are bailed out. Other advantages for being politically connected firms have been also found in preferential tax policies and subsidies (Pan et al., 2009), lower barriers to entry (Luo and Liu, 2009), legal protections (Li et al., 2008) and government contracts (Goldman et al., 2013).

³² See e.g., Chan et al. (2012); Luo and Zhen (2008); Xin and Song (2014); Yu and Pan (2008).

However, there is some evidence that political connections can be detrimental to a company, the opposite effect could arise due to the politicians or government will extract at least some rents through this connection, and corporate value will be improved only when the marginal benefits of the connections outweigh their marginal costs. It has been argued that the political connections significantly reduce investment efficiency in state-owned enterprises (Chen et al., 2011) and make firms lose independence from the government, which impedes firm's decision-making (Marquis and Qian, 2013). Shleifer and Vishny (1994) document that rent-seeking usually occurs if politicians can bring profits to the firm, and as long as the resources allocation is distorted, a social welfare loss may incur. In addition, Shleifer and Vishny (1998) indicate the "grabbing hand" that bureaucrats or politicians extract resources from listed SOEs under their control to fulfil political purposes that are not consistent with firm value maximization. In particular, Fan et al. (2007) point out that a politically connected CEO is highly likely having political allies on the board, these boards show low degrees of professionalism, as fewer directors have relevant professional backgrounds, fewer academicians and women serving as directors, and older directors on average. Moreover, they also find that the accounting and stock return performance of the firms run by politically connected CEOs is poor relative their politically unconnected peers.

Other disadvantages of being politically connected firms also have been found in high cost of rent-seeking (such as over-employed employees, paying high wages, making large amounts of inefficient investment, etc.) thereby reducing company value (He and Zhou, 2011; Liang and Feng, 2010), poor firm performance (Deng and Zeng, 2009). Basically, enterprises have expended a lot of energy and resources in the process of establishing, maintaining and promoting political connections, which may reduce their investment in capacity building, and may also present excessive employees and investment. In general, the efforts to establish political connections distort corporate behaviours in some circumstances, generate rent-seeking costs, and ultimately impair the efficiency of resource allocation of enterprises and society.

Although the performance of many majority-state-owned enterprises was converging to that of private enterprises due to corporatization and associated reforms in the reform era, state-owned enterprises (SOEs) continue to receive a disproportionately large share

of credit extended from the main and large state-owned banks (also known as Big5 or SOBs) in China (Lin and Zhu, 2001; and Xu et al., 2005). Empirical research shows that state banks become less efficient in allocating credit because have been increasingly cored into bail out poorly performing state-owned enterprises (Lardy, 1998; Cull and Xu, 2000). These bailouts usually come in the form of stability loans to maintain SOEs afloat, as many of most of them keep excessive employment. Thus loans extended by state-owned banks to state enterprises can be viewed as having a strong bailout component rather as true external finance awarded based on creditworthiness.

5.3 Institutional Background

Before turning to the empirical study, it is essential to review the institutional background, particularly in terms of regulation, political systems and corruption. China is a socialist economy with characteristics of capitalist enterprises, where the state has a dominant position in the firm-level decision. Although the autonomy of firms' decision making and operation is improving in the current context of economic transition, the government still has significant power to influence firms' operations through policy support and interference. Although political connections are particularly important in China that a country's economy run by the state with many public firms being state-owned, controlled or influenced. SOEs is an important material and political basis for socialism with Chinese characteristics and an important pillar and reliable force for the Communist Party of China's governance of the country, therefore Party leadership and enhancing the role of the Party are "the root and soul" for SOEs.

The Chinese government launched a program that decentralized managerial decision rights of state-owned enterprises (SOEs) from the central government down to the local firm level during the early reform stage in the 1980s. The decentralization was motivated by the central government's desire to accelerate markets and to gradually weed out its central planning function. The reform of SOEs in the 1990s allowed SOEs to be partially privatized by issuing a minority allocation of shares to individual investors, who could trade their shares freely in newly established stock markets set up in Shenzhen and Shanghai process in 1990. Ideologically, this partial privatization was officially called corporatization, prohibited the government from selling its controlling

stake in the firms. In relation with the corporatization process in the 1990s, the central government further decentralized its power by specifying the exact decision rights to the SOE level including those rights mainly related to operating decision and the use of retained funds. While largely granting operating decision rights to SOE managers, the government kept ultimate decision rights regarding mergers and acquisitions, the disposal of shares and assets of these listed firms, and the appointment of CEOs as well.

The information about the quality of the firm's management and the extent of checks and balances on managerial decisions can be revealed by a board of directors. The level of professionalism and overseeing required by a firm is likely driven by the institutional environment to which the firm adapts (Hermalin and Weisbach, 2003). The property regulations in China's privatization process led to boards characterized by strong bureaucratic influence, weak governance, and low professionalism. Specifically, firms with government appointed, and politically connected CEOs have more directors with political ties and fewer directors with business experience or professional backgrounds, mainly due to politically connected CEOs need allies on the board to enhance their policies and objectives. While non-political professionals, or directors representing investors' interests, might violate the objectives of politicians (Fan et al., 2007).

Therefore, firms in China face the property rights constraints, namely the non-transferability of state ownership and the right of the government appoint CEOs, which could impair firm performance as well as board professionals and governance to some extent. With this institutional background, it is easy to predict that the non-transferable state-owned shares/assets would bring intractable incentive problems between government officials and firm manager. Under these circumstances, the governance of the firms would likely be weak and firm value would likely be dissipated, due basically to the lack of a free market that would release the firms from state ownership (Fan et al., 2007).

Although non-state-owned firms may not have board members or directors that currently work for the government, they may have retired officers, which due to Chinese culture virtually guarantees them a significant level of political connection, which leads to these firms are usually very aggressive in hiring former high ranking officials. Private enterprises and family-owned enterprises actively seek to political connection, which is a process of active rent-seeking. Although enterprises consume a

lot of resources in the process of establishing, maintaining and promoting political connections, they can also obtain a large number of scarce resources, property rights protection, and enhance corporate value (Xiong, 2012).

5.3.1 Connection with Communist Party of China Committee

China has one ruling political party, which is the Communist Party of China (CPC). The CPC was founded in 1921 and was originally formed to promote communist ideology in the country. The Party believes that the nation is best served by political unification both geographically and socially. Since the early 1980s, the CPC has placed a lot of emphasis on economic development and engaging with the rest of the world. The Party is especially keen on remaining control over the state-owned enterprises (SOEs) managed by State-owned Assets Supervision and Administration Commission (SASAC) on both central and local level. Some of these SOEs are the largest Chinese enterprises, accounting for most of the Chinese companies on the Fortune Global 500 list of the world's largest companies. These SOEs — often called 'national champions' — dominate the strategic sectors of the Chinese economy, such as aerospace, telecoms, power generation, automaking and shipbuilding. The leaders of these largest companies are not appointed by SASAC, but rather by the Party's Organisation Department. They are part of the Party's nomenklatura system and are cadres ranked at vice-ministerial level, which implies that many business executives are subject to cadre rotation and are moved to take up government or Party positions (Brødsgaard, 2018).

In general, the Party is playing a core role in an organized, institutionalized and concrete way, and providing direction, managing the overall situation, this phrase has been injected into the articles of association recently. Chinese President Xi Jinping, also the general secretary of the CPC Central Committee, stresses the CPC's leadership in SOEs is a "major political principle" during a recent national meeting held in October, 2016. The statement can be summarized in the following five points. First, the Party should lead SOEs in political, ideological and organizational aspects and Party organizations in SOEs should take charge of the direction and general aspects of SOEs' development and the implementation of policies. Second, the power and responsibilities of the Party in SOE decision-making, implementation and supervision processes should be clearly

defined, reminding on Party organizations and other corporate governance bodies of enterprises to perform their duties properly. Third, the CPC organization should be an inbuilt part of the corporate governance structure and the legal status in SOEs should be clear and properly observed, and reform to establish a modern enterprise system within SOEs should be adhered to as well. Fourth, while ordering strengthened grassroots Party organization in SOEs, the Party organizations should be in a key role of SOE personnel selection and efforts should be made to cultivate a number of quality corporate executives. Finally, Party committees at local levels should incorporate SOE Party organization building into their overall work plans, also ordering greater efforts to fight corruption, extravagance, embezzlement of state assets and other malpractice in SOEs³³.

The Party's Constitution mandates the establishment of a Party committee in any organization, including privately owned firms in China that has more than three full Party members. State-owned enterprises have their own CPC committee, even some private firms launch their CPC committee as well³⁴. The private sector Party committees are more than a reflection of the CPC's engagement with the public, it's also expected to help promote the companies' growth. The committee does not intervene in the company's operations, but it is important because it ensures the enforcement of government policies. The party organization of a company generally carries out activities that revolve around operations management, can help companies promptly understand relevant national guiding principles and policies, coordinate all parties' interests, resolve internal disputes, introduce and develop talent, guide the corporate culture, and build harmonious labour relations.

5.3.2 Connection With Central or Local Government

If the company's senior executives previously or currently have government background, that means previously or currently working for the government or government authorities on either central or local level, or a non-politically connected CEOs now are promoted to the government official. Under the culture of advocating "born kinship", such officials are more motivated and capable of caring for "maiden"

³³ See Xinhuanet at: http://www.xinhuanet.com/english/2016-10/11/c_135746608.htm

³⁴ For example, Xiaomi Corporation, Transfer Group, Huawei, JD Group.

enterprises by taking advantage of their government connection. CEO's government connection in this sample based on their current or former experience of being officers of government or government bureaus under State Council or Ministries such as Development and Reform Commission, Discipline Inspection Commission, Taxation Bureau, Supervision Bureaus at central and local level, as well as mayors at provincial, city, or county level.

CEO who used to working for or currently working for the government at the level of a city mayor or higher are defined as politically connected. The positions and government agencies identified from my sample include: provincial governors, city mayor, government tax bureau, and economic commission, discipline inspection commission, director of the central or local economic planning committee, and director of the central and local SASAC and so on. It is not easy to identify in more details which connection is the strongest because even though the central government and its agents have the ultimate power over decisions made by provincial or local governments, it is the provincial or local governments that have the strongest incentives to help the rent-seeking firms so as to fulfil local fiscal goals.

5.3.3 Connection with State-owned Enterprises

The SOEs play an important role in the Chinese economy, as they dominate China's strategic sectors and pillar industries. They are also key instruments for the implementation of CPC's policies and strategic initiatives. State firms that have the central government of its agents as the controlling shareholder and State-Legal Entity firms that have other SOEs as the controlling shareholder. Both State and State-Legal Entity firms are state-owned enterprises and by constitution belong to the central government and should in theory operate in a way that is beneficial to all Chinese citizens. But in terms of profitability, they are widely regarded as less profitable than privately-owned companies. But since then reform within this area has stalled and even gone backward. Instead of being divided into smaller, mutually competitive companies, China's large SOEs have experienced a process of consolidation that has created even bigger companies, many of China's large SOEs grew into huge enterprises with significant economic and political clout. The executive elite in charge of these

enterprises had vice-ministerial status and often outranked the state administrative organizations and bureaus that were supposed to regulate them.

Hence, there is a natural relationship between state-owned enterprises and the government, as well as the Party. They can easily obtain a large number of scarce resources controlled by the government, but they also bear a large number of political and social burdens, which may influence corporate value. Even though some state-owned enterprises went public during the corporatization process in SOE reform period, the state remains the controlling shareholder, therefore it is quite often that the directors or members of the board of directors are also government officials. According to the Company Code of 1993, the board members of state-owned companies are assigned by the State Owned Assets Supervision and Administration Commission of the State Council (SASAC). All boards of directors of state-owned companies are assigned and compensated by SASAC and thus have a certain degree of political connection. Apart from this, firms with boards that have stronger ties with the government indicating that these firms would be more politically connected.

Cross-appointment has become a key concept in the Party's management of state-owned businesses and government institutions. The Party controls SOEs in various ways. All enterprises must have a Party organization headed by a Party secretary. Party documents stipulate that all important decisions must first be discussed by the Party committee of the enterprise. Only after that committee has forwarded a recommendation can the matter be decided by the board and an action implemented. This ensures that the Party has a decisive say on enterprise operation and management. In enterprises where a board has been established, the company Party secretary and chairman of the board should be the same person. Members of the company's Party committee should also serve on the board of directors, management team and supervisory board. The principle of overlapping positions and cross appointments has been commonly observed in enterprise management, which is an effective measure to combine corporate governance with the Party, which is the political core of the company. In the same way, the government or its authorities can send people directly to sit on the board of state firms, while both the board of directors and the top managers of State-Legal Entity firms are assigned by their parent SOEs. Hence, a former leader of SOEs implies a certain level of political connection.

5.3.4 Connection with National People's Congress and Committee of Chinese People's Political Consultative Conference

Apart from connection with the Party, government officials and SOEs, the political connection also includes connections with *National People's Congress (NPC)* and *Committee of Chinese's People's Political Consultative Conference (CPPCC)*. Being a member of the NPC and the CPPCC might signal managerial talent and economic qualities, but it is very crucial to control for the role of political factors. Since both the NPC and the CPPCC are political bodies of state power, the procedures and criteria of their membership selection are less transparent, winning a seat on the NCP or the CPPCC means that the connection to politics is closer. These two mechanisms carry some commonalities, the NPC is the legislative body of the State, which is responsible for electing key central government officials, amending the Constitution and other legal documents, supervising the implementation of the Constitution and other legislation, and determining other major state affairs as well (Conyon et al., 2015). Typically, representatives of NPC are elected from 35 provincial levels of the People's Congresses and are nominated by the standing committee members of provincial congresses. NPC representatives hold a term of 5 years and there is no limit on the maximum number of terms.

On the other side, CPPCC is an institution of multiparty cooperation and political consultation led by the Communist Party of China, and its main responsibilities are conducting political, economy and social consultation, democratic supervision, and participation in the deliberation and administration of national affairs. Members are nominated by the standing committees of each Chinese region, affiliated political parties or organizations, and ethnic groups. Subsequently, the approval of membership made by the Chair's Council of proceeding CPPCC national committee and no election is required. The member of CPPCC holds a term of 5 years and there is no restriction on the maximum number of terms either. A concurrent national meeting is jointly held by the NPC and CPPCC every 5 years, known as "Lianghui" or "Two meetings". Their scarcity and status enable NPC deputies and CPPCC members do gain the highest recognition (Li et al., 2006, 2008). Moreover, due to the unique nomination and selection procedures, obtaining membership in the NPC or the CPPCC literally implies

winning a state-led contest, therefore being a member of NPC or CPPCC confers status and esteem to individuals.

The signal transmission mechanism indicates that the identity of the entrepreneur's NPC deputy or CPPCC member, on the one hand, signals that the enterprise especially the private enterprises have the strength and scale to be played, and on the other hand, the contribution to the economy made by these enterprises has been recognized by the society and government. In this sense, the political identity of these enterprises particularly the private enterprises conveys the signal of corporate quality, which helps them to obtain external funds easily and additional development opportunities, and promote the development of private enterprises (Hu, 2006).

Under the context of transition economies, whether preferential policies really can be put in place timely depends largely on “the efficiency of communication” between business and government bureaus. As a result, many enterprises hire ever government officials or experiences of deputies of NPC or members of CPPCC to work for them to develop or retain close ties with government and form a political connection. In fact, considering China's special conditions, their actual political influence is significantly different.

5.4 Methodology

5.4.1 Model Framework and Hypotheses

A standard Logit model is employed in this chapter, which is a typical example of Limited Dependent Variable Model with a binary dependent variable that takes only two values, zero and one. Consider a binary response model with response probability of the following form:

$$P(y = 1|x) = G(\beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k) = G(\beta_0 + X\beta) \quad (1)$$

where G is a function taking on values strictly between zero and one: $0 < G(z) < 1$ for all real numbers z to make sure that the estimated response probabilities are strictly

between zero and one. X is a vector of covariates and β is a vector of regression coefficients Here $z = X\beta = \beta_1x_1 + \dots + \beta_kx_k$. Specifically, for the logit model:

$$G(z) = \frac{\exp(z)}{[1 + \exp(z)]} \quad (2)$$

where G is the logistic function which is between zero and one for all real numbers z , this is the cumulative density function (CDF) for a standard logistic random variable.

The odds defined as the ratio of the probability to its complement, or the ratio of switching to not-switching in this case:

$$Odds_i = \frac{z_i}{1 - z_i} = \exp\{x'_i\beta\} \quad (3)$$

If the probability of switching is a half, the odds are one-to-one or even. If the probability of an event is 1/3, the odds are one-to-two. When the logistic CDF employed, the probability (z_i) of $y = 1$ (here means a switch occurs), conditional on X is $\exp(X\beta) / (1 + \exp(X\beta))$, Taking the logarithms, this function may be inverted to yield logit or log-odds:

$$\eta_i = \text{logit}(z_i) = \log \frac{z_i}{1 - z_i} = x_i\beta \quad (4)$$

This expression is termed the logit of z_i , with that term being a contraction of the log of the odds ratio. The odds ratio shows the probability in terms of the odds of $y = 1$, which implies that for a one-unit change in the j^{th} x , holding other x constant, is merely $\exp(\beta_j)$. If the odds ratio exceeds one, an increase in that x increases the likelihood that $y = 1$, and vice versa. As the probability goes down to zero the odds approach zero and the logit approaches $-\infty$. At the other extreme, as the probability approaches one the odds approach $+\infty$ and so does the logit. Hence, logits map probabilities from the range (0,1) to the entire real line. Solving for the probability z_i in the logit model in Equation 4 gives the more complicated model:

$$z_i = \text{logit}^{-1}(\eta_i) = \frac{\exp\{x'_i\beta\}}{1 + \exp\{x'_i\beta\}} \quad (5)$$

The left-hand side is the probability scale, the right-hand-side is a non-linear function of the predictors, and there is no simple way to express the effect on the probability increasing a predictor by one unit while holding the other variables constant. That complexity arises from the nonlinearity of the relationship.

There are two options for reporting the effect size of covariates in logistic regression. The first one is simply reporting the expected change in odds for one unit change in x by using odds ratios, and the other is reporting the expected effect at the mean of the x in the sample, which is known as the marginal effect. β_j indicates the change in the logit of the probability associated with a unit change in the j -th predictor holding all other predictors constant. The coefficient directly shows the direction of covariate effects such as increasing or lowering the likelihood of switching, but it does not show the magnitude of the covariate effect. Thereby, marginal effects are presented in the result section to identify magnitude s of partial effects.

Generally, the Logit model can be derived from an underlying latent variable model. Let y^* be an unobserved, or latent variable and suppose that:

$$y^* = \beta_0 + x\beta + \mu, \quad y = 1[y^* > 0] \quad (6)$$

where the error term μ is independent of x . Although x_j has a linear effect on y^* , it will not have a linear effect on the resulting probability that $y=1$. To estimate the effect of a continuous variable x_j on the probability of switching $P(y = 1 | x)$, this partial effect can be obtained by taking partial derivatives:

$$\frac{\partial P(y = 1|x)}{\partial x_j} = g(\beta_0 + x\beta)\beta_j, \text{ where } g(z) \equiv \frac{dG}{dz}(z) \quad (7)$$

Again, G is the cdf of a continuous random variable, g is a probability density function (pdf). In the logit model, $G(\cdot)$ is a strictly increasing cdf, and so $g(z) > 0$ for all z . Thus, the marginal effect of x_j on $P(y = 1|x)$ depends on x through the positive quantity $g(\beta_0 + x\beta)$, which implies that the marginal effect always have the same sign as β_j .

If x_1 is a binary explanatory variable, say whether a firm is a state-owned enterprise (SOE) or not, then the partial effect from changing x_1 from zero to one, holding all other variables fixed, is:

$$G(\beta_0 + \beta_1 + \beta_2 x_2 + \cdots + \beta_k x_k) - G(\beta_0 + \beta_2 x_2 + \cdots + \beta_k x_k) \quad (8)$$

In a binary choice model, the marginal effect of an increase in factor x_j cannot have a constant effect on the conditional probability that ($y = 1 | x$) since $G(\cdot)$ differs through the range of x values. In a linear regression model, the coefficient β_j and its estimate b_j measures the marginal effect $\partial y / \partial x_j$, and the effect is constant for all values of x . While in a binary model, the probability that $y = 1$ is bounded by $\{0,1\}$ interval, the marginal effect may vary. Compared with the linear probability model, the partial effects in Equation 7 by using the Logit model are harder to summarize because of the scale factor. Using the scale factor results from averaging the individual partial effects across the sample, leading to what is called the average partial effect (APE) or, sometimes, the average marginal effect (AME). For a continuous explanatory variable x_j , the average marginal effect is $n^{-1} \sum_{i=1}^n [g(\hat{\beta}_0 + x_i \hat{\beta}) \hat{\beta}_j] = [n^{-1} \sum_{i=1}^n g(\hat{\beta}_0 + x_i \hat{\beta})] \hat{\beta}_j$. The term multiplying $\hat{\beta}_j$ acts as a scale factor:

$$n^{-1} \sum_{i=1}^n g(\hat{\beta}_0 + x_i \hat{\beta}) \quad (9)$$

Equation 9 is easily computed after logit estimation, where $g(\hat{\beta}_0 + x_i \hat{\beta}) = \exp(\hat{\beta}_0 + x_i \hat{\beta}) / [1 + \exp(\hat{\beta}_0 + x_i \hat{\beta})]^2$.

This chapter attempts to understand why firms borrow from other (non-relationship) banks for their repeat credit needs, and how this decision affected by CEO's political connection. A key variable of interest is *Switch*, a dummy variable that identifies if the deal involves a new banking relationship for the borrowing firm. A bank-firm relationship is defined as a pairing between a lending bank and a borrower. To construct the dependent variable – *Switch*, I examine all the previous loan deals of the borrowing firm available in the CSMAR database. Coding *Switch* equal to 1 if the firm obtains a new loan from a bank which it did not have lending relationship in the previous 12 months, and 0 otherwise. In China, a firm may establish a new banking relationship

either because it wants to maintain multiple banking relationships or because it wants to switch to a new bank entirely by severing its relationships with its existing bank.

The empirical model mainly examines the effect of CEO's political connection on a firm's propensity to switch. To analyse this choice, this chapter estimates panel logit regression that controlling for firm factor, management factor, bank factor, and environmental factor, the Logit model is designed as follows:

$$\begin{aligned} Switch_i = & \alpha + \beta Firm_i + \gamma Management_i + \delta Bank_i + \theta Environmet \\ & + Interactive\ terms + \mu_i \end{aligned} \quad (10)$$

Where $Switch_i$ is a dummy variable and captures firm i 's *switch* behaviour, $Firm_i$ is a set of variables that related to firm-level characteristics, including the age, size, leverage, profitability, cash flows, growth, collateral, opaqueness of firm i and also control for industrial effect. $Management_i$ is a set of variables that related to the CEO's characteristics of the firm, including age, gender, tenure and political ties of CEO. $Bank_i$ indicates the types of lending banks of firm i , types of lending banks includes five large SOBs (Big5), Joint-Stock Commercial Banks (JSCBs), City Commercial Banks (CCBs), Policy Banks, Foreign Banks, and Other. *Environment* denotes external effect such as financial crisis and geographical location. In addition, this model also includes interactive terms to estimate the cross effects of multiple types of political connection on the firm's switch behaviour.

Comprehensively consider the views of the existing scholars and combine with the reality of China background, firm's political connection is defined as whether its CEO is a (1) current or former representative of the Communist Party of China; (2) current or former government officials (officer of the central or local governments, state authorities and military); (3) former leader of SOEs³⁵; (4) current or former deputy of National People's Congress (NPC); (5) current or former member of Chinese People's Political Consultative Conference (CPPCC). CEO has at least one of these types of connection thus considered as a politically connected firm.

³⁵ Former chairman or CEO of state-owned enterprises.

Previous studies have found the political effect on firm value, preferential treatment such as bank loans (Johnson and Mitton, 2003; Khwaja and Mian, 2005; Luo and Zhen, 2008; Yu and Pan, 2008), corporate bailout (Faccio et al., 2006), tax policies and subsidies (Pan et al., 2009), barriers to entry (Luo and Liu, 2009), and legal protections (Li et al., 2008), the first hypothesis is developed to investigate the political effects on firm's behaviour of changing their loan provider. The CEO's political connection is expected to have a significant effect on the firm's corporate decision in terms of switching loan provider.

In spite of China's economy experienced a rapid growth in the involvement of firms belonging to the private sector during the transition period from a centrally controlled to a market-determined one, most of the listed companies are state-owned enterprises that are partially privatized. To distinguish the type of political connection, this study uses an index to categorize the connection into five types that includes five dummies. The second hypothesis address the differentials of CEO's different types of political connection and the effect of multiple political connections. The influence of different types of political connection is different and a government connection is expected to have a stronger impact on firm's switching behaviour relative to connecting to NPC or CPPCC.

In fact, the three positions of chairman, CEO and Party secretary of firm's Party committee are the top positions of a wholly state-owned enterprise or state capital holding company registered under the Company Law, which could be the same person for two of these top positions. One of the most common management features of SOEs is that the three positions are held by the two leaders of the SOEs, one of whom holds two positions. If the two positions are held by the same person, he or she will be the top leader of the company. The usual situation is that the chairman of the board of directors is also the Party secretary of firm's Party committee, as the "chief", while another SOE leader is the "second-in-charge" as CEO, or it could be the case of the CEO is also the company's Party secretary. Details of variables are displayed in Table 5.1.

Table 5.1: Variable description

Variables	Description	Unit
<i>Switch</i>	Dummy variable takes value 1 if a firm starts to borrow from a new bank that did not have relationship with it in the past 12 months, 0 otherwise.	-
<i>Age</i>	Age of the firm when the firm switches.	Month
<i>Size</i>	Natural logarithm of year-ended total asset deflated by the Chinese GDP deflator.	CNY
<i>SOE</i>	Dummy variable that takes value 1 when the firm is state-owned enterprise; 0 otherwise.	-
<i>Profit</i>	Ratio of net profit on total assets.	%
<i>Leverage</i>	Ratio of long-term debt to total assets.	%
<i>Cash flows</i>	Ratio of cash and cash equivalents to total assets.	%
<i>Growth</i>	Ratio of sales growth.	
<i>Collateral</i>	Ratio of tangible assets to total debt.	%
<i>Opaqueness</i>	Ratio of intangible assets to total assets.	%
<i>Industry</i>	Eight sector dummies that take value 1 when the firm is operating in the sector of Agriculture /Mining /Manufacture /Construction /Energy /Transport /Real estate /Service, 0 otherwise.	-
<i>CEOage</i>	Age of CEO when the firm switches.	Year
<i>Gender</i>	Dummy variable that takes value 1 when the firm is run by a male CEO, 0 otherwise.	-
<i>Tenure</i>	Tenure of CEO when the firm switches.	Month
<i>Change</i>	Dummy variable takes value 1 if there is a change in CEO in a current relationship, 0 otherwise.	-
<i>Political connection</i>	Dummy variable takes value 1 if the CEO meets one of the following requirements: 1) current or former representative of the Communist Party of China; 2) current or former government officials (officer of the central or local governments, state authorities, and military); 3) former CEO or chairman of SOEs; 4) current or former deputy of National People's Congress (NPC); 5) current or former member of Chinese People's Political Consultative Conference (CPPCC), 0 otherwise.	-
<i>Party</i>	Dummy variable takes value 1 if the CEO is current or former representative of the Communist Party of China, 0 otherwise.	-
<i>Government</i>	Dummy variable takes value 1 if the CEO is current or former current or former government officials (officer of the central or local governments, state authorities and military, 0 otherwise.	-
<i>SOE's CEO</i>	Dummy variable takes value 1 if the CEO is former CEO or chairman of SOEs; 0 otherwise	-

<i>NPC</i>	Dummy variable takes value 1 if the CEO is current or former deputy of National People's Congress (NPC), 0 otherwise.	-
<i>CPPCC</i>	Dummy variable takes value 1 if the CEO is current or former member of Chinese People's Political Consultative Conference (CPPCC), 0 otherwise.	-
<i>SOB</i>	Dummy variable that takes value 1 if the lending bank is the five largest state-owned commercial banks (also known as Big5), 0 otherwise.	-
<i>JSCB</i>	Dummy variable that takes value 1 if the lending bank is joint-stock commercial bank, 0 otherwise.	-
<i>CCB</i>	Dummy variable that takes value 1 if the lending bank is city commercial bank, 0 otherwise.	-
<i>Policy</i>	Dummy variable that takes value 1 if the lending bank is policy banks, 0 otherwise.	-
<i>Foreign</i>	Dummy variable that takes value 1 if the lending bank is foreign banks, 0 otherwise.	-
<i>Other</i>	Dummy variable that takes value 1 if the lending bank is other types of banks, 0 otherwise.	-
<i>Crisis</i>	Dummy variable that takes value 1 if the year of switching in crisis year 2008 and 2009, 0 otherwise.	-
<i>City</i>	Dummy variable takes value 1 if the firm locates in the most developed tier-1 cities include Beijing, Shanghai, Guangzhou and Shenzhen, 0 otherwise.	-
<i>Govt* SOE's CEO</i>	Cross effect of CEO's multiple political connection of government and SOEs.	-
<i>Govt*NPC</i>	Cross effect of CEO's multiple political connection of government and National People's Congress.	-
<i>NPC*CPPCC</i>	Cross effect of CEO's multiple political connection of National People's Congress and Chinese People's Political Consultative Conference.	-

5.4.2 Data and Sample

Instead of using the board members, this study focuses on the firm's CEO's political connection and therefore narrows the range of directors and obtains the data on types of connection by manually identifying the background of CEO. For each listed company, the characteristics of executives such as their age and gender, as well as the profile of the CEO and board of directors can be obtained from the category of executive information from the China Stock Market and Accounting Research (CSMAR) database. In addition to the CEO's (director's) name, the profile typically contains information on age, gender, education, professional background, employment history, and start and end date of the position. From the profile, the CEO's political ties

can be traced by identifying whether he or she was currently or formerly an officer of the central government, a local government, state authorities, the military, or a former CEO/chairman of SOE, or a representative of the Party, NPC or CPPCC. For listed companies in the sample that with missing CEO's data, I manually collected CEO personal information and profiles by looking at the "Directors, Supervisors, Senior Management and Employees" section of listed firms' annual report from the website of company's official site, *Juchao*, *Sino Finance* and *Fenghuang (Phoenix) Finance Channel*.

Finally, this study obtains CEO data for 2,102 listed companies during the 2000-2016 period and covering 3,268 CEOs in that period. In addition to the CEO data, this study also obtains loan data, financial data, ownership data, industry and regional data from the CSMAR database. Table 5.2 reports information on the sample of listed companies, almost 36% of the sample listed firms appointed politically connected CEOs who were current or former government bureaucrats, deputies NPC or members of CPPCC, which suggests that the government remains direct influence on the considerable portion of firms through its CEO appointments.

The sample description has been displayed in Table 5.2. Different panels in this table report the sample by different criteria. For example Panel A shows that the listed companies in the sample on the year basis, Panel B shows the sample by firm's ownership structure, Panel C shows the sample by firm size, Panel D breaks down the sample by industry sector. There is no specific pattern in the percentage of politically connected CEOs on a year-by-year basis or among different sizes of firms, but there is an ownership variation, and cross-industry variation in the appointment of politically connected CEOs. It is easy to understand that the state-owned firms have a higher proportion of politically connect CEOs relative to the non-state owned firms, which is 56% and 21%, respectively, though this is the statistics that observed from the CEO profile of SOEs that meets at least one type of the political connections. Moreover, the highest percentage politically connected CEOs occurs in the transport sector (60%), followed by the energy sector (58%), agriculture sector (47%), construction sector (41%), mining sector (40%), real estate sector (37%), manufacture sector (36%) and service sector (23%).

Table 5.2: The Sample

	Total sample number	Firms with political connected CEOs	
		Number	% of the total sample by year/ownership/size/sector
Panel A: By year			
2000	57	7	12.28%
2001	119	9	7.56%
2002	220	20	9.09%
2003	222	30	13.51%
2004	192	47	24.48%
2005	69	22	31.88%
2006	75	16	21.33%
2007	243	56	23.05%
2008	402	105	26.12%
2009	445	130	29.21%
2010	457	144	31.51%
2011	497	137	27.57%
2012	867	232	26.76%
2013	1,129	282	24.98%
2014	1,287	302	23.47%
2015	1,217	262	21.53%
2016	70	16	22.86%
Panel B: By ownership			
SOEs	944	524	55.50%
Non-SOEs	1,158	241	20.81%
Panel C: By size			
Large	1,326	490	36.95%
SMEs	776	275	35.44%
Panel D: By industry			
Agriculture	38	18	47.37%
Mining	136	54	39.71%
Manufacture	1,238	448	36.19%
Construction	58	24	41.38%
Energy	78	45	57.69%
Transport	70	42	60.00%
Real estate	150	56	37.33%
Service	334	78	23.35%
Total	2,102	765	36.39%

Note: Columns 1 reports the number of firms in the sample, Columns 2 and 3 report numbers on the subsample of firms led by politically connected CEOs. Panel A, B, C, and D report the sample by year, firm's ownership, size and industry sector respectively.

5.5 Results

The regression analyses have been performed to examine the effects of the CEO's political connections on the firm's switching behaviour. To examine whether the effect of political connection is significant in firms' switch behaviour and the difference between five types of political connection, running the regression separately with one using an indicator to measure CEO's political connection, and the other using an index (with five dummies) to capture the influences from five types of political connection. The results of Logistic regressions particularly focus on the effects of political connection are shown in Table 5.3 that consists of two panels, where the marginal effects values reported. The column of *lower* bound reports the marginal effects of political connection indicators that using the sample with CEO's political connection characterized by the definition mentioned above, while the results are shown in the column of *upper* bound using the data that make all state-owned enterprises' CEO default as having political connection, thus the dummy variable of political connection codes as 1 if it is an SOE, even though the CEO's profile information show none previous or current experience in government bureaucrats or military, NPC or CPPCC. The reason to include an upper bound is that, under the condition of China economy, the most important executives of SOEs must be appointed by the state or government, this could be either chairman, or CEO, or party secretary, and it could be the same person to take two of these positions. An SOE's CEO's profile shows no experience that related to the government or meets none of the five political connections requirement above does not mean that this SOE has no political connection, it is possible the case of the chairman or company's Party secretary are politically connected. Under this special circumstance, an upper bound is necessary to be included to examine the scale of politically connected CEO's effect.

The difference between Panel A and B is that regression in Panel A only controls for the firm-level specific characteristics, including firm's age, size, ownership, profitability, leverage, cash flows, growth, ability of pledge collateral, level of opaqueness and management characteristics such as CEO's age, gender, length of term, political connection and their turnover. Additionally, Panel B also controls for the ownership characteristics of banks, and environment factor, as well as the interactive terms. The estimated results show that the CEO's political connection lowers the

likelihood of firm's switch behaviour, the probability of switching of these politically connected firms is 2% lower than non-connected firms, which confirms the first hypothesis of CEO's political connection has a significant impact on firm's switching behaviour. Using an index to categorize the political connection into five types of connection, the direction of different types of political connection effect is consistent with the overall indicator of political connection, though this effect is only significant in two of these types of connections. For example, when firm's CEO is a former SOE's CEO or member of Chinese People's Political Consultative Conference (CPPCC), these firms have 4.04% or 7.30% lower switch probability relative to firms that do not have these types of political connections, respectively. This result supports the first part of the second hypothesis. On the other side, the results in the upper column shown in Table 5.3 indicates that measuring CEO's political connection in a way that making the CEOs of all SOEs default to have a political connection, therefore the political connection indicator takes the value of 1 for all SOEs in this sample. Though this new sample generates an insignificant result for political connection indicator, it does show the same direction of this political effect and a significant result of being a member of CPPCC, which is partially in line with the results shown in the lower bound.

Adding additional sets of variables such as bank factors, environment factors and interactive terms generate slightly different results, which can be seen from Panel B. CEO's political connection is insignificant in both of the lower and upper bound by using two ways to measure CEO's political connection. Although the signs of different types of political connection are consistent with the results shown in Panel A, they are not significant, except for a connection with the NPC. A politically connected firm that has CEO is a former or current deputy of Nation People's Congress more likely to switch credit provider compared to firms without these types of connection when considering all sets of covariates.

Table 5.3: Effect of Political Connection

	Lower bound	Upper bound
Panel A		
Political connection	-0.0192** (0.0093)	-0.0094 (0.0144)
Connection Index		
Party	-0.0110 (0.0120)	-0.0160 (0.0116)
Government	-0.0126 (0.0163)	-0.0118 (0.0163)
SOE's CEO	-0.0404* (0.0241)	-0.0227 (0.0559)
NPC	-0.0085 (0.0215)	-0.0039 (0.0215)
CPPCC	-0.0730*** (0.0247)	-0.0723*** (0.0247)
Panel B		
Political connection	-0.0062 (0.0103)	-0.0194 (0.0154)
Connection Index		
Party	-0.0137 (0.0134)	-0.0125 (0.0134)
Government	-0.0209 (0.0209)	-0.0182 (0.0209)
SOE's CEO	-0.0704 (0.0467)	-0.0289 (0.0528)
NPC	0.1025*** (0.0284)	0.1050*** (0.2836)
CPPCC	-0.0160 (0.0276)	-0.0159 (0.0276)

Note: ***, **, * indicates significant at the 1%, 5% and 10% levels. Marginal effects are reported, the standard errors are reported in the parentheses. **Party** denotes current or former representative of the Communist Party of China; **Government** denotes current or former government officials (officer of the central or local governments, state authorities and military); **SOE's CEO** denotes former CEO/chairman of SOEs; **NPC** denotes current or former representative of National People's Congress **CPPCC** denotes current or former member of Chinese People's Political Consultative Conference.

Table 5.4 presents the results of Logistic regressions that analyse the effects of politically connected CEOs, characteristics of both firms and banks as well as an environment factor for the benchmark model and different groups of subsamples. In addition, interactive terms are also included to capture the effect of CEO's multiple

types of political connections. This chapter considers CEO's affiliation with the government as an indication of political interference. A government can be the central government (i.e. State council, the Communist Party of China), a local government that governs the geographic region within which the firm is located. It is commonly observed that listed firms' CEOs have multiple political links from this sample. To investigate whether the effects of political connections are concentrated in two or more specific types of political ties, interactive terms of separate political connection variables are incorporated. The combination of multiple political links is selected to form the interactive terms based on what I have observed from CEO's profile in the sample. Table 5.4 reports the interactives terms only with the significant result.

Although the dummy variable of CEO's political connection shows insignificant effect when considering bank factor, environment change and interactives, the interactive terms show that multiple political connections significantly reduces the probability of firm's switching, this effect is also significant on firms' switching behaviour for the subsamples of state-owned firms, non-state-owned firms, large firms and SMEs with three main features. First, firms with a CEO is current or former government officials also a former leader of SOEs are less likely to switch, especially in the subsamples of SOEs and large firms and this effect is stronger for large firms. Second, firms with a CEO is current or former government officials also deputy of National People's Congress (NPC) are less likely to switch, particularly in SOEs and small firms, and this effect is stronger for small firms. Third, firms with CEO is current and former deputy of NPC and also member of Chinese People's Political Consultative Conference (CPPCC) are also less likely to switch lenders, this effect is particularly significant in the subsamples of non-state-owned firms and large firms.

Therefore, firms that with politically connected CEOs are less likely to change their loan provider and these firms probability of switching is about 21.7% (average of the above combination of multiple types of political connections) lower relative to firms without politically connected CEOs. The interactive result (with 28.5%, 20.7%, and 15.9% for *Govt*SOE's CEO*, *Govt*NPC*, and *NPC*CPPCC*, respectively) indicates that the effect of connecting with government bureaucrats is greater than connecting with the NPC or CPPCC, because the government in both central and local level, as well as government agencies are more powerful than institutions like NPC and CPPCC,

which supports the second hypothesis. In particular, the effect of multiple political connections is stronger for the subsample of small firms, leads to a 71% lower in the probability of switching compared to non-connected small firms. This may due to these political relationships provide explicit government guarantee that may ensure them to obtain loan renewal from their existing relationship bank thereby less likely to switch to others.

These results are consistent with the evidence found that political connection has positive impacts on accessing bank loans. Having connection with the government department, especially multiple political ties, enables the firm to access bank loans more easily. If this could be achieved through renewing loan contracts with their existing banks, they would be less likely to consider changing their loan provider. This evidence confirms the broad theoretical and empirical agreement on the view that closer and stable firm-bank relationships efficiently develop a unique management structure. It not only reduce the level of information asymmetry between the firm and the bank, but also enables firms to access bank credit easily with lower loan rates and better loan conditions (e.g. Berger and Udell, 1995; Bharath et al, 2011; Boot and Thakor, 1994; Cole, 1998; Elsas and Krahnen, 1998).

In addition, the regression results show that small, non-SOEs and firms with high profitability, cash flows more likely to switch their credit provider. Large firms that have already build long bank-firm relationship prefer to stay with their incumbent bank. Apart from this, firms with older CEOs and CEO change, run by male CEO are more likely to switch lender, which confirms the finding of Faccio et al. (2016) suggesting that CEO gender plays a crucial role in corporate decision making. According to Faccio et al (2016), there are gender-related differences in risk-aversion, where women display a lower propensity for risk-taking than men, and tend to avoid choices that are (from their perspective) “too risky”. In particular, female CEOs tend to avoid riskier investment and financing opportunities, and are less likely to undertake all positive net present value projects. The age of the CEO affects his/her risk tolerance, which in turn affects the company’s investment and financing decisions. As suggesting by the existing literature, the older the executives, the more inclined they are to avoid risks

and be more robust in corporate decision-making and corporate behaviour³⁶, which contradicts my empirical finding, though this effect is too small to consider.

Moreover, firms do not have bank relationship with five large state-owned commercial banks (*SOB*) or joint-stock commercial banks (*JSCB*) have higher tendency to change their loan provider compared to firms that have loan relationships with major SOBs and JSCBs. Besides, firms located in the most developed cities such as Beijing, Shanghai, Guangzhou and Shenzhen less likely to switch to other lenders. Overall, most of these covariates results in this chapter are consistent with the results found in Chapter 3 using the survival analysis, to complement these results, this chapter also provides evidence that CEO's political tie has an impact on firm's switch behaviour, as well as the effect of CEO's gender.

³⁶ See Bertrand and Mullainathan (2001); He and Liu (2010).

Table 5.4: Estimate Results of the Logistic Regression Model

Variable	Benchmark	SOEs	non-SOEs	Large Firms	SMEs
Firm					
Age	0.000***	-0.001***	0.000**	-0.001***	-0.001***
Firm size	-0.043***	-0.025***	-0.066***	-0.039***	-0.047***
SOE	-0.024***			0.004	-0.088***
Profit	0.002**	-0.002	0.007***	0.001	0.004**
Leverage	0.001	-0.001	0.002**	-0.001	0.004***
Cash flows	0.004***	0.004***	0.003***	0.005***	0.000
Growth	0.000	0.015	0.000	0.000	0.001
Collateral	0.000	0.000	0.000	0.000*	0.000
Opaqueness	-0.000***	-0.003***	-0.001	-0.002	-0.001
Industry	Yes	Yes	Yes	Yes	Yes
Management					
CEO age	0.003***	0.003***	0.002	0.003***	0.002
Gender	0.042**	0.020	0.036	-0.003	0.106***
Tenure	0.000	0.000	0.000	0.000	0.000
Change	0.262***	0.272***	0.236***	0.281***	0.221***
Political connection	-0.006	-0.032**	-0.002	-0.024	0.026
Bank					
SOB	-0.224***	-0.132***	-0.336***	-0.224***	-0.208***
JSCB	-0.112***	0.001	-0.241***	-0.100***	-0.124***
CCB	-0.012	0.037	-0.079**	0.006	-0.034
Policy	-0.029	0.071**	-0.161***	-0.019	-0.033
Foreign	0.019	0.089***	-0.063	0.060**	-0.113**
Other	0.000	0.000	0.000	0.000	0.000
Environment					
Crisis	-0.016	-0.021	-0.024	-0.022	0.006
City	-0.028***	-0.054***	0.002	-0.025**	-0.011
Interactive terms					
Govt* SOE's CEO	-0.285***	-0.304***	0.000	-0.359***	-0.079
Govt*NPC	-0.207***	-0.403***	-0.115	-0.132	-0.707***
NPC*CPPCC	-0.159**	0.000	-0.164***	-0.166***	0.151
Observation	16,776	8,472	8,304	12,146	4,630
Prob > chi2	0.000	0.000	0.000	0.000	0.000

Note: ***, **, and * indicates significance level at the 1%, 5% and 10% level, respectively. Marginal effects are reported. The definition of large, medium and small firms based on the classification of firm's size made by *National Bureau of Statistics of China* (See Appendix B-Table B1).

5.6 Conclusion

This chapter has documented a significant presence of politically connected CEOs in publicly listed companies in China. Firms with politically connected CEOs are less likely to change their loan provider. Overall, the analysis of the particular types of political connection suggests that these measures reasonably capture the effects of government intervention in publicly traded firms in China. Even though the measures do not capture all possible channels of CEO's political connections, this study still finds that they have important influences on firm's switching behaviour. In addition, having a connection with government bureaucrats on both central and local levels implies that firms have the strongest type of political connection, which brings the largest influence on firms' switching behaviour by maintaining stable relationships with their incumbent banks and lowering likelihood of changing to other banks. Moreover, the significant interaction terms show that multiple political ties also lower the likelihood of switching, and this effect is stronger for the relatively small firms.

Various studies show that companies with political connections can obtain more loans, more favourable loan conditions and longer debt maturities, which are mainly due to the institutional substitution (Cull and Xu, 2005; Yu et al., 2010), implicit guarantee (Sun et al., 2006), and signal transmission of political connection (Hu, 2006; Sun et al., 2005). When the judicial system is inefficient and private property rights cannot be effectively protected, the informal system of substitution of political connections can reduce firms' operational risks and infringements, thereby reducing the difficulty of obtaining loan (Xiong, 2012). Implicit guarantees indicate that firms with political connections can get more government bailouts (Faccio et al., 2006), more financial subsidies (Luo and Tang, 2009; Yu et al., 2010), and preferential tax (Wu et al., 2009). The signal transmission mechanism describes that the political identity of the entrepreneur reflects favourable impression of the company that may obtain more investment and growth opportunity (Hu, 2006).

Generally speaking, from the perspective of rent-seeking, foreign scholars usually find that political connections bring a lot of rent-seeking benefits to enterprises, which influences their performance. From the perspective of the informal system substitution, domestic scholars believe that political connections protect enterprise property rights,

reduce government plunder, and thus influences enterprise performance. In the China context, and given that the mix results of political connection and firm value from previous literature, firms should fully consider the benefits of political connection brings to the firms as well as the management risk. Meanwhile, progress in SOE reform and development should be the criteria for assessing the performance of Party organizations in SOEs, stressing they should aim to improve corporate profitability, competitiveness and preserve or increase the value of state assets.

The heterogeneity of state-owned enterprises and private enterprises in terms of survival conditions, development goals and the way in which executives are appointed will result in large differences in their political strategies. Therefore, it is necessary to consider the influence of the enterprise mechanism on the political relationship. On this basis, the specific ways and mechanisms of political connection to the value of the enterprise can be further considered. In this way, a more comprehensive study of corporate remediation can be conducted in the future

6 Conclusion

6.1 Summary of Key Findings

What causes firms to switch to different loan provider in China? Using 18,233 firm-bank loan relationship matched data during 1996-2016, survival analysis has been applied in to examine the determinants of a firm switch to new banks and firm-bank relationship change in China. A Switch is defined as a firm obtains a loan from a new bank with which it did not have a lending relationship during the previous 12 months. As it is commonly recognized that firms in China borrow from multiple banks simultaneously and thereby changing from one bank to another does not necessarily mean that weakens the relationship with previous banks, or even terminates this current relationship. Forming a new relationship when a past loan deal with firm's current bank is outstanding is also considered as a switch through adding a new bank relationship. Hence, a firm's switch behaviour could be defined either by moving to other banks (terminating current relationship) or adding a new bank relationship in or after a current deal with its current bank.

Controlling for time-varying and time-invariant covariates of firm's characteristics, management characteristics, bank type-ownership and the economic environment, hazard functions from Chapter 3 show that small and young firms, and less leveraged firms are more likely to switch to other banks. These firms are considered as riskier and less profitable firms that obtain funds more difficultly relative to large firms, thereby switching may occur when their credit needs cannot be fulfilled by their incumbent banks. Firms operating in the real estate sector are found to be more likely to switch loan provider, compared to other sectors, this may due to the rapid development of China real estate industry in the 2000s with an increasing credit demand to support their expanding investments. In addition, the probability of switching will be higher if firms experience a CEO switch during the relationship period, and their tenure will increase the likelihood of switching banks.

As regards the effect of supply side, bank ownership shows a significant impact on firms switching behaviour. Firms that borrow from non-SOBs have a higher

probability of changing their bank loan provider (switching), while firms that have a loan relationship with the five large-scaled state commercial banks (SOBs) are more likely to stay longer in a stable bank relationship and less likely to change loan providers. Changing the economic environment could bring reasonable change to firm's switch. Increasing the PBoC's benchmark lending rate and reserve requirement ratio during the tight monetary policy period may push firms to switch, this may be due to an increase in bargaining power from the lending side. Likewise, all firms are less likely to switch in times of economic crisis as in the 2008-2009 period. Moreover, the more bank relationship a firm has, the higher its probability of switching.

These covariate effects are also consistent and robust in Chapter 4 and 5. To complement the main drivers of firms switching behaviour, Brand Performance Measures (BPM) generated from the Dirichlet model in Chapter 4 suggest that smaller bank group not only have far fewer borrowers than the larger bank group but also somewhat lower average borrow frequencies (i.e. lower repeat borrowing, less loyal borrower). Borrowers of the five large SOBs are the most loyal firms with the highest borrowing frequency and repeat rate. Besides, the highest duplication rate of SOBs indicates that most of the borrower of other bank groups also borrow from five large SOBs, which implies that SOBs are still very powerful and competitive in China's banking industry today. In addition to the external switching, firms are also observed to switch internally within a group of the bank. Using the Big5 as an example, borrowers of one SOB is also the customer of another SOB, the duplication level of borrowing from these five large SOBs does not vary too much as their market share and penetration level is very similar to each other. An extension of Dirichlet approach by adding covariates shows that SOEs are more likely to choose to borrow from SOBs than other types of banks, and this effect is significant for both subsample period of pre-crisis and post-crisis. It is unsurprising that SOEs' borrowing choices favour to SOBs due to historical reason and their natural close relationships, SOEs are perceived to have government to support them and also SOBs may have some preference internally in order to meet their 'quotas'. In general, the borrowing patterns of listed companies in China are mostly consistent in both pre and post-crisis period. The loyalty level to the SOBs declines considerably in the post-crisis period, which could be made up by an increase in the market shares of Joint-stock commercial banks (JSCBs) and City commercial banks (CCBs), as well as other groups of banks and their improving

customers' loyalty, indicating China's banking sector is moving towards a more commercial base.

Furthermore, Chapter 5 has confirmed the role of political connection in China's borrowing and lending relationship between firms and banks. Firms with politically connected CEOs are found to be less likely to change their loan provider. To some extent, some of these types of political connection suggest that these measures reasonably capture the effects of government intervention in publicly traded firms in China. In particular, having a connection with government bureaucrats on both central and local levels implies that firms have the strongest type of political connection, compared to the relationship with NPC or CPPCC, which brings the largest effect on firms' switching behaviour by maintaining stable relationships with their incumbent banks and lowering likelihood of changing to other banks.

To summarize. SOBs and SOEs have super stable firm-bank relationships, as for the rest, small, young and non-SOEs, firms with lower leverage, and multiple bank relationships, and operating in the real estate, and non-politically connected firms are more likely to switch. Firms that borrow from non-SOBs are also more likely to switch. Significantly, a long CEO tenure and a CEO switch during the lending relationship increase the likelihood of a switch.

6.2 Discussion and Policy Implication

What do these results tell us about the Chinese banking system and the lending relationship with the company sector? It tells us that political connection is important, *guanxi* is important³⁷, the decision of switching also credit provision in China is not just the same as Western countries, which is mainly decided on the commercial ground, but on political connection, ownership characteristics, management characteristics and economic environment condition as well. It also tells us that even in an environment of increasing commercialization, an environment fostered by the continuous reforms to the banking sector, the firm-bank relationship between SOEs and SOB s remain strong,

³⁷ The state ownership of the firm and bank represents one type of '*guanxi*'. The political ties of CEO also indicates a '*guanxi*' in the borrowing and lending activities and switching behaviour.

but the credit needs of the firm put a strain on it. A change in the CEO increases the likelihood of a firm changing its loan provider but a change to whom? It is possible that in the case of the SOE-SOB relationship the change is to another SOB through the political connection route, this has been partially confirmed in Chapter 5 which emphasizes the role of top executive's political connection. The within SOB group duplication analysis suggests that SOEs tend to change their loan providers internally between SOBs only indicating the strength of relationship within state-owned businesses. Another interpretation is that the increased commercialization of relationships in recent times has partially pushed firms away from the traditional 'guanxi' type of relationship in business, but these relationships especially in the state-sector remain strong³⁸. However, SOBs play a significant role in funding SOEs, resulting in nature and close relationship that impedes the business of good banking to some extent.

Managing and marketing of loan activities are crucial areas of research because of a stable and more commercialize firm-bank relationship is pursued by both firms and banks in China. Nearly half of firms maintain a multiple bank relationship and changing their loan provider does not cut them off from resurrecting a past bank relationship in the future. The fit of the Dirichlet model to firms borrowing from multiple groups of lending banks suggests that the well-known double jeopardy pattern observed in consumer-packaged goods can be extended to borrowing and lending relationships, which recommends that the NBD-Dirichlet model may apply to other context and data, for example, other financial activity behaviours – mergers and acquisitions, public listings, bond issuance etc. My exploration and findings provide great potential and possible implications for policy makers, banks and professional, as well as guidance policy on the firm-bank relationship, helps banks and other financial intermediaries to understand changes in these relationships and offers an insight for academic researcher and marketer to extend it to other fields.

³⁸ On the one hand, as the empirical evidence shows that SOE-SOB relationship remain super stable, thus switch (change) behaviour is less likely to happen in the state-owned enterprises. On the other hand, firms with 'guanxi' in terms of political ties have higher propensity to switch, because these 'guanxi' allows them to access credit from new loan providers easily. From the bank's perspective, having political connection gives them a strong signal that their loans contracts are implicitly and explicitly guaranteed by the government.

The policy implications from this study may be obvious to those of a poor understanding of the Chinese political economy. To some extent, a super stable SOE-SOB relationship seems like a roadblock which may bring impediment for Chinese development in various aspects, such as market competition, institutional environment and the development of non-state banking sector and non-state corporate sector. But China's commercial and banking system, while modern in many respects, this is a foundation on relationship norms developed over centuries. In fact, doing business in a transitioned economy like China is full of risks and uncertainty, even in the post-WTO era. A famous Chinese quote saying "*Crossing the river by feeling the stones*" was borrowed to represent a scientific working method, indicating that it is necessary to conduct a safe attitude in the face of new things and seek-stability. This also represents the second generation of the national leader Deng Xiaoping's attitude and method of leading China's reform and opening up, and it has been continually used today as a long-term guideline in the future. It vividly and accurately expresses the need to explore progress in the absence of experience, and suggests that reform must rely on certain theoretical research, economic statistics and economic forecasting. More importantly, the reform should be more trials and more summaries. The trials are successful and then promoted, which emphasizes both stability and exploration. As a result, the historical achievement in the past 40 years of reform and opening up is a full affirmation of the reform principle of "crossing the river by feeling the stones". Hence, it is an effective reform guideline with Chinese characteristics and in line with China's national conditions. Further reform and development are necessary to process in order to achieve a more commercialize and developed economy. Meanwhile, this study suggests the policymakers focus on removing the financial constraints and creating flexibility in the financial market, reducing the ideological discrimination against private sector by encouraging more SOBs to lend to non-SOEs to solve the small firms' problem of difficult financing to balance lending bias issue.

6.3 Limitations and Further Research

There are limitations of this study which could be further improved in a few ways and numerous extensions of this study could be done in the future. Firstly, although the

survival analysis provides significant determinants of firm's switching behaviour, and the Dirichlet approach explains well of the loan borrowing patterns of listed firms, these do not reflect the borrowing behaviour of all types of companies in China, especially those non-listed firms. This calls for future research to use a dataset that includes non-listed companies to verify the NBD-Dirichlet model patterns are evident for actual engagement in loan activity as well as the main driver of switching. Secondly, although the borrowing patterns and what else banks firms also borrow from have been addressed in this study, the question of where do firms switch to has not been completely solved, because firms are observed to switch either to a single lender or to multiple lenders, or both happen simultaneously in this sample, which brings challenges to fully address this issue. A proper measurement is possibly needed to be considered to identify deeply which bank group (or particular bank) firms switch to. Thirdly, broader applications were sought (i.e. by looking at frequency and duration combined, or replications across different countries), while there were many challenges with obtaining data that is in the correct format to apply the Dirichlet model. Since firms' borrowing behaviour is multifaceted, suggests that future research investigate differences in the various types of lending banks and other types of credit providers (i.e. private banks, shadow banks, etc) option available, to understand whether marketing strategy should focus on promoting loan products broadly, or particular types and/or combinations of lending activity. Finally, a benefit and cost analysis can be conducted to investigate the post effects of switching, for example how loan features and subsequent performance are impacted over time, do banks have less power to profit its clients?

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Appendix

Appendix A – for Chapter 2

Table A1: NPLs ratios of commercial banks (percentage %)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
SOB	10.5	9.7	8.0	2.8	1.8	1.3	1.1	1.0	1.0	1.2	1.7	1.7
JSCB	4.2	2.3	2.1	1.3	1.0	0.7	0.6	0.7	0.9	1.1	1.5	1.7
CCB	7.7	4.8	3.0	2.3	1.3	0.9	0.8	0.8	0.9	1.2	1.4	1.5
RCB	6.0	5.9	4.0	3.9	2.8	1.9	1.6	1.8	1.7	1.9	2.5	2.5
FB	1.1	0.8	0.5	0.8	0.9	0.5	0.4	0.5	0.5	0.8	1.2	0.9

Note: Note: SOB indicates five large-scaled State-owned commercial banks (Big5); JSCB indicates Joint-stock commercial banks; CCB indicates City commercial banks; RCB indicates Rural commercial banks; FB indicates foreign banks.

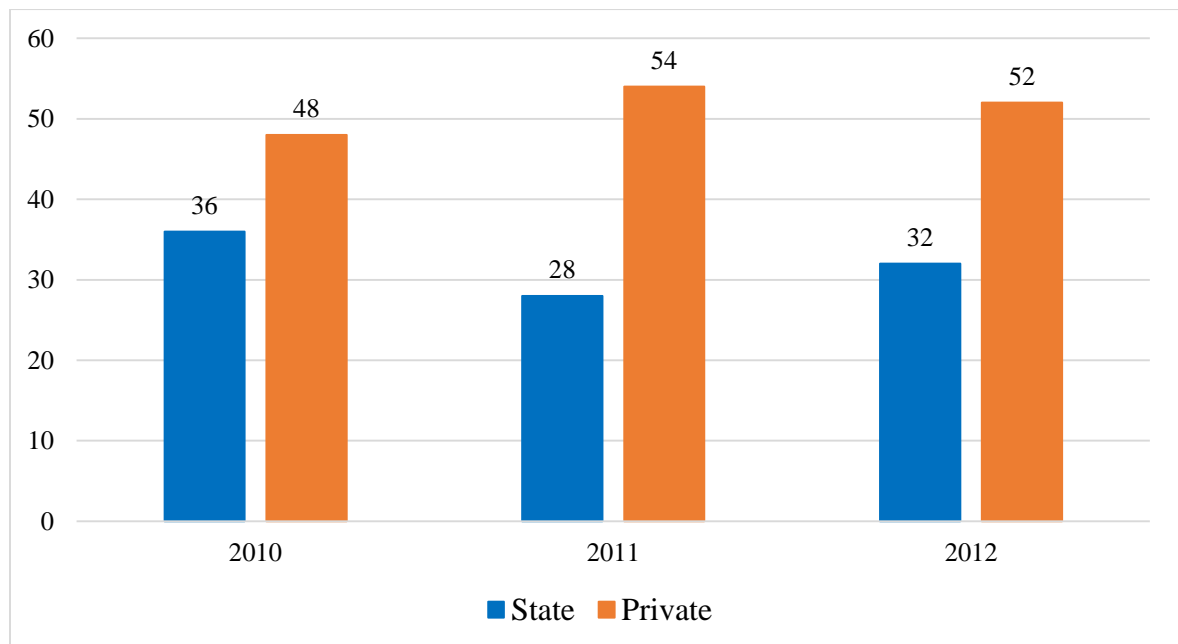
Source: China Banking Regulatory Commission (Annual report 2006-2012)

Table A2: Interest coverage ratio of state and private industrial enterprises, 1996–2012

	State enterprises	Private enterprises
1996	1.30	5.03
1997	1.32	3.23
1998	1.35	2.91
1999	1.73	3.68
2000	3.00	4.13
2001	3.10	4.59
2002	3.31	5.29
2003	4.54	5.72
2004	5.62	5.75
2005	6.32	6.43
2006	6.95	7.13
2007	6.90	7.77
2008	4.62	8.41
2009	4.93	9.22
2010	6.57	10.84
2011	5.28	9.96
2012	4.30	9.56

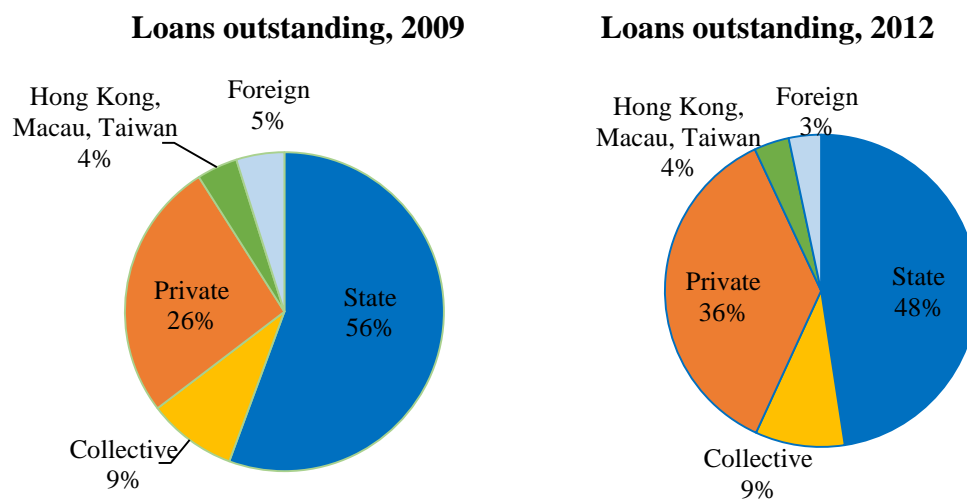
Source: National Bureau of Statistics of China (2013), Lardy (2014).

Figure A1: Flow of enterprise loans by ownership, 2010-12
(% of total enterprise loan)



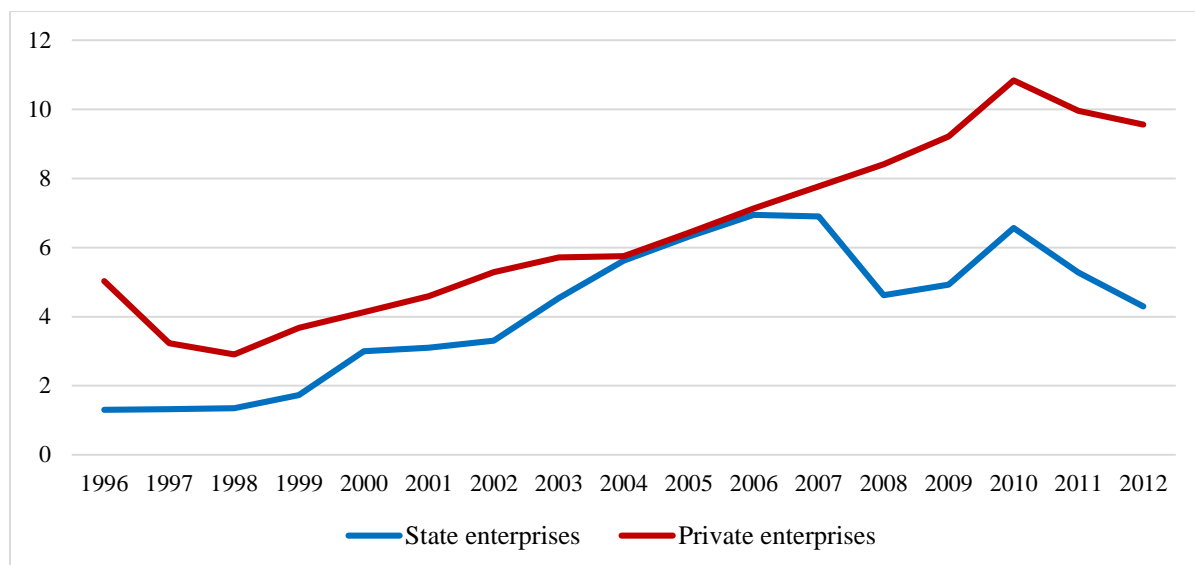
Sources: China Banking Association (2011, 2012, 2013), Lardy (2015).

Figure A2: Stock of enterprise loans by ownership, 2009-12



Sources: China Banking Association (2010, 2013) , Lardy (2014).

Figure A3: Interest coverage ratio of state and private industrial enterprises, 1996-2012



Note: Interest coverage ratio = (EBT + Interest Expense) / Interest Expense

Source: National Bureau of Statistics of China (2013), Lardy (2014).

Appendix B – for Chapter 3

Table B1: Statistical definitions of large, small and medium sized firms

Industry category	Index	Unit	Large	Medium	Small
Farming, forestry, animal husbandry and fishing	Operating income(Y)	10,000	$Y \geq 20000$	$500 \leq Y < 20000$	$50 \leq Y < 500$
Industry	Employees(X)	People	$X \geq 1000$	$300 \leq X < 1000$	$20 \leq X < 300$
	Operating income(Y)	10,000	$Y \geq 40000$	$2000 \leq Y < 40000$	$300 \leq Y < 2000$
Construction	Operating income(Y)	10,000	$Y \geq 80000$	$6000 \leq Y < 80000$	$300 \leq Y < 6000$
	Total assets(Z)	10,000	$Z \geq 80000$	$5000 \leq Z < 80000$	$300 \leq Z < 5000$
Wholesale	Employees(X)	People	$X \geq 200$	$20 \leq X < 200$	$5 \leq X < 20$
	Operating income(Y)	10,000	$Y \geq 40000$	$5000 \leq Y < 40000$	$1000 \leq Y < 5000$
Retail	Employees(X)	People	$X \geq 300$	$5 \leq X < 300$	$10 \leq X < 50$
	Operating income(Y)	10,000	$Y \geq 20000$	$500 \leq Y < 20000$	$100 \leq Y < 500$
Transport	Employees(X)	People	$X \geq 1000$	$300 \leq X < 1000$	$20 \leq X < 300$
	Operating income(Y)	10,000	$Y \geq 30000$	$3000 \leq Y < 30000$	$200 \leq Y < 3000$
Storage	Employees(X)	People	$X \geq 200$	$100 \leq X < 200$	$20 \leq X < 100$
	Operating income(Y)	10,000	$Y \geq 30000$	$1000 \leq Y < 30000$	$100 \leq Y < 1000$
Post	Employees(X)	People	$X \geq 1000$	$300 \leq X < 1000$	$20 \leq X < 300$
	Operating income(Y)	10,000	$Y \geq 30000$	$2000 \leq Y < 30000$	$100 \leq Y < 2000$
Hotels	Employees(X)	People	$X \geq 300$	$100 \leq X < 300$	$10 \leq X < 100$
	Operating income(Y)	10,000	$Y \geq 10000$	$2000 \leq Y < 10000$	$100 \leq Y < 2000$
Catering service	Employees(X)	People	$X \geq 300$	$100 \leq X < 300$	$10 \leq X < 100$
	Operating income(Y)	10,000	$Y \geq 10000$	$2000 \leq Y < 10000$	$100 \leq Y < 2000$
Information transmission	Employees(X)	People	$X \geq 2000$	$100 \leq X < 2000$	$10 \leq X < 100$
	Operating income(Y)	10,000	$Y \geq 100000$	$1000 \leq Y < 100000$	$100 \leq Y < 1000$
Software and information technology services	Employee (X)	People	$X \geq 300$	$100 \leq X < 300$	$10 \leq X < 100$
	Operating income(Y)	10,000	$Y \geq 10000$	$1000 \leq Y < 10000$	$50 \leq Y < 1000$
Real estate	Operating income(Y)	10,000	$Y \geq 200000$	$1000 \leq Y < 200000$	$100 \leq Y < 1000$
	Total assets(Z)	10,000	$Z \geq 10000$	$5000 \leq Z < 10000$	$2000 \leq Z < 5000$
Property management	Employees(X)	People	$X \geq 1000$	$300 \leq X < 1000$	$100 \leq X < 300$
	Operating income(Y)	10,000	$Y \geq 5000$	$1000 \leq Y < 5000$	$500 \leq Y < 1000$
Leasing and business services	Employees(X)	People	$X \geq 300$	$100 \leq X < 300$	$10 \leq X < 100$
	Total assets(Z)	10,000	$Z \geq 120000$	$8000 \leq Z < 120000$	$100 \leq Z < 8000$
Unspecified industry	Employees(X)	People	$X \geq 300$	$100 \leq X < 300$	$10 \leq X < 100$

Source: National Bureau of Statistics of China (2011).

Table B2: Window guidance policy stance

Indicator	Stance	Period	Definition
-2	Strongly discouraging	2003Q1-2004Q4 2006Q2-2008Q2 2009Q2-2010Q1	CMPR explicitly discourage growth of total credit.
-1	Weakly discouraging	2005Q1-2006Q1 2010Q1-2012Q2	CMPR points the target of optimizing credit structure, provides risk warning, and/or mentions that banks should control the pace of credit growth.
0	No explicit direction	2001Q1-2002Q4 2012Q3-2014Q2	CMPR only mentions the target of optimizing credit structure and separately listing the sectors that should be both discouraging and encouraging or no explicit direction of credit growth.
1	Weakly encouraging	2014Q3-Present	CMPR only lists sectors that to be encouraged for the target of optimizing credit structure.
2	Strongly encouraging	1998Q1-2000Q4 2008Q3-2009Q1	CMPR explicitly encourages the growth of total credit.

Source: Quarterly China Monetary Policy Report, and Chen et al. (2017).

Appendix C – for Chapter 4

Table C1: Markets shares of major groups of banks (measured by the bank's asset, unit: %)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
State-owned banks (Big5)	58.03	56.91	56.06	55.15	53.66	51.58	51.31	49.20	47.34	44.93	43.34	41.21	39.21	37.29
Joint-stock commercial banks	10.70	11.54	11.92	12.39	13.69	13.99	14.86	15.64	16.22	17.61	17.80	18.21	18.55	18.72
City commercial banks	5.29	5.40	5.44	5.90	6.29	6.54	7.14	8.24	8.81	9.46	10.03	10.47	11.38	12.16
Rural commercial banks	0.14	0.18	0.81	1.15	1.15	1.47	2.35	2.90	3.75	4.70	5.63	6.69	7.64	8.73
Policy banks	7.68	7.63	7.82	7.90	8.05	8.94	8.73	8.03	8.22	8.39	8.28	9.18	9.67	9.90
Foreign banks	1.50	1.84	1.91	2.11	2.36	2.13	1.70	1.83	1.90	1.78	1.69	1.62	1.34	1.26
Other banks	16.65	16.50	16.06	15.40	14.80	15.35	13.90	14.16	13.74	13.12	13.23	12.63	12.20	11.95

Source: China Banking Regulatory Commission Annual report (2007, 2017).

Table C2: Profit levels of major groups of banks (measured by return on equity, unit %)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
State-owned banks (Big5)	-0.49	6.01	16.26	14.59	15.58	18.07	18.22	18.00	19.70	19.09	18.88	16.79	14.58	13.17
Joint-stock commercial banks	14.99	15.39	21.65	22.80	16.64	19.06	16.40	16.63	18.58	19.22	18.42	16.76	14.53	13.21
City commercial banks	10.86	14.97	14.59	14.89	13.18	15.28	13.84	15.96	16.28	16.94	16.46	14.91	12.88	12.21
Rural commercial banks	18.00	30.00	18.85	16.43	12.97	13.71	13.36	13.82	15.43	15.94	15.91	14.84	12.40	11.77
Policy banks	10.92	11.71	18.00	18.02	13.93	6.04	8.68	8.96	10.95	13.81	14.61	14.52	8.09	8.19
Foreign banks	4.07	4.76	5.86	7.72	5.19	8.39	3.85	4.20	7.95	6.40	5.91	6.38	4.35	3.44

Source: China Banking Regulatory Commission Annual report (2007, 2017).

Table C3: Estimate results of the Dirichlet model (Within SOB group)

	BOC	ICBC	CCB	BOCOM	ABC
Panel A: Full sample					
SOE	-0.0093	0.0028	0.0056	0.0088	-0.0078
CEO change	0.0011	-0.0184	-0.0153	0.0312	0.0014
Firm size	0.0154	0.0116*	0.0105	0.0108**	-0.0057
Firm age	0.0000	0.0000	0.0000	0.0000	0.0001
Profit	0.0018	-0.0014	0.0001	0.0016	0.0013
Leverage	-0.0010	0.0001	0.0006	0.0007	-0.0003
Cash flows	0.0008	0.0000	0.0005	0.0003	0.0000
CEO number	0.0173	0.0016	0.0134	0.0039	0.0062
N	833				
Panel B: Pre – Crisis					
SOE	0.007	0.006	-0.026	0.015	-0.002
CEO change	0.024	-0.017	0.049	-0.035	-0.021
Firm size	0.011	-0.005	0.016	-0.012	-0.010
Firm age	0.000	0.000	0.000	0.000	0.000
Profit	0.000	0.000	0.001	-0.002	0.001
Leverage	-0.001	0.000	0.001	-0.001	0.000
Cash flows	0.000	-0.001	0.000	0.001	0.000
CEO number	-0.018	0.005	-0.029	0.025	0.016
N	260				
Panel C: Post – Crisis					
SOE	0.002	-0.018	0.005	0.017	-0.006
CEO change	-0.006	0.002	-0.021**	0.011*	0.014
Firm size	0.005	0.013	-0.010	-0.007	-0.001
Firm age	0.000	0.000	0.000	0.000	0.000
Profit	0.002	-0.002	-0.001	0.000	0.001
Leverage	-0.001	0.000	0.000	0.001	0.000
Cash flows	0.000	0.001	0.000	0.001	-0.001
CEO number	-0.013	-0.011	0.016	0.007	0.002
N	710				

Note: ***, **, * indicates a 1%, 5% and 10% significance level, marginal effects are reported.

Note: BOC indicates Bank of China; ICBC indicates Industrial and Commercial Bank of China; CCB indicates China Construction Bank; BOCOM indicates Bank of Communications; ABC indicates Agricultural Bank of China.