Switching Costs in China's Banking Market

by

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DECLARATION

This work has not previously been accepted in substance for any degree and is not concurrently submitted in candidature for any degree.

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Abstract

This thesis analyses switching costs in China's banking market in three main aspects. First, my thesis examines a model that investigates the effect of switching costs in the Chinese loan market on banking profitability. In keeping with the extant empirical literature it reports a positive relationship between bank profitability and switching costs. Furthermore it reports the estimation of a systems model of switching costs determination and profitability determination. The main result is that bank size measured by total assets is positively related to switching costs, while the ratio of deposits to assets is negatively related. The study also finds that banks that have higher cost-income ratios have a negative impact on switching cost. Second, this thesis examines the drivers of firms switching from one bank relationship to another. The results show that the principal driver of a switching action is the credit needs of the firm and a mixture of firm and bank characteristics. The findings support the extant literature that less opaque firms are able to switch more readily than opaque firms. The results also suggest that banks that develop their fee income services are more effective in locking-in their borrowers. Finally, this thesis determines the factors that decisions of firms to keep single bank loan providers or multiple bank loan providers. The results show that large firms are more likely to switch from single to multiple lending relationships. This study also finds that medium size and small firms with high quality prefer a single borrowing relationship while larger and higher quality firms are more likely to be involved in a large number of banking relationships. Increasing market competition decreases the probability of single bank-firm relationship.

Acknowledgement

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Chapter 1: Introduction

Switching costs, which arise from the asymmetry of information between firms and banks, cement the bank-firm relationship (Shy, 2002; Kim et al, 2003; Vesala, 2007). Banks manage to gain the extra rent from their customers based on the lock-in power that is generated by switching costs, which weaken the substitutability of loans provided by different banks. However, since long and close bank-firm relationships have high likelihood to make firms involved in lock-in problems, a number of previous researches have pointed out that a large proportion of firms have considered switching to another bank to overcome the financial constraint when being dissatisfied with their existing lending relationship. Meanwhile, firms are also more likely to be locked-in by the relationship bank and face higher switching costs, when they are borrowing from a single bank with lower monitoring costs and collateral requirements (Farinha and Santos, 2002). The decisions of firms to keep single or multiple banking relationships is based on the dual of externality of efficient single lending or anti-informational lock-in and less liquidity risk multiple lending.

Focusing on the above three points, this thesis analyses switching costs[1] in China's banking market. First, the thesis examines the magnitude of switching costs and the effect of switching costs in the Chinese loan market on banking profitability. Second, the bank-firm relationship and the drivers of firms switching from one bank relationship to another are investigated. Finally, it investigates the determinants of firms' choice on single or multiple banking relationships.

[1] This thesis focuses on the switching costs caused by information asymmetry.

1.1 Background and Motivation

Switching costs in banking represents a source of rent that reduces the competitiveness of the market. In addition to the administrative costs of changing a bank account, it is conjectured that in the loan market there are additional costs associated with informational asymmetries that the existing lender is more informed about the quality of the borrower than a potential new lender. It is argued that a borrower may face non-negligible switching costs when switching between banks in the Chinese banking market. High enough switching costs may completely prevent borrowers from switching and lock them in with their incumbent banks.

The confidentiality associated with the customer-loan relationship allows banks to exploit their informational advantage over competitors and lock-in their incumbent customers to earn higher positive expected profits on repeated lending. Previous research has pointed out that a large proportion of firms have considered switching to another bank to overcome the financial constraint when dissatisfied with their existing lending relationship. However, a strong bank-firm relationship gives banks a monopoly power through information collecting, which can result in negative effects on firms. Firms will face a non-favourable loan offer with higher interest rate from 'outside' banks because of incomplete information about the firms' financial condition. For 'outside' banks it is hard to distinguish 'good' and 'bad' firms. That means the informational disadvantage and lock-in problems can limit the ability of firms access to external finance resulting in financial constraints. Yet, firms switching their relationship banks have also been widely observed in the lending market.

Plainly a long-term and stable bank-firm relationship is not the only choice for firms. They have a high probability to switch when they face severe financial constraints which cannot be solved by the existing bank. The longer the existence of the incumbent relationship, the

higher the probability that the borrower will find another lender (Greenbaum et al, 1989). Since the switching costs arising from asymmetric information makes the switching action costly, the switching behaviours are observed heterogeneously across firms. Firms' transparency, external fund requirement and financial characteristics are the factors that drive the decision to switch lenders. Banks' lending decisions are not homogenous either, which significantly affects a borrower's access to external financial resources.

Other than switching or non-switching, firms need to make the decision on single or multiple banking relationships based on their characteristics. Whether a firm maintains a single or multiple lending relationships with a credit provider is the outcome of a company's strategic financial policy. Models of single or dual firm-banking relationships have been developed by Bolton and Scharfstein (1996) and Von Thadden (1998), but the literature is less clear on the single versus multiple firm-bank relationships. While firms borrowing from a single bank face lower monitoring costs and collateral requirements (Farinha and Santos, 2002), they are also more likely to be locked-in by the relationship bank and face higher switching costs. However, multiple firm-banking relationships can reduce the probability of liquidity risk and informational lock-in. But at the same time a multiple firm-bank relationship can involve significant transaction and monitoring costs.

A number of studies claim that firm size has a significant influence on the number of bank relationships. Large firms usually require a wide range of banking relationship in order to satisfy firm-specific credit needs (Ongena and Smith, 2000; Detragiache et al, 2000). While it is a standard finding that multiple bank relationships is usually associated with large firms, medium size and small enterprises are widely observed borrowing from more than one bank in countries like US, Portugal and Germany (Petersen and Rajan, 1994; Farinha and Santos,

2002; Brunner and Krahnen, 2013). A firms' quality is also another key variable that affects the number of bank relationships (Petersen and Rajan, 1994). Low quality firms are usually unable to increase the credit requirements from incumbent banks and needs to seek outside banks for help. From a lender's perspective, banks are willing to share bad credit clients with others in order to decrease their risk. Besides, banking market competition has been suggested as a main factor that could interpret the number of bank relationships. Single or multiple banking relationships can also reflect the level of competition from the credit demand side. A multiple firm-bank relationship is also more likely in an environment of competition between banks (Machauer and Weber, 2000).

The Chinese banking market is large and expanding. By the end of 2012 there were over 400 banks operating in China. However, there has been little in the way of research papers that investigate the topics of switching costs in the banking sector. What has been published focuses on the credit card or deposit market with the use of survey data or macro data. While these studies recognize the significance of switching costs on banks' market share and profits, there has been no study of switching costs in the loan market, or the determination of switching costs.

The reform period beginning from 2001 has made remarkable improvements in the performance of the banks, especially for the large commercial banks. The average non-performing loan ratio of the major commercial banks in China decreased from 17.9% in 2003 to 0.9% in 2011. Unlike the past where the banks were slaves to the socialist plan, Chinese commercial banks have focussed on credit quality when making lending decisions (Chang et al., 2009). Banks collect more information about firms' private financial information in order to lower the associated lending risk. As with many emerging economics bank credit remains

the main funding source for firms in China (Allen et al, 2005). The opacity of business in China, and information asymmetry are viewed by some as the key impact variables that define the lending relationship (Chang et al., 2009; Cao et al, 2010). But it is not simply the characteristics of the firm that matter, the lending bank's identity influences the lending decision and determines the quality of the bank-firm relationship (Hao et al., 2013).

Modern credit risk management methods and risk pricing since 2004 is standard practice (He and Wang, 2013). Loan quality is an important factor in the lending decision. Banks reduce their loan exposure to individual enterprises and widen the loan portfolio to more firms in order to diversify the risk. Large firms are more attractive for banks since they are less likely to default (Chang et al., 2009). Single firm-bank relationship is associated with SMEs (small and medium size enterprises). Relevant research has suggested that keeping a large number of banking relationships is not an optimal choice for them (He and Wang, 2009).

1.2 Objectives and Contribution

The three main objectives and contribution of this study are as follows:

First, this study seeks to fill a gap in the applied literature and enhance the understanding of the magnitude of switching costs in the loan market and its influence on profits in China's banks. The objective of this part is twofold. Since switching costs are heterogeneous across banks and cannot be observed, this research applies the structural model developed by Shy (2002) to measure the switching costs for each bank in the data sample, and analyse the determinants of the magnitudes of switching costs in the Chinese banking sector and their effects on banks' profits in a simultaneous equations system. Consistent with previous studies with other countries' data, this research finds that bank size shows a positive relationship

with switching costs; and switching costs enhance the profit banks earn from their consumers in the Chinese banking market. However, a particular Chinese feature is that this positive relationship is non-linear so that switching costs increase at a decreasing rate such that very large banks (the state-owned banks) exhibit lower switching costs than smaller banks. The principal new findings highlight that switching costs increase with the efficiency level of banks; and foreign banks implement low switching costs and profits because they are in a weak position relative to domestic banks.

Second, the topic of why firms switch banks is a relatively unexplored area of research, especially in China's banking market. This thesis attempts to make a contribution to fill this gap. The research findings are that firms usually switch banks for larger amount of loans and longer lending durations; and large firms, that are usually more transparent, have a higher probability to switch than small firms. These two findings are new in China's banking research and consistent with the results of previous studies with other countries' samples. The principle new findings in this research are that (i) strong financial conditions of the firm increase the likelihood of forming a new bank relationship; (ii) firms are more likely to switch to small market share banks, or low profitability banks, to seek more favourable lending contracts; (iii) Firms are less likely to switch banks that offer a bundled service of loan and bank services in order to avoid the lock-in problem.

The topic of single versus multiple banking relationships in the Chinese lending market is also an unexplored area of research. This thesis also attempts to fill this gap. The principal findings, conform with the general findings of the literature, which are that (i) the probability of a firm having multiple banking relationships increases with firm size; (ii) among all samples, firms with higher cash flow ratios (high quality) are more likely to maintain a single relationship; (iii) increasing market competition level reduces the probability of single bank-

firm relationship; (iv) firms that have a relationship with large banks are more likely to be involved in multiple lending relationships. The new finding of this research is that medium size and small firms of high quality tend to have a single relationship as well as large and high quality firms are more likely to have a large number of lending relationships.

1.3 Outline

The following part of this thesis includes five chapters. The remainder of the thesis is organized as follows:

Chapter 2 discusses institutional details about recent banking reforms, the Chinese banking system; the improvement of banks' credit quality and loan distribution of firms in recent years.

Chapter 3 introduces the characteristics of the Chinese banking industry and reviews the relevant theoretical foundation and the literature on switching costs. It goes on to describe the methodology of the relationship between switching costs and competition, and develops the empirical model based on the framework. Using a sample of 151 banks over the period 2003 to 2010, this chapter examines the effect of switching costs in the Chinese loan market on banking profitability.

Chapter 4 firstly reviews the relevant theoretical foundation and empirical research on asymmetric information, bank-firm relationships and the determinants of firms switching decisions. Then it describes the methodology and summarizes the main hypotheses of this study. A framework of firms' switching decision is developed. Based on this framework, an empirical model is derived. Lastly, this chapter uses a sample of matched data on firm-bank

lending in China over the period 1999-2012 to examine the drivers of firms switching from one bank relationship to another.

Chapter 5 firstly reviews the relevant theoretical foundation and empirical research on the topics of single or multiple banking relationships and the optimal number of banking relationships for firms. Then it describes the methodology of firms' banking relationship decisions and summarizes the main hypotheses of this study and introduces the models for empirical studies. In the empirical part, this study examines 1639 firms' single and multiple borrowing data during the period 2003-2012.

Chapter 6 is the conclusion. It provides a discussion of the overall findings and implications of this research and highlights the confirmatory aspects of the research that is already known about the Chinese banking market as well as the novel features of the research about what is not generally known about the Chinese banking.

Chapter 2: China's banking industry

2.1 Introduction

China's banking sector has been in a state of reform since 1978, changing from a sector that ran under the orders from socialist plan to an open and modern competitive industry. After China's entry into WTO, most Chinese banks make lending decisions based on commercial principles rather than the government policies (Chang et al., 2009). Some previous studies suggest that bank-firm relationships become very important for firms to get access to their credit needs (Allen et al., 2005; Chang et al., 2009; Cao et al., 2010). It is well known that applied economics and empirical analysis on any particular country/countries would be meaningless without a thorough awareness of the context. In order to help understand the theoretical and empirical analyses in the rest of the thesis, this chapter serves as a preface and gives the necessary background information about the Chinese banking system, the role of commercial banks, market competition and bank-firm relationships.

In this chapter, the general information about the reform of China's banking system from different perspectives is reviewed in section 2, including the banking industry reform, the changing role of the big four state-owned banks and the context of banking system in recent years. Section 3 outlines the characteristics of different types of banks, their history and development during the last few years. Section 4 describes the increasing competition in the Chinese banking market since 2003, including the context about banks' market share, profit level, the income structure and regional difference. Based on a decreasing non-performing loan ratio and improvement in the repayment ability of firms, section 5 outlines the lending relationships between banks and firms and banks' lending decisions in recent years. Section 6 concludes the chapter.

2.2 The reform of China's banking system

Banking industry reform in China has been ongoing since 1978. The reform set up a two-tier system with setting the People's Bank of China as the central bank. From 1978 to 1984, the big four state-owned banks[2] were established or re-established. They were initially limited to serve only their designed sectors of the economy, and then they were allowed to operate in all areas of the financial market since 1985. However, there was almost no competition in the Chinese banking market until the mid-1990s, since the big four banks mainly served as policy-orient lending from the government and were lack of incentives to compete (Lin et al., 2012). In 1994, banking sector reform was launched to stimulate big four banks into commercialization. Three policy banks[3] were established to take over the policy-orient lending activities from the big four banks. In 1995, the Commercial Bank Law of China was issued, which officially defined the four state-owned banks as commercial banks. From 1987, Joint-stock commercial banks have been gradually established; the first three of them are China Citic Bank, Shenzhen Development Bank and China Merchants Bank. Starting from 1995, city commercial banks and rural commercial banks were gradually established. Many of them were founded on the basis of urban credit cooperatives and rural credit cooperatives. Till the end of 2013, there are 145 city commercial banks, 468 rural commercial banks in China (See overview of China's banking system in appendix A.1). Banks are encouraged to diversify their portfolios by increasing their services to the private sector and individual consumers by government since 2001.

China's economic reform has increased the role of banks in the nation's economy and intensified the competition in the banking sector. Since China entered the WTO in 2001,

[2] The big four banks are Industrial and commercial bank of China, Agricultural bank of China, bank of China, and China Construction Bank.
[3] Three policy banks are China Development Bank, the Export-Import Bank of China, and Agricultural Development Bank of China.

China is gradually fulfilling her obligations under the World Trade Organization accession agreement, such as open her financial market to foreign banks. The entry to the WTO has pushed the banking sector reform. In order to compete globally, Chinese domestic banks have to use new technologies and improve their services as western banks. In 2003, Chinese National People's Congress approved the establishment of the China Banking Regulatory Commission, which replaced the Central Bank to take the regulatory function of the banking market. In the same year, the law of banking supervision was promulgated. The Chinese banking market has entered in the age of globalization and modernization since then.

2.3 The role of Chinese banks

According to the China Banking Regulatory Commission (CBRC) annual report, banks operating in China's banking market are categorized into six types: Policy banks and China development bank, large commercial banks, joint-stock commercial banks, city commercial banks, rural commercial banks and foreign banks. Banking sector is a very important industry in Chinese economic system. Its total asset was around twice of GDP from 2003-2008. The ratio of the total asset of banking sector to GDP increases from 201.1% in 2008 to 257.2% in 2012.

Table 2.1: Total asset of banks (2003-2012) unit: RMB 10 Billion

Bank/Year		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Large commercial banks	Total asset	1605	1798	2101	2424	2850	3258	4070	4689	5363	6004
	Total asset to GDP (%)	118.2	112.5	113.6	112.0	107.2	103.7	119.4	116.8	113.4	115.6
Joint-stock commercial banks	Total asset	296	365	447	545	727	883	1182	1490	1838	2353
	Total asset to GDP (%)	21.8	22.8	24.1	25.2	27.4	28.1	34.7	37.1	38.8	45.3
City commercial banks	Total asset	146	171	204	259	334	413	568	785	999	1235
	Total asset to GDP (%)	10.8	10.7	11.0	12.0	12.6	13.2	16.7	19.6	21.1	23.8

Rural commercial banks	Total asset	4	6	30	50	61	93	187	277	425	628
	Total asset to GDP (%)	0.3	0.4	1.6	2.3	2.3	3.0	5.5	6.9	9.0	12.1
Foreign banks	Total asset	42	58	72	93	125	135	135	174	215	238
	Total asset to GDP (%)	3.1	3.6	3.9	4.3	4.7	4.3	4.0	4.3	4.6	4.6
Policy banks	Total asset	213	241	293	347	428	565	695	765	931	1122
	Total asset to GDP (%)	15.6	15.1	15.8	16.1	16.1	18.0	20.4	19.1	19.7	21.6
Banking institutions	Total asset	2766	3160	3747	4395	5312	6315	7952	9531	11329	13362
	Total asset to GDP (%)	203.6	197.6	202.6	203.2	199.8	201.1	233.3	237.4	239.5	257.2

Source: China banking regulatory commission annual report 2012; Chinese statistical yearbook 2013.

Policy banks and China development bank group includes China Development Bank (CDB), the Export-Import Bank of China (EIBC), and Agricultural Development Bank of China (ADBC). They are mainly responsible for state-invested projects for developing areas, trade development projects, and state-invested agricultural projects. CDB is primarily responsible for supplying funding for large infrastructure projects. EIBC mainly provides policy financial support to the export and import products, technologies and services. ADBC is primarily responsible for the financial support to agriculture development projects in rural regions.

Besides Policy banks and China development bank, others are all commercial banks who are chasing customers and competing for market share and profit in the banking market. Large commercial banks group includes Industrial and commercial bank of China (ICBC), Agricultural bank of China (ABC), bank of China (BOC), China Construction Bank (CCB), and Bank of Communications (BOCOM). The majority shares of them are held by the central government. Due to historical reasons, large commercial banks are also the biggest banks in China with the largest share of asset in the banking sector. They were dominant the banking

market in 1990s. In recent years, their total asset to GDP ratio takes a comparatively steady proportion between 107%-120% (see table 2.1). Although they are the largest group in China banking sector, their annual asset growth rate is slower than joint-stock banks, city and rural commercial banks.

Joint-stock Commercial banks group includes China Citic bank, China Everbright Bank, Huaxia Bank, Guangdong Development Bank, Ping An Bank (Shenzhen Development Bank), China Merchants Bank, Shanghai Pudong Development Bank, Industrial Bank, China Minsheng Banking, Ever bright Bank, China Zheshang Bank and Bohai Bank. Joint-stock commercial banks are usually considered as having higher operational efficiency and better services than large commercial banks (Chang et al., 2009). Table 2.1 shows that their total asset to GDP ratio increases very fast, from 21.8% in 2003 to 45.3% in 2012. Their total asset grows to 23530 billion RMB in 2012. Joint-stock commercial banks group is the second largest bank group in China.

City commercial banks and rural commercial banks groups have the largest number of banks in China. They usually have comparatively small size and mainly supply financial services in their local regions. The first established city commercial bank is Shenzhen City Commercial Bank in 1995, which located in one of the special economy zones in China. Although they are comparatively small, their asset growth rates are extremely high. Table 2.1 shows that the sum of city commercial banks and rural commercial banks' total asset to GDP ratios increases from 11.1% in 2003 to 35.9% in 2012.

Foreign banks have been given opportunities to enter the market after China's entry into the

WTO[4]. Most of foreign banks choose to locate in big cities in the east part, where the financial development is known as more advanced than other parts of China. Table 2.1 shows that foreign banks group is the smallest group in China's banking sector. Their annual asset growth rate is lower than joint-stock banks, city and rural commercial banks groups.

2.4 China banking market

Among the six types of banks in China's banking system, large commercial banks group takes the highest market share (see figure 2.1). However, with the growth of other types of banks and competition of the market, the large commercial banks' market share decreases from 69.6% in 2003 to 51.9% in 2012. After 2006, the banking market competition has been encouraged by central government. Joint-stock banks, city commercial banks and foreign banks have kept taking the market share from the five large commercial banks since then. Joint-stock banks have the highest market share growth rate which is around 5.97% during the past several years, and become the second largest market share group with the market share of 20.3% in 2012. Each of the 12 joint-stock banks has got notable increasing in market share portion. City commercial banks and rural commercial banks have 3.88% and 4.18% average annual market share growth ratio during the last nine years respectively. Their market share has reached 10.7% and 5.4% in 2012, respectively. This fact presumably indicates that small banks also have the competitive power base on their local networks (relationship with local enterprises), efficient operation and good customer services. Foreign banks took 1.8% market share in 2003, and gradually increased to 2.8% in 2007. Then the ratio decreased and kept fluctuated around 2%. In 2012, foreign banks hold 2.1% market share, which is the smallest market share group in China's banking market. Some research suggests that as

[4] The WTO agreement stated that foreign banks could enter into the Chinese banking market since 2001, then after a transition period of 5 years (protection period of weak domestic industry) geographical and business restrictions were gradually eliminated. At the end of 2006, foreign banks have a non-discriminatory manner as in China's banking market.

newcomers to the Chinese banking sector, foreign banks are known to lack a relationship network and accumulation of information in the local market, which is a big disadvantage for them to raise the switching costs and extend the market share. Furthermore, foreign banks lack branches, which is another disadvantage for them to attract new customers and lock-in their incumbent clients. Since policy banks serve the policy-oriented financial projects, their market share is comparatively stable during the last nine years, with only a small increasing in 2008 and 2009 due to government stimulation policies to the national economy[5].

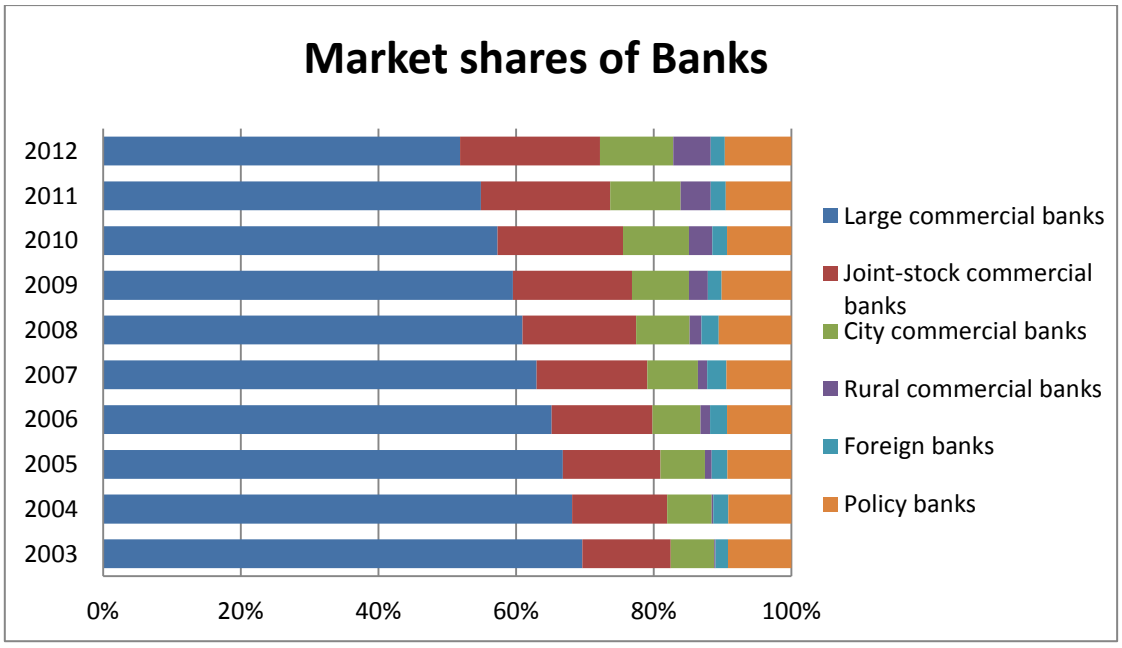


Figure 2.1: Market shares of banks (according to total asset)
Source: Calculate from the data in China banking regulatory commission annual report 2012. Data in details attached in Appendix A.2.

Figure 2.2 indicates that large commercial banks get the lowest profit level in 2003 but become the second highest in 2012. The fast growing is based on two main reasons. First, the government has divested approximately 1.98 trillion RMB of non-performing loans from the large commercial banks, helped them to change their ownership structure and brought in strategic foreign investors (Lin et al., 2012). Second, the banks have listed themselves on

[5] Chinese government made a four trillion RMB stimulus package plan as its biggest reaction to stimulate the economy against the global financial crisis.

stock exchange[6], which forced them to operate as 'real and international commercial banks' with improving the management level, service and operation efficient. Profits of Joint-stock banks have always been kept at a high level above 15%. Combined with their market share, this data presumably indicates that they are the best performance domestic banks. City commercial banks and rural commercial banks have the similar profit trend with joint-stock banks, not as high as but around 14% after 2007, which shows the small banks still have the ability to compete with large banks. Banks with small size also can make decent profits and extend their market share in China's banking market. Foreign banks have the lowest profit level around 5%. Foreign banks may need to give more price discount and special offers than domestic banks to attract new consumers in order to extend their business and market share, which leads to lower the profit level.

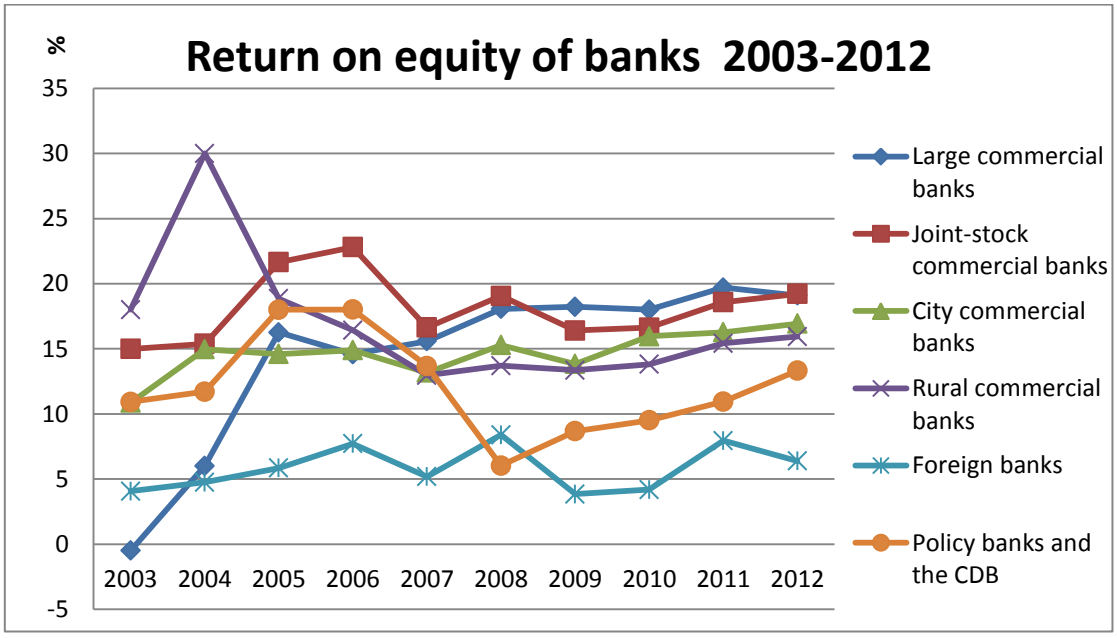


Figure 2.2: Profits level of banks (return on equity)
Source: Calculate from the data in China banking regulatory commission annual report 2012. Data in details attached in Appendix A.3.

[6] BOCOM was listed on Hong Kong Stock Exchanges in June 2005, and on Shanghai Stock Exchange in May 2007; CCB was listed on Hong Kong Stock Exchanges in Oct 2005, and on Shanghai Stock Exchange in Sep 2007; BOC was listed on Hong Kong Stock Exchanges in June 2006, and on Shanghai Stock Exchange in July 2006; ICBC was listed on Hong Kong and Shanghai Stock Exchanges Oct, 2006; ABC was listed on Hong Kong and Shanghai Stock Exchanges in July, 2010.

It shows in table 2.2 that net interest income takes stable proportion with more 60% in income contracture of commercial banks. The main source of Chinese banks' profit is the interest from loans. Investment returns take the second largest proportion of banks' income, but decrease from 27.4% in 2007 to 19.8% in 2012. In contrast, net fee-based income increases from 9.4% to 13.7% in the last six years. According to the conclusion made on the China banking regulatory commission annual report, banks' profit level has positive relationship with the size of interest-bearing credit assets, operational efficiency, the improvement in credit risk management (lower level of non-performing loan) and the continuously stable interest spread. As for the competition, banks should take advantages of switching costs to lock in more customers and attract new customer from their rivals in order to raise their profit level.

Table 2.2: Income contracture of banks

Year	Net interest income	Net fee-based income	Investment returns	others
2007	62.9%	9.4%	27.4%	0.3%
2008	61.2%	9.7%	24.5%	4.6%
2009	63.0%	11.8%	24.1%	1.1%
2010	66.4%	11.9%	20.7%	1.0%
2011	66.2%	14.0%	18.5%	1.3%
2012	64.9%	13.7%	19.8%	1.6%

Source: China banking regulatory commission annual report 2009-2012.

The economic development level in China is different between regions, which leads the amount of deposits and loans are heterogeneous among regions in the banking market. The east part of China is the most developed area, while the central and west part of China are usually considered as less developed[7]. As figure 2.3 shows, the total deposit in east region is around three times more than in the central or west regions from 2005 to 2011. The loans in

[7] East region includes Beijing, Tianjin, Shanghai, Liaoning, Hebei, Shandong, Jiangsu, Zhejiang, Fujian, Guangdong and Hainan; Central region includes Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei and Hunan; West region includes Sichuan, Chongqin, Neimengu, Guizhou, Yunan, Shaanxi, Gansu, Ningxia, Xingjiang, Guangxi and Tibet.

east region is around four times than in the middle or west regions in 2011. The regional difference makes domestic banks and foreign banks focus their business in east part of China. This is presumed to result a more fierce competition market in the east region.

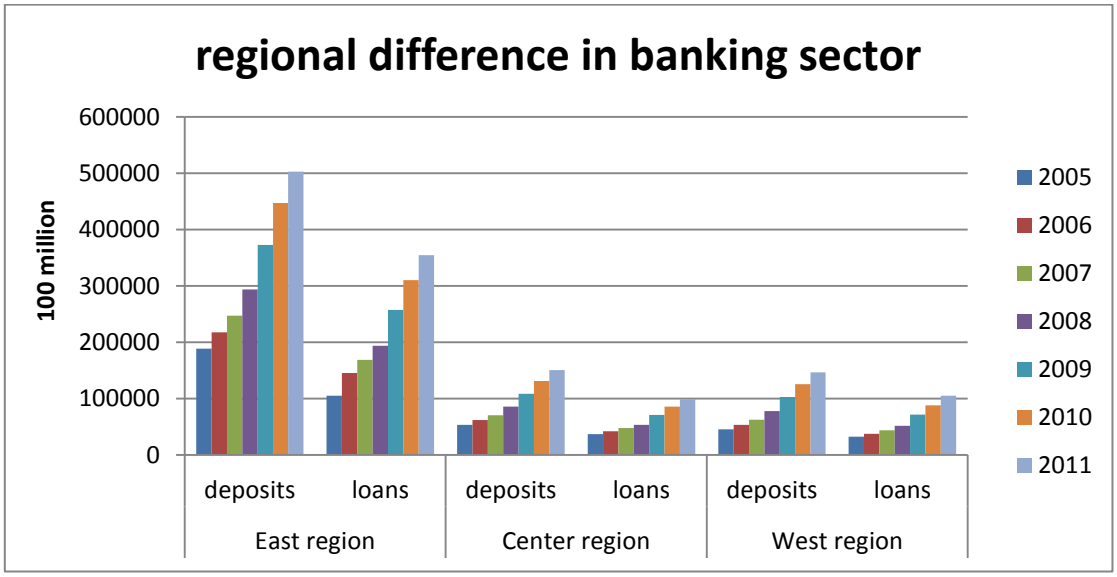


Figure 2.3: Regional difference in banking sector
Source: Almanac of China's Finance and Banking, 2010. Detail data attached in Appendix A.4.

2.5 Bank-firm relationships

The bank-firm relationships have been changed by the recent banking reform. In 1990s, the major of the lending relations was driven by government, from stats-owned banks to stats-holding enterprises. This political connections affected banks' lending decision, which could increase the chance for lending to risky firms (Hao et al., 2012). Before 2000, the large commercial banks in China had a great amount of non-performance loans, which had significantly negative effect on their credit quality and reputation. However, after China's entry into the WTO in 2001, the reform and marketization in China's banking sector lead to not only a competitive banking market, but also remarkable improvements in the performance of the banks. Additionally, the distribution of loans is not only concentrated in state-holding enterprises anymore. It also benefits the high credit quality private enterprises.

In China, bank-firm relationships are crucial for firms, since bank loans are the most important source of funding for firms (Allen et al., 2005). Not only a bank's characteristics but also a firm's characteristics influence the quality of a bank-firm relationship. Unlike the past where the banks were slaves to the socialist plan, Chinese commercial banks have focused on credit quality when making lending decisions in recent years (Chang et al., 2009). Nowadays, firms getting access to loans mostly depend on their credit level and performance other than political leverages. Risky firms are less likely to get loans.

2.5.1 Improvement of banks' credit quality

The banking reforms push China's banking system keep improving, then lead to a healthier and more competitiveness market. Banks have great improvement in their performance. The average non-performing loans ratios of commercial banks have consciously decreased over the past several years[8], from 7.1% in 2006 to 1.0% in 2012 (see table 2.3). The largest decrease comes from the large commercial banks group, from 9.7% in 2006 to 1.0% in 2012. These data indicate that the commercial banks focus on their borrowers' quality rather than on policy lending. And this in turn contributes to improvement in banks' credit quality and reputation, which makes them more competitiveness in the globe market.

Joint-stock banks have the lowest NPLs ratios from 2006 to 2012. Compared with large commercial banks, joint-stock banks have less historical burden. Their credit quality keeps improving steadily through the past several years, and reaches the lowest NPLs ratio at 0.6% in 2011. Meanwhile, city and rural commercial banks have remarkable improvement in their performance and credit quality as well. They successfully lower their NPLs ratio from 4.8%

[8] From 1998 to 2010, approximately 100 billion USD governments authorized funding injected into SOCBs to help them raise the capital adequacy ratio and removed approximately 53 billion USD from the NPLs. Details can be found in appendix table A.6.

and 5.9% in 2006 to 0.8% and 1.8% in 2012, respectively. The foreign banks, considered as the banks with high level management and operation efficiency, always have the low NPLs ratio from 2006 to 2012.

Table 2.3: NPLs ratios of commercial banks unit: %

	2006	2007	2008	2009	2010	2011	2012
Commercial banks in total	7.1	6.2	2.4	1.6	1.1	1.0	1.0
Large commercial banks	9.7	8.0	2.8	1.8	1.3	1.1	1.0
Joint-stock banks	2.3	2.1	1.3	1.0	0.7	0.6	0.7
City commercial banks	4.8	3.0	2.3	1.3	0.9	0.8	0.8
Rural commercial banks	5.9	4.0	3.9	2.8	1.9	1.6	1.8
Foreign banks	0.8	0.5	0.8	0.9	0.5	0.4	0.5

Source: China banking regulatory commission annual report 2006-2012.

Billett et al. (1995) find that a higher credit rating can raise a bank's profit by reducing funding costs or permitting a more extensive derivative business. The Fitch long-term debt credit ratings of the 14 major domestic Chinese commercial banks, who take more than 70% of lending market share in China, are shown in table 2.4. The five large commercial banks have state-owned background. So their credit ratings are higher than joint-stock commercial banks. The lowest rating in large commercial banks group is A- for the Bank of Communications. All others get rate A since 2007. Compared with the large commercial banks, joint-stock banks have smaller size, shorter rating history and less branches. The ratings for joint-stock commercial banks are lower than large commercial banks, which are between BBB and BB+. In general, the major domestic commercial banks are no lower than BB+, which indicates that the Chinese banking market is a healthy and stable market.

Although the credit ratings suggest that large commercial banks have better credit quality than joint-stock commercial banks, but they cannot fully stand for the performance of banks. Large commercial banks have higher Fitch ratings, while joint-stock commercial banks have lower NPLs ratios. Some scholars argue that joint-stock commercial banks have higher efficiency and management level than large commercial banks (Fu and Hefferman, 2009; Jiang et al., 2009). Berger et al. (2009) also find that state-owned banks have lower efficiency than the foreign banks in Indian. However, recent research claims that the large commercial banks have attracted foreign strategic investors, which has effectively improved their ownership structures and efficiency level (Hao et al., 2013). Foreign capital inflow also helps domestic banks to improve their performance. Foreign investments have been permitted to buy non-controlling stakes in Chinese banking since 2003, with a limit of 25% of capital (joint foreign investment). Till 2010, the total amount of foreign capital inflow in the financial sector is approximately 50 billion USD. The improving rates of major commercial banks imply that competitiveness of the banks becomes higher and China's banking market becomes healthier.

Table 2.4: Fitch Rating of major commercial banks

Bank name	Fitch Rating							
	2005	2006	2007	2008	2009	2010	2011	2012
Industrial and commercial bank of China	A-	A-	A	A	A	A	A	A
Bank of China	A-	A-	A	A	A	A	A	A
China Construction Bank	A-	A-	A	A	A	A	A	A
Bank of Communications			A-	A-	A-	A-	A-	A-
Agricultural bank of China							A	A
China Citic bank							BBB	BBB
China Everbright Bank							BBB	BBB
Huaxia Bank							BB+	BB+

China Guangfa Bank	BB+	BB+
Ping An Bank	BB+	BB+
China Merchants Bank	BBB	BBB
Shanghai Pudong Development Bank	BB+	BB+
Industrial Bank	BB+	BB+
China Minsheng Banking	BB+	BB+

Source: Bankscope Database

2.5.2 Credit quality and loan distributing of firms

The NPLs ratios not only reflect the management level and efficiency of banks, but also reflect credit quality of borrowers (firms) to some extent. High ratios of NPLs also indicate that risky firms have high probability to get access to loans. Table 2.5 shows that distribution of NPLs ratios by industry. First, the time series changes of all industries show that non-performing loans have decreased from 2006 to 2012. The most significantly shrinking of NPLs ratio is the Farming, forestry, animal husbandry and fishing industry from 46.09% in 2006 to 2.35% in 2012. The wholesale and retail trades and the hotels and catering services industries, which have the second and third highest NPLs ratio in 2006, at 17.3% and 19.55% respectively, have dramatically reduced to 1.61% and 1.89% in 2012 respectively. Second, compared by industries, financial services sector takes the lowest NPLs ratio in 2012, at 0.21%. The manufacturing industry, which makes the famous 'Made in China', always keeps a comparatively low NPLs ratio, at 1.54% and 1.60% in 2011 and 2012 respectively. Third, the highest NPLs ratio in 2012 is in Farming, forestry, animal husbandry and fishing industry at 2.35%, which is still considered as in an acceptable range. These data implies that risky firms have lower probability to get loans now. Chinese commercial banks have focused on borrowers' quality when making lending decisions.

Table 2.5: Distribution of NPLs ratios of commercial banks by industry unit: %

industrial	2006	2007	2008	2009	2010	2011	2012
Farming, forestry, animal husbandry and fishing	46.09	47.10	7.50	4.52	3.15	2.35	2.35
Mining	3.74	3.27	0.68	0.38	0.25	0.27	0.22
Manufacturing	10.40	8.89	3.30	2.58	1.87	1.54	1.60
Production and supply of electricity, gas and water	2.18	2.39	2.09	1.41	1.19	1.03	0.72
Construction	4.27	3.35	1.71	1.32	0.77	0.66	0.57
Transport, storage and post	2.01	2.10	1.59	1.29	0.97	1.09	0.82
Information transmission, computer services and software	5.33	5.55	3.32	2.62	1.93	1.44	1.44
Wholesale and retail trades	17.30	13.92	4.08	2.71	1.56	1.16	1.61
Hotels and catering services	19.55	16.11	7.70	4.82	3.01	2.56	1.89
Financial services (sector)	1.38	0.69	0.21	0.08	0.30	0.21	0.21
Real estate	6.61	4.91	3.35	1.93	1.26	0.97	0.71
Leasing and business services	10.61	8.02	1.84	0.90	0.73	0.60	0.47
Scientific research, technical services and geologic prospecting	13.60	11.16	4.17	2.98	1.88	0.93	1.05
Management of water conservancy, environment and public facilities	1.30	1.27	1.14	0.37	0.39	0.33	0.19
Services to households and other services	4.78	6.01	2.63	1.68	1.29	0.98	0.87
Education	2.38	3.79	3.24	2.29	1.64	1.62	1.20
Health, social security and social welfare	4.31	5.68	2.60	1.61	1.03	0.73	0.46
Culture, sports and entertainment	14.83	13.12	6.08	3.24	1.76	1.19	0.91
Public management and social organizations	5.39	6.21	1.48	0.44	0.60	0.70	0.43

Source: China banking regulatory commission annual report 2006-2012.

In the period of 1980s and earlier 1990s, banks was controlled and instructed by the central or local government. As one of the heritages, the relationship between state-owned banks and state-holding enterprises are closer. Some researchers suggest that state-holding enterprises have advantages in getting access to lending channel when compared with private enterprises.

However, the recent statistics show that there is no significant lending difference between state-holding enterprises and private enterprises in medium-sized enterprise[9] group in 2010 and 2012 (see figure 2.4). In small enterprise group, private enterprises can get more loans than state-holding enterprises. Figure 2.4 shows there is a big lending gap in large enterprise group between state-owned and private enterprises. However, considered most state-owned enterprises belongs to large enterprise group, while private enterprise are less likely to grow as big as state-holding enterprises, the big loans gap cannot reflect the unfair lending distributions between state-holding enterprises and private enterprises. In general, the data shows that the banking lending decisions are less relies on the background of firms, but more on firms' performance and characteristics.

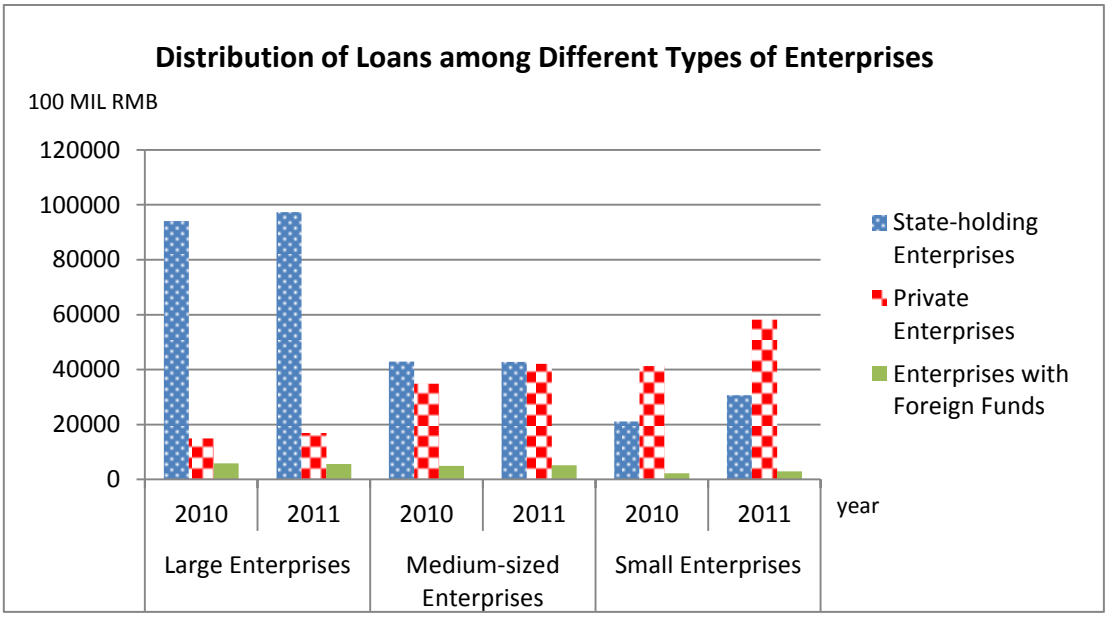


Figure 2.4: Distribution of loans among different types of enterprises
Source: DRCNET Statistical Database System. Detail data attached in Appendix A.7.

2.6 Conclusion

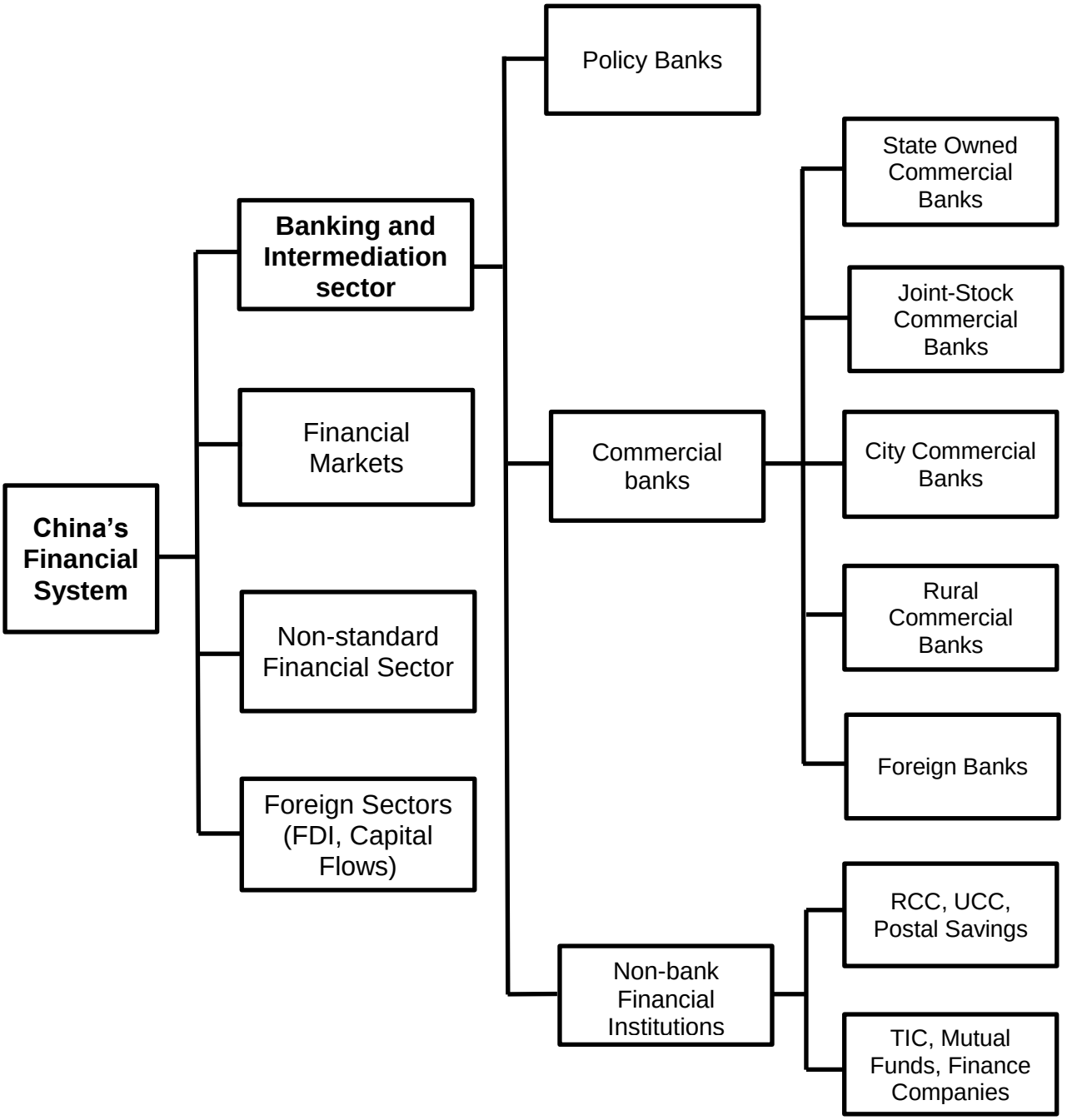
The present chapter is a context chapter aiming to provide some background information of China's banking system, particularly in banking reform, market competition and bank-firm

[9] Statistical Definitions of Large, Medium-sized and Small Enterprises are attached in Appendix table A.5.

relationships. The statistics and facts in the Chinese banking industry suggest three main backgrounds for the following research. First, banking sector is very important in national economy and plays a dominating role in China's financial system. Unlike in some developed countries that only small firms are highly rely on banks to get credit, most Chinese firms rely on bank financing regardless of the size of their business and the scale of their operations (Allen et al., 2005; Chang et al., 2009). Under this condition, when firms cannot be satisfied with their incumbent banks, switching to others banks usually becomes their first choice and even the only choice. Second, China's banking market is a fiercely competitive market in which more than 400 banks are poaching customers and chasing profits since 2011. With the growth of other types of domestic commercial banks and the competition of the market, the market share of large commercial banks decreases from 69.6% in 2003 to 51.9% in 2012. Since net interest income is the main income resource to banks, the Chinese banks have to focus on strategic pricing to attract and 'lock-in' customers. Switching costs play an important role in banks' strategy and the competition of the banking market. Third, unlike borrowing decisions of state banks to state-owned firms were historically mandated by Chinese government during 1990s, which resulted in high NPL ratios for banks. In recent years, banks make their lending decisions based on firms' performance and quality, which make them successfully lower their NPL ratios. Since borrowing-lending is a bilateral relationship, not only the characteristics of the firms, but the banks' characteristics influence the lending decision and determine the quality of the bank-firm relationships (Hao et al., 2013).

Appendix A

A.1. Overview of China's Banking System



Note: RCC: Rural Credit Cooperatives; UCC: Urban Credit Cooperatives; TIC: Trust and Investment Companies.

Table A.2: Market share of banks (according to banks' asset) unit: %

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Large commercial banks	69.6	68.1	66.8	65.2	63.0	60.9	59.5	57.3	54.9	51.9
Joint-stock commercial banks	12.8	13.8	14.2	14.6	16.1	16.5	17.3	18.2	18.8	20.3
City commercial banks	6.3	6.5	6.5	7.0	7.4	7.7	8.3	9.6	10.2	10.7
Rural commercial banks	0.2	0.2	1.0	1.4	1.3	1.7	2.7	3.4	4.4	5.4
Foreign banks	1.8	2.2	2.3	2.5	2.8	2.5	2.0	2.1	2.2	2.1
Policy banks	9.2	9.1	9.3	9.3	9.5	10.6	10.2	9.4	9.5	9.7

Source: China banking regulatory commission annual report.

Table A.3: Return on equity of Banks Unit: %

Banks/years	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Large commercial banks	-0.5	6.0	16.3	14.6	15.6	18.1	18.2	18.0	19.7	19.1
Joint-stock commercial banks	15.0	15.4	21.6	22.8	16.6	19.1	16.4	16.6	18.6	19.2
City commercial banks	10.9	15.0	14.6	14.9	13.2	15.3	13.8	16.0	16.3	16.9
Rural commercial banks	18.0	30.0	18.8	16.4	13.0	13.7	13.4	13.8	15.4	15.9
Foreign banks	4.1	4.8	5.9	7.7	5.2	8.4	3.9	4.2	8.0	6.4
Policy banks and the CDB	10.9	11.7	18.0	18.0	13.7	6.0	8.7	9.5	10.9	13.3

Source: China banking regulatory commission annual report 2011, 2006. (Note: Profits of banks from 2003 to 2006 are per-profits).

Table A.4: Loans and deposits of banks in different regions Unit: RMB 100 mil

province		2005	2006	2007	2008	2009	2010	2011
East region								
Beijing	Deposits of banks	28969.9	33793.3	37700.3	43980.7	56960.1	66584.6	75001.9
	Loans of banks	15335.5	18131.6	19861.5	23010.7	31052.9	36479.6	39660.5
Tianjin	Deposits of banks	6090.5	6839.2	8242.1	9954.2	13887.1	16499.3	17586.9
	Loans of banks	4722.4	5415.7	6543.8	7689.1	11152.2	13774.1	15924.7
Hebei	Deposits of banks	10888.3	12675.8	14474.3	17844.7	22502.4	26270.6	29749.5
	Loans of banks	6480.8	7480.2	8466.5	9506.7	13284.1	15948.9	18460.6
Liaoning	Deposits of banks	12465.0	14103.0	15678.0	18778.0	23351.1	28057.0	30832.0
	Loans of banks	8306.0	9456.0	10763.0	12348.0	16222.1	19662.0	22832.0
Shanghai	Deposits of banks	22219.5	24924.7	28168.5	33055.1	41486.5	52190.0	58186.5
	Loans of banks	14801.1	15968.9	18019.4	20294.8	26086.6	34154.2	37196.8
Jiangsu	Deposits of banks	22821.6	26722.8	31338.0	38063.4	47796.0	58455.4	66215.1
	Loans of banks	16282.6	19383.7	23265.8	27081.1	35132.7	42522.9	49101.2
Zhejiang	Deposits of banks	21117.9	25005.9	29030.3	35481.2	45112.0	54478.1	60893.1
	Loans of banks	17122.1	20757.8	24939.9	29658.7	39223.9	46938.5	53239.3
Fujian	Deposits of banks	7547.2	9109.4	10187.4	11916.4	14828.9	18753.2	21106.5
	Loans of banks	5280.3	6598.9	8265.1	9665.2	12682.5	15920.8	18982.8
Shandong	Deposits of banks	17453.3	19973.8	22370.5	27220.3	35080.2	41505.9	46825.5

	Loans of banks	13803.1	16135.9	18151.9	20794.7	27241.2	32329.6	37301.8
Guangdong	Deposits of banks	37736.5	42775.3	48190.9	55086.6	68392.3	79989.5	91589.5
	Loans of banks	2254.8	24989.4	29326.9	32507.5	43219.9	50120.0	58611.2
Hainan	Deposits of banks	1302.0	1560.3	1873.0	2350.9	3175.7	4217.3	4504.5
	Loans of banks	994.7	1123.3	1228.0	1383.5	1940.9	2509.7	3194.6
Center region								
Shanxi	Deposits of banks	7151.2	8656.0	10111.9	12827.6	15759.8	18636.8	21003.2
	Loans of banks	4328.9	4878.7	5514.2	6041.9	7915.4	9728.7	11265.6
Jilin	Deposits of banks	4374.5	5071.8	5277.3	6433.3	8405.7	9702.6	10962.2
	Loans of banks	3401.3	3921.6	4361.1	4891.0	6300.4	7279.6	8240.9
Heilongjiang	Deposits of banks	6256.4	7032.7	7657.7	9077.5	11116.1	12924.2	14416.4
	Loans of banks	3724.6	4028.1	4330.6	4594.0	6145.7	7390.6	8761.1
Anhui	Deposits of banks	6068.8	7177.9	8485.9	10387.0	13404.4	16477.6	19547.3
	Loans of banks	4399.2	5205.2	6127.9	7030.3	9438.6	11737.8	14164.4
Jiangxi	Deposits of banks	4510.9	5275.4	5954.4	7262.0	9352.8	11907.8	14322.1
	Loans of banks	3064.1	3501.2	4083.6	4613.3	6416.2	7843.3	9302.0
Henan	Deposits of banks	10126.7	11492.6	12669.4	15340.1	19175.1	23148.8	26774.8
	Loans of banks	7550.3	8567.3	9642.6	10439.7	13437.4	15871.3	17648.9
Hubei	Deposits of banks	8335.2	9710.0	11206.4	13563.4	17653.1	21716.6	24090.6

Hunan	Loans of banks	5855.8	6696.1	7770.9	8732.3	12018.3	14583.3	16332.1
	Deposits of banks	6589.5	7799.5	9155.3	10971.7	14025.5	16643.3	19444.1
	Loans of banks	4590.0	5233.6	6157.5	7115.3	9536.6	11521.7	13462.5
West region								
Neimenggu	Deposits of banks	3331.5	4075.3	4986.1	6380.5	8414.0	10278.7	12063.7
	Loans of banks	2618.0	3240.0	3803.1	4564.2	6385.5	7919.5	9727.7
Guangxi	Deposits of banks	4262.3	5029.5	5801.0	7075.0	9638.9	11819.9	13528.0
	Loans of banks	3104.6	3636.9	4331.0	5110.1	7360.4	8979.9	10646.4
Chongqing	Deposits of banks	4743.8	5587.5	6662.4	8102.0	11084.8	13455.0	16128.9
	Loans of banks	3561.6	4443.8	5197.1	6384.0	8856.6	10888.2	13195.2
Sichuan	Deposits of banks	10050.0	11943.6	14089.0	18787.7	25127.8	30504.1	34971.2
	Loans of banks	6898.6	8003.1	9416.2	11395.4	15979.4	19485.7	22514.2
Guizhou	Deposits of banks	2793.0	3316.0	3838.7	4750.0	5912.5	7387.8	8771.3
	Loans of banks	2319.0	2708.5	3145.0	3581.5	4670.2	5771.7	6875.7
Yunnan	Deposits of banks	5199.5	6131.3	7170.9	8418.9	11119.6	13478.9	15429.4
	Loans of banks	4031.0	4803.5	5671.7	6594.3	8779.6	10706.0	12347.0
Tibet	Deposits of banks	456.3	545.7	643.4	829.0	1028.4	1296.7	1662.5
	Loans of banks	179.3	204.1	223.8	219.3	248.4	301.8	405.1
Shaanxi	Deposits of banks	6549.0	7452.5	8553.2	10790.9	14043.4	16590.5	19227.1

	Loans of banks	4043.0	4463.2	5170.8	6056.8	8276.6	10222.2	12097.3
Gansu	Deposits of banks	2931.4	3341.3	3765.0	4745.7	5903.1	7146.7	8460.9
	Loans of banks	1942.8	2131.3	2448.2	2768.4	3739.9	4576.7	5736.2
Qinghai	Deposits of banks	737.8	903.7	1105.2	1389.6	1791.0	2327.0	2834.8
	Loans of banks	641.6	729.8	882.1	1033.9	1408.3	1832.8	2239.0
Ningxia	Deposits of banks	993.7	1140.3	1288.2	1598.2	2068.4	2586.7	2978.4
	Loans of banks	841.8	993.9	1196.5	1414.3	1928.7	2419.9	2907.2
Xinjiang	Deposits of banks	3461.0	4068.9	4638.4	5424.4	6877.2	8898.6	10442.8
	Loans of banks	2339.8	2481.2	2767.1	2918.1	3952.1	5211.4	6603.4

Source: Almanac of China's Finance and Banking, 2010.

Table A.5: Statistical Definitions of Large, Medium-sized and Small Enterprises (newest)

Industry Branch	Index	Unit	Large	Medium-sized	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	$Y \geq 80000$	$6000 \leq Y < 80000$	$300 \leq X < 6000$
	Total assets (Z)	10,000	$Z \geq 80000$	$5000 \leq Z < 80000$	$300 \leq X < 5000$
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 trades	Employees (X)	People	$X \geq 300$	$50 \leq X < 300$	$10 \leq X < 50$
	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 services	Employees (X)	People	$X \geq 300$	$100 \leq X < 300$	$10 \leq X < 100$
	Operating income (Y)	10,000	$Y \geq 10000$	$2000 \leq Y < 10000$	$100 \leq Y < 2000$
Soft and scientific research, technical	Employees (X)	People	$X \geq 300$	$100 \leq X < 300$	$10 \leq X < 100$
	Operating income (Y)	10,000	$Y \geq 10000$	$1000 \leq Y < 10000$	$50 \leq Y < 1000$

services					
Real estate	Operating income (Y)	10,000	$Y \geq 200000$	$1000 \leq Y < 200000$	$100 \leq X < 1000$
	Total assets (Z)	10,000	$Z \geq 10000$	$5000 \leq Z < 10000$	$2000 \leq X < 5000$
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	$Z \geq 120000$	$8000 \leq Z < 120000$	$100 \leq X < 8000$
No specified industry	Employees (X)	People	$X \geq 300$	$100 \leq X < 300$	$10 \leq X < 100$

Source: National bureau of statistics of China.

Table A.6: Capital injections from government to the SOCBs

Data	Bank	Currency	Amount (Billion)	Financed by:
1998-1999	SOCBs	RMB	275	Ministry of Finance
2003-2004	CCB	USD	22.5	Central Bank (international reserves)
2003-2004	BOC	USD	22.5	Central Bank (international reserves)
2005	ICBC	USD	15	Central Bank (international reserves)
2008	ABC	USD	19	Central Bank (international reserves)

Note: SOCBs (State-owned commercial banks), CCB (China Construction Bank), BOC (Bank of China), ICBC (Industrial and Commercial Bank of China), ABC (Agricultural Bank of China).
Source: China Banking Regulatory Commission.

Table A.7: Distribution of loans among different types of enterprises Unit 100Mil RMB

	Large Enterprises		Medium-sized Enterprises		Small Enterprises	
	2010	2011	2010	2011	2010	2011
State-holding Enterprises	94146.7	97400.7	42966.3	42858.5	21121.9	30687.4
Private Enterprises	14971.8	16895.8	34928.5	42164.9	41255.6	58251.9
Enterprises with Foreign Funds	5826.8	5638.8	4956.8	5092.3	2234.8	2940.7

Source: DRCNET Statistical Database System.

Chapter 3: The determinants and the effect of switching costs on profitability in Chinese banking

3.1 Introduction

In this chapter I will study the switching costs in the Chinese bank lending market, in which a borrower may face non-negligible switching costs when switching between banks. High enough switching costs may completely prevent borrowers from switching and locks them in with their incumbent banks. Kim et al. (2003) claim that switching costs mainly arise from asymmetric information between borrowers and lenders. Some of the literature of switching costs and the lending relationship find that when a borrower switches the new bank often does not know the borrower's quality information as well as the former one does. Hence, generally, before lending the borrowers know their own credit quality, repayment performance, and risk of defaulting on loans better than the banks. These information asymmetries will result in higher loan rates when the borrowers switch to new banks. The borrowers' costs of switching banks include the loss of their relationship with their current bank and an increasing loan rate.

As a kind of market power for banks, switching costs play an important role in the competition of the banking sector. Porter (1980) has claimed that 'in view of the potential importance of switching costs, the impact of all strategic moves on switching costs should be considered'. The banks often take advantage of switching costs to decrease the substitutability of the loans provided by their competitors. On the one hand, higher switching costs result in a lower probability of borrowers switching. The magnitude of switching costs becomes an important channel to strengthen the banks' market power. However, the management level, operating efficiency, and performance are heterogeneous among banks,

which results in different 'information monopoly' power, while market competition tends to affect this monopolization. Hence, the magnitude of switching costs is determined by three main factors: the extent of the information monopoly that the banks can get, to what degree that they can make use of this information, and the effects of the whole market lending condition. On the other hand, the banks which have higher switching costs will presumably lock in more customers and lead to more profits. Hence, the bank's profits will also be influenced by the magnitude of their switching costs.

In 2006, China was the world's second largest economy (IMF, 2006). China's banking sector is massive and it has a fast growth rate, which intermediates more than 70% of capital in China. At the end of 2011 there were over 400 banks operating in China's banking market, which created fierce competition. However, only a few papers have discussed the topic of switching costs in China's banking sector. Most papers focus instead on the credit card or deposit markets and use survey data or macro data. Although prior studies have recognized that switching costs have a significant influence in the bank's market share and profits, there is a lack of understanding of the effect of switching costs in the lending market, as well as the poor determinations of switching costs.

This chapter seeks to enhance the understanding of the magnitude of switching costs and their influence on profits of banks in China lending market. For the empirical part, since the switching costs are heterogeneously among banks and cannot be observed, I firstly apply the structural model developed by Shy (2002) to evaluate the switching costs for each bank in all sample years. I then analyze the determinants of the magnitudes of switching costs in the Chinese banking sector and their effects on the banks' profits in a simultaneous equations system. This chapter is organized as follows: Section 2 offers a brief introduction of the

reform and changes in China's banking market; Section 3 reviews the relevant theoretical foundation and empirical researches on switching costs; Section 4 first describes the methodology of the relationship between switching costs and competition, it then introduces the model's setting for empirical studies; Section 5 describes the data; Section 6 provides a discussion of the empirical results; and, Section 7 draws a number of conclusions.

3.2 The Chinese banking market

The Chinese banking industry has been in a state of reform since 1978. Numerous papers have described the Chinese banking market in detail and it is not the intention of this chapter to repeat the same here. This chapter instead focuses on the key elements of the banking sector that is germane to the empirical research reported in this chapter. The entry of China to the WTO gave an additional impetus to the process of banking sector reform. In 2003, the Chinese National People's Congress approved the establishment of the China Banking Regulatory Commission, which replaced the Central Bank's regulatory function in the financial market. In the same year, the Law of Banking Supervision was promulgated.

The commercial banking market can be separated into large commercial banks (state owned banks – SOBs), joint-stock commercial banks (JSBs), city commercial bank (CCBs), rural commercial banks (RCBs) and foreign banks (FBs). Despite the seemingly diverse nature of the banking market, more than half of market share is dominated by the five large commercial banks. However, with the growth of other types of banks and competition of the market, the five large commercial banks' market share keep decreasing, shrinking from 69.63% in 2003 to 54.89% in 2011. Since China entered the WTO in 2001, the joint-stock banks, city commercial banks and foreign banks have increased their market share at the expense of the SOBs.

Recapitalization, profitability and cost efficiency have been joint objectives of the SOBs aided by international listing[10], global outreach, and acceptance of strategic foreign investors (Lin et al, 2012). The profitability of the non-SOB sector has improved, as has their productivity and efficiency (Matthews and Zhang, 2010). The reform process has been extended to loan pricing and limited loan rate differentiation between banking entities has become a possibility since 2004. Table 3.1 shows the development of interest rate deregulation in China banking market. In 1996, the loan rate floating range was comparatively smaller, from 0.9 to 1.1 of benchmark loan rate. Then, in 1999, this rate range extended to 0.9-1.3 times of the benchmark for small and medium enterprises, while it remained the same for large enterprises. However, in 2004, the upper limit of loan rate had been moved, as well as the lower limit of the deposit rate. Hence, banks are almost free to set price according to their strategy. The statistics shows that during December 2004 and December 2008 less than 30% of all loans were made at the benchmark rate (Xu et al., 2013). This suggests that most borrowers had been charged higher lending rate.

Table 3.1: Interest rate deregulation

Year	Loan	Deposit
1996	All enterprises: 0.9-1.1 of benchmark rate	Equal to the benchmark rate
1998	Medium and large enterprise: 0.9-1.1 times; small enterprise: 0.9-1.2 times	Equal to the benchmark rate
1999	Large enterprise: 0.9-1.1 times; small and medium enterprise: 0.9-1.3 times	Equal to the benchmark rate
January 2004	All enterprises: 0.9-1.7 times	Equal to the benchmark rate
October 2004	0.9 times - Upper limit removed.	No lower limit-benchmark rate

Note: The interest rate liberalization process started in 1996 and halted in 2004.

[10] BOCOM was listed on Hong Kong Stock Exchanges in June 2005, and on Shanghai Stock Exchange in May 2007; CCB was listed on Hong Kong Stock Exchanges in Oct 2005, and on Shanghai Stock Exchange in Sep 2007; BOC was listed on Hong Kong Stock Exchanges in June 2006, and on Shanghai Stock Exchange in July2006; ICBC was listed on Hong Kong and Shanghai Stock Exchanges Oct, 2006; ABC was listed on Hong Kong and Shanghai Stock Exchanges in July, 2010.

Sources: Podpiera (2006)

Table 3.1 suggests that Chinese banks have the capability to price differentiate and use strategic pricing to attract and 'lock-in' customers by developing switching costs.

3.3 Literature review

3.3.1 Earlier research on switching cost theories

The concept of switching costs was invented by Porter (1980). Many theoretical studies have since explored the effects of the consumers' switching behaviour on a firm's competition strategy and market outcome. For example, Farrell and Shapiro (1988) use a dynamic model to study the effects of switching costs on firm's competition strategy. Their findings suggest that firms with larger market shares tend to compete less aggressively on attracting new consumers. Sharpe (1990) has formulated a model of borrowing under asymmetric information to explain the loyalty of borrowers to the banks from which they borrow money. His theory suggests that banks make the best offers to their existing borrowers because they know the quality of their existing borrowers better than their competitors do. Customers are then 'informational captured' by their own banks and will thus be charged a higher price if they switch since they are unable to transfer their quality information to new banks. Beggs and Klemperer (1992) evaluate the duopolists' prices and market share in a market with switching costs in an advanced multi-period model, in which new consumers arrive while some of the old consumers leave every period. They find that equilibrium prices and firms' profits are higher in a market with switching costs than in a market without switching costs. Klemperer (1995) summarizes relevant research and concludes that, in general, switching costs for consumers exist in many markets and these raise the market prices. Vesala (2007) distinguishes between switching costs and the informational advantage gained in a banking-firm relationship and examines how switching costs affect the profits available from relationship based lending. This paper finds that the value of the informational advantage first

decreases and then increases due to the size of the switching costs. On the one hand, very low switching costs discourage competing banks from making offers because it gives a chance for low quality borrowers to switch banks. Very high switching costs, on the other hand, lock in high quality borrowers to their current bank and make it impossible for banks to extract rents.

3.3.2 Earlier Empirical studies

Based on micro-level data, some scholars use an empirical method to explore whether switching costs have a significant influence on bank lending and bank-customer relationships. Hubbard et al. (2002) use a matched sample of individual loans, borrowers, and banks with contract-level loan data of US to find that small firms or firms with no bond rating will face a higher loan rate when switching between banks. High asymmetric information is supposed to make the switching costly for small firms. Stango (2002) examined the credit card market and investigated the relationship between price setting and consumer switching costs. Using a detailed panel of credit card issuers, this paper found that switching costs are an important influence on pricing for commercial banks but have almost no influence on pricing for credit unions. Waterson (2003) compares switching behaviour among different industries. The author uses survey data to find that borrowers in the banking industry are much less likely to switch than those in other industries. Kim et al. (2003) apply a novel model to Norwegian bank-level data to estimate the magnitude of switching costs for customers. They claim that switching costs are encountered when a firm opens a new relationship with its current main banks, or when firms switch to a lender that was one of its non-main banks in the previous period. Their empirical results show that switching costs are on average about one-third of the average lending rate.[11] Santos and Winton (2008) use contract-level loan data to find that

[11] They take switching costs as homogenous among banks and evaluate the average value for the whole banking industry.

during a recession bank-dependent firms without accessibility to the public debt market pay significantly higher loan rates than those firms with the accessibility. This indicates that the bank-dependent firms have to pay the banks to take advantage of information monopoly when the credit risk rises in the lending market. But firms with public debt market accessibility pay lower spreads and, correspondingly, their spreads rise significantly less in recessions, which suggest that the macro economy is likely to affect the switching costs. In their study of the bank-firm level of four Italian local credit markets, Barone et al. (2011) empirically show that firms tend to borrow from their main bank over time because of the lock-in effect arising from switching costs.

Since switching costs cannot be directly observed, researchers have worked on methods to estimate switching costs. According to Kim et al. (2003), the average costs of switching in the market can be estimated mainly based on bank loans, market share, interest rate, and net interest margin. Shy (2002) invents a 'quick-and-easy' way to calculate consumer switching costs among brands directly in a given industry based on Nash-Bertrand equilibrium model. This paper notes that the consumers' switching costs will be determined by price setting mechanisms and the firms' market share. The author then offers an example of evaluating each bank's switching costs by using data drawn from the largest four in Finland.

3.3.3 Studies of switching costs in the Chinese banking sector

Some empirical studies of switching costs in Chinese banking sector have focused on the deposit account and credit card market. Su (2007) compares the competition between local banks and foreign banks in the view of switching costs. The author indicates that, as new comers to China banking market, there are far fewer branches of foreign banks than local banks, especially the State owned banks (SOBs), which probably raises costs when the

consumers switch to foreign banks. The lack of a relationship network makes it hard for foreign banks to lock-in customers. Su (2007) also claims that competition will decrease the switching costs in the market and that foreign banks can increase their market share growth through an advanced marketing strategy. In another study, Su and Chen (2009) use survey data to study the determinations of switching costs in deposit account according to individuals and banks characteristics. They define four types of switching, which are: transaction costs, learning costs, uncertainty costs and relationship costs. They then interview the customers through a questionnaire to find the key factors affecting the switching choices.[12] Combined with the interviewer's information and other relevant information, the authors collected panel data from 926 samples. Their empirical model is designed as follows:

$$Y = \alpha_0 + \alpha_1 X + \alpha_2 Z + \varepsilon \qquad (1)$$

where Y represents the switching costs, X is the sector of consumers characteristics, and Z stands for the banks' characteristics. The results show that the bank-client relationship and service quality significantly affect the switching costs, and young people are more likely to have lower switching costs than old people. Yu et al. (2008) focus on the relationship between banks and consumers; in their empirical study they use survey data to examine how switching costs affect the consumers' decision to change deposit accounts. They measure the relationship in two aspects: the economic aspect and the service quality aspect. They mark switching equal to 1 if a consumer has changed in the last 6 months, otherwise it is set to 0. Similar to Su and Chen (2009), they use an OLS to study those factors that affect the individual's switching. Their empirical results show that switching costs have a negative effect on the consumers' switching actions. They find that the bank-client relationship is very important to banks, and this will lower the consumer's switching probability.

[12] Mark 1 is strongly disagrees and 5 is strongly agree. The score range is between 1 and 5.

Ho (2007) describes the bank reform in China and claims that consumers face switching costs when they change deposit banks. He adds transaction costs into a static demand model to explore whether the switching costs effect on the consumer preferences. The empirical results show that consumers face switching costs when changing, and that more branch locations and higher quality employees of banks are preferred by consumers. Ho (2009) improves the model he used in 2007, and studies the relationship between switching costs and deposit demand in China. The author makes the assumption that consumers only choose to use deposit services from the Industrial and Commercial Bank of China (ICBC), the Agricultural Bank of China (ABC), the Bank of China (BOC), and the China Construction Bank (CCB). The paper index the ABC, the BOC, the CCB and the ICBC are a, b, c and d, respectively. In period t, if consumer i switches from one bank to another bank j, then a switching cost τ must be incurred. The consumer's utility from deposit services is:

$$u_{ijt} = \delta_{jt}^{f} - \tau + \varepsilon_{ijt} \qquad (2)$$

where $\delta_{jt}^{f} = -\alpha p_{jt} + x_{jt}\beta + \xi_{jt}$. δ_{jt}^{f} stands for the independent of consumer characteristics, in which p_{jt} is the service fee of bank j, x_{jt} is observed product characteristics of bank j, and ξ_{jt} is unobserved product characteristics of bank j. ε_{ijt} represents consumer characteristics. The paper defines Ω_t be the information set available to consumers in period t. The value function for the current consumers at the ABC is:

$$V_i(\varepsilon_{ijt}, a, \Omega_t) = Max\Big(\delta_{jt}^{f} + \varepsilon_{iat} + \beta E\big[V_i(\varepsilon_{ijt+1}, a, \Omega_{t+1})\big|\Omega_t\big],\ \delta_{bt}^{f} + \varepsilon_{ibt} + \beta E\big[V_i(\varepsilon_{ijt+1}, b, \Omega_{t+1})\big|\Omega_t\big] -$$

$$\tau,\ \delta_{ct}^{f} + \varepsilon_{ict} + \beta E\big[V_i(\varepsilon_{ijt+1}, c, \Omega_{t+1})\big|\Omega_t\big] - \tau\Big),\ \delta_{dt}^{f} + \varepsilon_{idt} + \beta E\big[V_i(\varepsilon_{ijt+1}, d, \Omega_{t+1})\big|\Omega_t\big] - \tau) \qquad (3)$$

The value functions are asymmetries for BOC, CCB and ICBC. In order to simplify the dynamic optimization problem, the author exploits the fact that there is no outside option for consumers and defines the difference of value functions as:

$$\Delta EV(j,a,\Omega_t) = \log\left(\frac{e^{-\tau}+e^{\Delta\delta^f_{jat}+\beta E[\Delta EV(j,a,\Omega_{t+1})|\Omega_t]}+\sum_{k\neq a} e^{\Delta\delta^f_{kat}+\beta E[\Delta EV(k,a,\Omega_{t+1})|\Omega_t]-\tau}}{1+\sum_{k\neq a} e^{\Delta\delta^f_{kat}+\beta E[\Delta EV(k,a,\Omega_{t+1})|\Omega_t]-\tau}}\right) \quad (4)$$

where $\Delta EV(j,a,\Omega_t) = EV(j,\Omega_t) - EV(a,\Omega_t)$, $\Delta\delta^f_{jat} = \Delta\delta^f_{jt} - \Delta\delta^f_{at}$ and $j = \{b,c,d\}$.

To compute market share, the payoff of a consumer staying in the ABC is $u_{iat} + \beta E[EV(a,\Omega_{t+1})|\Omega_t]$, while switching to other bank is $u_{ijt} - \tau + \beta E[EV(j,\Omega_{t+1})|\Omega_t]$ $(j = \{b,c,d\})$. Then, the probability of consumer i switching from the ABC (a) to the bank j is:

$$P(a \to j) = \frac{e^{\Delta\delta_{jat}-\tau}}{1+\sum_{k\neq a} e^{\Delta\delta_{kat}-\tau}} \quad (5)$$

where $j \neq a$. For the probability of consumer i in other banks (b, c, d), the functions are asymmetries. Based on the estimating method of Berry et al. (1995), the author uses the following equations to update the differences of net flow utilities:

$$\Delta\delta^{f\prime}_{jamt} = \Delta\delta^f_{jamt} + \Psi\left(\ln\left(\frac{s_{jmt}}{s_{amt}}\right) - \ln\left(\frac{\hat{s}_{jmt}(\tau)}{\hat{s}_{amt}(\tau)}\right)\right) \quad (6)$$

where $j = \{b,c,d\}$, and Ψ is the tuning parameter. Hence, the predicted market share of the four banks are the function of τ, which are denoted by $\hat{s}_{amt}(\tau)$, $\hat{s}_{bmt}(\tau)$, $\hat{s}_{cmt}(\tau)$ and $\hat{s}_{dmt}(\tau)$. In equation (6), m stands for the provinces market, as the author measures the market in Chinese provinces to construct the pool data. Hence, the bench model for estimation is:

$$\Delta\delta^f_{jmt} = \Delta x_{jmt}\beta_x - \alpha\Delta p_{jt} + \Delta\xi_{jmt}. \quad (7)$$

Using the provincial data from the biggest four banks, this empirical study shows that switching cost is an important factor for consumers to make bank choices and the consumer needs to stand 5% of their deposit value loss as switching costs when they switch to other banks. This switching cost evaluation is close to the 4% that was found by Kim et al. (2003) in Norway's loan market and the 0-11% found by Shy (2002) in Finland's deposit market. Meanwhile, this research finds that banks reduce their service fees to attract consumers at the

start and then expect to earn more from consumers in the extended time period. Therefore, switching costs are a significant factor that affects the Chinese banking market.

Shen and Chen (2011) reviewed the literature of switching costs in the credit card market. They collected the relevant research in four main aspects, which are: the definition of switching costs, types of switching costs, the effects of switching costs on customers, and the method to analysis switching costs. Though this literature review, they tried to provide a reference for future studies of switching costs in the credit card market.

3.4 Methodology

3.4.1 Estimation of switching costs

Two-period models of switching costs affecting the market in terms of consumer's behavior and competition were widely used in the 1980s, in which the representative works are Klemperer (1987a, b). These models usually set a Bertrand competition in a market with switching costs. However, allowing for switching costs in equilibrium leads to the non-existence of Nash-Bertrand equilibrium because of the assumption of homogeneous switching costs (Shy, 2001). In order to solve this problem, Shy (2002) built a model that was based on a new equilibrium concept, which is called the undercut-proof equilibrium. The model of consumers changing suppliers when facing switching costs is described as follows.

There are two firms A and B competing Bertrand style with brand A and brand B products, respectively. The marginal costs of the two firms are assumed to be 0. The consumers are distributed between the firms so that initially N_A consumers have already purchased brand A and N_B consumers have already purchased brand B. All of the consumers face switching

costs, SC>0, if they wish to change supplier. The utility function of each consumer type derived from the next purchase is given by:

$$U_A \stackrel{\text{def}}{=} \begin{cases} -P_A & if\ staying\ with\ A \\ -P_B - SC & if\ buying\ from\ B \end{cases} \quad (8)$$

$$U_B \stackrel{\text{def}}{=} \begin{cases} -P_A - SC & if\ buying\ from\ A \\ -P_B & if\ staying\ with\ B \end{cases} \quad (9)$$

If firm A wishes to poach customers from firm B, it has to offer a lower price than firm B. Furthermore, the price difference has to be larger than the switching cost S to make it worthwhile for consumers to switch. Let N_A denote the (endogenously determined) number of brand A buyers (the next period purchase), and N_B denote the number of brand B buyers (the next period purchase). Then, (8) and (9) imply that:

$$N_A = \begin{cases} 0 & if\ P_A > P_B + SC \\ N_A & if\ P_B - SC \le P_A \le P_B + SC \\ N_A + N_B & if\ P_A < P_B - SC \end{cases} \quad (10)$$

$$N_B = \begin{cases} 0 & if\ P_B > P_A + SC \\ N_B & if\ P_A - SC \le P_B \le P_A + SC \\ N_A + N_B & if\ P_B < P_A - SC \end{cases} \quad (11)$$

Assume that the firms' production costs are zero. Denote π_A and π_B as the profit of firm A and B. Thus, due to the equilibrium in Bertrand model, the profits of each firm are given as:

$$\pi_A(P_A, P_B) = P_A N_B \text{ and } \pi_B(P_A, P_B) = P_B N_B \quad (12)$$

A Nash-Bertrand equilibrium would be a pair of non-negative prices $\{P_A, P_B\}$. For a given P_B, firm A chooses P_A to maximize π_A, and the symmetry method to maximize π_B of firm B. Although the Nash-Bertrand equilibrium does not exist in pure strategies, an undercut-proof equilibrium does. According to Shy (2002) definition 1: firm i is said to undercut firm j, if it sets its price to $P_i < P_j - SC$, i=A, B and $i \neq j$, That is, if firm i 'subsidizes' the switching cost of firm j's customers.

Prices represent an undercut-proof equilibrium if it is impossible for any firm to increase profits by undercutting the competitor while it is impossible for any firm to raise its price without being profitably undercut by the competitor. The under-proof property is formally designed (definition) as in Shy (2002):

A pair of prices $\{P_A^U, P_B^U\}$ satisfies the undercut-proof property (UPP) if:

(a) For a given P_B^U and N_B^U, firm A chooses the highest price P_A^U subject to the constraint

$$\pi_B^U = P_B^U N_B^U \geq (P_A - SC)(N_A + N_B) \qquad (13)$$

(b) For a given P_A^U and N_A^U, firm B chooses the highest price P_B^U subject to the constraint

$$\pi_A^U = P_A^U N_A^U \geq (P_B - SC)(N_A + N_B) \qquad (14)$$

Although firm A sets the highest price possible in order to maximize profits, the price is still sufficiently low to prevent firm B from undercutting and taking the whole market. Firm A's price is set low enough to make firm B's profit from not undercutting, $P_B^U N_B^U$ larger than the profit firm B would make when undercutting and capturing the whole market, $(P_A^U - SC)(N_A + N_B)$. But since both firms set prices as high as possible, the inequalities hold as equalities. These equalities give the unique pair of prices $\{P_A^U, P_B^U\}$ where

$$P_A^U = \frac{(N_A+N_B)(N_A+2N_B)*SC}{(N_A)^2+N_A N_B+(N_B)^2} \qquad (15)$$

and

$$P_B^U = \frac{(N_A+N_B)(2N_A+N_B)*SC}{(N_A)^2+N_A N_B+(N_B)^2}. \qquad (16)$$

Then solve for the switching costs based on undercut-proof equilibrium. Inserting equations (13) and (14) in the equalities of definition gives that $N_A^U = N_A$ and $N_B^U = N_B$. The solutions for switching costs are given as follow:

$$SC_A = P_A - \frac{P_B N_B}{N_A + N_B} \qquad (17)$$

$$SC_B = P_B - \frac{P_A N_A}{N_A + N_B} \qquad (18)$$

Shy (2002) extends the model described above to a multi-firm industry for estimating switching cost using merely information on market shares and prices, which is based on a solution to the non-existence of a Nash-Bertrand equilibrium. As to the estimation in the banking sector, price setting by banks is measured by the average lending interest rate. Define S_i to be the switching cost of a brand i consumer, and assume that S_i (i=1,2,……L) are known all firms and consumers. Then, each firm $i \neq L$ takes P_L as given and sets maximal P_i to satisfy:

$$\pi_L = P_L N_L \geq (P_i - Switching\ costs_i)(N_i + N_L) \qquad (19)$$

According to the method, the switching costs estimation model is designed as follows:

$$Switching\ Cost_{it} = P_{it} - \frac{P_{Lt} N_{Lt}}{N_{it} + N_{Lt}} \qquad (20)$$

where the switching costs of bank i are estimated as a function of the average interest P set by bank i and L, and the market share of bank i and L at period t. $P_{Lt}\ and\ N_{Lt}$ denote the average interest rate and market share of bank L, which has the lowest market share in period t, respectively. Assume that the firm with the smallest market share, firm L, is a prey target of firm 1. Therefore, the price P_L of firm L would make undercutting its price by firm 1 unprofitable; that is,

$$\pi_1 = P_1 N_1 \geq (P_L - Switching\ costs_L)(N_1 + N_L) \qquad (21)$$

Since P_{Lt} is observed, the unobserved remaining switching cost $Switching\ costs_{Lt}$ can be solved as treating equation (12) equality. Thus, the switching costs of the bank which has lowest market share at period t can be estimated as:

$$Switching\ Cost_{Lt} = P_{Lt} - \frac{P_{1t}N_{1t}}{N_{1t}+N_{Lt}} \qquad (22)$$

3.4.2 A framework of the determinants and profitability of switching costs

Determinants of switching costs

Switching costs mainly arise from asymmetries of information, which are proved to be heterogeneous among different sized banks (Shy, 2002; Kim et al, 2003). Asymmetrical information contains two aspects, which are: information asymmetric in the bank-borrower relationship and lack of information sharing between banks. Large banks tend to have more customers, which raise the asymmetrical information comparative advantages. Symmetrically, small firms that are usually considered as opaque stand more for the asymmetrical information and are less likely to switch banks (Gopalan et al, 2011). Although information sharing is considered to reduce switching costs (Gehriga and Stenbacka, 2007), currently only negative information (bad credit information) sharing is provided in China. In addition, a rational bank is not willing to share their client's information with their competitors. Hence, bank size plays an important role in determining the level of switching costs.

Operational efficiency is different among banks. It is imaginable that the degree of switching costs are partly dependent on how efficiently the bank takes advantage of asymmetrical information and collect useful information. Berger et al. (2005b) argue that small banks are better able to collect and act on 'soft'[13] information than large banks. Hence, operational efficiency should be included as one determinant of switching costs.

[13] Soft information is the internal information about the investing project cannot be credibly communicated from firm to non-relationship banks.

Banks usually create artificial switching costs to set barriers for consumers to change suppliers (Smidt et al., 2006). An effective strategy for banks is to develop other correlations and borrowing to develop a closer bank-firm relationship. Kim et al. (2003) suggested that when switching between credit suppliers, costs related to the loss of capitalized value of the previously established relationship would be involved. Having other business relationships with banks set the lock-in power and results in higher switching costs.

Having enough funding sources enhances the banks' market power in lending. The total loans in the China banking sector have increased from 2003 to 2010 at an average annual growth rate of 28.8%. Huge and growing loan demand has significantly challenged the banks' lending capabilities. Many firms have high likelihood to switch to another bank to overcome the financial constraint when they are dissatisfied with their incumbent banks. An ample deposit can guarantee that banks satisfy the growing borrowing requirements of their customers and lower the probability of their customers switching to other banks for financial help.

Based on above analysis, here I use the switching costs as the dependent variable regressed on the bank characteristics (measure the degree of asymmetries, operation efficient, artificial barrier and fund sources) and a set of macro variables (measure economy and industry environment) to explore whether the independent variables have explanatory power for switching costs; that is:

$$Switching\ Cost_{it} = \alpha_0 + X_{it}\alpha_1 + M_{it}\alpha_2 + u_{it} \qquad (23)$$

where X_{it} stands for bank characteristics, M_{it} is a set of macroeconomics variables.

Determinants of banks' profit with switching costs

Set *N* banks in a competitive market, where $i \in \{1,2,\dots,N\}$. The customers have been locked-in to their incumbent banks in previous period. When they switch to non-relationship banks, they bear the switching costs. Assume when choosing from which bank to borrow that the firms compare the gain from the difference of prices charged by the various suppliers and the loss from switching costs. Here, as in Kim (2003), switching costs (s) are added to the prices charged by the non-relationship banks. Hence, the probability of a firm staying with its bank is given by $pr_t(i \to i) = f\{p_{it}, p_{iRt} + s_{it}\}$, where p_{it} is the price charged by the incumbent bank, *i* and p_{iRt} are the prices charged by the rival banks. Since higher switching costs (s_{it}) help bank *i* to lock-in more customers, there is $\frac{\partial pr_t(i \to i)}{\partial s_{it}} > 0$. Symmetrically, the probability for firms switching from rival banks to bank *i* is given by $pr_t(R \to i) = f\{p_{it} + s_{iRt}, p_{iRt}\}$, where s_{iRt} is the rival bank's switching costs. The switching costs of rival bank's offer a barrier for their customer switching to bank *i*, hence $\frac{\partial pr_t(R \to i)}{\partial s_{iRt}} < 0$. So the total loans of bank *i* in period t (L_{it}) is given as:

$$L_{it} = pr_t(i \to i) * L_{it-1} + pr_t(R \to i) * L_{iRt-1} \qquad (24)$$

where is the market share of rival banks of bank i.

Denote π_{it} as the profit of bank in period t. N_{it} is probability of the non-performing lending. Meanwhile, r is the interest rate of deposit, which is assumed as homogenous for all banks. C_{it} stands for the non-interest expense. Here, assume that the total amount of lending is equal to the total amount of deposit for bank I in period t ($L_{it} = D_{it}$). The profit function of bank I in time t is as follows:

$$\pi_{it} = (p_{it} * (1 - N_{it}) - r) * L_{it} - C_{it} \qquad (25)$$

By substituting equation (24) into (25), there is:

$$\pi_{it} = (p_{it} * (1 - N_{it}) - r) * [pr_t(i \to i) * L_{it-1} + pr_t(R \to i) * L_{iRt-1}] - C_{it} \quad (26)$$

In equation (26), it is clear that $\frac{\partial \pi_{it}}{\partial s_{it}} > 0$, which suggests that switching costs have a positive effect on the bank's profits.

A large amount of previous studies have claimed that the bank's profits are linked to the bank's characteristics and macroeconomics variables. Similar to Stephan et al. (2009) and Gopalan et al. (2011), here I set the profits determination model as:

$$\pi_{it} = \beta_0 + \beta_1 switching\ costs_{it} + X_{it}\beta_2 + M_{it}\beta_3 + \varepsilon_{it}. \qquad (27)$$

3.4.3 Empirical model

Based on above analysis, the systems model of switching costs determination and profitability determination is given as:

$$Switching\ Cost_{it} = \alpha_0 + \alpha_1 \ln(Bank\ size)_{\text{it}} + \alpha_2 NEI_{it} + \alpha_3 Deposita_{it} + \alpha_4 NIR_{it} + \alpha_5 GGDP_{it} + \alpha_6 MCR + u_{it} \qquad (28)$$

$$ROA_{it} = \beta_0 + \beta_1 Switching\ Cost_{it} + \beta_2 \ln(\text{Bank size})_{\text{it}} + \beta_3 NEI_{it} + \beta_4 Deposita_{it} + \beta_5 Capitalr_{it} + \beta_6 MCR + \varepsilon_{it}. \qquad (29)$$

In equation (28) and (29), switching costs are values, which have been evaluated according to the method of Shy (2002) and described in the appendix. GGDP stands for annual growth ratio of real GDP, which measures the macro effect on switching costs. The other variables are the banks' characteristic variables. The details of each variable are described below:

Return on asset (ROA), which is measured as net income over total asset. The switching

costs will be reinforced through better using of asymmetric information.

Bank Size is defined as total assets. Stephan et al. (2009) finds that bank size has a negative effect on a firm's switching behaviour, which suggests that large banks have stronger lock-in power. Large banks have more client and branches than small banks, which strengthens the asymmetrical information comparative advantage and lock-in power. Hence, bank size is expected to have a positive effect on switching costs.

Non-interest expense ratio (NEI), which is defined as the ratio of non-interest expense over income on loans, provides information on variations in operating costs. The ratio reflects a firm's efficiency at generating profits and measures the management level of banks. A high return on asset value presumably means efficiency management, which is expected to have a positive effect on taking advantage of asymmetrical information. Banks with low levels of NEI are considered as having efficient management, are skilled employers, and are less bureaucratic. This will be helpful to lock-in the borrowers and make more profits. Non-interest expense ratio is expected to have a negative influence on switching costs and on profits.

Non-interest income ratio (NIR), which is defined as Non-interest income over total gross income, stands for the income structure of banks. Since banks with high non-interest income ratios tend to have more correlation (intermediary business, consulting, investment and so on) with firms other than lending, which presumably raise the switching costs and strengthens the lock-in power to enhance firms to stay with their current lending relationships.

Capital ratio (Capitr) is expected to have a positive relationship with the bank's profits, which is measured by total equity over total asset. Capital ratio reveals capital adequacy and captures the general average safety and soundness of the financial institution. Banks with higher capital to asset ratios are considered relatively safer compared to institutions with

lower ratios. Safer banks will normally have a lower cost of external funding, which has a positive effect on their profitability.

Fund source (Deposita) is captured by the total deposit over total assets, which is expected to have a positive effect on switching costs and profits. Deposit is considered as the major and perhaps the cheapest source of funding for banks. In a lending market where there is increasing demand, more funding source will results in higher bargaining power and more market strategies for banks.

Annual growth of GDP (GGDP) stands for annual growth ratio of real GDP, which is expected to have a positive relationship with switching costs. It is commonly considered that GDP development considered as the demand for lending is increasing (or decreasing) in cyclical upswings (or downswings). The banks' market power will rise from an increase in lending demand. Then, consumers will be charged higher interest rate when switching banks.

Market concentration ratio (MCR) measures the loan market structure in the banking industry by means of the market concentration variable, which is defined as the ratio of the five largest banks' assets to the total assets of the entire banking sector. A higher market concentration ration tends to indicate monopoly power, which may result in higher rates being charged on loans and lower interest rates being paid on deposits. On the other hand, a higher bank concentration might be the result of a tougher competition in the banking industry, which would suggest a negative relationship between performance and market concentration (Boone and Weigand, 2000).

An important difference between the banks is their heterogeneity in operation. The SOBs operate nationally and are constrained to operate throughout the nation. The JSBs have the jurisdictional capability to do the same but concentrate on the economically profitable regions

of the eastern coastal area. The CCBs and RCBs operate within the provincial and rural areas. Therefore, the backgrounds for different categories of banks are not same. These differences are captured by regional dummy variables. Similarly, it is argued that big banks have less motivation to lock-in their clients; therefore, bank size dummy variable are included to test whether different sized banks have different switching costs.

Some control dummy variables will be added into the system regression, which include region dummy, bank ownership dummy and bank size dummy. The details of each variable are described below:

Region dummy takes headquarter of banks in east part of China as 1, otherwise 0. The economic and financial development of east part of China is more advanced than other parts of China. The lending market in east part of China is presumed to have fierce competition.

Foreign banks dummy (FOREIGN) measures foreign banks as 1, and **Domestic banks** as 0. Foreign banks are newcomers to the banking market in China. Compared with local banks, foreign banks lack a network relationship. Domestic banks include large commercial banks, joint-stock commercial banks, city and rural commercial banks. Large commercial banks are the biggest banks in China, they were the first to be established, and now take the largest share of the banking market. Joint-stock commercial banks, city, and rural commercial banks are usually considered as having higher efficiency and better services than large commercial banks.

Large banks dummy (Large) measures bank asset larger than 10000 Billion CNY in 2010 as 1, otherwise 0.

Medium size banks dummy (Medium) measures bank asset smaller than 10000 Billion

CNY and larger than 1000 Billion CNY in 2010 as 1, otherwise 0.

Small size banks dummy (Small) measures bank asset smaller than 1000 Billion CNY, in 2010 as 1, otherwise 0.

Table 3.2: Variable definition

Variables	Definition	Unit
Switching Costs (SC)	Estimated value according to Shy (2002)	-
Return On Assets (ROA)	Net income over total asset	%
Bank Size	Annual total asset of Banks	Mil CNY
Non-interest expense ratio (NEI)	Non-interest expense over income on loans	%
Non-interest income ratio (NIR)	Non-interest income over total gross income	%
Capital ratio (CAPITALR)	Total equity over total asset	%
Fund source (DEPOSITA)	Total deposit over total assets	%
Annual growth of GDP (GGDP)	Annual growth ratio of real GDP	%
Market concentration ratio (MCR)	The five largest banks' assets over the total assets of the entire banking sector	%
Regional difference dummy (REGIONAL)	Headquarter of bank located in east region of China equal to 1, otherwise 0	-
Foreign banks dummy (FOREIGN)	Foreign banks equal to 1, otherwise 0	-
Large banks dummy (LARGE)	Bank asset $>1\times10^7$ Mil CNY	-
Medium banks dummy (MEDIUM)	1×10^7 Mil CNY > Bank asset > 1×10^6 Mil CNY	-
Small banks dummy (SMALL)	1×10^6 Mil CNY > Bank asset	-

3.5 Data

The bank-level data are collected from BANKSCOPE. Only commercial banks are included in the sample because the three policy banks in China are government-directed lenders and lack market performance. In addition, the sample excludes the banks whose market share is less than 0.01% because they can be neglected when doing the nationwide research. The sample contains data from 151 banks[14] over eight years, from 2003 to 2010[15]. Some banks have zero cells for data during some years in their financial reports, creating gaps in the data set. Hence, the regression data is unbalanced.[16] Total loans of the sample banks take an average 74.7% of total loans in the Chinese lending market.[17] Loans from the policy banks account for an average of 13.5% of total loans in the lending market, which do not operate according to market competition actions. So, the banks in the sample are considered as sufficient to reflect the facts of the Chinese banking sector.

Table 3.3 shows the average switching costs, which are estimated according to the method of Shy (2002),[18] in different groups of banks in the sample year. Compared with the average profits of banks, it is easy to observe that the degree of switching costs has a positively high correlation with the profits of the banks (see Fig. 3.1). Since there is a lack of loans or interest rate data in the sample, foreign banks' switching costs cannot be calculated in year 2003 or 2004.

[14] See the list of 151 banks in Appendix B.8.
[15] China Banking Regulatory Commission established in 2003, which indicated China banking market entry into a new age. So here the sample begins from 2003.
[16] These gaps appear randomly and it is not expected to bias the results. See Woolridge (2009).
[17] Total loans include the loans from banks and trust companies.
[18] The method to estimate described in appendix B.9.

Table 3.3: Estimated switching costs of banks (% of loans)

	2003	2004	2005	2006	2007	2008	2009	2010
Large commercial banks	4.62	4.56	4.82	5.14	6.16	6.67	4.69	4.71
Joint-stock commercial banks	3.84	5.08	5.21	5.21	5.90	6.57	4.72	5.01
City and rural commercial banks	3.89	4.14	4.86	4.59	4.91	5.96	4.65	4.96
Foreign banks	NA	NA	3.56	4.77	2.70	4.64	3.11	3.20

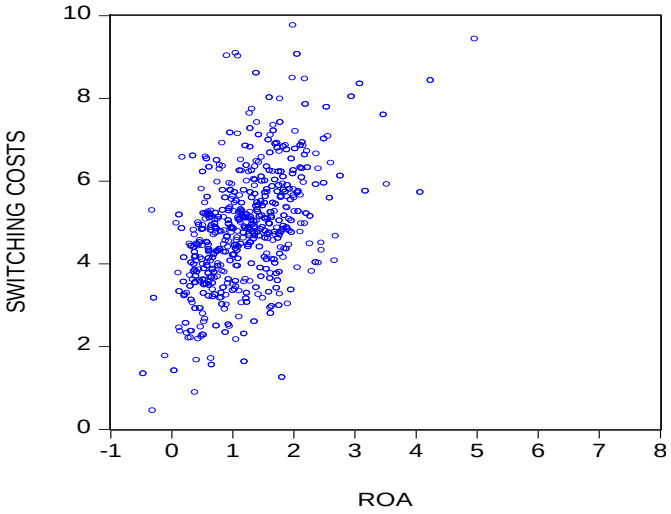


Figure 3.1: Scatter graph of Switching costs and ROA

A summary of the variables used for switching costs regression and the impact of switching costs on bank lending profits regression is presented in the Table 3.4. Several facts are worth noting. The gaps between the maximum and minimum numbers of switching costs and other bank characteristics are very large, which indicate heterogeneity performance among banks. Switching costs ranges from 0.45 to 9.78, reflecting a big difference in lock-in power.[19] The average market share is 0.945. The smallest market share numbers in each year either come from city commercial banks or rural commercial banks, while the highest one is ICBC in 2004. Although the maximum value of ROA is very large, it is an occasional value. Most ROA of the banks are below 2%, the average value of ROA is 1.335% in the sample market.

[19] The lowest value is switching costs of China Zheshang Bank in 2004. In 2004, China Zhejiang Commercial Bank was reorganized and started business as a new private bank. The highest value is switching costs of Qishang Bank in 2008. On March 22, 2009, Zibo City Commercial Bank changed its name to the Qishang Bank.

The large commercial banks hold the largest market share, but do not have the highest profit rate. This is likely to show that the ability to get profit is not based on market share.

Table 3.4: Summary statistics[20]

	Obs.	Mean	S.D.	Min	Max
Key variables					
Switching Costs (%)	512	4.831	1.415	0.450	9.758
ROA(%)	630	1.335	1.226	-1.535	18.587
Other bank's characteristics					
Bank Size (Mil CNY)	640	518846	1629853	2164.600	13458622
NEI (%)	512	41.819	31.449	8.212	542.783
NIR (%)	535	11.432	1.278	5.564	20.705
Capital ratio (%)	635	6.568	4.940	-13.714	42.024
The effect of fund source (%)	631	75.394	16.866	0.027	103.364
Macro Variables					
Annual growth of GDP (%)	1216	16.311	3.927	8.552	22.881
Market concentration ratio (%)	1216	55.028	3.264	51.473	59.175

3.6 Empirical results

The system of equations is estimated simultaneous by using three stages least squares[21]. The suspect endogenous variables in the model are NEI, Deposita, Capital ratio, Bank size, Market concentration ratio, Annual growth of GDP and Fund source are taken lagged as instrumented. The independent variables have no significant correlation between each other, the test table attached in appendix (B.5-B.6).

[20] Subgroup summary statistics are attached in Appendix, table B.1-B.4.

[21] 3SLS has one step more than 2SLS by using estimated moment matrix of the structural disturbances to estimate all coefficients of the entire system simultaneously, which can effectively solve the problem of endogeneity in simultaneously equation model. In addition, 3SLS belongs to full information estimation, while 2SLS belongs to limited information estimation.

3.6.1 Benchmark model regression

Table 3.5: Estimation for the simultaneous equations model with 3SLS

Variables	SWITCHING COSTS	Variables	ROA
Ln(BANK SIZE)	0.111***	SWITCHING COSTS	0.180***
	(3.326)		(6.646)
NEI	-0.015***	Ln(BANK SIZE)	-0.010
	(-3.723)		(-0.445)
DEPOSITA	0.021***	NEI	-0.010***
	(5.065)		(-5.393)
NIR	0.280***	DEPOSITA	0.013***
	(6.849)		(3.066)
GGDP	-0.042	CAPITAL RATIO	0.099***
	(-1.078)		(2.701)
MCR	-0.051**	MCR	-0.046***
	(-1.967)		(-3.078)
C	4.569***	C	1.794
	(2.786)		(1.308)
R^2	0.405	R^2	0.362
D.W.	1.643	D.W.	1.813
Obs	277	Obs	312

Notes: Standard errors are reported in the parentheses. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Column 2 of table 3.5 shows the result of magnitude of switching costs. *BANK SIZE*, which has a significantly positive effect on switching costs, is consistent with expectations. First, large banks are most likely to have more branches locations, which is an important fact that is valued by consumers (Chun-Yu Ho, 2012). Second, bigger banks have more advantages in asymmetrical information, especially for small firms, which stand more information asymmetric when they facing big banks (Gopalan et al., 2012). It is noticeable that *NEI* shows a significant negative effect on switching costs at 1% level, which is the same as

expectations, since non-interest expense ratio is usually used to measure how efficient the bank is. Efficient banks are presumably better in making use of asymmetrical information, which turns out to be a significant positive effect on switching costs. This suggests that efficient management will enable banks to take advantage of 'information monopoly' more effectively and increase their market power to lock-in their customers. Meanwhile, *DEPOSITA* has positive and significant relationship with switching costs. This also satisfies the expectations. In a market with big loan demand like China, more fund source means more bargaining power in lending, which gives banks more power in lock-in and more funding resources for borrowing. *NIR* has a significantly positive effect on switching costs, which is consistent with our expectations. Business relationships other than lending between banks and firms strength the bank-firm relationships and offer the banks an advantage to hold on to their customers. *GGDP* shows no significant effect on switching costs. One aspect, the annual growth of GDP, indicates that loan demand is increasing to some extent. A higher demand level increases the market power of banks, which makes them tend to charge higher interest rates to customers. However, banks usually offer discounts to new customers in order to extend market share, which will have a negative effect on switching costs (Klemperer, 1995). Market concentration ratio (MCR) gives a significant negative effect on switching costs at 1% level. The highest market concentration ratio in China lending market is 59.18%, while the lowest is 51.47%, which can be considered as very high. The big banks that hold the 'monopoly power' tend to be less aggressive. In addition, small banks do not have enough resources to lock-in their customers effectively under this condition. Hence, it reflects that switching costs will decrease when the market becomes more concentrated (Tirri, 2007; Mercieca et al., 2008).

Column 4 of table 3.5 shows the regression result, including the influence of switching costs on profits of banks. Here, the dependent variable ROA takes the profit level of banks. It is clear that *SWITCHING COSTS* gives a significant positive effect on profits of banks at the 1% level. This result is consistent with the prediction of some theoretical researches (Klemperer, 1987b; Beggs and Klemperer, 1992), indicating that lock-in power is an important variable in the banks' profit strategies. Banks can benefit from higher switching costs, and then higher profits lead to a strengthening of the information asymmetries. Switching costs and ROA have a positive bilateral relationship. *Ln(Bank size)* has no significant relationship with profits. Larger bank size tends to lead to more income, as well as more costs. In addition, the operation and management efficiency of a bank is also an important factor in affecting bank profitability. For example, the market share of large commercial banks, which once took over 80% of the whole market in 1990s, has been decreasing in these years because of intensive competition. In addition, their average profits are lower than other types of banks during some sample years. The lack of a significant correlation between market share and profits proves that small banks also have competitive power and the ability to make high profits in China's banking market. *NEI* is significant at the 5% level, which has a negative effect on profit. As low non-interest expense level can strengthen the switching costs, the low expense absolutely can have a passive influence on profit. Standing for the level of fund source, *DEPOSITA* gives a positive relationship with profit, which is consistent with the expectations. More deposits lead to depressed earnings only if there is insufficient loan demand, since this type of funding is costly in terms of the required branching network. However, China has had a huge loan demand in these years. So more deposits means more fund source which will result in more profit for the banks. *CAPITAL RATIO* shows a significant positive relationship with profits, which is consistent with expectations. First, banks with higher capital to asset ratios are considered relatively

safer compared to institutions with lower ratios. Then, a lower risk increases a bank's creditworthiness and reduces its funding cost. In addition, banks with higher equity to assets ratios will normally have a lower need of external funding, which again has a positive effect on their profitability (Dietricha and Wanzenried, 2009; Vong and Chan 2006). Empirical findings confirm that there is a statistically significant negative relation between the *Market concentration ratio* and the ROA variable in China. This result is similar to Dietrich and Wanzenried (2011), who use Switzerland as a research target market.

3.6.2 Regression on regional and banks ownership dummy

The eastern region of China takes an average of 64.6% and 64% loans and deposits, respectively. In addition, 66.4% of banks in the sample set their headquarters in eastern China. As the most developed area of China, the competition in the lending market here is presumably the most intensive. Some scholars point out that firms will pay to switch to poach new customers. Chen (1997) suggests that firms will 'pay to switch' to get new customers, and 'pay to switch' makes the market more competitive. Farrell and Klemperer (2007) claims that small firms act aggressively and price low to attract new consumers, who they can exploit in the future. Using the Bolivian credit registry data between 1999 and 2003, Ioannidou and Ongena (2010) find that banks often have a substantial drop in their loan rate to attract new customers and then, after a period of about one and a half years, they start to increase their loan rate. However, there is no evidence that fierce competition will lead to information sharing between banks and reduce asymmetrical information. Therefore, the regional difference is supposed to have no effect on switching costs.

Table 3.6: Structural Estimation with regional and foreign dummy

Variables	Switching Costs	Variables	ROA
Ln(BANK SIZE)	0.085**	SWITCHING COSTS	0.174***
	(2.181)		(6.582)
NEI	-0.014***	Ln(BANK SIZE)	-0.010
	(-3.349)		(-0.391)
DEPOSITA	0.020***	NEI	-0.008***
	(4.203)		(-4.146)
NIR	0.260***	DEPOSITA	0.009***
	(6.380)		(2.683)
GGDP	-0.041	CAPITAL RATIO	0.085***
	(-1.055)		(2.721)
MCR	-0.067**	MCR	-0.055***
	(-2.522)		(-3.923)
REGIONAL	0.156	REGIONAL	-0.173**
	(0.872)		(-2.223)
FOERIGN BANK	-0.431**	FOREIGN BANK	-0.297**
	(-2.463)		(-2.020)
C	5.824***	C	2.756***
	(3.365)		(2.342)
R^2	0.411	R^2	0.410
D.W.	1.651	D.W.	1.820
Observations	277	Observations	312

Notes: Standard errors are reported in the parentheses. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

In table 3.6, after added the regional dummy into the model, the estimation of row 2 shows that *REGIONAL* has an insignificant effect on switching costs of banks, which is consistent to the expectations. But it is easy to imagine that 'pay to switch' or poaching to new customers will decrease the income of banks and lower their profits. In column 4 of table 3.6, a regional dummy has a significant negative effect on profit at 5% level. The intensive competition in eastern China reduces the banks' average profits level. While in other regions of China, the

less intensive competition enable banks to make more profits.

Usually, foreign banks are considered as the most efficient banks in China since they have a longer history and more mature management than local banks. But *FOREIGN BANK* has a significant negative effect on switching costs in column 4 at 5% level. As newcomers to the Chinese lending market, foreign banks are known to lack a relationship network and accumulation of information in the local market. These are disadvantages for them because they cannot raise the switching costs when they compete with domestic banks. Hence, the lower switching costs will encumber foreign banks to make high ROA level. In column 4, *FOREIGN BANK* has a significant negative effect on profits, which support this idea. Furthermore, foreign banks may need to give more discounts and other special offers than local banks to attract new consumers in order to extend their business and market share, which will also lower the profit level.

3.6.3 Regression with different bank size dummy variable

Farrell and Klemperer (2007) claim that larger firms tend to be lazier and lose their consumers to a smaller firm, which is known as the 'fat cat effect', with the larger firm being a nonaggressive 'fat cat' while small firms are more aggressive in attracting and keeping consumers. This implies that larger banks are less motivated in raising their switching costs, but small size banks will be more positive. Here, the empirical study divides banks into three categories, large, medium and small, to test whether the effects are significant difference on switching costs.

Table 3.7: Structural Estimation of different bank size affecting on switching costs

	(1)	(2)	(3)	(4)
Variable	Switching Costs	Switching Costs	Switching Costs	Switching Costs
Ln(BANK SIZE)	0.185***	0.164***	0.089**	0.137***
	(4.190)	(3.713)	(2.331)	(3.328)
NEI	-0.016***	-0.015***	-0.016***	-0.015***
	(-4.081)	(-4.021)	(-4.022)	(-3.862)
DEPOSITA	0.020***	0.021***	0.022***	0.020***
	(4.900)	(5.141)	(5.166)	(4.881)
NIR	0.294***	0.282***	0.262***	0.298***
	(7.232)	(6.985)	(6.564)	(7.305)
GGDP	-0.015	-0.032	-0.047	-0.020
	(-0.374)	(-0.804)	(-1.201)	(-0.508)
MCR	-0.057**	-0.061**	-0.067**	-0.063**
	(-2.075)	(-2.147)	(-2.378)	(-2.232)
LARGE× Ln(BANK SIZE)	-0.083***	-0.044**		
	(-3.181)	(-2.336)		
MEDIUM× Ln(BANK SIZE)	-0.028		0.006	
	(-1.545)		(0.400)	
SMALL× Ln(BANK SIZE)		0.033**	0.037**	
		(2.014)	(2.152)	
Ln(BANK SIZE)^2				-0.049*
				(-3.335)
C	0.830	1.949	3.869**	-3.798
	(0.397)	(1.043)	(2.247)	(-1.230)
R^2	0.429	0.430	0.417	0.431
D.W.	1.726	1.722	1.659	1.722
Observations	277	277	277	277

Notes: Standard errors are reported in the parentheses. * significant at 10% level; ** significant at 5% level; *** significant at 1% level. The result of another part of simultaneously equations, the ROA regressions, is attached in the Appendix, table B.7.

In row 2 of table 3.7, *LARGE× Ln(BANK SIZE)* shows a significant negative effect on switching costs at 5% level. The coefficient for the effect of large bank size on switching costs is 0.157, which is smaller than the other two bank types. As Farrell and Klemperer expected, the size of big bank contributes less to keep a higher switching costs. This is presumably an important reason why large commercial banks in China kept losing their market share in the sample years. In row 3, *SMALL× Ln(BANK SIZE)* gives a significant positive effect on switching costs, which means the small bank size has the highest contribution ratio to switching costs than the other two bank types. The small banks are hungry to poach consumers and keep the bank-client relationships. Column 4 gives a robustness test for regression (1) and (2), which shows that *SMALL× Ln(BANK SIZE)* gives a significant positive effect on switching costs, while *MEDIUM× Ln(BANK SIZE)* has no significant relationship with switching costs. In regression (4), $Ln(BANK\ SIZE)^2$ has been taken into the benchmark model. It shows a significant negative relationship on switching costs at 10% level, which means that large banks will be less active to keep high switching costs.

3.7 Conclusion

I have proposed an empirical model to analyze the effect of bank characteristics and macro variables in the magnitude of switching costs, and the influence of switching costs on banks' profits determination. I apply the Shy (2002) model to estimate switching costs of each bank in every sample year, and then develop equations to investigate the switching costs determinations and how they affect the profits of banks with bank behaviors and macro economy variables.

My findings are mainly in fourfold: first, the profit over asset (ROA), which shows the efficiency level of banks, has a significant positive effect on switching costs. This implies that

efficient management can take advantage of asymmetrical information to enhance the switching costs of banks. The switching costs also have a significant influence on the profits of banks, as expected, which indicates that switching costs strengthen the ability of banks to make more profits. Second, bank size shows a positive relationship with switching costs in all sample regression. A rise in the size and number of sub-branches will obviously bring more information asymmetries to banks to strength their lock-in power. However, different bank sizes have various effects on switching costs. Small banks tend to have more motivation to enhance their switching costs power since they are usually eager to extend their market share; while large banks are less aggressive, which is called as big banks' 'fat cat effect' (Farrell and Klemperer, 2007). The deposit level has a positive relationship with switching costs, showing that stronger bargaining power contribute to switching costs. Third, the profit determination regression results show that market share has no significant effect on profits of banks. While the banks' deposit level and capital ratio have a significant positive effect on profit. Non-interest expense ratio, which stands for the operating efficient level of banks, has a negative effect on switching costs. As in similar studies, the market concentration ratio has a negative effect both on switching costs and profits of banks. Fourth, I set dummy variable to distinguish the domestic banks and foreign banks, and find that different types of banks have different situation in the relationship of switching costs and profits. As the newcomers to the Chinese banking market, when compared with the domestic banks, foreign banks are in a weak position in terms of rising switching costs and making profits. Furthermore, considering the regional difference in economy development, this chapter sets a regional dummy to distinguish the effects from the east of China and the other parts of the country. Although regional difference has no significant effect on the magnitude of switching costs, the eastern region, which has more intensive competition, has a negative effect on the banks' profits level.

Appendix B

Table B.1: Summary Statistics in subgroups: Large commercial banks

	Obs.	Mean	S.D.	Min	Max
Key variables					
Switching Costs (%)	40	5.171	0.890	3.453	7.162
ROA(%)	40	1.283	0.436	0.209	1.838
Other bank's characteristics					
Bank Size (Mil CNY)	40	5906058	3087310	925920	13458622
NEI(%)	40	41.661	7.09	30.143	55.421
NIR(%)	40	15.372	0.934	10.243	20.705
Capital ratio (%)	40	3.992	4.861	-13.714	7.751
The effect of fund source (%)	40	83.113	8.152	69.665	103.364

Table B.2: Summary Statistics in subgroups: Stock-joint banks

	Obs.	Mean	S.D.	Min	Max
Key variables					
Switching Costs (%)	76	5.202	1.077	0.450	7.738
ROA(%)	81	1.026	0.569	-1.534	2.500
Other bank's characteristics					
Bank Size (Mil CNY)	82	726679	614596	10307	2402507
NEI(%)	76	44.865	37.773	24.166	222.771
NIR(%)	82	12.123	1.195	8.664	18.423
Market share (%)	82	1.337	0.870	0.028	3.237
Capital ratio (%)	82	4.995	4.074	-1.318	31.344
The effect of fund source (%)	82	76.179	8.957	50.669	90.849

Table B.3: Summary Statistics in subgroups: City and rural commercial banks

	Obs.	Mean	S.D.	Min	Max
Key variables					
Switching Costs (%)	343	4.915	1.437	1.248	9.757
ROA(%)	438	1.480	1.392	0.031	18.586
Other bank's characteristics					
Bank Size (Mil CNY)	445	72630	242577	2164	3389122
NEI (%)	342	37.538	15.653	8.212	171.486
NIR(%)	353	11.547	2.431	7.485	14.651
Market share (%)	442	0.094	0.143	0.005	1.754
Capital ratio (%)	441	5.890	3.345	-0.396	42.024
The effect of fund source (%)	437	79.670	11.752	0.026	96.491

Table B.4: Summary Statistics in subgroups: foreign banks

	Obs.	Mean	S.D.	Min	Max
Key variables					
Switching Costs (%)	53	3.498	1.289	0.889	6.654
ROA(%)	71	0.815	0.635	-0.749	2.409
Other bank's characteristics					
Bank Size (Mil CNY)	72	53583	49155	4075	205620
NEI (%)	54	64.765	72.343	11.943	542.783
NIR(%)	60	7.183	4.756	5.564	9.352
Market share (%)	72	0.127	0.361	0.010	3.093
Capital ratio (%)	72	13.944	7.209	4.739	41.795
The effect of fund source (%)	72	44.251	20.433	4.666	77.034

Table B.5: Correlation of independent variables in magnitude of switching costs

	LN(SIZE)	NEI	DEPOSITA	NIR	GGDP	MCR
LN(SIZE)	1					
NEI	0.108**	1				
DEPOSITA	0.116***	-0.159***	1			
NIR	0.063	-0.245***	0.121***	1		
GGDP	-0.221***	-0.074*	0.014	0.162***	1	
MCR	-0.189***	0.055	0.162***	-0.443***	-0.013	1

Note: *,**,*** significant at 10%, 5% and 1% level.

Table B.6: Correlation of independent variables in the effect of switching costs on profits

	SC	LN(SIZE)	NEI	DEPOSITA	CAPITR	MCR
SC	1					
LN(SIZE)	0.184***	1				
NEI	-0.267***	0.108**	1			
DEPOSITA	0.315***	0.116***	-0.159***	1		
CAPITR	-0.179***	-0.261***	0.115***	-0.530***	1	
MCR	-0.184***	-0.188***	0.057	0.156***	-0.326***	1

Note: *,**,*** significant at 10%, 5% and 1% level.

Table B.7: Structural Estimation of bank size affecting on switching costs (a)

	(1)	(2)	(3)	(4)
Variable	ROA	ROA	ROA	ROA
SWITCHING COSTS	0.182***	0.181***	0.182***	0.181***
	(6.700)	(6.696)	(6.715)	(6.691)
Ln(BANK SIZE)	-0.012	-0.012	-0.015	-0.012
	(-0.521)	(-0.532)	(-0.662)	(-0.535)
NEI	-0.010***	-0.010***	-0.010***	-0.010***
	(-5.373)	(-5.373)	(-5.347)	(-5.375)
DEPOSITA	0.013***	0.013***	0.012***	0.013***
	(2.982)	(2.971)	(2.819)	(2.970)
CAPITAL RATIO	0.096***	0.096***	0.089**	0.095***
	(2.622)	(2.608)	(2.439)	(2.606)
MCR	-0.046***	-0.046***	-0.048***	-0.046***
	(-3.099)	(-3.110)	(-3.207)	(-3.110)
C	1.865	1.883	2.077	1.887
	(1.369)	(1.383)	(1.527)	(1.388)
R^2	0.370	0.372	0.385	0.372
D.W.	1.808	1.807	1.795	1.806
Observations	312	312	312	312

Notes: Standard errors are reported in the parentheses. * significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table B.8: List of banks in sample

Large commercial bank	Zhejiang Tailong Commercial Bank
Industrial and commercial bank of China,	Qishang Bank
Agricultural bank of China	Bank of Ningxia
Bank of China	China & South Sea Bank Ltd
China Construction Bank	Bank of Liaoyang
Bank of Communications	Zhejiang Chouzhou Commercial Bank
Joint-stock commercial bank	Jiangsu Wujiang Rural Commercial Bank
China Citic bank	Bank of Luoyang
China Everbright Bank	Wuxi City Commercial Bank
Huaxia Bank	First Sino Bank
Guangdong Development Bank (China Guangfa Bank)	Commercial Bank of Zhengzhou
Shenzhen Development Bank (Ping An Bank)	Xiamen Bank
China Merchants Bank	Lanzhou City Commercial Bank
Shanghai Pudong Development Bank	Zhejiang Xiaoshan Rural Cooperative Bank
Industrial Bank	Dongying City Commercial Bank
China Minsheng Banking Corporation	Bank of Guilin
Evergrowing Bank	Yantai Bank
China Zheshang Bank	Laishang Bank
Bohai Bank	Linshang Bank
City and Rural commercial bank	Nanchong City Commercial Bank
Bank of Beijing	Bank of Inner Mongolia
Huangshi City Commercial Bank	Bank of Jinhua
Bank of Shanghai	Kunshan Rural Commercial Bank
Bank of Jiangsu	Bank of Liuzhou
Beijing Rural Commercial Bank	Zhuhai City Commercial Bank
Chongqing Rural Commercial Bank	Taizhou City Commercial Bank
Bank of Ningbo	Bank of Anshan
Ping An Bank	Suzhou City Commercial Bank
Shanghai Rural Commercial Bank	Bank of Fuxin
Bank of Nanjing	Handan Commercial Bank
Bank of Hangzhou	Dezhou City Commercial Bank
Xuchang City Commercial Bank	Nantong City Commercial Bank
Guangzhou Rural Commercial Bank	Bank of Deyang
Huishang Bank	Yingkou City Commercial Bank
Bank of Tianjin	Chinese Mercantile Bank
Bank of Dalian	Jiaxing City Commercial Bank
Bank of Guangzhou	Datong City Commercial Bank
Bank of Chengdu	Zhanjiang City Commercial Bank
Dongguan Rural Commercial Bank	Bank of Xinxiang
Harbin Bank	Ningbo Yuyao Rural Cooperative Bank
Foshan Shunde Rural Commercial Bank	Panzhihua City Commercial Bank
Hankou Bank	Nanning City Commercial Bank
Shengjing Bank	Zhejiang Mintai Commercial Bank
Bank of Chongqing	Bank of Jining
Bank of Dongguan	Changzhi City Commercial Bank
Bank of Jilin	Jiaozuo City Commercial Bank

Bank of Jinzhou	Huzhou City Commercial Bank
Bank of Changsha	Changshu Rural Commercial Bank
Baoshang Bank	Mianyang City Commercial Bank
Sin Hua Bank	Cangzhou City Commercial Bank
United Rural Cooperative Bank of Hangzhou	Ganzhou City Commercial Bank
Xiamen International Bank	Yangzhou City Commercial Bank
Wuhan Rural Commercial Bank	Hengyang City Commercial Bank
Kwangtung Provincial Bank	Jiujiang City Commercial Bank
Guiyang Commercial Bank	Chengde City Commercial Bank
Bank of Qingdao	**Foreign Bank**
Xi'an City Commercial Bank	HSBC Bank (China)
Qilu Bank	Standard Chartered Bank (China)
Guangxi Beibu Gulf Bank	Bank of East Asia (China)
China Investment Bank	Citibank (China)
Fujian Haixia Bank	Bank of Tokyo Mitsubishi UFJ (China)
Bank of Hebei	Sumitomo Mitsui Banking Corporation (China)
Jiangsu Jiangyin Rural Commercial Bank	DBS BANK (China)
Jiangsu Zhangjiagang Rural Commercial Bank	Mizuho Corporate Bank (China)
Fudian Bank	Hang Seng Bank (China)
Bank of Wenzhou	Nanyang Commercial Bank (China)
Kincheng Banking	Deutsche Bank (China)
Shenzhen Rural Commercial Bank	BNP Paribas (China)
Bank of Nanchang	OCBC Bank (China)
National Commercial Bank	Royal Bank of Scotland (China)
Bank of Jiujiang	United Overseas Bank (China)
Bank of Weifang	Australia and New Zealand Bank (China)
Weihai City Commercial Bank	JP Morgan Chase Bank (China)
Ningbo Yinzhou Rural Cooperative Bank	Woori Bank (China)
Bank of Rizhao	Wing Hang Bank (China)
China State Bank	Hana Bank (China)
Bank of Shaoxing	Shinhan Bank (China)
Yien Yieh Commercial Bank	Bangkok Bank (China)

B.9: The method to estimate switching cost

Switching costs are calculated through each year's cross section data. First I got the lowest market share (N_{Lt}) of bank in year t. Then multiply the corresponding bank's average interest rate (P_{Lt}), which calculated by income on loans divide total loans. According to follow equation, I can get the switching costs of bank i in year t.

$$Switching\ Cost_{it} = P_{it} - \frac{P_{Lt}N_{Lt}}{N_{it}+N_{Lt}} \qquad \text{(B.1)}$$

, P_{it} is average interest rate of bank i in year t; N_{it} is market share of bank i in year t.

Then taking the interest rate (P_{1t}) and market share (N_{1t}) of biggest market share bank data into the follow equation to calculate the lowest market share bank's switching costs in year t, with the data of P_{Lt} and N_{Lt}.

$$Switching\ Cost_{Lt} = P_{Lt} - \frac{P_{1t}N_{1t}}{N_{1t}+N_{Lt}} \qquad \text{(B.2)}$$

The example below illustrates;

Example:

	Bank 1	Bank 2	Bank 3	Bank 4
Market share	40%	30%	20%	10%
Average interest rate	5.5	5.3	5.6	5.4

In this example, Bank 4 is the smallest bank. Therefore:

$$\mathrm{SC_1} = \mathrm{P_1} - \frac{\mathrm{P_4N_4}}{\mathrm{N_1+N_4}} = 5.5 - \frac{5.4*10\%}{40\%+10\%} = 4.42 \ ; SC_2 = P_2 - \frac{P_4N_4}{N_2+N_4} = 5.3 - \frac{5.4*10\%}{30\%+10\%} = 3.95$$

$$SC_3 = P_3 - \frac{P_4N_4}{N_3+N_4} = 5.6 - \frac{5.4*10\%}{20\%+10\%} = 1.80 \ ; SC_4 = P_4 - \frac{P_1N_1}{N_1+N_4} = 5.4 - \frac{5.5*40\%}{40\%+10\%} = 1.00$$

Chapter 4: Why do firms switch banks? Evidence from China

4.1 Introduction

Switching costs, which arise from asymmetry information between firms and banks, have a significant effect on the bank-firm relationship (Shy, 2002; Kim et al., 2003; Vesala, 2007). Banks tend to keep their clients private credit information and exploit their informational advantage over competitors. Therefore, they can manage to lock-in their incumbent customers and earn a higher than expected positive profit on repeated lending. Many previous studies have consistently pointed out that a large proportion of firms have considered switching to another bank to overcome financial constraints when they are dissatisfied with their incumbent lending relationship. However, a strong bank-firm relationship gives the banks monopoly power through information collecting, which then results in negative effects on firms. Firms usually face non-favourable loan offers with higher interest rate from outside banks since they are lack of firms' financial condition information and hard to distinguish 'good' and 'bad' firms. This means that there is an informational disadvantage and lock-in problem, which can limit the ability of firms getting to get access to external finance and results in financial constraints. However, firms switching their relationship with their banks have been widely observed in the lending market.

Obviously, a long-term and stable bank-firm relationship is not the only choice for firms. For example, they have a high probability to switch when they face severe financial constraints that cannot be solved with the current bank. The longer existence of the incumbent relationship results in a higher probability that the borrower will find another lender (Greenbaum et al., 1989). Since the switching costs arising from asymmetric information makes the switching action costly, the switching behaviours are observed heterogeneity in

firms. The firm's transparency, external funding requirements, and financial characteristics are presumably the determinants of a decision to switch lenders. In addition, the banks' lending decisions are not homogenous, which can significantly affect a borrower's access to external financial resources. This chapter aims to find the reason why firms switch banks, and it asks what kinds of banks they prefer when they form a new relationship.

With the rapid growth of the economy, the Chinese credit market has expanded quickly. Firms are eager to get a financial supply and, since bank loans are the most popular funding source in the Chinese lending market, the main channel they can choose is to seek help from the banks (Allen et al., 2005). In China a firm's transparency and information asymmetry are also considered as key impact variables on the lending relationship (Chang et al., 2009; Cao et al., 2010). The firm's borrowing characteristics as well as the lending bank's identity influence the lending decision and the quality of bank-firm relationship (Hao et al., 2013). The recent reform, beginning from 2001, has produced remarkable improvements in the performance of Chinese banks, especially for the large commercial banks. For example, the average non-performing loan ratio of the major commercial banks in China decreased from 17.9% in 2003 to 0.9% in 2011. The overall performance improvement of Chinese commercial banks shows that Chinese commercial banks are more and more focused on the borrower's credit quality when they make lending decisions. Since the firm's information is now very important to the banks' lending decisions (Chang et al., 2009), the banks need to collect more of the firm's private financial information in order to lower the lending risk and NPL ratio. Under the condition of asymmetric information and switching costs, the bank-firm relationship and the determinants of firms switching banks in China are worthy for further study.

The topic of why firms switch banks is a relatively unexplored area of research. This chapter attempts to make a contribution to fill this gap. The study has examined more than 2,000 matched firm-bank lending deals during the period 1999 to 2012. The principal findings are that: (i) firms usually switch banks for larger amount of loans and longer lending durations; (ii) large firms, who are usually more transparent, have a higher probability to switch than small firms; (iii) the strong financial conditions of the firm increases the likelihood of forming a new bank relationship; (iv) firms are more likely to switch to small market share banks or lower profitability banks to seek more favourable lending contracts; and (v) banks that offer a bundled service of loan and bank services are more able to lock-in firms to maintain a current lending relationship.

The remainder of the chapter is organized as follows: section 2 reviews the relevant theoretical foundation and empirical research on asymmetry information, bank-firm relationship and the determinants of firms switching banks; section 3 describes the methodology of the firms' switching decision and summarizes the main hypotheses of this study, it then introduces the model's setting for empirical studies; section 4 describes the data; section 5 provides discussion of empirical results; and section 6 draws the conclusions.

4.2 Literature review

4.2.1 Lending relationship with asymmetrical information

Many researches claim that asymmetric information between firms and banks create barriers for borrowers who wish to switch lenders. Kim et al. (2003) claim that switching costs mainly arise from asymmetric information between borrowers and lenders, and is incurred when economic agents change their suppliers. Hence, information asymmetry has a significant influence on firms when they switching to other funding sources. This

disadvantage for borrowers seeking external funding has been first observed between small firms and financiers. Keasey and Waterson (1993) suggest that information asymmetry is a main imperfection in the provision of finance to small firms. Berger and Udell (1998) analyse the effect of asymmetric information on lending relationship with US small firm data and find that informational opacity keeps small firms from obtaining large amounts of external funding. Small firms are more likely to get access to external equity from venture capitalists, and they rely less on banks when compared with other type of firms. Some studies have argued that a strong banking relationship can decrease the information problem, but with ambiguous results about the effect of such lending relationship on a firm's financial constraints. The 'inside' bank could make use of the information advantage that it gains from the lending relationship to make more informed credit decisions. However, the 'outside' banks which do not have 'inside' information would charge a higher interest rate when a firm switches, which will worsen the borrower's financial constraints (Sharpe, 1990; Rajan, 1992). Other than theoretical works, the evidences of empirical research around this topic are also mixed. Petersen and Rajan (1994) find that small firms are tending to borrow from banks which provide them informational intensive financial services. They suggest that firms spend more time in a lending relationship would make them get access to more fund. Berger and Udell (1995) get the empirical evidence that small firms with longer banking relationships will borrow at lower rates and have less probability to pledge collateral than other small firms. Besides, they find that banks accumulate the amounts of this private information over the duration of the lending relationship. The banks will then use this kind of information to refine their loan contract terms. Houston and James (1996) claim that a single strong banking relationship would have a negative effect on high-growth firms. In contrast, multiple lending relationships have a positive effect on high-growth opportunities.

Besides research on the impact of asymmetry information to firms, some scholars have focused on the relationship between the bank's information and their lending decision. Through an empirical research based on US data, Berger et al. (2005b) argue that small banks are better able to collect and act on soft information[22] than large banks. Large banks are most likely to lend to big firms with a good credit record and are less willing to lend to informationally 'difficult' credits, while small bank usually have a higher propensity to lend to difficult credit based on soft information. Using Japan survey data, Uchida et al. (2008) found similar results to Berger et al. (2005b). Their empirical evidence shows that the large firms tend to set the relationship with large banks, while small banks are most likely to have a stronger relationship with small firms. Small banks have a comparative advantage in terms of processing soft information and delivering relationship lending. Since banks have access to efficient information production through the establishment of a lending relationship, Bharath et al. (2007) seek to measure the direct benefits that can be obtained by banks. They find that the degree of information asymmetry increased the likelihood of banks winning the borrower's future loan contract. Furthermore, the firms conducting IPOs had a high probability of keeping their current lending relationships. Sapienza (2002) finds that the merger action of banks will be harmful for small borrowers. Since mergers cause the banks to become bigger and obtain more information, they will decrease the supply of loans to small borrowers. Moreover, they find that bank merger increases the probability of firms being cut off from their lending relationship with incumbent banks. Large firms have a higher probability of switching banks, while small firms choose to maintain their current borrowing channel.

[22] Soft information is the internal information about the investing project cannot be credibly communicated from firm to non-relationship banks.

4.2.2 The impact of specific characteristics on switching behaviour

Papers have started to explore the impact of characteristics specific to lending relationships, firms, banks, and markets on the firm switching behaviour. The probability of a firm switching banks is heterogeneous in a firm's characteristics, such as firm's size, age, intangible, constrained, leveraged and so on. However, these studies have not analysed switching costs directly, but provide some evidence about the determinants that affect the firm-bank relationship and push the switching actions. Harhoff and Körting (1998) empirically examine the role of lending relationships in determining the costs and collateral requirements for external funds with survey data originated from a conclusive survey of small and medium-sized German firms. They check whether collateral will be needed when firms form a new lending relationship and find that the duration of the lending relationship and financial distress can have a negative impact on collateral requirement, while the number of lenders and age of firms have a positive effect on collateral requirement. In an empirical study on Norwegian data form 1979 to 1995, Ongena and Smith (2001) support the evidence that the value of the bank-firm relationship declines through time and firms tend to end the lending relationship to avoid lock-in. Moreover, they find that the switching costs are not high enough to prevent firms changing banks often, which implies that the banks did not take the advantage of asymmetric information very well in that period. In addition, their findings show that the firms prefer to switch from small banks to larger banks, and hold on to their long-term lending relationship. But they found no evidence that the larger banks supply more funds than other banks.

Table 4.1: Determinants of lending relationship

Paper	HK (1998)	OS (2001)
Country	Germany	Norway
Observation	994	383

Model	Probit	ML
Dependent	Collaterala	Hazardb
Lending Relationship		
Number of lenders	++	+++
Duration	--	+++
Firm Characteristics		
Firm Size	---	---
Financial distress	+++	
Firm age	--	
Profitability		+++
Bank loans/assets	?	
Firm leverage		+++

Note: +++ Positive and significant at 1%, ++ at 5%, + at 1%. --- Negative and significant at 1%, -- at 5%, - at 1%. ? means unclear relationship, which is shown as insignificant in regression. HK, Harhoff and Körting (1998); OS, Ongena and Smith (2001).

[a] Dummy variable indicating whether collateral or guarantee was required for obtaining new line of credit (required=1/otherwise=0).

[b] The hazard function determines the probability that a relationship terminates.

Detragiache et al. (2000) examine the impacts of a firm's and bank's characteristics on the probability of single banking relationship with matched bank-firm data. The empirical results show that the firm's profitability has a positive impact on keeping a single banking relationship, while firm size and leverage have a negative effect on the probability of a single bank, which meant that bigger firms tend to set multi-bank relations. In contrast, bank size has a positive effect on keeping a single lending relationship. Similar to Detragiache et al. (2000), Farinha and Santos (2002) analyse the single and multiple firm-bank relationship choices. In their sample, they observe that almost all of the firms borrowed for the first time from a single bank, but soon some of them start borrowing from additional banks. Throughout the empirical analysis they find that the likelihood of a firm substituting a single relationship with multiple relationships increases with the duration of that relationship. The

results also show that this kind of switching is more likely to occur for firms with more growth opportunities and for firms with poor performance.

Table 4.2: Determinants of firm-bank relationship

Paper	DGG (2000)	FS (2002)
Country	Italian	Portugal
Observation	1754	1577
Model	OLS	TVD
Dependent	single	single[a]
Lending Relationship		
Number of switching[b]		---
Firm Characteristics		
Firm Size	--	---
Firm Leverage	---	
Firm age	?	?
Profitability	+++	
Bank loans/assets		---
Sales growth (%)		---
Liquidity/assets		+++
Bank Characteristics		
Bank size	---	?
Assets growth (%)		?
Liquidity/assets[c]		?
Profits/assets		?
Market Characteristic		
Bank location		?
Bank concentration		?

Note: +++ Positive and significant at 1%, ++ at 5%, + at 1%. --- Negative and significant at 1%, -- at 5%, - at 1%. ? means unclear relationship, which is shown as insignificant in regression.
DGG, Detragiache et al. (2000); FS, Farinha and Santos (2002); TVD, time-varying model.
[a] Parametric model (Weibull distribution). [b] Number of times firms switch banks. [c] Bank liquidity equals cash plus deposits at the central bank and interbank deposits.

Besides studies about the numbers of lending relationship and switching action, some papers have tried to answer the question of why firms switch banks and have looked at their behaviours after switching. Stephan et al. (2009) used unique firm-bank matched Ukrainian data to find the determinants of firms switching their main banks. The empirical results show that riskier and larger Ukrainian companies are more likely to switch banks. In contrast, large bank size and powerful bank leverage are the main variables that prevent switching. Their study highlights the essential role of 'main bank' power, which is measured by the share of firm equity hold by the bank. It turns out to have a significant positive relationship with switching action. Furthermore, the paper finds that firms have a lower performance after switching their main bank because they will be charged a higher interest rate by new banks, which negatively affects the firms' financial condition.

Using a large loan sample from 1990 to 2006, Gopalan et al. (2011) examine why firms switch to new banks for their new loans instead of staying with their relationship banks. They find that transparent[23] firms are more likely to form new banking relationships. Firms who form new lending relationships to overcome borrowing constraints will usually take out a large loan after switching. As for the switching decision, firms are more likely to switch from small banks to large banks. Moreover, they find that firms form new banking relationship to obtain larger loan amounts and invest more in new property and equipment. The firms will then experience an increase in leverage following the switch. They highlight that firms will benefit from switching actions with an increase in capital expenditures and sale growth.

[23] They use three variables to measure firm's information quality: firm size, long term credit rating and the number of security analysts following the firm's stock.

Table 4.3: Determinants of switching banks

Paper	STT (2009)	GUY (2011)
Country	Ukraine	U.S.
Observation	8975	12806
Model	TEM FE	Logit
Dependent	Switching	New Relationship
Lending Relationship		
Amount		---
Long term		?
Short term		---
Long time between deals		+++
Prev. large bank[a]		---
Firm Characteristics		
Firm Size	+++	+++
Firm Leverage	+++	
Firm age		?
Profitability		++
Non Compustat[b]		---
Bank Characteristics		
Bank size	---	---
Main bank power[c]	+++	
Bank leverage	---	
Non-performing loans/total asset	++	

Note: +++ Positive and significant at 1%, ++ at 5%, + at 1%. --- Negative and significant at 1%, -- at 5%, - at 1%. ? means unclear relationship, which is shown as insignificant in regression. STT, Stephan et al. (2009); GUY, Gopalan et al. (2010). TEM, treatment effect dummy variable. [a] A dummy variable that identifies if any of the borrower's relationship banks is large bank. [b] A dummy variable that identifies borrowing firms for which financial data is not available in Compustat database, measuring the transparency of firms. [c] Main bank power denotes the share of firm's equity held by the main bank.

Other than determinants of switching, Ioannidou and Ongena (2010) focus on 'the time to change' and study the loan conditions and bank behaviour when firms change lenders. They make a clear definition about switching, which is a firm borrowing from a bank that it did not have a loan relationship with during the last 12 months. They distinguish banks into two types, 'inside' and 'outside' banks. The former is that the bank had a loan relationship with the firm during the prior year. The latter means that the bank does not have a loan relationship with the firm during the year before. The following figure shows the definition of switchers. They call firm A the switcher and bank 3 the outside bank for firm A, as bank 3 lent to other firms but not to firm A during the last year. Bank 1 and 2 were the switcher's inside banks, as they had lending relationship in the last year.

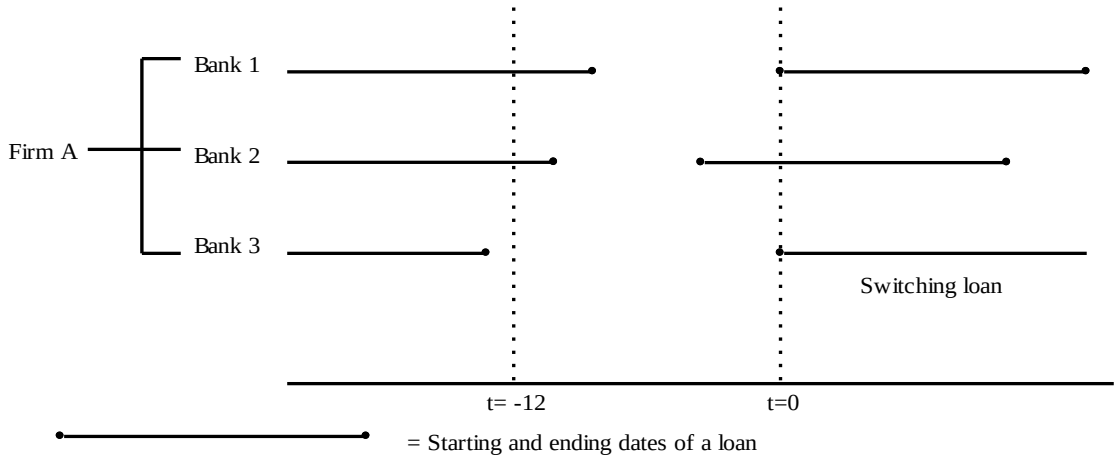


Figure 4.1: Switchers, inside banks, and outside banks
Source: Ioannidou and Ongena (2010)

Using the Bolivian credit registry data between 1999 and 2003, their empirical results indicate that turning to a new bank ('outside' bank) leads to a substantial drop in loan rate. Then, after a period of about one and a half years, the 'new' (now 'inside' bank) bank started increasing its loan rate. After three years, the loan rate will be back to its level before the change. They claim that this bank strategy is consistent with the existence of hold-up costs in bank-firm relationships. They also highlight that information-sharing regime is very important for banks selecting firms.

4.2.3 Relevant studies about China bank-firm relationship

Studies stick to bank-firm relationships, a few have focused on the effect of asymmetric information on switching costs and the determinants for firms to switch banks. Huang (2003) researched the impact of firm listing on its lending relationship in China. The author takes bank-firm relationship as a dependent variable, and denotes setting lending relationship as 1, otherwise 0. Using logistic regression, the paper finds that the performance of a firm has a significant positive effect on setting lending relationship before listing. However, the performance of a firm will be less important for lending decision after listing. Clearly, the act of listing makes more information about the firm available, which effectively lowers the bank's information collecting costs. Using survey data with 308 questionnaires from the firms' senior executives, Liu and Mei (2009) analyse the determinants of continuance or terminating banking relationship. They claim that switching costs are the main determinant for a firm pursing the lending relationship with an incumbent bank. Bank characteristics are also significant effect on the switching decision of firms.

Table 4.4: Analysis on bank-firm relationship and switching costs in Liu and Mei (2009)

		Switching costs	Switching costs	Switching costs
Quality of bank-firm relationship	Pearson Correlation	0.247*		
	Sig (2-tailed)	0.030		
	No. Observation	308		
Benefit of bank-firm relationship	Pearson Correlation		0.034*	
	Sig (2-tailed)		0.008	
	No. Observation		308	
Firms stay with incumbent banking relationship	Pearson Correlation			0.043*
	Sig (2-tailed)			0.000
	No. Observation			308

* stands for significant at 5% level

Based on the survey data of World Bank on 1186 SMEs in China, He and Wang (2009) conduct an empirical study on the impact of bank-firm relationship on the growth of firms. The empirical model they used is as follows:

$$Growth_j = \alpha_0 + \alpha_1 Ln(1 + scope)_j + \alpha_2 Ln(1 + length)_j + \alpha_3 Ln(1 + depth)_j + X\alpha_4 + \varepsilon_j \quad (1)$$

, where $Growth$ denotes the annual sales growth ratio of firms, $scope$ is the number of bank-firm relationship, $length$ stands for the average duration of lending, and $depth$ is a dummy variable to indictae whether firms can borrow without collateral. X is a set of firm's characteristics. They find that the longer duration and more number of lending relationship will slow down the growth of firms. Their results imply that large firms had a high probability of switching banks.

Chang et al. (2009) study the impact of information from lending relationship to loan default in China. They distinguish information as 'hard' and 'soft', which stands for the publication information and the information arising from repeated lending, respectively, and focused their research on the economic role of banks' soft information. Their logit model is set as follows:

$$\Pr(loan\ default) = f(Soft\ information, hard\ information, \gamma_{industry}, \lambda_{year}) \quad (2)$$

,where $loan\ default$ is a dummy equal to 1 if a firm is in the stage of defaulting its loan, and 0 otherwise. They find that soft information and firm size have a significant negative effect on the duration of both short and long-term lending relationships. Moreover, their study suggests that the lending decisions of Chinese banks are mostly based on commercial principles other than government policies during their sample period from 2003 to 2006.

4.3 Methodology

4.3.1 Model and Hypotheses

This chapter's primary objective is to determine how a firm chooses between a relationship bank and a non-relationship bank for their repeat borrowing needs. Consider a firm that has no financial resources and wants to implement a project. The investment of the project borrows from bank. In period 0, the project return (cash flow) denote as K. The investment (borrowing) cost is $(1+r)I_0$, where r is bench interest rate. Similar as Vesala (2007), here I set firms (loan applicants) have heterogeneous types, which are good credit firms (G) and bad credit firms (B). Denote Q as the quality of the firm.

$$Q = \begin{cases} G\ (good\ firm), & if\ K-(1+r)I_0 > 0 \\ B\ (bad\ firm), & if K-(1+r)I_0 < 0 \end{cases} \qquad (3)$$

As with Von Thadden (2001), there are two assumptions for this model, as follows: first, good firms consume any profit after period 0; and second, the outstanding debts of bad firms are forgiven. Under the relationship lending of this period, information is gathered by the lender beyond the relatively transparent data available in the financial statements. For non-relationship banks, they are free to get transparent information and the obverse part of opaque information, but this is not as accurate as the information held by the relationship bank.

In period 1, firms come to a new round of borrowing procedures. Firms have relationship with an incumbent bank, which is denoted as the 'inside' bank, otherwise they are 'outside' banks. Here I assume that although the 'inside' bank knows the information that they have gathered from the relationship firms, it has a 'noisy signal'. Denote P_g the probability that a good credit firm will be viewed as good, and $1-P_g$ as the probability that be viewed as bad. Better performances of firms ensure that they have higher probability to be viewed as good

firm, which is $P_g = \frac{1}{1+z^{-(K-(1+r)I_0)}}$, where $z > 1$. Let P_b be the probability that a bad credit firm will be viewed as a bad firm, and denote $1 - P_b$ as the probability that the firm will be viewed as a good credit firm. Symmetrically, firms with a worse performance will have a higher probability to be viewed as a bad firm, which is $P_b = \frac{1}{1+z^{(K-(1+r)I_0)}}$. Hence the 'inside' bank still has the information advantage $P_g, P_b \in (\frac{1}{2}, 1)$.

The 'outside' bank has a higher probability to misjudge the quality of firms because of the existence of asymmetrical information between firms and 'the outside' bank. Similar to Sharpe (1990), here the probability of 'outside' bank views a good firm as good is given by $\lambda_g = \frac{1+\phi}{2} P_g$, where $0 \leq \phi < 1$. Then, the probability being viewed as a bad firm is $1 - \lambda_g$. Symmetrically the probability that an 'outside' bank views a bad firm as bad is $\lambda_b = \frac{1+\phi}{2} P_b$, and the probability viewed as a good firm is $1 - \lambda_b$. It is clear that $\lambda_g < P_g$ and $\lambda_b < P_b$.

Consider that a probability for success and failure of the lending project, I denote L_g is probability that a bank is willing to lends to good credit firm, and let L_b be the probability of a bank lending to a bad credit firm. Since a firm in a good credit states has higher probability to get loans, here has $L_g \gg L_b$.

If a firm chooses to process the lending relationship with incumbent bank, the value of loan it may get is denoted as Q_{inside}, which is an index of the loan quality consisting of loan amount (I_1), duration (D) and interest rate (r). While $Q_{outside}$ stands for the value of loan offer that comes from 'outside' bank. Hence, $Q_{outside/inside} = \frac{I_1}{1+r} * D^{\alpha}$, where $\alpha > 1$.The expected value of firm staying with current bank-firm relationship for repeating borrowing is given by:

$$V_{inside} = \begin{cases} [P_g L_g + (1 - P_g) L_b] * Q_{inside} \ \ if\ good\ firm \\ [P_b L_b + (1 - P_b) L_g] * Q_{inside} \ \ if\ bad\ firm \end{cases} \quad (4)$$

The expected value of firm switching bank is given by:

$$V_{outside} = \begin{cases} [\lambda_g L_g + (1 - \lambda_g) L_b] * Q_{outside} \ \ if\ good\ firm \\ [\lambda_b L_b + (1 - \lambda_b) L_g] * Q_{outside} \ \ if\ bad\ firm \end{cases} \quad (5)$$

Then,

$$V_{outside} = \begin{cases} \left[\frac{1+\phi}{2}(P_g L_g - P_g L_b) + L_b\right] * Q_{outside} \ \ if\ good\ firm \\ \left[\frac{1+\phi}{2}(P_b L_b - P_b L_g) + L_g\right] * Q_{outside} \ \ if\ bad\ firm \end{cases} \quad (6)$$

Considered transaction costs will occur when a firm changes credit supplier. Here, denote c as transaction costs. Firms are looking for better financial fund source from banks in period 1, which can be denoted as Max$\{V_{inside}, V_{outside} - c\}$. Let 1 stand for switching, 0 for non-switching. Hence, the decision equation of firms' switching is given by:

$$Switching = \begin{cases} 1, if\ V_{outside} - V_{inside} > c \\ 0, if\ V_{outside} - V_{inside} \leq c \end{cases} \quad (7)$$

i) Switching behaviour and deal terms:

Rewriting equation (7) as the probability of switching determination gives:

$$Prob(Switching = 1) \sim \begin{cases} \mathrm{Q_{outside}} > \frac{[(\mathrm{P_g L_g - P_g L_b}) + \mathrm{L_b}] * \mathrm{Q_{inside}} + c}{\frac{1+\phi}{2}(\mathrm{P_g L_g - P_g L_b}) + \mathrm{L_b}} & if\ good\ firm \\ \mathrm{Q_{outside}} > \frac{[(\mathrm{P_b L_b - P_b L_g}) + \mathrm{L_g}] * \mathrm{Q_{inside}} + c}{\frac{1+\phi}{2}(\mathrm{P_b L_b - P_b L_g}) + \mathrm{L_g}} & if\ bad\ firm \end{cases} \quad (8)$$

Obviously, in equation (8) there are $\frac{\partial(V_{outside} - V_{inside} - c)}{\partial I_1} > 0$ and $\frac{\partial(V_{outside} - V_{inside} - c)}{\partial D} > 0$, which suggests that more favourable offer (large amount of loans (I_1) and longer lending duration (D)) from 'outside' banks result in higher probability for firms switching banks. The first hypothesis is given as:

H1: *Given that information asymmetry is a barrier for firms' switching to a new bank, there is a higher probability to switch when firms get access to more favourable credit than remaining with incumbent banks*[24].

Firms need to choose between a relationship and a non-relationship bank for their repeat loan when they have the financial need. Since bank loans are the most important source of funding for firms in China (Allen et al., 2005; Hao et al., 2013), it is important that Chinese firms account for this when they make the switching decisions. As Ioannidou and Ongena (2010) claim, turning to a new bank is a defining moment for both the firm and its current lenders, firms often take these strategic decision at the highest level. Switching costs arise from asymmetrical information, which sets a barrier for switching. This implies that favourable loans are the key motivation when Chinese firms plan to switch to overcome a financial constraint. Hence, the first hypothesis expects that more generous lending contracts from 'outside' bank will drive firm to switch.

ii) Loan demand and a firm's characteristics:

Firms are willing to form new lending relationship when they get more attractive loans from an 'outside' bank. Published or shared information about transparency and reputation are very important, such as firm size and financial condition. Under the condition of equation (8), there are $\frac{\partial(V_{outside}-V_{inside}-c)}{\partial\phi} > 0, \frac{\partial(V_{outside}-V_{inside}-c)}{\partial K} > 0$;

Otherwise,

$$\frac{\partial(V_{outside}-V_{inside}-c)}{\partial\phi} \leq 0, \frac{\partial(V_{outside}-V_{inside}-c)}{\partial K} \leq 0.$$

[24] Interest rate has not been included into the model, since Chinese banks were not free to price their loans until after Oct 2004.

These results suggest that higher cash flow and transparency enhance the higher likelihood for a firm to switch. Usually, larger firms are more transparent than small firms (Elyasiani and Goldberg, 2004; Stephan et al., 2009). Hence, larger firms presumably have higher probability to change banks. The second hypothesis is given as follows:

H2a: *Given the asymmetry of information between 'inside' and 'outside' banks, the more transparent a firm is.*

H2b: *The better its financial health, the greater the probability that it will form a new lending relationship.*

The average non-performing loans ratios of Chinese commercial banks have continuously decreased over recent years, from 7.1% in 2006 to 1.0% in 2011. The largest decrease came from the large commercial banks group, from 9.7% in 2006 to 1.0% in 2011. These data indicate that the commercial banks focus on their borrowers' quality rather than on policy lending. Since the existence of asymmetrical information between 'inside' and 'outside' banks, the 'outside' banks have difficulty finding a firm's internal credit information. Under this condition, transparent firms are more attractive to 'outside' banks. In contrast, borrowers with poor financials may repeat borrow from their relationship lenders (Diamond, 1989). Firm size is likely to have a positive relationship with information transparency (Lin et al., 2007; Stephan et al., 2009). Furthermore, firm size usually reflects the bargaining power of larger borrower (Harhoff and Körting, 1998). In summary, more transparent firms (larger firms) and firms in better financial conditions have a higher propensity to switch.

iii) Loan supply and bank's characteristics:

Lending decisions are wildly observed as heterogeneous between different banks. Large banks are usually considered as nonaggressive when poaching new customers, which is

known as the 'fat cat' effect (Farrell and Klemperer, 2007), and tend to have a lower probability to lend. While small banks or banks with low profitability have a higher likelihood to lend, even to some 'risky' borrowers, since they need to extend market share and improve profitability. Furthermore, small banks are usually more efficient than larger banks in collecting 'soft' information, which makes them more willing to preserve or create bank-firm business relationship (Berger et al., 2005). Hence, the lending probability ($L_{g/b}$) is effected by the bank's characteristics, which can be written as: $L_{g/b} = f(bank\ characteristics)$. The following hypothesis addresses the effect of bank characteristics on switching.

H3a: *Firms are more likely to switch to small banks for their credit needs than large banks.*

H3b: Low profitability banks are more attractive to firms since they have higher likelihood to satisfy the firm's credit requirements.

In China the banking industry is heterogeneous and it has a mix of large and small banks with intensive competition in the market. The five large commercial banks hold the largest part of market share, but this has decreased by about 14.74% from 2003 to 2011. In the same period, joint-stock banks have the highest share growth, around 5.97%, and have become the second largest market share group in the Chinese banking industry with 18.81% market share in 2011. City commercial banks and rural commercial banks had a 3.88% and 4.18% market share growth during the last nine years, respectively. From these observations, it is clear that small banks are eager to extend their business and have higher propensity to lend than large banks.[25] Large banks usually rely more on observable firm characteristics in making lending decision than small banks (Cole et al., 1999), which implies they are less willing to lend than small banks under the same information asymmetry condition. Furthermore, small banks are

[25] Evidence of this is reported in Ferri (2009).

more efficient at lending to small firms than large banks (Sapienza, 2002). It is presumed that medium and small firms are more likely to switch to small banks.

4.3.2 Empirical models

Based on the above analysis, the switching determination of a firm can be effected by deal terms, characteristics of firm and bank, which implies that these variables are the determinants of switching behaviour. Equation (7) can be rewritten as:

$$Switching = f(Deal\ terms, Firm\ Characteristics, Bank\ Characteristics) \quad (9)$$

Similar to the many relevant empirical studies, the firms' classification and bank-firm relationship dummy variables have been added into the model. The basic model that I estimate using probit regressions has variants of the following form:

$$Switching_i = \alpha_0 + D_i\alpha_1 + F_i\alpha_2 + B_i\alpha_3 + u_i \quad (10)$$

, where the $Switching_i$ stands for the switching behaivor, D_i indicates the deal terms[26], F_i is a set of firms' characteristics variables, B_i stands for the banks characteristics and R_i indicates the bank-firm relationship variables. Note that $Switching = 1$ indicates that the firm switches the lending relationship. In the above equations, the deal terms includes: the amount of loan, the duration of the loan, and a dummy of whether the collateral required for the lending. The set of a firm's characteristics variables includes firm size, cash flow ratio and the dummy variables of the firm's classification (private own enterprise, medium size and small firms and so on). While the market share of the bank, non-interest income ratio, bank's ROA and large commercial bank dummy belongs to the bank's characteristics variables. The details of variable definition are listed as follows:

[26] Interest rate has not been included into the model, since Chinese banks cannot free to price their consumers until Oct 2004.

Table 4.5: Variables definition

Variables	Definition	Unit
Switching	A firm borrows from a bank which did not have a loan relationship with the firm during last 12 month, denote switching=1; otherwise switching=0	-
Amount of loan (Amount)	The amount of money of each loan contract	CNY
Duration of loan (Duration)	The duration of each loan contract	Year
Collateral (Collateral)	Whether collateral is required when a firm borrowing from a bank. Collateral needed=1; otherwise=0	-
Total asset of firm (Tasset)	Annual total asset of firm	CNY
Total sales of firm (Firmsales)	Annual total sales of firm	CNY
Cash flow ratio (Cashflows)	Firm's annual net cash flow over total sales	%
Private enterprise (Private-Own)	Dummy variable to distinguish the private enterprise and state-own enterprise. Private enterprise=1, otherwise=0	-
Agriculture [b]	Dummy variable for industry Classification [a]. Agriculture industry=1, otherwise=0	-
Manufacture [c]	Dummy variable for industry Classification. Manufacture industry=1, otherwise=0	-
Real estate [d]	Dummy variable for industry Classification. Real estate industry=1, otherwise=0	-
Energy [e]	Dummy variable for industry Classification. Energy industry=1, otherwise=0	-
Services [f]	Dummy variable for industry Classification. Services industry=1, otherwise=0	-
Medium and small firm (M-S firm)	Statistical definitions of medium-sized and small enterprises from National Bureau of Statistics of China [g]. Denote that medium and small firm M-S firm=1; otherwise equal to 0	-
Market share of bank (Marksh)	Bank's loan over total loans in the market	%

Variables	Definition	Unit
Total asset of bank (Bankasset)	Annual total asset of bank	CNY
Non-interest income ratio	Bank's non-interest income over total gross income	%
Bank's return on asset (Bankroa)	Bank's net profit over total earning assets	%
Large commercial bank (Large bank)	Large commercial bank=1, otherwise=0	-
Banking market Competition ratio (HHI)	The sum of the squares of the market shares (percentage of banks' assets over the total assets of the entire banking sector) of the five largest banks	-

[a] Industry Classification here according to "Listed Company Industry Classification Guidelines (2012 Revision)", China Securities Regulatory Commission
[b] Agriculture: Farming, forestry, animal, husbandry and fishing industry
[c] Manufacture: Manufacture Industry
[d] Real estate: Real estate industry
[e] Energy: Production and Supply Electric Power, thermal Power, gas and water industry
[f] Services: Wholesale, retail, trades hotels and catering services industry
[g] Statistical definitions of medium-sized and small enterprises table is attached in Appendix C.1.

As since the target of this study is to estimate the determinant of a firm's switching behaviour with deal terms and characteristics of firm and bank, the empirical study is in two stages. The first step of my analysis is to estimate the impacts of a firm's characteristics and deals terms on the propensity to form a new banking relationship. This study then analyses the relationship between post-switching banks' characteristics and new banking relationship. Since switching is only available from the borrower's second deal onwards, the empirical studies drop the first deal in the regression. The specific model for the determinants of deal terms and firms' characteristics on switching is:

$$Switching_i = \alpha_0 + \alpha_1 lnAmount_i + \alpha_2 Duration_i + \alpha_3 Collateral_i + \alpha_4 lnTasset_i + \alpha_5 Cashflows_i + \alpha_6 Private_i + \alpha_7 Industry\ dummy_i + u_i \quad (11)$$

The specific model for the relationship between post-switching bank characteristics and a firm's preference when switching is as follows:

$$Switching_i = \beta_0 + \beta_1 lnAmount_i + \beta_2 Collateral_i + F_i\beta_3 + \beta_4 Marksh_i +$$

$$\beta_5 Noninterest\ income_i + \beta_6 Bankroa_i + \varepsilon_i \quad (12)$$

The last stage, the robustness check model is designed as:

$$Switching_i = \alpha_0 + D_i\alpha_1 + F_i\alpha_2 + B_i\alpha_3 + R_i\alpha_4 + \alpha_5 HHI_i + u_i \quad (13)$$

, where HHI_i stands for banking market concentration ratio.

4.4 Data

The basic source of the data that I have used in this study for corporate characteristics is the CSMAR (China Stock Market Financial Statements) database. The financial reports of China banks are taken from the Bankscopes database. I then match the two samples with the corresponding lending deals. Since the research take past deals to code *switching*, the data only contains the deal from second borrowing (data detail in appendix C.2). The sample includes 311 firms (non-financial firm) and 41 banks,[27] from 1999-2012, with 2102 matched data. However, some firms and banks characteristics variables lack data in some sample years, making the regression unbalanced. Since these gaps appear to be completely random, they should not affect the estimations in any way other than reducing the sample size (Wooldridge, 2009).

A total of 51.5% firms switched after their last pervious borrowing. Firms are more likely to switch to a multiple bank-firm relationship instead of keep single lending relationship. Only

[27] The sample includes 5 large commercial banks, 12 joint-stock commercial banks, 19 City and Rural commercial bank, and 5 foreign banks. Details are attached in Appendix C.3.

25% kept their single bank-firm relationship after switching. The average deal amount is 89835613 CNY. The highest and lowest loan amount is 259000000 and 1500000, respectively. Here the logarithm is taken on the absolute values in order to smooth the data and lower the probability of heterogeneity problems. The average Ln(deal amount) is 17.498, and the highest and lowest value is 22.386 and 14.221, respectively. In the sample, all of the deals only involve a single lender, which means that no syndicate of lenders are involved. The average number of lending relationships is 3.901. In the first period of a firm's lending deals, 77.3% borrow from large banks. The average lending duration is 1.528 year, and 68.4% deal durations are between 1 and 2 years.

Although the firms in this sample are all listed, they are heterogeneous in size. The largest total asset is 138000000000 CNY, while the smallest is only 5220090. The values are also taken logarithm in regression. The average cash flow to total sales ratio is -3.616. Observations from private firms take a small proportion as 7.7% and from the medium size and small firms takes 24.6%. Nearly half of the switching or non-switching behaviours in the observations come from manufacturing firms, and around 1/3 come from real estate and services firms. As to bank characteristics, there is a big gap between the highest and lowest market share. Although the large banks' market shares keep decreasing due to the competition during the sample years, they still hold the most clients. The highest is the market share of ICBC in 2001, while the lowest is the market share of Deyang City Commercial Bank in 2008. Besides the market share index, the dummy variable *large bank* is also used to distinguish large banks and others. The statistic shows that 54.4% borrowing deals are with large banks.

Table 4.6: Summary Statistics

	Obs.	Mean	S.D.	Min	Max
Dependent variable					
Switching	2102	0.511	0.497	0	1
Deal Characteristics					
Ln(Amount)	2047	17.498	1.158	14.220	22.386
Ln(1+Duration)	1802	0.811	0.401	0.077	3.060
Collateral	2102	0.738	0.439	0	1
Firm Characteristics					
Ln(Tasset)	2102	21.557	1.035	15.468	25.651
Ln(Firmsales)	2097	20.853	1.323	15.468	25.838
Cashflows	2095	-3.616	39.186	-81.412	77.211
Private-Own	2102	0.077	0.267	0	1
Agriculture	2102	0.021	0.146	0	1
Manufacture	2102	0.471	0.499	0	1
Real estate	2102	0.164	0.371	0	1
Energy	2102	0.048	0.231	0	1
Services	2102	0.142	0.349	0	1
M-S firm	2012	0.264	0.440	0	1
Bank’s Characteristics					
Marksh (%)	1882	7.613	0.396	0.021	24.176
Ln(Bankasset)	1886	14.550	1.514	2.805	16.554
Non-interest income ratio (%)	1884	13.420	1.356	7.585	21.406
Bankroa (%)	1865	1.245	0.897	-0.282	34.063
Large bank	2102	0.544	0.498	0	1
Market Characteristics					
HHI	2102	714.305	105.102	564.589	941.224

4.5 Empirical results

This study aims to investigate why firms switch their relationship banks. Switching action is defined as a firm borrowing from a bank that did not have a loan relationship with the firm during the last 12 months. Hence, the dependent variable *switching* is a dummy variable, either 0 or 1. As in many previous studies, I have used the probit method to estimate the regression models.[28] Since the endogeneity of a firm's switching decision problem existence is suspected in the model, a probit model with continuous endogenous (ivprobit) has been used for the following empirical study.[29] All of the data in regression are winsorized at the 1st and 99th percentiles.

4.5.1 New lending relationship, deal terms, and a firm's characteristics

The estimates for the determinants of switching probability are shown in Table 4.7. The outcomes provide evidence that the probability of a firm switching banks is determined by deal terms, firm characteristics and bank-firm relationship. In table 4.7, *Ln(amount)* has the significant positive effect for firms to form new borrowing deals, which indicates that one of the reasons why firms switch is to seek more loans. When the sample is divided into switching and non-switching groups, the statistic shows that the average amount of loan in switching group is 35.6%, which is higher on average than in the non-switching group. Since the amount of loan, impact of duration of loan is similar in the firms' decision to form new banking relationship, *duration* has a significant positive effect on the probability of switching above the 5% level. The statistical analysis shows that the average contract duration increased from 1.31 year to 1.73 year after switching. Since a long contract usually indicates a stable

[28] Correlation table of independent variables are attached in Appendix C.4.
[29] Lagged terms of Firm's characteristics have been selected as instrument variables except dummy variables.

relationship, it is normal that firms chase for a long and stable lending relationship. Furthermore, a longer relationship means that more information has been passed to the banks (Farinha and Santos, 2002). Hence, banks prefer to offer a longer contract to their new clients with good credit. The above results prove *Hypothesis 1*. *Collateral* has no significant effect on a firms' behaviour in the regressions.

As for the firm's characteristics, *Ln(Tasset)* (firm size) shows a signification positive relationship with switching behaviour at 1% level in column (2)-(6), which indicates that large firms have a high probability of forming a new banking relationship. Since firm transparency is usually considered to have positive relationship with firm size, which implies that small firms are less transparent than larger firms (Elyasiani and Goldberg, 2004; Stephan et al., 2009), the positive relationship shows that more opaque firms are less likely to switch banks. Asymmetrical information can contribute to lock-in power of banks but transparent firms can decrease the asymmetry information level and suffer less from switching costs (although this cannot be observed). This result is consistent with Stephan et al. (2009) and Gopalan et al. (2011). Another key variable of the firm's characteristics is *Cashflows* (cash flow ratio), which indicates the ability of a company to generate cash from its sales. In this case, *cashflows* has a significant positive effect on switching banks behaviour. High cash flow ratio presumably indicates a good performance. Firms with higher internal cash flows ratio and good performance should be less reliant on the incumbent relationship, which drives firms to have a high likelihood to switch. On the other hand, they have good financial conditions, which are attractive for 'outside' banks. These results support *Hypothesis 2a&b*. The *private-own* variable gives an insignificant result, which shows that there is no significant difference in switching behaviour between state-own or private-own enterprise.

The heterogeneity in industries is found in the regression. The regression results show that the firms in the energy and service industries have higher likelihood to switch banks.

Table 4.7: The determinants of deal terms and firms' characteristics on switching

	Pr(Switching)			
	(1)	(2)	(3)	(4)
Deal terms				
Ln(amount)	0.118***	0.114***	0.112***	0.121***
	(3.951)	(3.776)	(3.724)	(4.174)
Ln(1+Duration)	0.174**	0.168**	0.172**	0.165**
	(2.095)	(2.012)	(2.073)	(1.989)
Collateral	-0.037	-0.051	-0.043	
	(-0.536)	(-0.726)	(-0.614)	
Firm characteristics				
Ln(Tasset)	0.106***	0.082**	0.084**	0.085**
	(3.058)	(2.406)	(2.500)	(2.550)
Cashflows	0.002**	0.002**	0.002**	0.002**
	(2.439)	(2.153)	(2.252)	(2.228)
Private-own	0.075	0.154	0.136	
	(0.067)	(1.342)	(1.203)	
Agriculture		0.066		
		(0.288)		
Manufacture		-0.145		
		(-1.565)		
Real estate		-0.144		
		(-1.385)		
Energy		0.316*	0.377**	0.368**
		(1.948)	(2.458)	(2.395)
Services		0.365***	0.429***	0.430***
		(3.181)	(4.223)	(4.224)
C	-4.362***	-3.373***	-3.838***	-4.010***
	(-5.594)	(-4.770)	(-4.945)	(-5.223)

Wald Chi^2	69.46	98.87	98.04	94.81
Obs	1781	1781	1781	1781
Prob: Wald test of exogeneity[30]	0.424	0.384	0.435	0.443

Note: Z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Regression result with regular probit is attached in Appendix C.5.

4.5.2 The propensity to form new banking relationship based on bank characteristics

The regression of this part is to test what types of banks and firms are more likely to form a lending relationship. Since the details of a loan deal may have correlations with a bank's characteristics, as in Gopalan et al. (2011), the duration of loans[31] is not included in the following probit model with continuous endogenous (ivprobit) regressions. Although I control the firms' characteristic and bank-firm relationship variables in these regressions, I do not report the results in the following table other than banks' characteristics (the full table is attached in Appendix C.6). The results are presented in table 4.8.

Table 4.8: Post-switching bank characteristics and new banking relationship

	Pr(switching)				
	(1)	(2)	(3)	(4)	(5)
Marksh	-0.020*** (-3.989)	-0.016*** (-3.119)	-0.021*** (-3.965)		
Marksh*M-S firm		-0.029*** (-2.681)			
Bankroa	-0.241*** (-3.252)	-0.211*** (-2.838)	-0.206*** (-2.711)	-0.206*** (-2.783)	-0.171** (-2.295)
Bankroa*M-S firm			-0.193*** (-2.770)		-0.186*** (-2.692)
Large Bank				-0.268***	-0.269***

[30] Wald test of exogeneity do not reject the null that there is exogeneity in the regression.
[31] When bank facing liquidity crisis, they are tending to lend in short term other than long term.

	Pr(switching)				
	(1)	(2)	(3)	(4)	(5)
				(-4.279)	(-4.272)
Non-interest income ratio	-0.093***	-0.094***	-0.092***	-0.095***	-0.094***
	(-3.601)	(-3.627)	(-3.528)	(-3.714)	(-3.650)
C	-2.887***	-3.670***	-4.039***	-2.932***	-4.043***
	(-2.942)	(-3.491)	(-3.601)	(-3.004)	(-3.617)
Wald Chi^2	105.63	111.66	110.76	106.40	112.33
Obs	1812	1812	1812	1812	1812
Prob: Wald test of exogeneity[32]	0.454	0.488	0.482	0.455	0.477

Note: Z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Regression result with regular probit is attached in Appendix C.7.

In columns (1), (2) and (3), *market share* of banks (Marksh) shows a significant negative relationship with switching. This implies that firms tend to switch to small market share banks. The variable *large bank* shows a similar result in column (4) and (5). The statistics show that the average amount borrowing from large commercial banks is 41.4% less than firms borrowing from non-large commercial banks. Since small market share banks are more aggressive in extending their market share, they usually have a higher propensity to lend than large market share banks. The significant negative result of joint variables (market share*medium-small firms) in column (2) reflects that medium-small size firms are more likely to form new relationship with small market share banks than large firms. This result is consistent with the evidence in Berger et al. (2005b) and Gopalan et al. (2011). Since large firms find it easier to borrow from large banks, small firms prefer to seek financial help from small banks. In table 4.8, *Bankroa* also shows a significant negative relationship with switching. Banks with low profitability have a high propensity to lend since interest income is the main income resource for Chinese banks. Under the same asymmetry information

[32] The Wald test of exogeneity did not reject the null that there is exogeneity in the regression.

condition, lower profitability firms are more likely to lend. The significant negative results of joint variables (market share*medium-small firms) in column (3) and (5) reflect that medium-small size firms are more likely to form new relationship with this kind of banks since they are more opaque than large firms. The results above show strong evidence that is consistent with *Hypothesis 3a&b*. Interestingly, the results show that high non-interest income ratios lower the probability for firms to switch to a new bank. Since banks with high non-interest income ratios tend to have more correlation (intermediary business, consulting, investment and so on) with firms other than lending, this presumably raises the switching costs and strengthens the lock-in power to enhance firms to stay with their current lending relationships. It is obvious that firms tend to avoid being locked-in and keep a simple lending relationship with their banks.

4.5.3 Robustness check

Table 4.9: The determinants of firms switching banks

	Pr(switching)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Deal Terms							
Ln(Amount)	0.145***	0.157***	0.161***	0.162***	0.143***	0.144***	0.126***
	(4.518)	(5.527)	(5.679)	(5.763)	(4.699)	(4.983)	(4.407)
Ln(1+Duration)	0.122**						0.105**
	(2.247)						(2.013)
Collateral	-0.003	0.043	0.058	0.046	0.025		
	(-0.044)	(0.572)	(0.761)	(0.612)	(0.311)		
Firm Characteristics							
Ln(Tasset)	0.128***				0.094**	0.085**	0.077**
	(3.264)				(2.169)	(1.985)	(2.268)
Ln(Firmsales)		0.082**	0.075**	0.078**			
		(2.544)	(2.344)	(2.467)			
Cashflows	0.002**	0.001*	0.001*	0.001*	0.002**	0.002**	0.002**

	Pr(switching)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	(1.975)	(1.886)	(1.707)	(1.832)	(1.974)	(1.981)	(2.282)
Private-own	0.284	0.189	0.082		0.057		
	(1.364)	(0.941)	(0.738)		(0.507)		
Private-own*M-S Firm	-0.252		-0.151				
	(-1.004)		(-0.635)				
Energy						0.285*	0.411**
						(1.885)	(2.768)
Services						0.294***	0.469***
						(3.460)	(4.980)
Bank characteristics							
Marksh		-0.019***			-0.020**	-0.019***	
		(-3.775)			(-3.919)	(-3.665)	
Ln(Bankasset)			-0.121***	-0.262***			
			(-5.316)	(-4.152)			
Bankroa		-0.251***	-0.168*	-0.216***	-0.247**	-0.231***	
		(-3.334)	(-1.860)	(-2.868)	(-2.666)	(-3.190)	
Non-interest income ratio		-0.089***	-0.093***	-0.091***	-0.091***	-0.095***	
		(-3.422)	(-3.622)	(-3.504)	(-3.229)	(-3.710)	
Market characteristic							
HHI					-0.0001		
					(-0.405)		
C	-5.383***	-2.853***	-1.446	-2.879***	-2.562	-2.497**	-3.979***
	(-6.176)	(-3.042)	(-1.485)	(-3.131)	(-0.812)	(-2.559)	(-5.147)
Wald Chi^2	72.74	104.55	116.51	101.06	105.87	116.09	92.89
Obs	1781	1812	1812	1812	1812	1812	1781
Prob: Wald test of exogeneity[33]	0.372	0.416	0.457	0.444	0.451	0.488	0.337

Note: Z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Regression result with regular probit is attached in Appendix C.8.

[33] The Wald test of exogeneity did not reject the null that there is exogeneity in the regression.

Some studies point out that medium size and small firms in China have difficulty in obtaining financing support from banks (Lin, 2007), especially for private enterprises who do not have a government background. This could lead medium size and small private firms to tend to stick with their incumbent banks since they experience difficulty finding external financing. In column (1) and (2), other *Private-own* and *Private-own*M-S FIRM* variables are insignificant, which suggests that the medium size and small private firms in the sample (all listed firms) have not shown a significant switching preference.

Then I denote firm total sales and bank size as firm size and bank size (instead of market share), respectively, and take them into regression to check the robustness of the previous results. In column (3) and (4), *Firm total sales* gives the same effect as *Firm total asset* to switching behaviours, which again supports that big firms are more likely to form a new banking relationship. Compared with the Wald Chi^2 statistic result in column (2) and the result from column (1) of table A.5, it is clear that variable *Ln(Tasset)* offers a higher Chi square, which suggests better results. In column (3), the impact of *Bank asset* on dependent variable is significantly negative, which is consistent with the previous result that firms tend to switch to small banks.

As in other studies (Herrera and Minetti, 2007; Uchida et al., 2008), here I add the banking market concentration variable as a control for the macro effect into regression to check the robustness of the results in table 4.7 and 4.8. In column (5), marker competition ratio (HHI) shows no significant relations to switching, but other variables results are consistent with the previous regressions.

4.6 Conclusion

Using firm-bank 2012 matched data originated during 1999-2012, this chapter has examined why firms switch to new banks for their repeat loans instead of staying with their relationship banks. This study defines switching action as a firm borrowing from a bank that it did not have a loan relationship with during last 12 month. The results provide evidence that the chief determinations of switching action come from the firm's credit needs, as well as the firm's and bank's characteristics.

This study finds that firms usually switch banks for larger loans and longer lending durations in order to overcome borrowing constrains. However, collateral requirement of lending has no significant effect on firms' switching behaviour. More favourable loan contract usually link with 'price cut' from bank to firms, which are also based on how banks observe their potential customers (Ioannidou and Ongena, 2010). Because of lack of interest rate data and Chinese banks incompetence to free price their consumers until Oct 2004, interest rate has not been involved into this study.

Since large firms are usually considered as more transparent than small firms (Stephan et al., 2009), this study finds a positive relationship between firm size and the probability of bank switching. Firms who have a better ability to generate cash from its sales are more likely to form a new bank relationship since they are attractive to banks and find it easy to get new loans. From banks' prospective, large firms or firms who have a better ability to generate cash are more attracted for them.

These findings suggest that firms are more likely to switch to small market share banks, or lower profitability banks, since these banks more aggressively extend their business and take

more risks to earn their profits, which will results in more loans for firms. Since banks with high non-interest income ratios tend to have more correlation with firms other than lending, this offers a lock-in power to enhance firms to stay with current lending relationships. Firms are less likely to switch to this kind of bank. It is good for firms to set ‘pure’ lending relationship with banks to avoid to be trapped in higher switching costs barrier.

Appendix C

Table C.1: Statistical Definitions of Large, Medium-sized and Small Enterprises (newest)

Industry Branch	Index	Unit	Large	Medium-sized	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	$Y \geq 80000$	$6000 \leq Y < 80000$	$300 \leq X < 6000$
	Total assets (Z)	10,000	$Z \geq 80000$	$5000 \leq Z < 80000$	$300 \leq X < 5000$
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 trades	Employees (X)	People	$X \geq 300$	$50 \leq X < 300$	$10 \leq X < 50$
	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	Employees (X)	People	$X \geq 300$	$100 \leq X < 300$	$10 \leq X < 100$

services	Operating income (Y)	10,000	$Y \geq 10000$	$2000 \leq Y < 10000$	$100 \leq Y < 2000$
Soft and scientific research, technical services	Employees (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	$Y \geq 200000$	$1000 \leq Y < 200000$	$100 \leq X < 1000$
	Total assets (Z)	10,000	$Z \geq 10000$	$5000 \leq Z < 10000$	$2000 \leq X < 5000$
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	$Z \geq 120000$	$8000 \leq Z < 120000$	$100 \leq X < 8000$
No specified industry	Employees (X)	People	$X \geq 300$	$100 \leq X < 300$	$10 \leq X < 100$

Source: National bureau of statistics of China

C.2 Data details

This analysis uses information from the CSMAR (China Stock Market and Accounting Research) Database of GTA Information Technology Ltd. GTA offers the most accurate, reliable, and useful China financial data. Their databases are developed by a team of experienced talents based on the standards and adjustment rules of well-known databases such as CRSP and Compustat.

The CSMAR Database provides listed companies in Shanghai and Shenzhen stock market since 1990. According to the statement types announced by the listed companies, this study collects the data based on three categories: Balance Sheet Statement, Income Statement, and Statement of Cash Flow. The data relevant with firm's loan (contract duration, amount, date, lending bank etc.) is collected from Balance Sheet Statement. Firm's characteristics are obtained from all the three categories. Here borrowers (firms) from the financial services sector are excluded.

Since this study distinguishes *switching* or *non-switching* behaviour of firms by using the criteria that a firm borrows from a bank which did not have a loan relationship with the firm during last 12 month, the loan contract data with beginning date and ending date are needed. The firms who are absent with this kind of data are deleted from the sample. The study restricts our analysis to 311 firms listed in Shanghai and Shenzhen stock market between the years 1999 and 2012.

CSMAR Database provides relationship bank's name. Financial reports of China banks are taken from the Bankscope database, which is collected by coding bank's name. Then this

study connects the relationship banks' data (market share, non-interest income ratio, bank's ROA etc.) with firms' characteristics in the corresponding year. The loans could be financed either by a single lender or by several lenders. Each lender's data is separately connected to the relationship firm. Finally, 2102 matched data are obtained by manually checking and matching. However, the sample is unbalanced because of a lack of data in some years but since these gaps appear at random.

To construct *New Relationship*, this study uses all the previous deals in the sample and codes *switching* equal to 1. Note that *switching=0* indicates that the firm repeats borrowing from a relationship bank. Since past deals are used to code *switching* or *non-switching* behaviour, this study constructs variables only from the borrower's 2nd deal onwards.

Table C.3: List of banks in sample

Type of Bank	Name of Bank
Large commercial bank	Industrial and commercial bank of China
	Agricultural bank of China
	Bank of China
	China Construction Bank
	Bank of Communications
Joint-stock commercial bank	China Citic bank
	China Everbright Bank
	Huaxia Bank
	Guangdong Development Bank (China Guangfa Bank)
	Shenzhen Development Bank (Pingan Bank)
	China Merchants Bank
	Shanghai Pudong Development Bank
	Industrial Bank
	China Minsheng Banking Corporation
	Evergrowing Bank
	China Zheshang Bank
	Bohai Bank
City and Rural commercial bank	Bank of Beijing
	Weihai Commercial Bank
	Bank of Shanghai
	Bank of Jiangsu
	Harbin Bank
	Chongqing Rural Commercial Bank
	Bank of Ningbo
	Bank of Dalian
	Shanghai Rural Commercial Bank
	Bank of Nanjing
	Bank of Hangzhou

	Jiaxing Commercial Bank
	Wenzhou Bank
	Huishang Bank
	Bank of Jiujiang
	Baoshan Bank
	Bank of Guangzhou
	Bank of Chengdu
	Bank of Chongqing
Foreign bank	HSBC Bank (China)
	Bank of East Asia (China)
	Citibank (China)
	DBS BANK (China)
	Nanyang Commercial Bank (China)

Table C.4: Correlation of independent variables

	Ln(Amount)	Ln(1+Duration)	Ln(Tasset)	Ln(firm sales)	Cashflows	Markshare	Ln(Bankasset)	Bank Roa	Nonint erest
Ln(Amount)	1.000								
Ln(1+Duration)	0.392 **	1.000							
Ln(Tasset)	0.270 ***	0.208 ***	1.000						
Ln(firmsales)	0.145 ***	0.076 ***	0.825 **	1.000					
Cashflows	0.030 ***	0.054 ***	0.090	0.241 **	1.000				
Markshare	0.004 ***	0.103 ***	-0.166 ***	-0.207 **	-0.009 ***	1.000			
Ln(Bankasset)	0.028 ***	0.150 ***	0.039 ***	0.015 **	0.049 *	0.750 **	1.000		
Bank Roa	0.008 ***	0.110 **	0.322 *	0.368 ***	0.118 **	-0.075 ***	0.291 **	1.000	
Nonintere st	-0.123 **	-0.203 **	-0.319 ***	-0.350 ***	-0.075	0.253 ***	-0.012 **	-0.336 ***	1.000

Note: *,**,*** significant at 10%, 5% and 1% level.

Table C.5: The determinants of deal terms and firms' characteristics on switching (Regular probit)

	Pr(Switching)			
	(1)	(2)	(3)	(4)
Deal terms				
Ln(amount)	0.117***	0.110***	0.113***	0.121***
	(3.930)	(3.625)	(3.769)	(4.225)
Ln(1+Duration)	0.176**	0.173**	0.176**	0.169**
	(2.085)	(2.024)	(2.054)	(1.990)
Collateral	-0.037	-0.060	-0.053	
	(-0.533)	(-0.847)	(-0.714)	
Firm characteristics				
Ln(TASSET)	0.098***	0.089***	0.090***	0.090***
	(3.444)	(3.106)	(3.162)	(3.233)
CASHFLOWS	0.002***	0.002***	0.002***	0.002**
	(3.008)	(2.904)	(2.923)	(2.955)
Private-own	0.077	0.144	0.113	
	(0.691)	(1.267)	(1.007)	
Agriculture		0.079		
		(0.343)		
Manufacture		-0.143		
		(-1.629)		
Real estate		-0.142		
		(-1.359)		
Energy		0.317*	0.420***	0.408***
		(1.955)	(2.820)	(2.748)
Services		0.368***	0.475***	0.470***
		(3.190)	(5.036)	(4.990)
C	-4.268***	-3.903***	-4.101***	-4.264***
	(-6.121)	(-5.467)	(-5.841)	(-6.186)
Wald Chi^2	76.17	111.74	108.09	106.53
Obs	1781	1781	1781	1781

Note: Z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table C.6: Post-switching bank characteristics and new banking relationship

	Pr(switching)				
	(1)	(2)	(3)	(4)	(5)
Deal terms					
Ln(amount)	0.142***	0.151***	0.152***	0.146***	0.154***
	(4.788)	(5.056)	(5.059)	(4.889)	(5.172)
Collateral	0.027	0.035	0.033	0.033	0.038
	(0.360)	(0.452)	(0.437)	(0.431)	(0.500)
Firm Characteristics					
Ln(TASSET)	0.095**	0.123***	0.140***	0.094**	0.137***
	(2.398)	(2.894)	(3.056)	(2.365)	(2.994)
CASHFLOWS	0.002**	0.001**	0.001**	0.001*	0.001*
	(2.029)	(1.989)	(1.929)	(1.855)	(1.724)
Private-own	0.057	0.138	0.174	0.067	0.180
	(0.507)	(1.186)	(1.452)	(0.604)	(1.518)
Bank Characteristics					
MARKSH	-0.020***	-0.016***	-0.021***		
	(-3.989)	(-3.119)	(-3.965)		
MARKSH*M-S firm		-0.029***			
		(-2.681)			
BANKROA	-0.241***	-0.211***	-0.206***	-0.206***	-0.171**
	(-3.252)	(-2.838)	(-2.711)	(-2.783)	(-2.295)
Bankroa*M-S firm			-0.193***		-0.186***
			(-2.770)		(-2.692)
Large Bank				-0.268***	-0.269***
				(-4.279)	(-4.272)
NON-INTEREST INCOME RATIO	-0.093***	-0.094***	-0.092***	-0.095***	-0.094***
	(-3.601)	(-3.627)	(-3.528)	(-3.714)	(-3.650)
C	-2.887***	-3.670***	-4.039***	-2.932***	-4.043***
	(-2.942)	(-3.491)	(-3.601)	(-3.004)	(-3.617)
Wald Chi^2	105.63	111.66	110.76	106.40	112.33
Obs	1812	1812	1812	1812	1812
Prob: Wald test of exogeneity[34]	0.454	0.488	0.482	0.455	0.477

Note: Z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

[34] Wald test of exogeneity do not reject the null that there is exogeneity in the regression.

Table C.7: Post-switching bank characteristics and new banking relationship (Regular Probit)

	Pr(switching)				
	(1)	(2)	(3)	(4)	(5)
Deal terms					
Ln(amount)	0.148***	0.157***	0.156***	0.151***	0.159***
	(5.069)	(5.323)	(5.315)	(5.179)	(5.413)
Collateral	0.027	0.034	0.033	0.032	0.038
	(0.353)	(0.448)	(0.428)	(0.424)	(0.489)
Firm Characteristics					
Ln(TASSET)	0.072**	0.094***	0.108***	0.070**	0.105***
	(2.325)	(2.894)	(3.134)	(2.262)	(3.039)
CASHFLOWS	0.002***	0.002***	0.002***	0.002***	0.002***
	(3.153)	(2.986)	(2.965)	(3.024)	(2.841)
Private-own	0.062	0.138	0.165	0.072	0.171
	(0.555)	(1.184)	(1.385)	(0.647)	(1.438)
Bank Characteristics					
MARKSH	-0.021***	-0.017***	-0.021***		
	(-4.041)	(-3.267)	(-4.032)		
MARKSH*M-S firm		-0.026***			
		(-2.500)			
BANKROA	-0.234***	-0.206***	-0.203***	-0.199***	-0.168**
	(-3.214)	(-2.787)	(-2.744)	(-2.730)	(-2.269)
Bankroa*M-S firm			-0.166***		-0.159**
			(-2.550)		(-2.458)
Large Bank				-0.271***	-0.271***
				(-4.321)	(-4.324)
NON-INTEREST INCOME RATIO	-0.098***	-0.099***	-0.097***	-0.100***	-0.099***
	(-3.792)	(-3.846)	(-3.768)	(-3.920)	(-3.895)
C	-2.411***	-3.059***	-3.341***	-2.447***	-3.344***
	(-2.786)	(-3.375)	(-3.538)	(-2.835)	(-3.550)
Wald Chi^2	115.39	121.68	110.76	115.87	121.93
Obs	1812	1812	1812	1812	1812

Note: Z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table C.8: Robustness check (Regular Probit)

	Pr(switching)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Deal Terms							
Ln(Amount)	0.147***	0.166***	0.163***	0.167***	0.149***	0.144***	0.121***
	(4.551)	(5.915)	(5.728)	(5.932)	(5.039)	(5.057)	(4.225)
Ln(1+Duration)	0.182**						0.169**
	(2.214)						(1.990)
Collateral	0.001	0.061	0.058	0.056	0.022		
	(0.018)	(0.806)	(0.762)	(0.733)	(0.272)		
Firm Characteristics							
Ln(TASSET)	0.104***				0.070**	0.072**	0.090**
	(3.296)				(2.114)	(2.330)	(3.223)
Ln(Firmsales)		0.057**	0.062**	0.060**			
		(2.272)	(2.456)	(2.360)			
CASHFLOWS	0.002**	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(2.831)	(2.710)	(2.725)	(2.811)	(3.152)	(3.112)	(2.955)
Private-own	0.262	0.076	0.177		0.062		
	(1.269)	(0.682)	(0.885)		(0.552)		
Private-own*M-S FIRM	-0.211		-0.138				
	(-0.852)		(-0.583)				
Energy						0.285*	0.408***
						(1.911)	(2.748)
Services						0.292***	0.470***
						(3.430)	(4.990)
Bank characteristics							
MARKSH		-0.024***			-0.021***	-0.019***	
		(-4.720)			(-3.930)	(-3.654)	
Ln(Bankasset)			-0.132***	-0.123***			
			(-5.560)	(-4.152)			
BANKROA		-0.172***	-0.148**	-0.183***	-0.247**	-0.237***	
		(-2.423)	(-2.060)	(-2.462)	(-2.653)	(-3.327)	
NON-INTEREST INCOME RATIO		-0.096***	-0.093***	-0.101***	-0.095***	-0.097***	
		(-3.713)	(-4.129)	(-3.951)	(-3.353)	(-3.764)	

Market							
MCR					-0.0001 (-0.218)		
C	-4.967*** (-6.458)	-4.170*** (-6.361)	-0.701 (-0.782)	-0.911 (-1.041)	-2.305** (-2.324)	-2.407*** (-2.805)	-4.264*** (-6.186)
Wald Chi^2	77.31	115.51	132.28	128.00	115.43	129.43	106.53
Obs	1781	1812	1812	1812	1812	1812	1781

Note: Z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Chapter 5: Single versus Multiple banking relationship in Chinese lending market-indictors of firm's size, quality or market Competition

5.1 Introduction

Single or multiple lending relationships that a firm maintains with banks are key characteristics of its financial policy. Strong theoretical research explain a firm's choice on single banking or two banking relationships (Bolton and Scharfstein, 1996; Von Thadden, 1998), but less clear for banking involving more banks. On one hand, previous studies suggest that firms borrowing from single bank are advantageous because it reduces the monitoring costs and the requirement of collaterals (Farinha and Santos, 2002). However, firms are easily to be lock-in by relationship bank when they keep single banking relationship. On the other hand, benefit of multiple banking relationships is suggested by some literatures that firms can reduce the probability of liquidity risk and the informational lock-in. But a number of considerations suggest that firms deal with more than one bank will be involved in significant transaction costs and monitoring costs, which make multiple banking more costly.

Firms need to make the decision on single or multiple banking relationships based on their characteristics. Many studies claim that the size of a firm has a significant influence on the number of bank relationships. Large firms usually require a wide range of banking relationships in order to satisfy their firm-specific credit needs (Ongena and Smith, 2000; Detragiache et al., 2000). Meanwhile, in countries like US, Portugal and Germany, even if the number of bank relationships tends to increase with firm size, medium size and small enterprises are often observed to borrow from more than one bank (Petersen and Rajan, 1994; Farinha and Santos, 2002; Brunner and Krahnen, 2013). A firm's quality is considered as another key variable that affects the number of bank relationships (Petersen and Rajan, 1994).

Low quality firms are usually unable to increase the credit requirements from incumbent banks and need to seek help from outside banks. From the lender's point of view, banks are willing to share bad credit clients with others in order to decrease their risk. In addition, banking market competition has been suggested as a main factor behind the number of bank relationships. Single or multiple banking relationships can reflect the level of banking competition from the credit demand side. A high degree of competition between banks is a possible lead to a large number of bank relationships, since firms can benefit from having access to more credit when the banks compete against each other (Machauer and Weber, 2000).

In the Chinese banking market, the reform period beginning from 2001 has made remarkable improvements in the performance of the banks, especially for the large commercial banks. Unlike in the past where the banks were slaves to the socialist plan, Chinese commercial banks have been able to focus on credit quality when making lending decisions (Chang et al., 2009). The average non-performing loan ratio of the major commercial banks in China decreased from 17.9% in 2003 to 0.9% in 2011. Credit risk control is very important in bank lending and banks charge different risk premium to their clients according to their features (He and Wang, 2013). Loan quality is a very important factor for banks to make their lending decisions. Analysis of the Chinese experience shows that banks choose to reduce the size of the loans granted and to finance more firms in order to diversify the risk. Large firms are more attractive for banks since they are less likely to default on a loan (Chang et al., 2009), while it has been shown that maintaining a large number of banking relationships is not an optimal choice for small and medium size firms (SMEs) (He and Wang, 2009). Within the banking sector itself, although the five biggest banks still dominate the market, their market share has continued decreasing, from 69.63% in 2003 to 54.89% in 2011. Although

constrained by relatively high entry barriers and interest rate regulations, the level of bank competition is still significantly extending.

The topic of single versus multiple banking relationships in the Chinese lending market is an unexplored area of research. This chapter attempts to make some contribution to fill this gap. This study examines 1639 firm level single and multiple borrowing data during the period 2003-2012. The principal findings are that: (i) the probability of a firm maintaining multiple banking relationships increases with firm size; (ii) among all samples, firms with higher cash flow ratios (high quality) are more likely to keep a single relationship; (iii) medium size and small firms with high quality tend to have single relationship, while large and high quality firms are more likely to keep a large number of lending relationships; (iv) increasing market competition level reduces the probability of single bank-firm relationship and drives firms to have higher likelihood to set relationship with more banks; and, (v) firms who have relationships with large banks are more likely to be involved in multiple lending relationships.

The rest of this chapter is organized as follows. Section 2 reviews the relevant theoretical foundation and empirical research on the topics of single or multiple banking relationships and the optimal number of banking relationship for firms. Section 3 describes the methodology of a firms' banking relationship decisions and summarizes the main hypotheses of this study, it then introduces the models that will be used in the empirical study. Section 4 describes the data. Section 5 provides discussion of empirical results. And finally, Section 6 draws conclusions.

5.2 Literature review

5.2.1 Theoretical explanations

5.2.1.1 Theoretical models of single versus multiple banking relationships

Detragiache et al. (2000) develops a theory of the optimal number of banking relationships with three-period model, which explains the determinant on firm's choices between multiple or single banking relationships. They find that the multiple bank relationship can decrease the probability of the liquidation problem but multiple relationships are more costly than a single relationship. The model is briefly described as follows.

Consider a firm who implements a project. The project starts at period 0 with the investment cost I_0. It is expected to produce a return (cash flow) K at the period 2 with the probability p. In period 1, the project needs a second allotment of funds I_1, which needs to borrow from bank(s). To keep the analysis simple, the authors make an assumption that $pK - I_1 \geq 0$. Denote ε as the probability of liquidity crises, which is independent events across banks. Hence, the probability that at least one of the relationship banks is available is $1 - \varepsilon^n$ in period 1. Denote c as the fixed cost for applying bank loans. Since banks need legal action to recover a loan if firms refuse to repay, v is introduce as the discount fraction. The expected profit firms can get through n bank(s) at period 0 is given by:

$$\pi(n) = (1 - \varepsilon^n)\left(\int_{\frac{I_1}{vK}}^{1} (pK - I_1)\, f(p)dp\right) - (I_0 + cn) \qquad (1)$$

Maximizing By maximizing expected profits by choice of n, the result is:

$$n^* = \frac{lnc - \ln\left(\left(-\int_{\frac{I_1}{vK}}^{1} (pK - I_1) f(p)dp\right)(ln\varepsilon)\right)}{ln\varepsilon} \qquad (2)$$

From equation (1), it is clear that the increase in n (higher number of multiple banking relationships) will raise the expected profitability of firms. Then, the optimal number of banking relationship is determined by the probability of liquidity crisis ε (equation 2). The larger that ε is, the larger number of banking relationships there will be.

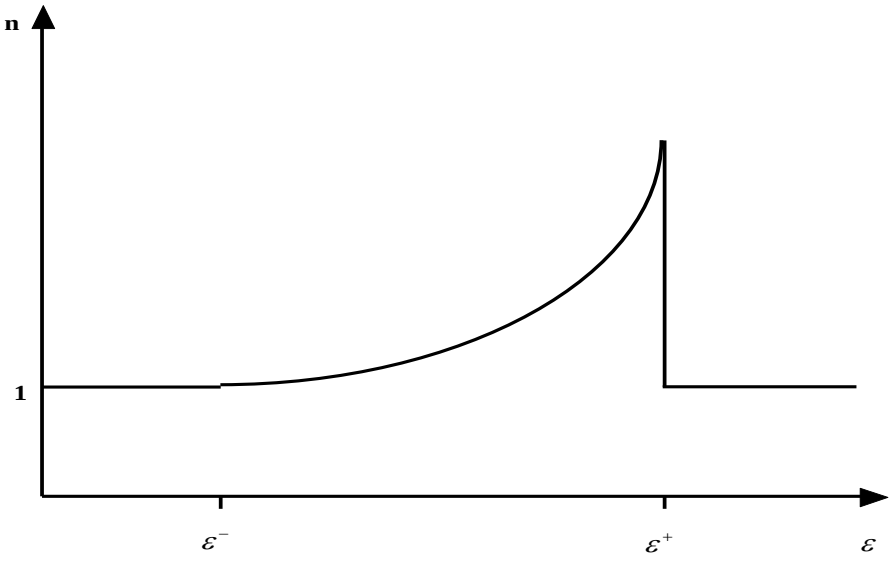


Figure 5.1: The determinants of optimal number of banking relationships

ε^- and ε^+ are the thresholds for ε defined the multiple banking area. From $\varepsilon^- < \varepsilon < \varepsilon^+$ firms chose to borrow multiple banks; while for very low ($\varepsilon < \varepsilon^-$) or very high ($\varepsilon > \varepsilon^+$) values of ε firms chose a single bank.
Source: Detragiache et al. (2000).

The model suggests that single banking relationship offer lower costs than multiple banking relationships. The probability of a liquidity crisis is the key determinant of the number of relationships since relationship banks may be unable to continue funding projects owing to unexpected problems and a firm may thus have to refinance from non-relationship banks. However, because the non-relationship banks did not know the quality of the deals, they had high a probability of rejection. To this point, large firms are more likely to choose multiple relationships since they are less sensitive to the costs.

Barboni and Treibich (2013) designed a lending game model to analyse the determinant of single or multiple bank relationship. Both supply and demand sides are in this game with an experimental credit market. Similar to other studies, they set an assumption that the borrower may not repay their loans. The information type is also assumed to significantly affect the lending decision in their model. They suggest that borrowers who are credit rationed and unable to stabilize their lending source will prefer to keep multiple relationships. The model is briefly described as follows.

Denote D as the loan getting from lender, which will use to invest into project. s is identified as the 'administrative costs' during the loan application produces. At the first period, the firm should decide whether to borrow D from single bank (full decision), or borrow $D/2$ from multiple (two) banks (partial decision). The probability that the bank gives the credit is denoted as γ. The gain from project defines as I condition on getting D, and $I/2$ condition on getting $D/2$. Interest rate of loan is named as r. The probability of the project being successful is α. In the second period, the condition on the success of project, the borrower chooses to repay the loan with probability β, and reject to repay with probability $1-\beta$ (Strategic default). After the agent's game play, the borrower's profit (π_B) will be given as:

$$\pi_B = \begin{cases} -2s & if\ no\ loan\ (\gamma_1 = \gamma_2 = 0) \\ \alpha[I - D(1+r)] - s & if\ loan\ is\ repaid\ (\beta = 1), full\ strategy \\ \alpha[I - D(1+r)] - 2s & if\ loan\ is\ repaid, full\ strategy\ (\gamma_1 = 1; \gamma_2 = 0) \\ & or\ partial\ strategy\ (\gamma_1 = \gamma_2 = 1) \\ \alpha\left[\frac{I}{2} - \frac{D}{2}(1+r)\right] - 2s & if\ loan\ is\ repaid, partial\ strategy \\ \alpha I - s & if\ strategic\ default\ (\beta = 0), full\ strategy \\ \alpha I - 2s & if\ strategic\ default, full\ strategy\ or\ partial\ strategy \\ \alpha\frac{I}{2} - 2s & if\ strategic\ default, partial\ strategy \end{cases} \quad (3)$$

Correspondingly, the lender's profit will be:

$$\pi_L = \begin{cases} s & if\ no\ loan \\ \alpha D(1+r)+s & if\ loan\ is\ repaid\ (\beta=1), full\ strategy \\ \frac{\alpha D}{2}(1+r)+s & if\ loan\ is\ repaid, partial\ strategy \\ -D+s & if\ strategic\ default\ (\beta=0), full\ strategy \\ -\frac{D}{2}+s & if\ loan\ is\ repaid, partial\ strategy \end{cases} \quad (4)$$

It is clear in equation (3) that the firms can get more profits through a single bank relationship under the normal condition (repay the loan). Equation (4) suggests that banks' lending decision (profitability level) is highly dependent on the information about α and β (whether the project is profitable and the borrower is in good credit). If the lender cannot get the information about α and β, they tend to end up playing the game. Based on this model, the authors make four main hypotheses, which are: borrowers are more likely to keep single-bank relationships if long-term relationships can be feasible; lenders prefer single relationship when relationship lending is feasible; borrowers in established lending relationships are less likely to switch; and, lenders are more likely to give the loans when project riskiness is low (α is high).

5.2.1.2 Theoretical explanations on the optimal number of banking relationships

The arguments with the effect of information asymmetric between lenders and borrowers on the number of banking relationship are not unique. Rajan (1992) suggests that the optimal strategy for a firm is to engage with a single bank because of the higher costs arising from asymmetrical information if they engage in multiple lending relationships. A single bank relationship is also most easily monitored, which results in cheaper financing for the firm. However, a single relationship offers banks the monopoly power to get access to the private information of the borrower, which will result in 'information hold up' and a 'lock-in' effect. Establishing a relationship with other banks can effectively avoid or reduce the hold-up problem (Sharpe, 1990; Von Thadden 1992), although firms face higher costs to keep

multiple relationships than they stay with single bank. Von Thadden (1998) recommends that firms with two banking relationships can limit the costs as well as reduce the risk of 'information capture'. However, the 'winner's curse' problem will rise from this two bank relationships system. Finally, the informed bank will leave the other banks to seek custom from only lower quality firms.

The transparency level of a firm is a very important effect factor on banking relationships. The relationship bank can exploit its information advantage to hold up the relationship firm, which will result in a worsening the firm's financial constraints (Gopalan et al., 2011). In order to avoid being held-up by the relationship bank, firms prefer to borrow from multiple banks, even if they can benefit from single bank relationship. However, banks face high costs to collect information from non-relationship firms, which will make opaque firms even harder to access external funds (Ziane, 2003). Therefore, firms who lack transparency have a higher likelihood of keeping a single banking relationship since the informational costs to switch to other banks are more likely to be higher than keeping an exclusive banking relationship (Berger et al., 2001).

Many scholars suggest the large and small firms have different behaviour in keeping single or multiple banking relationships. Firm size has been viewed as important indicator of the number of banking relationships. From the firm's point of view, firm size is usually regarded to have a positive relationship with the financial need. Large firms are more likely to keep multiple lending relationships since one bank can hardly satisfy their credit needs (Berger et al., 2005). Moreover, the costs of maintaining multiple lending relationships are higher than a single relationship. Compared with small firms, large firm will be less affected by this kind of expense (Machauer and Weber, 2000). From the bank's point of view, firm size plays a role

with the lending credit risk: lending to a large firm is less risky. Large firms tend to keep multiple banking relationships, which can be explained as the lending desire of banks to diversify the default risk (Detragiache et al., 2000).

From the view of banks, the fragility of banks causes many firms to tend to keep a large number of relationships since they need to ensure themselves against a premature withdrawal of credit. Firms keep more multiple banking relationships when there are financially fragile banks in the market (Detragiache et al., 2000). The effect of bank ownership type on the number of lending relationship has been noted. Since foreign banks are considered to have greater efficiency and are more competitive in developing countries (Bonin et al., 2005; Claessens and Laeven, 2004), firms are more likely to have a relationship with foreign banks to diversify their banking relationship, which usually results into a multiple banking relationship (Berger et al., 2005). The degree of bank competition also plays a role in determining the number of banking relationships. When a market is dominated by a few banks (i.e. the market competition is low), there is less motivation from banks to have a smaller number of banking relationships. In contrast, firms are more likely to keep a large number of banking relationship when market concentration is lower (Sterken and Tokutsu, 2003).

The duration of the lending relationship also plays a significant role in the determinant of the number of banks. Ongena and Smith (2000) argues that long-term lending relationships are more likely to push firms to terminate because the marginal gain has been decreasing and firms feel that they are being locked-in. On the other hand, duration is correlated with a firm's age. Younger firms who have only been operating for several years tend to have exclusive relationship while elder firms have a more significant average number of banking

relationship. Hence, long term established relationships are more likely to end because firms start to borrow from more than one bank (Fariha and Santos, 2002).

5.2.2 Prior empirical evidence

5.2.2.1 Empirical studies on single versus multiple banking relationships

Using Italian bank-firm data, Detragiache et al. (2000) examined why firms switch from a single bank to multiple banks. The banks in this study had a selection problem because of asymmetrical information, which may result in their refusal to lend. Under this circumstance, they predict that firms who keep a multiple relationship can reduce the probability of experiencing a liquidation problem. Their empirical findings support this prediction. They find that a higher profitability level makes firms tend to stick with a single bank, while firm size and firm age as well as firm leverage has a significant negative relationship on maintaining single bank relationship. In contrast, if the relationship bank size is large, firms prefer a single relationship other than multiple relationships since their credit requirement is easily satisfied. Similar with Detragiache et al. (2000), Farinha and Santos (2002) analysed the single and multiple firm-bank relationship choices. In their sample, they observe that almost all firms borrowed for the first time in their life from a single bank, but soon some of them switched to borrowing from multiple banks. They used a duration analysis of Portugal firm level data. Instead of studying the duration of relationship, they focus on the end of the exclusive relationships caused by firm switching behaviour. They find that firms with a high growth rate or with poor performance are more likely to keep multiple relationships. Firm size also shows a negative effect on single banking relationship. A longer duration of banking relationship increases the probability of firms to maintain multiple banking relationships. Cosci and Meliciani (2002) analysed why firms keep multiple banking relationship other than

single relationship, with Italian firm data provided by a large Italian bank. They find that a firm is more likely to be engaged in multiple relationships as their size grows and as they grow older. Higher firm leverage pushed firms to borrow from multiple banks. The funding demand from high tech firms results in a multiple relationships. Sterken and Tokutsu (2003) investigated the determinants of the choice between single and multiple banking relationships with data from Japanese listed firms. They find that a higher debt to asset ratio decreases the probability of a single banking relationship while liquid asset ratio plays a converse role on the relationship. Firms with a higher level R&D investment, which stands for larger amount of funding to be needed, have a higher probability of establishing multiple banking relationships.

Table 5.1: Determinants of switching from single to multiple banking relationships

Paper	DGG (2000)	FS (2002)	CM (2002)	ST (2003)
Country	Italian	Portugal	Italian	Japan
Observation	1754	1577	393	20740
Model	OLS	TVD	Probit	Logit
Dependent	Single	Single[a]	Multiple	Single
Lending Relationship				
Number of switching[b]		---		
Firm Characteristics				
Firm Size	--	---	+++	?
Firm Leverage	---		+++	
Firm age	?	?	+++	
High tech firms			+++	
Profitability	+++			?
Bank loans/assets		---		---
Sales growth (%)		---		
Liquidity/assets		+++		+++

Firm R&D			---
Bank Characteristics			
Bank size	---	?	
Assets growth (%)		?	
Profits/assets		?	

Note: +++ Positive and significant at 1%, ++ at 5%, + at 1%. --- Negative and significant at 1%, -- at 5%, - at 1%. ? means unclear relationship, which is shown as insignificant in regression.
DGG, Detragiache et al. (2000); FS, Farinha and Santos (2002); CM, Cosci and Meliciani (2002); ST, Sterken and Tokutsu (2003).
a: Parametric model (Weibull distribution).
b: Number of times firms switch banks.

5.2.2.2 Empirical studies on determinants of the number of banking relationships

Machauer and Weber (2000) investigated SMEs in Germany to determine how they chose how many banking relationships to maintain. They found that firm size and the duration existence of banking relationship determine the number of banking relationships. However, firms who keep a house bank relationship are more likely to have a small number of lending relationship. Besides, more collateral will be needed if firms stick with fewer banks. Ziane (2003) examined the determinants of the number of credit relationship with data from small and medium sized French firms. In contrast with Marchauer and Weber (2000), they found that the existence duration of lending relationship plays a negative effect on the number of banking relationships. Firm size and leverage positively influences the number of relationship, while the profitability level of firms has a negative effect on the number. The collateral requirement and firm age do not show a significant effect on the choice of the number of banking relationships in their empirical work. Tirri (2007) claims that firms chose multiple lending relationships in order to decrease the probability of liquidity crisis. The empirical study with Italian firms' data suggests that larger, older, and riskier firms prefer to have more relationships with banks. The number of banking relationships has a significant relationship with the growing of market concentration ratio.

Berger et al. (2005a) focus on the effects of banks' characteristics and ownership on the number of banking relationship using data from India. Their empirical results indicate that firms with a relationship with a foreign-owned bank are more likely to keep a large number of lending relationships. The average size and liquidity of relationship banks tends to cause firms to have a small number of bank relationships. The listed firms, who are considered as transparent firms, have a high likelihood of establishing more lending relationships than other firms. They find that the firm's size and age plays a positive role on firms engaging a large number of banks, which is also proven by Vopin (2007) with data from 18 European countries. Using the data from Japan, Uchida et al. (2008) examined the influence of bank size on lending relationship with other control variables, such as a firm's size and age. Similar as Berger et al. (2005b), they find that larger banks prefer to lend to larger firms while smaller banks tend to lend to smaller firms. But they have found no strong evidence that bank size has a negative relationship with the number of credit relationships. In their regression, firms from the construction industry tend to prefer to engage with fewer banks while firms in the retail industry tend to set more banking relationships.

Table 5.2: Determinants of the number of banking relationships

Paper	MW (2000)	Ziane (2003)	BKPZ (2005)	Tirri (2007)	Volpin (2007)	UUW (2008)
Country	Germany	French	India	Italian	Cross country	Japan
Observation	723	1800	3422	393	899	1832
Model	RE Poisson	Poisson	Poisson	GLS	RE	IV
Dependent	Number of banking relationship					
Lending Relationship						
Duration of relationship	+++	--				
Collateral		?				

requirement

Firm Characteristics						
Firm Size	+++	+++	+++	+++	+++	+++
Firm size^2				---		
Firm age		?	++	+++	+++	?
Firm age^2				---		
Firm Leverage		++		+++		
Listed firms			+++			
Profitability		--				
Bank loans/assets			+++			
Capital ratio						---
Bank Characteristics						
Bank size			---			?
Bank liquidity			---			
Foreign-owned Bank[a]			+++			
House bank[b]	---					
Bank fragility					---	
Market Characteristics						
HHI				---		
HHI^2				+++		

Note: +++ Positive and significant at 1%, ++ at 5%, + at 1%. --- Negative and significant at 1%, -- at 5%, - at 1%. ? means unclear relationship, which is shown as insignificant in regression.
MW, Machauer and Weber (2000); BKPZ, Berger et al. (2005a); UUW, Uchida et al. (2008).
a: If at least one of the relationship banks is foreign-owned, denote foreign-owned equal to 1, otherwise 0. b: If bank feels as house bank of the borrower.

5.2.3 Relevant research in China

Although many Chinese researchers have examined bank-firm relationship and relationship lending, only few of them have focused on the choice of single or multiple banking

relationship, or the determinants of the number of credit relationship. Chinese scholars have noted the effect of information asymmetry on lending relationships and have done some relevant studies. By distinguishing information as 'hard' and 'soft', which stand for the publication information and the information arising from repeated lending, respectively, Chang et al. (2009) studies the impact of information from lending relationship to loan default in China and focus their research on the economic role of the banks' soft information. They find that the internal credit rating scores of banks play a key role in lending decision. While the soft information part of the rating contributes to the improvement in assessing credit quality, the depth of lending relationship (longer duration and larger number of relationships) helps to decrease the cost of asymmetrical information.

Shen et al. (2009) observed the information asymmetric between the banks and firms affecting the lending decisions of banks and found that the lending decisions are not homogenous among banks. They then conducted an empirical study to examine how the bank's characteristics affect the lending decision. The authors find that smaller banks are most likely to lend more to the SMEs. The competition level and the manager's (bank institution) wage is linked to NPL, which has had a positive effect on the propensity to lend to SMEs. In China, SMEs are less likely to get the loans from banks than large firms. Using firm level data from Dongguan City, Yao and Deng (2009) tried to find the determinants of the relationship lending for SMEs. Their empirical evidence shows that firm age, firm size and the duration of relationship lending helps firms to access repeat lending. They claim that SMEs need to establish a long-term relationship with banks, as well as have a sustainable development strategy, in order to reduce the asymmetrical information between the firms and the banks.

Based on the survey data of World Bank on 1,186 SMEs in China, He and Wang (2009) empirically studied the impact of bank-firm relationship on the growth of firms. They designed three variables to measure the bank-firm relationship, which are: the number of relationships, the duration of the relationships, and the collateral requirement when borrowing. They find that the duration and the number of banking relationships have a negative effect on the firm's sales growth. This implies that a longer relationship can create a hold-up problem, which is harmful for the firm's development. For SMEs, keeping a large number of banking relationships is not an optimal choice.

Wang et al. (2013) examines the determinants of an enterprise's R&D through lending relationship with a data sample drawn from Chinese growth enterprise market listed companies. Their empirical results indicate that firms with a higher R&D intensity tend to have higher relationship lending figure, while a higher relationship lending is most likely to increase the firm's innovation efficiency. In addition, firm size has a significant negative effect on relationship lending, which suggests that relationship debt is more important for SMEs than large firms.

Table 5.3: Determinants of bank-firm relationships-evidence from China

Paper	Shen et al (2009)	HW (2009)	YD (2009)	Chang et al (2010)	Wang et al (2013)
Observation	662	1186	242	2063	310
Model	2SLS	OLS	Logit	Probit	GLS
Dependent	SMEs loans[a]	Sales growth	Pr(repeat loan)	Loan default	Bank loan%[b]
Lending Relationship					
Duration of relationship		---	+++		
Number of relationship		-			

Borrow without collateral	++			
Firm Characteristics				
Firm Size	+++	++	---	-
Firm Leverage			++	?
Firm age		+	?	
Profitability	+++		---	+++
Bank loans/assets	?	?		
Cash flow ratio			---	
Listed firm			?	
Firm R&D				+++

Bank Characteristics	
Bank size	?
Market share	---
Profits/assets	---
Wage linked to NPL	+++
Cost of deposit	+

Note: +++ Positive and significant at 1%, ++ at 5%, + at 1%. --- Negative and significant at 1%, -- at 5%, - at 1%. ? means unclear relationship, which is shown as insignificant in regression.
HW, He and Wang (2009); YD, Yao and Deng (2009);
a: The proportion of loans granted to SMEs over the total loans of the bank. b: The sum of all bank loans divided by total debt.

5.3 Methodology

5.3.1 Frame work and hypotheses

Who borrow from Chinese banks? The aim is to explore the characteristics of the lending decisions that firms make in China's lending market and to assess whether the explanations from previous studies are consistent with the empirical evidence. The main hypotheses that I will test are given below.

According to the Previous research of banking relationships has shown that informationally opaque firms are more likely to have a single lender (Berger et al., 2001). Usually, larger firms are considered to be more transparent firms (Eylasiani and Goldberg, 2004; Stephan et al., 2009). Hence, the idea has been raised that larger firms tend to have multiple banking relationships and smaller firms tend to maintain a single relationship, which has been found by several studies (Detragiache et al., 2000; Machauer and Weber, 2000; Cosci and Meliciani, 2002; Uchida et al., 2008). Moreover, firm size is initially regarded as having a positive relationship with the financial needs (Ziane, 2003). Large firms tend to have multiple relationships. In addition, firms who maintain more banking relationships are implied to experience higher quasi-fixed costs than firms who maintain a single relationship, which can represent a significant expense for small firms (Machauer and Weber, 2000).

> H1: *Large firms have high likelihood to set multiple banking relationships and small firms are more likely to have a single relationship. The probability of single banking reduces as firm size increases.*

Many researches claim that multiple banking is costly for the borrowing firms (Farinha and Santos, 2002; Petersen and Rajan, 1994; Tirri, 2007) because it may involve higher transaction costs, monitoring costs, collateral requirements, and credit costs. Higher quality firms' are easily satisfied with a single banking relationship since their banks are more likely to set an exclusive lending relationship with high quality customers. Hence, good firms are better able to keep a single banking relationship. As to low quality firms, a bank may choose to share the risk with their competitors by limiting the loan amount, in which low quality firms are forced to seek more banks for additional credit. Petersen and Rajan (1994) find that firms who borrow from multiple banks are of lower quality than those that borrow from a single bank. Hence, the second hypothesis is given as follows:

H2: *Choices of single or multiple borrowing relationships are a proxy for a firm's credit quality. Higher quality firms are more likely to keep a single banking relationship.*

Generally, a high market concentration ratio indicates a monopoly power, which is associated with non-competitive behaviour higher price and lower availability of credit. When the banking markets are less competitive, there are fewer potential alternatives choices of credit funding for firms (Mercieca et al., 2009). While, in a more competitive market banks have more incentive to chase customers, which may derive the firms, especially whose credit needs are hard to be satisfied with a single banking relationship, to set more than one banking relationships (Ongena and Smith, 2000). Due to the Chinese bank reforms, more banks are entering the market to compete with the largest five state-owned banks. By the end of 2011, there were over 400 banks operating in China. A more competitive market make causes tend to set multiple banking relationships. Hence, the third hypothesis is given as follows:

H3: *Market concentration level is negatively related with the number of banking relationships. Firms are more likely to have a single banking relationship in a more concentrated market.*

5.3.2 Empirical models

The first model tests the effect of firm size, firm quality, local market competition level and other firm's characteristic on a firm's choices to maintain single or multiple banking relationships. The Logit model is designed as follows:

$$Single_i = \alpha_0 + \alpha_1 lnTasset_i + \alpha_2 ln(firmage)_i + \alpha_3 Cashflows_i + liquidity_i + \alpha_5 loanA_i + \alpha_6 BLbank_i + \alpha_7 HHI_i + \alpha_8 Industry\ dummy_i + u_i \quad (5)$$

, where $Single_i$ is the dummy variable, which is equal to one when firm i keeping single banking relationship; $lnTasset_i$ is the total asset of the firm; $ln(firmage)_i$ stands for the age of the firm; $Cashflows_i$ is the net cash flow over total asset, which measures the quality of firm; $liquidity_i$ stands for firm's liquidity level; $loanA_i$ is the firm's total loan over total asset; $BSbank_i$ is firm who has a banking relationship(s) with a large bank(s)[35]; and, HHI_i is the banking market concentration ratio.

The second model investigates the determinants of firms switching from single relationship to multiple relationships. Many previous research has pointed out that the firms may seek multiple banking relationships by switching banks to avoid the hold-up problem of a single relationship bank (Sharpe 1990; Rajan, 1992; Boot, 2000). Since banks try to extract rents from relationship firms by acquiring private information about their quality, borrowers may initiate multiple relationships banks to react (Von Thadden, 1998). The second stage of the empirical study examines the determinants of firms substituting single relationship with multiple relationships. The Logit model is given as:

$$(Switch-Single)_i = \alpha_0 + \alpha_1 lnTasset_i + \alpha_2 \ln(firmage)_i + \alpha_3 Cashflows_i + \alpha_4 liquidity_i + \alpha_5 loanA + \alpha_6 BLbank_i + \alpha_7 HHi_i + \alpha_8 preduration_i + \alpha_9 ln(preamount)_i + u_i \quad (6)$$

, where $preduration_i$ and $ln(preamount)_i$ are the lending relationship duration and borrowing amount of firm before switching, respectively.

The third stage of this empirical study analyses the number of relationships in the multiple banking relationships region. Since this area of study is very important in practice (Deteragiache et al., 2000; Berger et al., 2005), unlike the first stage work which tries to capture the determinants of different choices for single or multiple borrowing relationships,

[35] There are five large commercial banks: Industrial and Commercial bank of China, Agricultural Bank of China, Bank of China, China Construction Bank, and Bank of Communications.

this stage of the work is designed to investigate the determinants of number of banking relationships when a firm has more than one banking relationships. The model with actual number of banking relationships is estimated by a Poisson model, which is frequently used with count data:

$$\text{Numrelation}_i = \alpha_0 + \alpha_1 lnTasset_i + \alpha_2 \ln(firmage)_i + \alpha_3 Cashflows_i + liquidity + \alpha_5 loanA + \alpha_6 BLbank_i + \alpha_7 HHi_i + \alpha_8 Industry\ dummy_i + u_i \quad (7)$$

The details of variable definition are listed as follow:

Table 5.4: Definition of the variables

Variables	Definition	Unit
Single relationship (Single)	Firms keep single relationship=1, otherwise=0	-
Single after switching (Switch-Single)	Firms keep single relationship after switching=1, otherwise=0	-
Number of relationship (Numrelation)	The number of banking relationship firms keep	-
Total asset of firm (Firm size)	Annual total asset of firm	CNY
Firm age	The age of the firm	year
Cash flow ratio (Cashflows)	Firm's annual net cash flow over total sales	%
Liquidity/asset (Liquidity)	Firm's total current liabilities over total asset	%
Loan/asset (Loana)	Firm's total borrowing(s) from bank(s) over total asset	%
Borrowing from large banks (BLbank)	If firm borrowing from large bank(s)=1, otherwise=0	-
Pre-duration	Duration of single banking relationship before firm's switching action	year
Pre-amount	Amount of the borrowing in the single banking relationship before firm's switching action	CNY

HHI	The five largest banks' assets over the total assets of the entire banking sector	%
Private enterprise (Private-Own)	Dummy variable to distinguish the private enterprise and state-own enterprise. Private enterprise=1, otherwise=0	-
Medium and small firm (M-S firm)	Statistical definitions of medium-sized and small enterprises from National Bureau of Statistics of China [a]. Denote that medium and small firm M-S firm=1; otherwise equal to 0	-
Manufacture [b]	Dummy variable for industry Classification [c]. Manufacture industry=1, otherwise=0	-
Real estate [d]	Dummy variable for industry Classification. Real estate industry=1, otherwise=0	-
Services [e]	Dummy variable for industry Classification. Services industry=1, otherwise=0	-

[a] Statistical definitions of medium-sized and small enterprises table is attached in Appendix D.1.
[b] Manufacture: Manufacture Industry
[c] Industry Classification here according to "Listed Company Industry Classification Guidelines (2012 Revision)", China Securities Regulatory Commission
[d] Real estate: Real estate industry
[e] Services: Wholesale, retail, trades hotels and catering services industry

5.4 Data

This research has a decent data set assembled from the CSMAR (China Stock Market Financial Statements) database, which contains information on the listed firms' borrowing behaviours, their balance sheet and income statements. In all, data on 305 firms with 1,639 lending information (single and multiple banking relationships) are employed from year 2003 to 2012.[36] Table 5.5 reports the patterns of firm size, age and quality with the corresponding number of relationships. In the sample, a single banking relationship can be observed in around half of the sample. This result is similar to Berger et al. (2006), which find that in Argentina 56.05% of lending relationships are single banking relationships. Farinha and

[36] The China Banking Regulatory Commission was established in 2003, which indicated that the Chinese banking market had entered a new age. So here the sample begins from 2003.

Santos (2002) reported that in Portugal 55.16% of their sample had a single bank lending relationship. Petersen and Rajan (1994) found that a single banking relationship dominated the US small firm market. In contrast, Detragiache et al. (2000) found that only a small proportion of small Italian firms have single banking relationships. Berger et al. (2005a) showed that multiple banking relationships dominate the Indian market.

Table 5.5 also shows that multiple relationships become more prevalent as firms get larger. 32.46% of firms who keep single banking relationship have a total asset smaller than 1 billion CNY and 94.24% of firms with single banking relationship have the total asset smaller than 10 billion CNY. The proportion among firms with five banking relationship reduce to 11.76% and 81.18%, respectively. A total of 29.84% of firms who keep single banking relationship are younger than 10 years, and 91.23% of firms with single banking relationship have been established less than 20 years. The proportions among firms with five banking relationship are 32.94% and 87.06%, respectively. It seems no big difference on firm age when the number of relationship varying from one to five. This may be explained by the fact that most Chinese enterprises have been established after 1978 due to the reform and opening policy. Hence, even the listed firms are comparatively young and have a lower age gap. However, when the whole sample is taken into comparison, it is still obvious that as firms get larger and older, they tend to have more banking relationships. The cash flow ratio, which usually stands for the quality of firms, shows a higher mean value in single relationship group, as well as the groups of more than six banking relationships. The mean value of cash flow ratio in groups where the firms keep two to five banking relationship are comparatively lower: 26.67% of firms who keep single banking relationship have a cash flow ratio lower than 5%, and 76.34% of firms with a single banking relationship have a cash flow ratio lower than 20%. However, among firms with five banking relationships, 37.95% and 83.53% have cash flow ratio lower than 5% and 20%, respectively, which suggests a lower proportion of high

quality firms than in single banking relationship group. Combined with the phenomena of positive relationship between firm size and number of lending relationships, this comparison suggests that single relationships are more prevalent among higher quality and smaller firms while larger and higher quality firms are most likely to be involved in more than six banking relationships.

Table 5.5: Distribution of number of lending relationships with firms' size, quality and age

Number of relationships	Proportion %	Firm size (Billion CNY)			Cash flow ratio (%)			Firm age (year)		
		Mean	<1 (%)	<10 (%)	Mean	<5 (%)	<20 (%)	Mean	<10 (%)	<20 (%)
1	46.91	3.32	32.46	94.24	7.02	26.67	76.34	13.34	29.84	91.23
2	22.16	4.58	30.69	91.23	4.15	27.40	79.45	14.06	32.06	89.59
3	13.61	4.48	32.29	94.62	4.35	31.39	82.06	13.71	30.49	88.34
4	5.78	3.44	14.74	96.84	5.76	21.05	81.05	15.74	14.74	81.05
5	5.19	7.23	11.76	81.18	3.96	37.65	83.53	14.27	32.94	87.06
6	2.82	5.05	8.33	83.33	9.11	12.50	76.62	19.13	8.33	68.75
7	1.83	4.91	0.00	86.67	12.02	6.67	63.33	19.79	6.67	73.33
≥8	1.71	7.05	0.00	78.57	16.88	0.00	64.29	16.36	7.14	71.43

Table 5.6 reports the summary statistics of variables. The average number of relationships that these firms have is 2.268. Although all of the firms in the sample are listed, they are heterogeneous in size. Hence, the values of firm size are taken in logarithmic regression in order to smooth the data and lower the probability of heterogeneity problems. The averages of the cash flow ratio and liquidity ratio are both positive, with the value of 6.108 and 1.410, respectively. The average loan over total asset ratio is 12.524. The value of HHI decreased from 819.756 in year 2003 to 564.589 in year 2012, which indicates increasing competition in the Chinese banking market. Observations from private firms take a small proportion: 9.1%

and from the medium size and small firms takes 28.0%. Nearly half of single and multiple borrowing information in the observations come from manufacturing firms and 16.0% and 12.2% come from real estate and services firms, respectively. In addition, the statistics show that 58.3% of lending relationships are involved with large banks.

Table 5.6: Summary statistics

	Obs.	Mean	S.D.	Min	Max
Single	1639	0.469	0.499	0	1
Number of banking relationship	1639	2.268	1.725	1	11
Ln(Firm Size)	1639	21.373	1.150	15.468	25.652
Ln(Firm Age)	1637	2.538	0.484	0.693	4.111
Cash flow ratio	1633	6.108	21.822	-50.645	49.593
Liquidity/asset	1637	1.410	1.722	0.061	38.078
Loan/asset	1639	12.524	16.653	0.086	89.884
HHI	1639	748.635	86.158	564.589	819.756
BLbank	1639	0.583	0.493	0	1
Private firm	1639	0.091	0.288	0	1
Medium and small firm	1639	0.280	0.449	0	1
Manufacture	1639	0.486	0.499	0	1
Real estate	1639	0.160	0.367	0	1
Services	1639	0.122	0.328	0	1

Some previously studies have claimed that a single banking relationship has a high likelihood of leading firms to be held up by incumbent banks. Then, by dropping the first period's data for each of the firms who keep a single relationship with incumbent banks, in order to identify the switching or non-switching behaviour, this study finds that the 192 samples keep a single relationship after switching and 474 samples substitute a single relationship with multiple relationships from then on. The results of the comparison are reported in table 5.7, which shows that these are two quite different groups of firms. Despite being younger, the

firms that substitute a single relationship with multiple relationships are larger and have bigger loan requirements. The higher quality and more liquid firms are more likely to have a single relationship after switching. Moreover, the larger amount of firms with a former single lending relationship tends to drive firms to maintain a single banking relationship.

Table 5.7: Average value in subgroups

	Single relationship after switching (192 samples)			Multiple relationship after switching (474 samples)			W-M-W test for means	t-test for means
	Mean	Median	S.D.	Mean	Median	S.D.		
Ln(Firm Size)	21.11	20.82	1.16	21.30	21.11	1.03	2.06**	1.89*
Ln(Firm Age)	2.68	2.71	0.42	2.59	2.64	0.43	1.79*	2.47**
Cash flow ratio	11.96	9.06	21.74	-4.76	1.48	26.86	2.92***	3.30***
Liquidity/asset	1.45	1.29	1.54	1.18	1.04	0.64	2.92***	3.27***
Loan/asset	4.25	3.45	3.77	8.51	6.51	9.40	2.94***	2.80***
HHI	690.98	646.31	90.60	689.04	738.45	644.55	0.83	0.93
Pre-Ln(loan amount)	18.55	17.47	1.26	17.52	17.50	1.14	2.95***	2.01**
Pre-Duration	1.80	1	2.24	2.10	1	2.00	0.63	0.90
BLbank	0.62	-	0.49	0.69	-	0.46	-4.01***	-4.05***
Private firm	0.10	-	0.30	0.09	-	0.28	-0.44	-0.42

Note: W-M-W (Wilcoxon-Mann-Whitney) test for difference of means: the null hypothesis of equal distributions for two populations is rejected at: *** at 1%, ** at 5%, * at 10%; t-test for difference of mean: the null hypothesis of equal means is rejected at: *** at 1%, ** at 5%, * at 10%.

5.5 Empirical results

The aim of this study is to investigate the determinants of a firm's different choices to maintain single or multiple banking relationships. This empirical study has three stages: first, the determinants of the probability that a firm borrowing from only one bank is tested; then, the determinants of a firm keeping a single banking relationship after switching banks are

examined; finally, this study examines the determinants of the number of banking relationships in multiple banking regions.[37] As in many other studies, the Logit method is used to estimate the first two stages of regression models, and Poisson regressions are used for third stage of the study.

5.5.1 Single vs multiple lending relationship

Table 5.8: Single vs multiple lending relationship

	Pr(Single=1)			
Explanatory Variable	(1)	(2)	(3)	(4)
Firm Size	-0.035*** (-2.951)	-0.031*** (-2.611)	-0.037** (-2.561)	-0.028** (-2.361)
Firm Age	-0.016 (-0.449)	0.003 (0.134)	-0.017 (-0.607)	
Cash flow ratio	0.002*** (3.325)	0.002*** (2.660)	0.002** (2.307)	0.001* (1.734)
Liquidity/asset	0.017* (1.848)	0.019** (1.994)	0.017* (1.910)	0.021** (2.227)
Private firm	-0.040 (-0.921)	-0.043 (-0.961)		
Loan/asset	-0.009*** (-5.121)	-0.009*** (-5.280)	-0.008*** (-5.303)	-0.008*** (-5.304)
BLbank	-0.075*** (-3.101)	-0.072*** (-2.980)	-0.080*** (-3.353)	-0.074*** (-3.068)
HHI	0.0004*** (3.494)	0.0005*** (3.976)	0.0004*** (3.287)	0.0005*** (3.866)
M-S firm*Cash flow			0.003*** (2.620)	0.004*** (2.801)
M-S*firm age			-0.014 (-1.105)	

[37] Correlation table of independent variables are attached in Appendix D.2.

Manufacture		0.001 (0.048)		
Real estate		-0.080* (-1.935)		-0.089*** (-2.515)
Services		-0.051 (-1.163)		
LR Chi^2	136.53	142.50	147.04	149.07
Prob> Chi^2	0.000	0.000	0.000	0.000
Pseudo R^2	0.061	0.064	0.066	0.068
Obs	1617	1617	1617	1617

Note: Average Marginal effects are reported in the table; Z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Coefficient-report table is attached in Appendix D.3.

Table 5.8 reports the results of single versus multiple lending relationships regressions. In all regressions of table 5.8, *Firm size* gives a negative and significant relationship with the probability of a single lending relationship, which indicates the increasing probability of multiple banking relationships as firm size increases. This result is consistent with previous studies (Cosci and Meliciani, 2002; Berger et al., 2005; Uchida et al., 2005). Large firms are usually considered as more transparent firms, which presumably results in low cost for banks collecting information under the asymmetrical information condition. Banks are most likely to choose large firms to set a relationship in order to diversify the firm-specific credit risk. Large firms usually have larger borrowing requirements, which make them more reliant on multiple banking. In addition, firms' business scopes are likely to increase with size, and firms with more business have higher probability to rely on several banks (Detragiache et al., 2000). The above result supports *Hypothesis 1*. Usually, older firms may have lower barriers to set new banking relationships since to some extent that they are better known, so they may be selected by banks to form a multiple bank relationship. Somewhat surprisingly, *Firm Age* does not play a significant role in China's listed firm's decisions on setting single or multiple

relationships. The quality of the firm, which is measured as *Cash flow ratio* here, has a significant positive impact on the probability of single banking in regression (1) and (2). Good firms are more likely to be satisfied with their increasing credit requirement by their relationship banks, which drives them to keep a single relationship. They also have a higher ability to internally finance some of their investment. Bad firms are usually refused by banks for credit need, which forces them to find another bank for additional credit. From the banks' scope, risk diversification drives banks tend to share the risk of low quality firms with their competitors. These results support *Hypotheses 2*. In regression (3) and (4), the study introduces variable *M-S firm*Cash flow* into the model, and finds that medium size and small firms with high quality are more likely to have single banking relationships. The margin effect of firm quality for the probability of single relationship in medium size and small firms is 0.004, which is higher than ratio of large firms (0.001).

Liquidity/asset has a positive relationship with probability of single banking. This result supports the option that firms with less liquidity are more likely to keep multiple lending relationships since firms with low liquidity usually need to seek more banks to solve the liquidation problem. However, both firms with financial problems and firms who grow faster are most likely to have low liquidity ratio and, therefore, it could not be claimed that firms with less liquidity are poor quality. The dummy variable *Private firm* is insignificant here, which suggests that no heterogeneity has been found between private firms and non-private firms. *Loan/asset* shows a significant negative relationship with probability of single lending relationship, which is consistent with Farinha and Santos (2002). Multiple banking is more likely to be positive related to the amount of banking lending from a firm. The empirical result shows that *Borrowing from large banks (BLbank)* has a negative effect on the probability of borrowing from a single bank. This result suggests that firms borrowing from

large banks are more likely to rely on multiple banking than firms borrowing from small banks. The firms borrowing from large banks have a higher than 7% probability, on average, to initiate multiple banking relationships. The *HHI* entries in the table are all positively and significant, highlighting that firms in less concentrated markets are more likely to engage in multiple banking relationships. First, firms have higher probability to find it easier to form new lending relationship under a more competitive market, so they are less like to seek help from several banks to satisfy their credit needs. Second, banks are tending to provide better terms to clients (e.g., larger amount) in order to attract firms in a competitive environment (Mercieca et al., 2009). The results above show strong evidence of support for *Hypothesis 3*. In addition, this empirical study finds that real estate firms have around 9% probability to form multiple banking than other kinds of firms.

5.5.2 Single vs multiple relationship after firms' switching behaviour

Since firms maintaining a single banking relationship have a higher probability to be involved in a hold-up problem, while switching bank is an effective way to avoid being locked-in and having not to pay extra rents to the relationship bank. A number of previous researches have pointed out that a large proportion of firms choose to switch to another bank(s) to overcome the financial constraints that they face when they are dissatisfied with their exiting lending relationship. In the observation, some firms choose to switch but maintain a single relationship while others substitute a single relationship with multiple banking relationships. This stage of the empirical work analyses the determinants of a firm's different choices on single or multiple borrowing relationship after switching banks.

Table 5.9: Switching to single vs switching to multiple banking relationships

	Pr(single after switching=1)		
Explanatory Variable	(1)	(2)	(3)
Firm Size	-0.042**	-0.051**	-0.056***
	(-2.341)	(-2.134)	(-3.315)
Firm Age	-0.086*	-0.085*	-0.091**
	(1.827)	(1.813)	(2.203)
Cash flow ratio	0.002***	0.008***	0.002***
	(3.338)	(3.213)	(3.275)
Liquidity/asset	0.049**	0.045*	0.043*
	(2.034)	(1.879)	(1.845)
Private firm	-0.015	-0.015	
	(-0.249)	(-0.251)	
Loan/asset	-0.007**	-0.005**	-0.004*
	(-2. 437)	(-2.148)	(-1.752)
BLbank	-0.103***	-0.099***	-0.099***
	(-2.909)	(-2.799)	(-2.828)
Pre-duration		-0.007	
		(-0.327)	
Ln(Pre-amount)		0.039***	0.039***
		(3.422)	(3.463)
HHI	-0.0001	-0.0001	
	(-0.334)	(-0.179)	
LR Chi^2	50.21	62.58	62.34
Prob> Chi^2	0.000	0.000	0.000
Pseudo R^2	0.063	0.079	0.079
Obs	662	656	656

Note: Average Marginal effects are reported in the table; Z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Coefficient-report table is attached in Appendix D.4.

In regression (1), (2) and (3) of table 5.9, the result shows that *firm size* significantly increased the probability of choosing multiple relationships after switching. Other than higher lending demand, which is usually positive correlated with firm size, large firms seem to be

more attractive to ‘outside’ banks since they are more transparent (Yin and Matthews, 2013). Larger firms are more likely to switch to multiple relationships while smaller firms have a higher probability of keeping a single bank relationship. This shows again that firm size is a key variable that determines the number of lending relationships. In column (1), (2) and (3), *Firm age* has a negative relationship with single relationship after switching at the 10% significance level. When combined with the results of firm size, this indicates that the growing age of smaller firms increases the probability of switching to a single relationship since younger firms who are less known by the public may face more severe adverse selection problems when seeking financial help from non-relationship banks.

It is notable that, at the 1% level, the firm’s quality has a significant impact on single relationship. This suggests that higher quality firms are more likely to switch to a single relationship than multiple relationships, which is consistent with the previous results. No matter switching or non-switching behaviours, good firms prefer to choose a single banking relationship since they may have lower monitoring costs and fewer requirements for collateral. Some researchers claim that a long term banking relationship may results in a more serious lock-in problem. Hence, firms may switch to multiple borrowing relationships to protect themselves from further hold-up costs. However, the variable *Pre-duration*, which stands for the duration of single banking relationship before switching, does not have a significant effect on single or multiple relationship choice here. The variable *Pre-amount*, which stands for the amount of borrowing before switching, has a significant positive effect on single relationship after the firm’s switching action. This result suggests that firms who had larger loan requirements that were satisfied before switching would also keep single relationship after switching. The empirical results show that competition level (HHI) cannot

distinguish the firm's choice on switching to single relationship or switching to multiple relationships.

5.5.3 The determinants of the number of relationships in the multiple banking

Table 5.10: The analysis of number of relationships in the multiple banking

	Number of banking relationships			
Explanatory Variable	(1)	(2)	(3)	(4)
Firm Size	1.062*** (3.081)	1.064*** (3.117)	1.053** (2.253)	1.062*** (3.002)
Firm Age	1.096** (2.012)	1.096** (1.904)	1.099** (2.058)	1.081* (1.702)
Cash flow ratio	1.002* (1.831)	1.002* (1.850)	1.003* (1.931)	
Liquidity/asset	0.944*** (-2.893)	0.948*** (-2.894)	0.941*** (-2.983)	0.946*** (-2.893)
Private firm	1.002 (0.028)	1.007 (0.067)	1.104 (0.213)	
Loan/asset	1.006*** (6.126)	1.006*** (6.218)	1.006*** (6.154)	1.006*** (6.913)
BLbank	1.095** (2.304)	1.105** (2.523)	1.090** (2.173)	1.101** (2.441)
HHI	0.998*** (-5.689)	0.999*** (-5.066)	0.999*** (-5.592)	0.999*** (-5.641)
M-S firm*Cash flow			0.998 (-0.797)	
Private*firm age			0.986 (-0.660)	
Firm size*Cash flow				1.0001*** (2.868)
Manufacture		1.005 (0.099)		

Real estate		0.948 (-0.780)		
Services		1.138** (2.021)		1.149*** (2.618)
C	1.767 (1.028)	1.481 (0.670)		1.735 (0.992)
LR Chi^2	122.60	131.49	124.96	130.64
Prob> Chi^2	0.000	0.000	0.000	0.000
Pseudo R^2	0.038	0.040	0.038	0.040
Obs	869	869	869	869

Note: The incidence rate ratios (IRR) are reported in the table; Z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Multiple relationships analysis is for the firms who have more than one banking relationships. Coefficient-report table is attached in Appendix D.5.

To make the empirical specification richer, the third stage regressions are estimated here in order to check the determinants of the number of banking relationships, the results are reported in table 5.10. Several points are worth noting. First, *firm size* has a significantly positive relationship with the number of banking relationships, which indicates that the number of relationships tend to grow with the size of the firms. Larger firms have a higher likelihood to engage in more banking relationships, which is also found by Voplin (2007) and Uchida et al. (2008). At the 1% level, *Liquidity/asset* has a significant negative effect on the number of lending relationships, which enhances the likelihood that firms facing higher risk of liquidity problem are more likely to engage in larger numbers of multiple banking relationships.

Second, unlike the insignificance of the determinate of single and multiple lending choice regressions, *firm age* shows a significantly positive effect on the numbers of banking relationships, which is consistent with the result of Detragiache et al. (2000). This result suggests that, although the firm's choice on single or multiple banking relationships does not

depend on their age, if they have chosen to keep multiple banking relationships then their growing age will make it more likely that they will have larger numbers of relationships. In order to test the hypotheses that larger and higher quality firms are more likely to be involved in large numbers of banking relationships, a joint variable *Firm size*Cash flow* is introduced into the regression (4). The significant positive relationship shows that large and better firms do indeed tend to have more banking relationships. Obviously, high quality and larger firms are more attractive for banks.

Finally, in column (1) to (4), after controlling for a number of firm-level variables and some macro variables, *BLbank* has a significant positive effect on the numbers of lending relationships, which suggests that firms borrowing from large banks have a higher likelihood to maintain a larger number of banking relationships. This result is consistent with Berger et al. (2005b). Large banks may be interested in selling services other than loans to their clients (Cosci and Meliciani, 2002; Yin and Matthews 2013), so firms usually need to seek other banks to borrow from. Consistent with the regressions of single versus multiple lending relationships, HHI shows a significant negative effect on the number of lending relationships, which indicates that fierce competition causes firms to have a higher probability to keep more lending relationships.

5.6 Conclusion

Using the data from China banking market, this chapter finds the determinants of why some firms choose single banking relationship while others tend to borrow from more than one bank. The empirical work is in three stages. First, this study explores the factors why firms choose to establish multiple relationships with banks instead of maintaining a single relationship. This chapter then investigates why firms substitute a single relationship to

multiple banking relationships after switching banks. Finally, the empirical study examined the determinants of the number of banking relationships. A Logit model and Poisson model are used in the empirical part.

The empirical results provide evidence that firm size is a key factor that affects the firm's choice of single or multiple banking relationships. The number of banking relationships is also predominantly influenced by firm size. Firm size increases the probability of firms maintaining multiple lending relationships, as well as increasing the number of relationship banks. As to the analysis of a firm's choice after switching, the results indicate that larger firms have a higher probability to switch to multiple relationships other than single relationship. Firm quality is another important factor for firms making decision on single or multiple banking relationships. Higher quality firms prefer single relationships since a single relationship means most effective lending with lowest monitoring costs and requirement for collateral. In multiple banking relationship regions, firms with better performance have a high probability to have more lenders. This study also finds that medium size and small firms with high quality prefer a single borrowing relationship while larger and higher quality firms are more likely to be involved in a large number of banking relationships. Increasing levels of market competition, which is highlighted in this study, decrease the probability of single bank-firm relationship and drives firms to have higher likelihood to have a relationship with more banks. This is easily explained by the fierce competition that forces banks to poach more firms and the increased probability of firms engaging in multiple relationships.

This research has also explored how firms with less liquidity are more likely to keep multiple lending relationships. A large amount of credit need usually drives firms to seek help from more banks. There is no difference between private firms and non-private on single or

multiple lending choices. Interestingly, firms who have relationships with large banks are more likely to be involved in multiple lending relationships.

Appendix D

Table D.1: Statistical Definitions of Large, Medium-sized and Small Enterprises (newest)

Industry Branch	Index	Unit	Large	Medium-sized	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	$Y \geq 80000$	$6000 \leq Y < 80000$	$300 \leq X < 6000$
	Total assets (Z)	10,000	$Z \geq 80000$	$5000 \leq Z < 80000$	$300 \leq X < 5000$
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 trades	Employees (X)	People	$X \geq 300$	$50 \leq X < 300$	$10 \leq X < 50$
	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	Employees (X)	People	$X \geq 300$	$100 \leq X < 300$	$10 \leq X < 100$

services	Operating income (Y)	10,000	$Y \geq 10000$	$2000 \leq Y < 10000$	$100 \leq Y < 2000$
Soft and scientific research, technical services	Employees (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	$Y \geq 200000$	$1000 \leq Y < 200000$	$100 \leq X < 1000$
	Total assets (Z)	10,000	$Z \geq 10000$	$5000 \leq Z < 10000$	$2000 \leq X < 5000$
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	$Z \geq 120000$	$8000 \leq Z < 120000$	$100 \leq X < 8000$
No specified industry	Employees (X)	People	$X \geq 300$	$100 \leq X < 300$	$10 \leq X < 100$

Source: National bureau of statistics of China

Table D.2: Correlations of variables

	Firm size	Firm age	cashflowr	Liquiditya	Loanasset	BSbank	HHI	Private
Firm size	1.000							
Firm age	0.156***	1.000						
Cashflowr	0.065**	-0.063***	1.000					
Liquiditya	-0.043**	-0.028***	-0.061***	1.000				
Loanasset	-0.182***	-0.010**	-0.064*	0.035***	1.000			
BSbank	0.007**	-0.034***	-0.025***	-0.022	0.019***	1.000		
HHI	-0.486***	-0.499**	-0.037***	0.067***	0.018**	0.081***	1.000	
Private	0.112***	-0.020***	-0.016***	0.133**	0.097	-0.086***	-0.041***	1.000

Note: *,**,*** significant at 10%, 5% and 1% level.

Table D.3: Single vs multiple lending relationship
(Coefficients reported)

	Pr(Single=1)			
Explanatory Variable	(1)	(2)	(3)	(4)
Firm Size	-0.156***	-0.139***	-0.163**	-0.125**
	(-2.963)	(-2.589)	(-2.541)	(-2.312)
Firm Age	-0.070	0.017	-0.075	
	(-0.567)	(0.134)	(-0.607)	
Cash flow ratio	0.008***	0.007***	0.006**	0.005**
	(3.356)	(2.639)	(2.293)	(1.729)
Liquidity/asset	0.075*	0.084*	0.077*	0.096**
	(1.848)	(1.986)	(1.903)	(2.215)
Private firm	-0.177	-0.188		
	(-0.921)	(-0.960)		
Loan/asset	-0.038***	-0.039***	-0.038***	-0.039***
	(-5.146)	(-5.133)	(-5.153)	(-5.154)
Borrowing from large bank	-0.329***	-0.317***	-0.354***	-0.327***
	(-3.087)	(-2.949)	(-3.309)	(-3.035)
HHI	0.002***	0.002***	0.002***	0.002***
	(3.448)	(3.924)	(3.324)	(3.799)
M-S firm*Cash flow			0.014***	0.015***
			(2.600)	(2.776)
M-S*firm age			-0.062	
			(-1.103)	
Manufacture		0.007		
		(0.049)		
Real estate		-0.354*		-0.396**
		(-1.927)		(-2.497)
Services		-0.224		
		(-1.161)		
C	1.711	0.901	1.972	0.251
	(1.180)	(0.592)	(1.178)	(0.167)
LR Chi^2	136.53	142.50	147.04	149.07
Prob> Chi^2	0.000	0.000	0.000	0.000
Pseudo R^2	0.061	0.064	0.066	0.068

Obs	1617	1617	1617	1617

Note: Z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table D.4: Switching to single vs switching to multiple banking relationships (Coefficient reported)

	Pr(single after switching=1)		
Explanatory Variable	(1)	(2)	(3)
Firm Size	-0.226**	-0.279**	-0.303***
	(-2.310)	(-2.112)	(-3.232)
Firm Age	-0.457*	-0.462*	-0.493**
	(1.813)	(1.798)	(2.177)
Cash flow ratio	0.008***	0.008***	0.008***
	(3.256)	(3.141)	(3.197)
Liquidity/asset	0.262**	0.244*	0.234***
	(2.011)	(1.862)	(1.829)
Private firm	-0.081	-0.083	
	(-0.249)	(-0.251)	
Loan/asset	-0.035**	-0.048**	-0.023*
	(-2.401)	(-2.148)	(-1.752)
Borrowing from large bank	-0.548***	-0.538***	-0.538***
	(-2.852)	(-2.748)	(-2.775)
HHI	-0.0004	-0.0002	
	(-0.334)	(-0.179)	
Pre-duration		-0.215	
		(-0.327)	
Ln(Pre-amount)		0.039***	0.215***
		(3.322)	(3.360)
C	2.771	4.154	3.794*
	(1.014)	(1.489)	(1.853)
LR Chi^2	50.21	62.58	62.34
Prob> Chi^2	0.000	0.000	0.000
Pseudo R^2	0.063	0.079	0.079
Obs	662	656	656

Note: Z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table D.5: The analysis of number of relationships in the multiple banking (Coefficient reported)

	Number of banking relationships			
Explanatory Variable	(1)	(2)	(3)	(4)
Firm Size	0.060***	0.062***	0.052**	0.060***
	(3.081)	(3.117)	(2.253)	(3.002)
Firm Age	0.092**	0.092**	0.094**	0.078*
	(2.012)	(1.904)	(2.058)	(1.702)
Cash flow ratio	0.002*	0.002*	0.002*	
	(1.831)	(1.850)	(1.931)	
Liquidity/asset	-0.058***	-0.053***	-0.061***	-0.056***
	(-2.893)	(-2.894)	(-2.983)	(-2.893)
Private firm	0.002	0.007	0.099	
	(0.028)	(0.067)	(0.213)	
Loan/asset	0.006***	0.006***	0.006***	0.006***
	(6.126)	(6.218)	(6.154)	(6.913)
BLbank	0.091**	0.100**	0.086**	0.096**
	(2.304)	(2.523)	(2.173)	(2.441)
HHI	-0.002***	-0.001***	-0.001***	-0.001***
	(-5.689)	(-5.066)	(-5.592)	(-5.641)
M-S firm*Cash flow			-0.002	
			(-0.797)	
Private*firm age			-0.014	
			(-0.660)	
Firm size*Cash flow				0.0004***
				(2.868)
Manufacture		0.005		
		(0.099)		
Real estate		-0.053		
		(-0.780)		
Services		0.129**		0.139***
		(2.021)		(2.618)
C	1.767	1.481		1.735

	(1.028)	(0.670)		(0.992)
LR Chi^2	122.60	131.49	124.96	130.64
Prob> Chi^2	0.000	0.000	0.000	0.000
Pseudo R^2	0.038	0.040	0.038	0.040
Obs	869	869	869	869

Note: The incidence rate ratios (IRR) are reported in the table; Z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Multiple relationships analysis is for the firms who have more than one banking relationships.

Chapter 6: Conclusions

Switching costs, which mainly arise from the asymmetry of information between borrowers and lenders, are a widely recognized issue in banking markets around the world. Nowadays, more than 400 banks are poaching customers and chasing profits in the Chinese banking market. The fierce competition makes switching costs an important determinant of banks' strategy, firms' lending choice and bank-firm relationships.

To analyse the effects of switching costs in China's banking market, this thesis has presented research findings on three aspects: the determination of banks' profit; firms' bank switching choices and the determination of single versus multiple bank-firm lending relationships. First, the thesis provides evidence that switching costs contribute to the profit of banks, and the level of switching costs is significantly affected by a bank's characteristics. Second, it presents findings on the reasons why firms switch banks, what characteristics make firm have a high probability to switch and what kind of banks are more attractive to firms. Third, it presents the empirical factors that determine firms' choices on single or multiple bank-firm relationships.

The structure of my research and main findings are shown in figure 6.1. Switching costs have significant effects on a bank's strategy; a firm's switching behaviour and bank-firm relationship. On the bank side, switching costs offer bank lock-in power, through which they can extract higher profit and maintain long-term bank-firm relationships. Switching costs have a significant positive effect on the level of competition in the banking market. In general, switching costs increase with bank size and efficiency level of banks. On the firm side, firms usually switch banks when they are dissatisfied with their incumbent banks. Favourable contracts, larger size and higher quality can enable firms to switch more easily.

As for the bank-firm single versus multiple relationship, the study finds that the choice of multiple banking relationships is preferred by large, low quality and older firms.

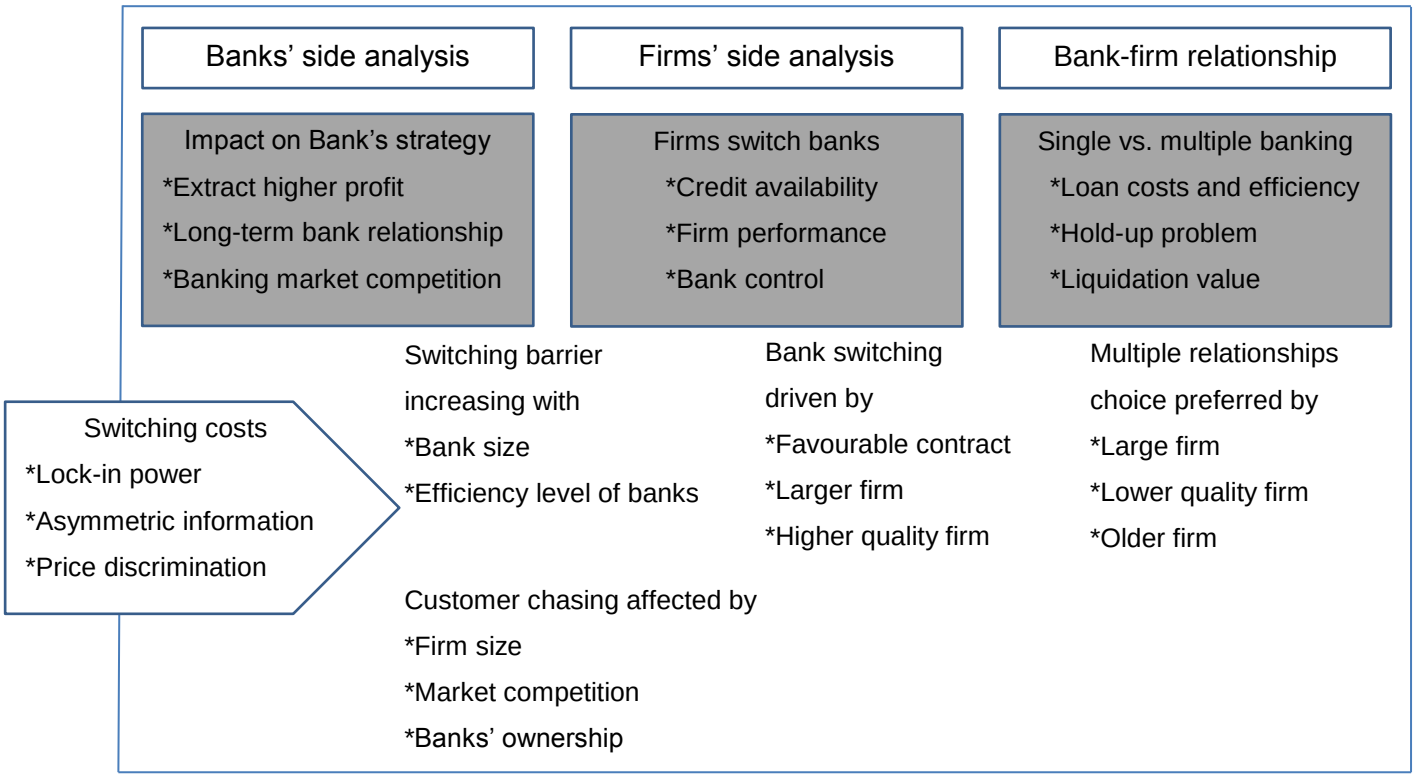


Figure 6.1 Structure of the research and main findings

6.1 Switching costs and China's banking market

Switching costs are not necessarily anti-competitive. They are a market outcome and are part of how competition works in China's banking market but they do not make the market less competitive. Switching costs can intensify competition because of large numbers of uncommitted new customers in the growing banking market. The results of the thesis indicate that switching costs increase with the competition level because they become more and more important for a bank's strategy. Furthermore, the competition 'softening effect' of switching costs in the markets can be compensated by competition from aggressive small banks who offer better services and favourable contracts to attract customers. In chapter 3, the empirical results show that small banks are tending to have more motivation to enhance their switching

costs power, since they are usually eager to extend their market share; while big banks are less aggressive, which is known as the 'fat cat effect' (Farrell and Klemperer, 2007). Chapter 4 also finds that firms are more likely to switch to small market share banks, or lower profitability banks, since these banks are aggressively extend their business and take risk to earn profit, which will result in more loans for firms.

Switching costs also have a significant influence on the profits of banks, which indicates that switching costs provide a separate mechanism for profits generation. Market concentration has been found to have a negative effect on bank profitability. As a result the switching costs and profit performance associated with the very large state-owned banks is lower than that of other commercial banks in China. While SOBs remain large and dominate the banking market, lower switching costs increase banks consumer welfare. As competition intensifies and the SOBs lose market share, banks will increasingly use their lock-in power to increase switching costs.

China's banking market is a comparatively stable market. When a static analysis is applied to this research, it is easy to explain that most of the domestic banks benefiting from switching costs are in a "harvesting" phase. However, as the newcomers to China's banking market, it may be better to take a more dynamic analysis into account that the losses (or reduced profits) of foreign banks facing, because they are probably in their "investment" phase. Foreign banks grow slowly in China's banking market with taking around 2%-3% market share since 2003. The empirical results in chapter 3 suggest that when compared with the domestic banks, foreign banks show that they are in a weak position to increase switching costs and make profits. Lack of local networks and comparatively small size block them to make full use of

switching costs. They need to ‘invest’ in the market to attract more customers in order to extend their market share.

6.2 Lock-in power and banks’ strategy

Focusing on credit supplier’s side, switching costs enhance banks’ ability to lock-in their customers, extend their market share and gain extra profit. Analysis in theory, large commercial banks (The big five state-own banks) with more branches and informational networks have been given advantage on setting switching barriers. However, this research finds that bank size shows a complex relationship with switching costs. A rise in size and number of sub-branches do bring more information asymmetric to banks to strength the lock-in power. But in China, the ‘very large’ banks have lower switching costs than ‘large’ banks suggesting a non-linear relationship between bank size and switching costs, where after some critical size switching costs decline.

This research also find that the large banks are less concerned with the lock-in strategy of extracting rent from switching costs than the smaller banks, largely because the competitive pressure faced by the joint stock banks and city commercial banks is fiercer than that faced by the state-owned banks. Indeed my findings confirm the standard view that SOBs have social objectives as well as profit objectives, which means maintaining branches in unprofitable regions and conducting investment in loss-making ventures as part of a wider social objective.

Small banks with less informational advantage can still benefit from switching costs. By making customers repeat borrowing from one bank, switching costs create a powerful incentive for the bank to improve their efficiency and services level. Empirical results show

that non-interest expense ratio (NEI) has a significant negative relationship with switching costs. It means that switching costs increasing with the efficiency level of banks, which offer an effective channel for small banks to extend their market share. This implies that efficient management can take advantage of asymmetries in information to enhance switching costs of banks. The facts described in chapter 2 show that the market share of large commercial banks, during the last ten years, has gradually been taken by other domestic banks, such as joint-stock banks, city and rural commercial banks. The profit determination regression results also show that market share has no significant effect on profits of banks. Small banks can raise the switching costs level to lock-in their customers and survival from the fierce competition with large commercial banks through increasing their operation efficiency.

Offering a bundle of services to customers is a good way to help banks to raise the switching barrier. Banks can increase the switching costs through selling firms services other than lending, which tend to strength the bank-firm relationship and offer them the advantage to hold-up their customers deeply. Income from other services is reflected by non-interest income ratio on a bank's financial report. Chapter 3 finds that non-interest income ratio has significantly positive effects on switching costs. The argument is that a bank that has a higher proportion of its revenue generated from non-interest services is more able to lock-in firms by offering a bundle of services alongside the loan. Furthermore, this strategy makes the product (loan) heterogeneous between banks, which strengths the competition in the lending market. By contrast, since banks with high non-interest income ratios tend to have more correlation with firms other than lending, which offer lock-in power to enhance firms to stay with current lending relationships. The results in chapter 4 show that firms are less likely to switch to this kind of bank.

6.3 Firms' switching behaviour and relationship banking

Switching costs make banks more difficult to win customers who have already borrowed from their rivals. A 'price cut' may be required for borrowers to switch when 'outside' banks try to attract new customers. This 'price cut' usually means a more favourable loan contract. Chapter 4 finds that firms usually switch banks for larger amount of loans and longer lending durations in order to overcome borrowing constrains. However, such pricing reductions of banks are based on how they observe their potential customers. A firm's transparency level and performance are the main determinants of whether it can win a good contract or not. As large firms are usually considered as more transparent than small firms (Elyasiani and Goldberg, 2004; Stephan et al., 2009), this thesis finds that a positive relationship between firm size and the probability of bank switching. Firms who have a better ability to generate cash from sales are more likely to form new bank relationships, since they are more attractive to banks and can easily get new loans. As for firms' bank selection, seeking help from small banks is a good choice, where they usually can get more favourable contract than large banks. This research finds that opaque and low quality firms find it difficult to get credit from non-relationship banks. Firms should either become large or improve their performance to strengthen their leverage when switching banks. From firms' prospective, it is good for them to choose 'pure' lending relationship with banks, since banks tend to offer a bundled service of loan and bank services to firms to make it hard to switch.

The existence of switching costs discourages firm to keep a long and single banking relationship because of the hold-up problem. Increasing intensity of competition make firm have higher probability to be involved in a multiple banking relationships. It is shown in chapter 5 that increasing market competition level decreases the probability of single bank-firm relationship and drives firms to have higher likelihood to set relationship with more

banks. It is easy to explain because fierce competition forces banks to poach more firms and increases the probability of firms engaging in multiple relationships. Chapter 2 shows that the average non-performing loans ratio of commercial banks continuously decreases from 7.1% in 2006 to 1.0% in 2012, which indicates that Chinese commercial banks have focused on credit quality when making lending decisions (Chang et al., 2009). Clearly, transparency and high quality firms are more attractive for banks. The results of chapter 5 show that firm size increases the probability of firms maintaining multiple lending relationships as well as the number of relationship banks. Firm quality is another important factor for firms making decisions on single or multiple banking relationships. Higher quality firms prefer single relationships since single relationships mean more effective lending with lower monitoring costs and lower collateral requirements. In multiple banking relationship regions, firms with better performance have high probability to get more lenders.

Keeping a relationship with incumbent banks instead of terminating it, and seeking help from other banks is an effective way for firms to avoid switching costs and find more loans. However, as the previous studies point out that single banking relationship mean lower monitoring costs, less collateral requirements and lower transaction costs than multiple bank-firm relationships. It is good for small and high quality firms to keep single banking relationships. Large and high quality firms would be better to maintain more banking relationships since they usually have larger credit need. Chapter 5 finds that medium size and small firms with high quality prefer single borrowing relationships while large and higher quality firms are more likely to be involved in a great number of banking relationships. For bad firms, keeping multiple banking relationships is a wise decision since they are more likely to be involved with liquidity problems. Large firms are considered as more transparent, which will enable large and bad firms to have a higher likelihood to set multiple banking

relationships, since banks know how bad they are and offer the corresponding contract. In contrast, since small and bad firms have difficulty acquiring loans from 'outside' banks, it is better for them to maintain at least one long-term banking relationship.

6.4 Conclusions

Compared with previous studies, this thesis finds something new in China's banking market. Switching costs are found to be less important to the big-five banks when compared with other domestic banks. Small banks are more aggressive in extending market share and making profit. For firms, strong financial conditions can increase the likelihood of switching banks. Firms prefer to switch to small market share banks, or lower profitability banks to seek more lending contracts. Banks that offer a bundled service of loan and bank services will have more capacity to lock-in firms. But firms dislike switching to this kind of bank. They prefer 'pure lending' to avoid potential hold-up problems.

The data I used in my research is from the Bankscope and CSMAR (China Stock Market and Accounting Research) database. The use of hard data makes my research more objective and helps to avoid some subjective selection problems associated with survey data. The data includes 151 banks and more than 300 listed firms' lending behaviour, which appropriately shows that facts of switching costs and bank-firm relationship in the Chinese banking market. However, it should be recognized that the models used in this research do not represent dynamic, but static behaviour. The Chinese banking market is fast-growing, in which the strategy and performance of banks and firms may be not consistent. The results of my thesis are based on the facts and data in the past, some of them may not reflect the facts since 2012. I find that foreign banks are very weak at increasing switching costs and making profit when compared with domestic banks, but their performance may improve in the future. I find that

private and state-own firms have no significant difference on bank switching behaviour, but the difference may become significant now. Because of the lack of data, I cannot examine whether the interest rates offered from inside and outside banks have effects on firms' switching behaviour, which could be a very important factor in the analysis. Since this thesis focuses on the empirical research, no significant theoretical innovations have been made.

The questions about bank-firm relationships in China's banking market that I leave for further research include: Do the state-owned banks offer credit help to bad firms under government mandates? Does the bank-ownership type have an effect on a firm's choice of bank? Does the 'inside' bank offer a different loan rate to the 'outside' bank? Does switching benefit a firm's performance? Further research is needed to investigate more deeply the effects of switching costs, bank ownership and the effect of loan rate on lending behaviour and bank-firm relationships.

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