Regional Economic Growth and Financial Development : The Empirical Analysis of Chinese Regional Convergence and Banking Industry Efficiency

林, 健怡
九州大学大学院経済学府経済工学専攻

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DEDICATION

DEDICATED TO MY RESPECTED

PROFESSOR ISOGAI AKINORI

AND

PROFESSOR NAKATA MASAO

who have shown me a respectable paragon, given me great help during thesis writing, and encouraged me to chase ideals

DECLARATION

I hereby solemnly declare that my dissertation does not contain any material accepted for any degree by any institution and does not contain any material published by others except those mentioned as references in the text. To provide support to my dissertation, some of my published and accepted research papers are appended. They are:

1. Comparisons of Bank Cost Efficiency in China (I): Based on Majority Ownership. *Studies in Applied Economics*, December 2012, Vol. 6, forthcoming.

2. Generalized Delta Convergence Analysis of Regional Economic Growth Based on 1952-2008 Chinese Provincial Level Empirical Results. *The Keizai Ronkyu*, November 2011, Vol. 140, pp. 43-53.

3. Fifty-Seven Years of Regional Growth in China: Convergence and Comparative Analysis. *The Proceedings of 2011 International Conference on Economics Business and Marketing Management* (published as full paper), March 2011, pp. 139-143.

4. The Determinants of Foreign Investments in Chinese Real Economy and Banking Industry. *Studies in Applied Economics* (under review).

Some of my research papers that were presented at different conferences:

1. Comparisons of Bank Cost Efficiency in China: Based on Majority and Minority Ownership Category Stochastic Frontier Approach Analysis. *Cambridge Business & Economics Conference*, Murray Edwards College, Cambridge University, Cambridge, UK, June 28th, 2012.

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4. Comparisons of Bank Cost Efficiency in China. *Applied Economics Workshop of Kyushu University*, Kyushu University, Fukuoka, Japan, November 22nd, 2011.

5. Comparisons of Bank Cost Efficiency in China (I): Based on Majority Ownership Analyses, *2011 Spring Meeting of Japan Association for Applied Economics*, Chukyo University, Nagoya, Japan, June 26th, 2011.

6. Fifty-Seven Years of Regional Growth in China: Convergence and Comparative Analysis, *2011 International Conference on Economics Business and Marketing Management*, Shanghai, China, March 11th-13th, 2011.

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LIN Jianyi
Department of Economic Engineering
Graduate School of Economics
Kyushu University, Japan
Student No. 3EC09023R
Session: October 2009-March 2013

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December 4, 2012

Abstract

At the beginning of Reform and Openness in 1978, a political slogan, 'When some people and some regions get rich first, others will be brought along and through this process, common prosperity of the entire population will be gradually achieved', was proposed by Chinese central government. Worldwide admitted, continuous and spectacular economic growth certainly endorses the accomplishment of this political slogan particularly. There is no doubt that the target of 'some people and some regions get rich first' has been achieved after decades of sustainable high-speed economic growth, having participating in WTO in 2001 as well as having ascended to the second largest GDP country in 2011. With the proposal of new political slogan 'construct a harmonious society' several years ago, the political goal of 'achieving common prosperity' is put forward once more. This dissertation focuses on a particular aspect of China's 'build in a harmonious society' issue in its economic boom proceeds, from both the economic side and financial development side.

This dissertation empirically investigates how the development of the financial market has an influence upon the regional economic growth in China. Specifically, the author focuses on the impulsive financing force of the external way of foreign investors (foreign capital utilization, foreign shares within the Chinese banking industry) and foreign rivals (foreign banking assets), as well as the domestic way of Chinese financing system self-reform (especially the Chinese banking industry).

Firstly, the author quantifies the degree of regional economic convergence (or divergence inversely) in Chapter 3. Distinguishing from former researches, this dissertation is aroused by the inquiry of 'whether reforms benefit generating a convergent economic growth'. Evidence co-proves that regional economic growth convergence significantly exists in the post-reform period (1978-2008). However,

the post-financial-reform period (1978-1994) shows weak δ^2 divergence or weak β convergence. Therefore, the economic reform accelerates convergent speed, whereas the financial reform slows down this outstanding trend.

Secondly, the author empirically investigates determinations of external foreign financial utilization in Chinese regions in Chapter 4. Other existing researches have investigated the decisive role of FDI in Chinese economic growth on an aggregate level (namely in all industries). Distinguishing from these previous studies, a special focus is given to a separated foreign capital inwards into regional financial intermediation in this dissertation. However, aggregate foreign capital utilization is also employed as an object of basis. According to the results of our empirical analysis, the economic factors, rather than the financial factors, are confirmed more significantly in aggregate foreign capital attraction. On the other hand, the financial determinants show significantly positive effects to foreign bank asset distribution. In the concrete, a pluralistic, developed financial institution with a large but low-efficiency banking industry attracts foreign rivals in the banking industry.

Thirdly, measurements of banking industry cost efficiency and influence factors are the bright spots in Chapter 5. Stochastic Frontier Approach (SFA) was chosen as the method of cost efficiency measurement. The empirical results show that the category of the 1990s newly established policy banks is most cost efficient. The participation of foreign minority ownership has a significantly positive impact on the cost efficiency of the banking industry, in spite of a lack of weight strength. And the market-oriented factor (total asset expansion) has a statistically significant impact on the cost efficiency, while the government intervention (credit control) does not. These results verify an evidence that the market-oriented factor plays a more crucial and substantial role than the government intervention in Chinese banking industry reform during the post-WTO period (2002-2009).

In Summary, both the internal domestic financial and the external foreign

financial approaches impact on Chinese fast economic growth. Introducing competition, especially external foreign force, into banking industry is proved to be an effective approach to cost efficiency improvement. However, foreign capital generally emphasizes profitability. Especially the East region has well developed ahead of other regions with the preferential policy for decades. If the government does not carry out any measure except for deregulation, foreign capital may maintain consentrating in the East region. As a result, the economic disparity between regions must be accelerated. To narrow the enlarged regional gaps, the government should take feasible and practical measures which induce foreign capital into less developed region, particularlly their financial market. As a first step, tax reduction or subsidies for foreign investors who invest into financial institutions in the West or the Middle region is worth considering. On long terms, market-oriented competition should be the core reform orientation for the goals of both ‘get rich’ and ‘achieve national common prosperity’.

Key words: Convergence; Foreign Capital Utilization; SFA; Cost efficiency; China

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Chapter One

Introduction

1.1 Research background

Recently, the Chinese economy has commanded attention because of its immense size, dynamic performance, and successful reform of socialist systems. More than an unexpected short-lived economic boom, China has maintained its incredibly rapid economic growth rate for more than 30 years. A progressive transition successfully guides this centrally planned economy to being market-oriented with a sustainable high-speed economic growth rate, which is recognized as a paragon and has been named ‘China’s growth model’ in the field of economic reform. A rush of case studies, policy analyses, as well as many more empirical researches and future growth forecasts have set off its charming achievements. Approvals and confidences are apt to sweep away the initial goal of Chinese reforms.

At the beginning of Reform and Openness in 1978, a political slogan, ‘When some people and some regions get rich first, others will be brought along and through this process, common prosperity of the entire population will be gradually achieved’, was proposed by Chinese central government. Worldwide admitted,

continuous and spectacular economic growth certainly endorses the accomplishment of this political slogan particularly. There is no doubt that the target of 'some people and some regions get rich first' has been achieved after decades of sustainable high-speed economic growth, having participating in WTO in 2001 as well as having ascended to the second largest GDP country in 2011. With the proposal of new political slogan 'construct a harmonious society' several years ago, the political goal of 'achieving common prosperity' is put forward once more. Therefore, this thesis endeavors to provide a particular aspect of China's 'build in a harmonious society' issue in its economic boom proceedings, from both the economic growth side and financial development side.

There is a common consensus that the east coast area of China is flourishing more than other areas. And this disequilibrium exists longer than Reform and Openness. Therefore, the first question is: *do the economic system reform and financial system reform help generate a 'harmonious society' or, instead, lead to economic disparity?* Firstly, the degree of regional economic convergence (or divergence inversely) in each political phase is quantified. The phases include long-term period (1952-2008), post-economic-reform period (1978-2008), and post-financing-reform period (1994-2008). And then, by comparing degree changes, whether the regional economic growth gaps are enlarged or not in reforms is estimated. When the regional economic growth trends show convergence, the economic gaps among regions will be shortened. The political reform goal of 'achieving common prosperity' will only be reached someday if the convergence exists. And the date of 'common prosperity' relies on the economic convergent speed. Adversely, if the regional economic growth trends show divergence, the regional gaps enlarge. As a result, the goal will be hard to achieve. Moreover, various economic factors are taken into convergence (or divergence inversely) determination analysis. The focal point of the determinations is financial industry development throughout dissertation.

As well as the Chinese growth feature, there is also a long-debated issue as to

whether there is a connection between financial development and economic growth in developing and developed countries. What's more, if there is causality (and if so, in what direction): is it the financial development that induces economic growth or that maybe financial development merely follows economic growth? Generally speaking, finance is a ramification of economic development. It emerges as a result of economic prosperity and work division of increased specialization of economic activities. Therefore, Robert Lucas (Meier & Seers, 1984) dismisses finance as being 'over-stressed' determinants of economic growth. The Nobel Prize winner Joan Robinson (Robinson, 1980) famously supported this opinion that 'where enterprise leads, finance follows'. Not being unique, some researchers have argued that finance, as a common productive factor, only reacts to expectations of economic growth (Berger, Hasan, & Klapper, 2004; Yin, Shang, & Broadbent, 2010). From this perspective, finance does not cause economic growth, but responds to changing demands from the 'real sector'.

However, other researchers hold different views on whether long-term sustainable economic growth depends on the ability to raise the rates of accumulation of physical and human capital, to use the resulting productive assets more efficiently, and to ensure the access of the whole population to these assets. Many studies have proven the active role of financial sector in economic growth (Ang, 2008; Berger, Hasan, & Klapper, 2004; Greenwood, Sanchez, & Wang, 2010; King & Levine, 1993; Levine, 1999). And financial intermediation supports this process by mobilizing saving and allocation investment, spreading risk, and providing liquidity to firms (FitzGerald, 2006). Financial intermediaries refer to banking institutions in this dissertation, in that they accept deposits and make loans, which may reduce the costs of acquiring and processing information and thereby improve resource allocation (Boyd & Prescott, 1986). It is robustly shown in these literatures that improvement and enhancement of the finance sector is beneficial to economic growth (Berger, Hasan, & Klapper, 2004; Klein & Olivei, 2008; Li & Liu, 2004; Lin & Sun, 2009; Tian & Zhou, 2008). Overwhelming

evidence, mixed within developing countries (Haber, 1991, 1997) and developed countries, as well as cross-country (Berger, Hasan & Klapper, 2004; Demetriades & Hussein, 1996), proves that financial development plays an important role in promoting economic growth. The author adopts this view of financial development with Chinese economic growth.

There are several reasons to believe that this study may not only contribute to China, but will also be applicable to the rest of the world. The 'Chinese pattern' transformation from centrally planned to marketed-oriented in past decades is doubtlessly sucessful and adapatable for other countries for its sustainable high-speed economic growth and important affection to global market. Firstly, China was the second largest GDP country in 2010, and is expected to become even larger (In some forecasts, it is expected to be the biggest by 2050[1]). China has one quarter of the world's population and 15 percent of its purchasing power parity (PPP), which was measured by GDP in 2010. Furthermore, China is a big emerging market for foreign investors and producers. At the same time, it is also one of the main exporters of capital, mainly directed to the U.S. current account deficit. Globalization connects and tightens the countries' relationships as well as those of the multinational enterprises (MNEs). Viewing from a Chinese banking industry perspective, the Big Four banks of Chinese state-owned commercial banks were all in the top-ten list of the world's largest banks according to market capitalization by the end of 2011. What's more, Industrial & Commercial Bank of China and China Construction Bank Corporation have the first and the second spots respectively.

Owning to the transformation is named 'Reform and Openness', foreign capital is taken into study in this dissertation besides internal domestic finance. Combining Chinese economic growth with allocation of foreign capital utilization, investigating foreign bank locations within Chinese financial industry, and

[1] Source: *Banking in 2050: How Big Will the Emerging Markets Get?* PriceWaterhouseCoopers (2006).

measuring foreign shareholders' influence on Chinese banking industry cost efficiency, this dissertation depicts external foreign financing approach impacts during the reform proceedings, as well as delivering political suggestions on 'common prosperity' reform targets.

1.2 Research emphasis and innovation

1.2.1 Research structure and emphasis

This thesis mainly investigates the impulsive economic and financing forces. Combining the forces of external foreign investors, rivals, and internal domestic financing entities, how the Chinese financial industry alternated and influenced the regional economic disparity along with the economic system reform and financial system reform policies is investigated. Meanwhile, the redistribution determinations of external foreign capital utilization and the cost efficiency influences of the banking industry of major domestic internal finance are investigated. Having priority over economic factors, financial determinants and financial development are the prominent research objectives of this dissertation.

The remainder of the thesis proceedings as follows:

Part 1 (Chapter 1): Introduction

The opening chapter gives a general overview of the current situation of the Chinese economy. The general thoughts and the main structure of the thesis are then illustrated for the aim of a quick preview and easy reading. Research methodologies, data resources, study emphasis, motivations and contributions, as well as the limitations of this thesis are briefly illustrated in this chapter.

Part 2 (Chapters 2-3): General Situations of Chinese Economy and Chinese Regional Economic Growth

This part revolves around the Chinese economic growth and regional convergence, including a macro-economic environment statement and empirical evidence analyses. The objective period is not limited to just the last reform decades. Chapter 2 gives a rough view of rapid national (but regional) unbalanced growth through demonstrations of region division, GDP growth, population, income disparity, industry structure and classification, infrastructure and capital stock, foreign investment and openness, and other conventional indicators. To proceed with regional disparity exploration in Chapter 2, Chapter 3 quantifies the imbalance degree and influence factors of this imbalance mainly via β convergence and various δ convergence analyses.

Part 3 (Chapter 4): Foreign Capital Utilization in Chinese Real Economy and Financial Industry

FDI is a universal financing method that can be found in various industries and regions. The unbalanced distribution of foreign capital among regions is a sensitive indicator of openness degrees and external financing levels from abroad. In this chapter, foreign capital utilization is not merely an aggregate concept, but is considered separately on an industrial level. The measurement of foreign bank institution assets is regarded as a special fund allocation of foreign capital utilization inward in the Chinese banking industry. Therefore, scale and efficiency of the Chinese banking industry, as well as other financial industry development indicators, are employed as influences of foreign bank institution distribution.

Part 4 (Chapter 5): Transition Character and Cost Efficiency of Chinese Banking Industry

To proceed (in Part 3) with Chinese financial development and the influence of foreign involvers in the banking industry, this section moves a further step on banking industrial studies. Firstly, this chapter discusses the relationship of Chinese sustainable rapid economic growth and financial institution development, especially the critical role of the banking industry in Chinese economic bloom in

view of former researches. By means of tracing back Chinese modern banking history, evolutions, and reform stages, and demonstrating the current industrial situation and bank performance, particularly the transforms of state-owned banks and policy banks, a sketch of the Chinese banking industry is briefly plotted out.

The second section of this chapter is banking industry cost efficiency measurement and a discussion on influence factors. Stochastic Frontier Approach (SFA) was chosen as the cost efficiency measurement method. The main attention is paid to the period before and after 2001 and 2006, when China experienced a transition period and officially became a member of WTO; new legal provisions were carried on and some trade barriers were abolished. Bank individuals and bank categories are ranked according to the level of relative cost efficiency. Furthermore, banks are ranked both by categories and by individuals. Bank categories are separated by their majority ownership, for example, state-owned banks, joint-stock banks, and policy banks. After bank order ranking, influences of cost efficiency are discussed through regression models. Majority ownership, minority foreign ownership, total assets, and non-performing loans are considered main influence factors of cost efficiency measurement. Market-oriented factor (total asset expansion) and government intervention (credit control) effects are estimated and compared through LS regression models.

Part 5 (Chapter 6): Conclusions

In summary, this chapter presents overall conclusions and policy suggestions based on former studies. Additionally, further study expectation is also discussed.

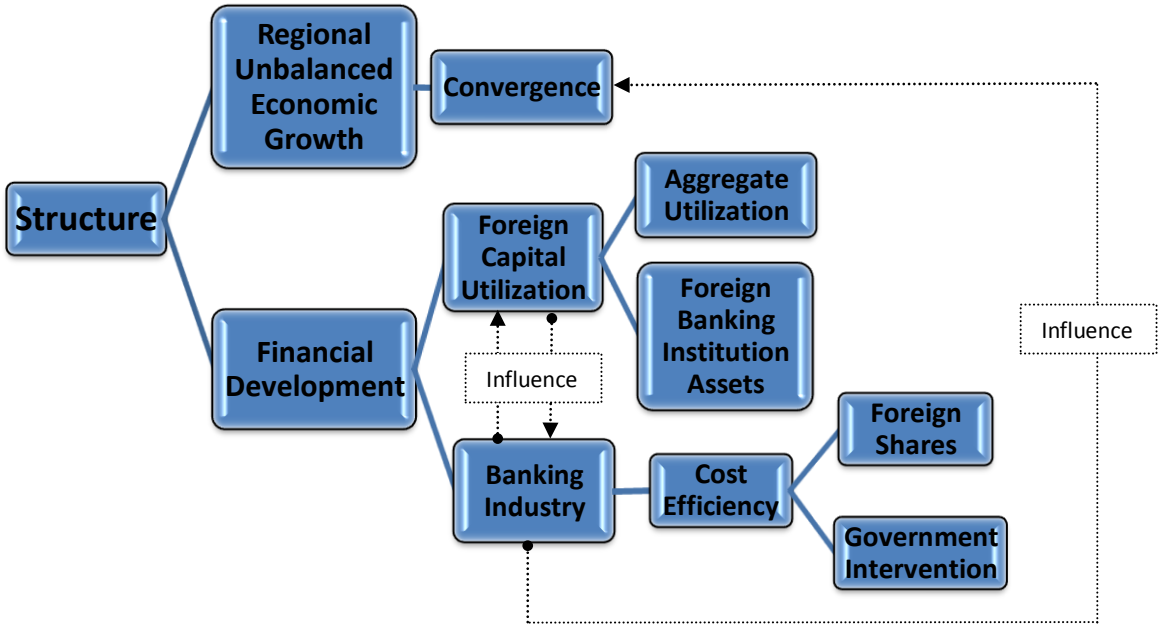


Figure 1.1: Structure of Thesis

The main body of this thesis can be recognized as two parts (see Figure 1.1): inspections of Chinese regional economic growth convergence (or divergence inversely) trends (Chapter 3), and financial influence factors and financial development (Chapters 3, 4, and 5). Other economic influence factors are also discussed, but the financial influence factors and financial development are the main trunk in this thesis.

Some intersected financial studies link analyses of economic convergence and finance as an integrated organism. Firstly, regarding financial influence factors, the major domestic financing approach and force of the Chinese banking industry is applied as core determinants in the convergent (or divergent inversely) trends analyses (in Chapter 3), and in foreign investment attraction and utilization studies (in Chapter 4). Especially in Chapter 4, both banking industry scale (deposits and

loans) and banking industry performance and efficiency (NPL ratio) are used as influence variables of foreign capital utilization. What's more, these two variables of the banking industry are repeatedly applied in distribution determination of aggregate levels of foreign capital utilization and foreign bank institution assets. Secondly, when referring to financial approaches, two major financing channels are considered: foreign capital utilization and banking industry. In this dissertation, finance from the banking industry is regarded as the major 'internal domestic financial approach', while foreign capital utilization is defended as the 'external foreign financial approach'. Moreover, other domestic internal financing approaches, such as public listed stock market and credit created by non-financing institution, are appended as supplements and similarly figured as independent variables in regression models. Thirdly, owing to the dominant status in Chinese enterprise finance and the core research objective in this thesis, cost efficiency of the banking industry is separately measured in Chapter 5. In addition, ownership impacts of majority shares and minority foreign shares, influences of marked-oriented factors and government interventions are distinguished and compared after cost efficiency measurements and ranks.

1.2.2 Research innovation and contributions

The issue of regional convergent or divergent economic growth trends, theme of financial development, and even the causality of both are no longer new subjects. Therefore, some new and bright points of this study are worth mentioning.

The primary motivation of convergence or divergence of Chinese regional economic growth study is an inspection and verification of the accomplishment degree of the initial political slogan of 'When some people and some regions get rich first, others will be brought along and through this process, common

prosperity of the entire population will be gradually achieved', which was proposed at the beginning of the Reform and Openness. Therefore, not merely the evidence of 'convergence' or 'divergence' should be concluded; the speed of convergence (or divergence inversely), which is highly influenced by reforms, should be illustrated as well. In order to show convergence (or divergence inversely) in more aspects, this dissertation applies more than one methodology: δ^2 convergence, *HHI-TEC*, and β convergence. Combing these methodologies, a more comprehensive overview of Chinese regional economic trends is described. This thesis measures convergence in different political phases, for example, long-term period (1952-2008), post-reform period (1978-2008), and post-financial-reform period (1994-2008). The convergence (or divergence inversely) results with political phase separation help evaluate effects of policy. *Do the economic system reform and financial system reform help generate a 'harmonious society' or, instead, lead to regional disparity?* According to the empirical results, the economic reform accelerates the convergent speed, whereas the financial reform slows down this outstanding trend. However, evidence also shows that the δ^2 divergence reversed to convergence in post-WTO period (2002-2008). After participating in WTO (2001), preferential openning-up policy is no more limited in the Special Economic Zone and some easten cities. The foreign capital restrictions is gradually relaxed. As a result, the interior regions receive more preferential policy than before. Therefore, the 'Mathew effect' (polarization) slows down again.

Panel data, instead of cross-sectional data in other literatures, was used in β convergence analyses. Provinces are treated as identifications of three regions (East, Middle, and West), which are set as cross-sections in the regressions. Therefore, β convergence of regional level, rather than that of provincial level, is concluded in each political phase.

As in reality, the banking industry plays an essential role in Chinese enterprise financial activities. The financial industrial factor, therefore, is represented by the

banking industry scale (deposits and loans) in convergence analysis. And it demonstrates a significantly positive role in each regional economic convergence period. According to this result, the focal point of the financial influences is the banking industry throughout dissertation.

There are a variety of financial development indicators from formal financial channels and informal financial channels. Most scholars hold optimistic and positive views of the formal financial channel in China. The main contributory way of the Chinese financial industry to rapid Chinese economic growth during 1985-1999 is proven to be the intermediary section (Hao, 2006), which is one of the formal financial channels. They also argue that insufficiently developed informal finance cannot serve the needs of the Chinese market, but banking development plays an important role in Chinese economic growth. Furthermore, the firms with bank financing grow faster than the similar ones without bank financing (Ayyagari, Demirgüç-Kunt, & Maksimovic, 2007). Many other evidences support this 'positive active relationship' viewpoint, using different datasets and methods as well. For example, the study of Liu and Li (Liu & Li, 2001) shows that the growth of provincial aggregate output is positively related to the loan growth of the largest banking institutions and self-raised funds, via a province-level dataset for the period of 1985-1998.

The 'financial intermediation supports economic growth' viewpoint is adopted and realized as banking industry studies in this dissertation. Most researches unilaterally consider single domestic finance or external foreign finance. But in this thesis, two impulsive financing forces are considered parallel. In this thesis, 'internal finance' refers to the domestic financial approach, for example, banking institutions, stock exchange markets, and non-financial institutions, while 'external finance' refers to finance from foreign investors or foreign countries in the form of either a foreign bank institution or foreign shares within domestic banks, as well as investment into other industries. The internal way of finance is regarded as being in a leading position of enterprise financial activities. The banking industry is

regarded as the main force of the financial industry for its enormous market share and significant role in real economic growth. Other domestic financing approaches are recognized as valid supplements. Regarded as a major financial force, not only scale expansion but also performance and efficiency improving of banking industry are essential development dimensions and influences to economic growth. Therefore, scale (deposits and loans), performance (NPL ratios), and efficiency (cost efficiency) are taken into measurement.

In other hands, FDI was proven to have contributed over 40% of China's economic growth, and the Chinese growth rate may be 3.4 percentage points lower without this inward power (Whalley & Xin, 2010). The external financing way of foreign investors (foreign capital utilization, foreign shares within the Chinese banking industry) and foreign rivals (foreign banking assets) is set as an important additional force to internal financing approaches. Through a balanced investigation of internal and external financing approaches, this thesis has a strong advantage of filling the vacancy of multi-financing approaches in economic growth, especially in the modern, increasingly globalizing economic system.

Secondly, existing researches usually choose the item of FDI (Buckley, Clegg, & Wang, 2007; Zhao & Du, 2009; Cheng, 2008; Young, & Lan, 1997; Zeng, Wan, & Tam, 2009). However, the author applies a new concept of 'Aggregate Foreign Capital Utilization' instead of FDI in regression. FDI represents the foreign direct investment in a certain area, including the realized capital and the amount still on the contract. Being different from FDI, 'Aggregate Foreign Capital Utilization' only consists of the utilized part of foreign capital, which is more accurate to mirror the foreign capital's real influence.

Thirdly, most FDI determination studies only investigate FDI on an aggregate level (namely in all industries). Distinguishing from them, the author gives a special focus on foreign capital inwards into regional financial intermediate institutions. Therefore, the dependent variable of 'Foreign Bank Institution Assets'

is separately adopted. ‘Foreign Bank Institution Assets’ measures assets of foreign bank institutions within the Chinese banking industry, so that both scale and efficiency of the Chinese banking industry are employed as control variables in regressions. The total assets of foreign banks only occupying 2% of the Chinese banking industry by the end of 2010 (see Table 5.1). Also, the banking industry is a small piece of the tertiary industry of the whole economy (see Figure 1.2). Different from applying economic factors in ‘Aggregate Foreign Capital Utilization’ investigations, financial industry factors are exclusively employed as control variables in regressions with the dependent variable of ‘Foreign Bank Institution Assets’.

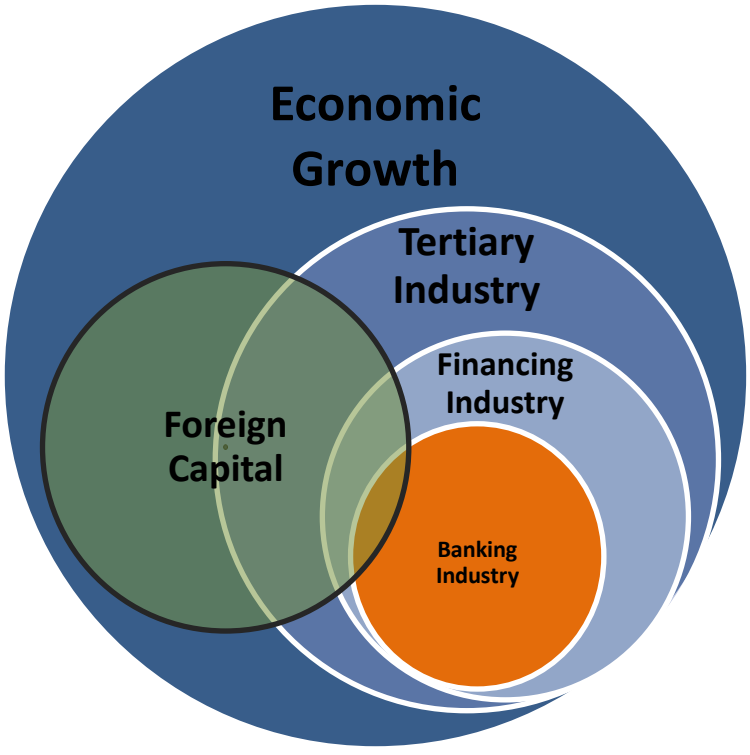


Figure 1.2: Relationships

In the Chinese banking industry cost efficiency part, ownership impacts and comparisons of domestic majority and foreign minority shares, influences of marked-oriented factors, and government interventions are the focal and creative points of this part. Marketed-oriented factors are represented by banking total assets (TA), while the government intervention is disclosed through non-performing loan rate (NPL rate) control. The explanation of this classification is discussed in Chapter 5. Evidence shows that total asset expansion is more significant in uplifting cost efficiency than NPL rate control. The foreign shareholder influences on cost efficiency are measured on a percentage level and as a dummy variable. Only the coefficients of dummy variables of foreign investor participations show significantly positive results. This result illustrates that foreign involving has an significant buy weak influence on banking industry cost efficiency improvement. The reason behind this may be due to small share percentages of foreign investors, which is related to banking regulation by CBRC. The ceiling on foreign investor shares of local banks was limited to 15% by the end of 2003. Although the ceiling has risen to 25% since 2006, the number of domestic banks owning foreign shares is still seldom.

As the Chinese policy banks are newly established, which are different from those historically burdened ones in other countries, and as these Chinese policy banks have been restructuring themselves into commercial joint-stock banking institutions, aimed at becoming a fully international bank and expanding their business branches and scope abroad, policy banks in China are no longer policy banks in a narrow sense. In another aspect, these policy banks had an market share more than 8% when measured by total assets by the end of 2010. Therefore, the author creatively put policy banks into a sample scope, comparing them with other ownership-type banks.

1.3 General thoughts and research methodologies

1.3.1 Research thoughts and data resources

China has taken off rapidly since the Reform and Open-door policy exacuted in 1978. And its industry structure is absolutely different from how it was at the beginning of the transformation, and is more doubtlessly different from the early stage of the establishment of the People's Republic of China. The industry structure is not the only change that has happened. The administrative division, the statistic criteria, the industry standard, and other things are changing all the time. Therefore, this thesis uses the current statistic criteria of the National Bureau of Statistics of China [2] as basic principles, employing other data sources as references.

The mainly used sources of economic growth work are the *Statistical Yearbook of China*, the *Almanacs of China's Finance and Banking*, the *China Sixty Years Compendium of Statistics*, the *China City Statistical Yearbook*, and *the Data of Tertiary Industry of the People's Republic of China*. Other reliable public sources from websites are also taken into account. In the case of statistical criteria conflicts among the sources, the author gives priority to the first three kinds.

The sample mainly employs (as basic observations) balanced or unbalanced macro-economy panel data of Chinese provinces, autonomous regions, and municipalities directly under the central government during the period of 1952-2010. As Chong Qing was separated from Si Chuan Province as a municipality in 1997, this thesis counts the date of Chong Qing and Si Chuan as one unit in the whole sample period in our long-term empirical analyses. The samples of Hai Nan Province, Xin Jiang Province and Tibet Province, with serious data omitted in the past-1978 phase, are taken off objects in some models. Generally, this thesis has 28 provinces, autonomous regions, and municipalities for

[2] National Bureau of Statistics of China website: www.stats.gov.cn.

economic analyses.

To make geographical macro-economic comparisons of inequity and convergence analyses, this thesis brings in the 'three major regions' concept. China is divided into three geographical regions: the East, the Middle, and the West (See Chapter 2). Each region contains around ten provinces, autonomous regions, and municipalities. The eastern region accounted for about 85% of the FDI in China, and even peaked to 92% in 2000 (Li, Hou, & Chan, 2008). Although openness has accelerated the expansion of international corporations nationwide since post-WTO period, shares belonging to the middle and western regions are still too small to rival the eastern area. The preferential policy in the eastern region is an essencial factor. The preferential financial policy will be briefly illustrated in Chapter 4 and Chapter 5.

Years 1978 and 1994 should be paid more attention to. Since 1978, China has executed economic system reform policies. The administrative document of the *Decision of the State Council on Reform of the Financial System* has been enacted since 1994. From then on, a completed improvement of the financial law system, deregulation of financial market entry, and removal of the financial operating boundary were highly and pressingly put on the agenda. Also, years 2001 and 2006 are crucial time points for the foreign banks' cooperation in China, with China officially becoming a member of WTO and abolishing many former trade barriers for foreign investors. Many policies have changed and operating environments have alternated.

Looking at *Bankscope* data sources, the *China Banking Regulatory Commission (CBRC) Annual Report*, *Chinese regional financial operating main report*[3], *Mainland China Banking Survey* by KPMG, and *Chinese Almanac of Finance*, we can obtain an unbalanced annual panel data of Chinese banks for a shorter period than the economic field. The basic data source of short-term

[3] Translated from Chinese by the author.

banking individuals is from the *Bankscope*. Annual reports provided by individual banks via their websites, which are mainly the public listed banks and those who provide annual reports on websites, are used as supplementary materials as well. The *Bankscope* data source has more detailed information about bank individuals, but the active time period and bank units of the Chinese banking industry are still not as sufficient as the American or Japanese banking industry. The transparency and public extent of banking industry data were an avoidable flaw when this thesis chose the Chinese banking industry as its research objective.

Longer-term financing institution development is consulted from the *Statistical Yearbook of China*, the *Almanacs of China's Finance and Banking*, the *China Sixty Years Compendium of Statistics*, *the China City Statistical Yearbook*, and *the Data of Tertiary Industry of the People's Republic of China*. The data from these sources referred to above are compared and double-checked for prudence. Most of the sample banks follow International Financing Reporting Standards (IFRS) or International Accounting Standards (IAS), while a smaller part[4] acts according to local General Accepted Accounting Principles (local GAAP), namely the Chinese Accounting Standards (CAS). While there are some small differences between the IFRS and the CAS, it should be mentioned that the CAS has been continuously developing in recent years, following in the principles of IFRS[5]. Furthermore, the improvement of new Accounting Standards for Business Enterprises (ASBEs) does not represent a major departure from the current GAAP in China, although it does strongly reaffirm the use of the concept of 'substance over form'[6]. For these reasons, we can ignore the accounting methodology differences of the original data.

In addition, if price adjustment is referred in lines, the Consumer Price Index

[4] There are eight bank samples following the local GAAP: Agriculture Bank of China, China Everbright Bank, Guangdong Development Bank, Agricultural Development Bank of China, Export-Import Bank of China, China Evergrowing Bank, China Zheshang Bank, and China Bohai Bank.
[5] According to the latest announcement by International Accounting Standards Committee (IASC), the CAS can be recognized as being equal to IFRS.
[6] Source: *Mainland China Banking Survey 2006*, KPMG (2006).

(CPI) of 1990 is used as an adjustmental base. Additionally, this thesis also applied the correspondent year-end exchange rate to the data, which is denominated in foreign currencies to make sure the collected data is all denominated in Chinese Yuan (namely RMB). For the purpose of readability, the units of 10 million RMB, 100 million RMB, a billion RMB, as well as other units are used for different parts of this thesis.

For any econometric analysis and empirical studies, the common difficulty lies in the availability and reliability of the data. In this dissertation, most data rely on public data sources, for example, *China Statistic Yearbook* and *A Sixty Years Statistical Compendium for New China* published by the National Bureau of Statistics of China, *CBRC Annual Report* published by China Banking Regulatory Commission, and *Mainland China Banking Survey* published by KPMG. For the missing value, the author quotes second-hand data from other papers or reports, some missing growth speed in certain provinces is calculated by an interpolation method, or the author adjusts the econometric techniques to the available data.

1.3.2 Research methodologies

To measure unbalanced Chinese regional economic development in both time and space dimensions, this thesis constructs and analyses both δ convergence and β convergence methods via a provincial basis but regional level panel data with a long-run time series from the Communist Revolution of 1952 to 2008. According to the previous work, the author divides the whole country into three areas: the East, the Middle and the West. Firstly, the author uses numerous δ convergence indicators to measure the disequilibrations and concentrations of provinicial economic growth. Meanwhile, advantages and disadvantages of δ convergence indicators are pointed out by the author. Then, to compensate the deficiencies of δ convergence, the author moves a further step toward β convergence. By employing

neoclassical growth theory and the Solow model, the existences of β convergence of the whole country in the long phase (1952-2008), post-reform phase (1978-2008), and post-financial-reform phase (1994-2008) are separately verified.

To analyze the economic growth diversity based on a Chinese regional level, the author mainly analyzes the coefficients of conditional convergence and explanatory variables. The key influencing factors include the ratio of financial scale to gross output production, the social capital stock ratio, the growth rate of labor force, the industrial structure influence, the openness effect, the education level influence, the degree of infrastructure investment influence and so on.

The available public data of foreign capital utilization in a real economy can be traced back to the 1980s. However, owing to foreign investment restrictions in banking institutions, available data of foreign capital operating in China is lagging behind the economic data. Therefore, Chapter 3 has to compromise to the time period of financial data. Using Chinese provincial level panel data from 2005 to 2009, Chapter 3 estimates the determinants of foreign capital utilization on regional economic growth and the financial industry. Least Squares (LS) and Instrument variables (IV) are used for logarithm regression of both aggregate level and foreign bank asset scope of the dependent variables. The regional influence factors of actually utilized foreign investment are generally categorized into the following six groups: the GDP proportion of the tertiary industry's output, the development of finance, the market size, the infrastructure, the openness degree, and the regional education level. Each of the six groups has one or more significant results on the dependent variable – Aggregate Foreign Capital Utilization. Out of these six, the variables of local market development and local higher education level appear to be the most significant. Additionally, another dependent variable – Foreign Bank Institution Assets – can be seen to be explained by the variables within the financial industry. The development level of the local financial institutions and the local financial liberalization show significantly to foreign bank branch site selection. As well, the geographical factor plays an

important role because of preferential policy in certain region.

As amounts of former literatures support that the formal finance in China, especially the banking industry, shows a statistically significant and economically pronounced impact on local economic growth or enterprise financing activities, this thesis chooses the cost efficiency analyses of banking institutions to reflect the Chinese financial development to some degree. China accelerates banking system reforming, as it numbers among one of the fastest-growing emerging economies in the world. And the Chinese banking development studies and literatures through various aspects can be found varying time phases or methodologies. This thesis helps detect the effects by analyzing the cost efficiency of Chinese banks through using an unbalanced panel data over 2002 to 2009. At first, the author assesses the bank cost efficiency of both absolute values and relative values by stochastic frontier approaches (SFA) only for the Chinese 20 major banks. The results of SFA show the cost efficiency ranks of both the bank individuals and the bank categories. The individuals with highest relative efficiency are the China Development Bank (CDB), a policy bank, and the Industrial Bank (IB), a joint-stock bank. The most inefficient banks are the Agricultural Bank (ABC), the China Bohai Bank (CBB) and the Bank of China (BOC), two of which are large state-owned commercial banks. Coinciding with previous research, the category of state-owned commercial banks has the least efficiency across three sample groups. The most efficient category, however, is the policy bank group, which is a fact that runs contrary to most literatures. And the possible causes of this contrary are discussed in Chapter 5. Secondly, factor analyses results of LS regressions illustrates that the majority ownerships of both state-owned and joint-stock are significantly negative to cost efficiency (at 1% level). The minority ownership of foreigners (measured by participating dummy) is significantly positive to cost efficiency (at 1% level). The government intervention of credit control is insignificant, while the market-oriented total asset expansion is significantly positive (at 1% level), measured on banking industry level.

1.4 Limitations

The first possible limitation is that banking cost efficiency used in the study does not precisely capture the financial development. The financial reform that takes place in the financing system, especially with the development of marketization and privatization, is not limited in the banking industry; other markets such as the stock or bond markets have leapt and grown since the 1990s. The cost efficiency is a partial aspect of financial institution development, as well as the banking industry. But limited by the transparency of financing sector data, choosing the Chinese banking industry as the study objective is an expedient way to peek the financial reform achievement. But incomprehensiveness of financial development is still an avoidable flaw of this thesis.

Empirical results are severely limited by the data source. A long-term provincial panel data of 52 years is applied to economic convergence analysis, while short-term bank individual panel data of less than 10 years is employed for banking cost efficiency analysis. And because of financial data opacity for a long period, especially the lack of provincial level data of bank individuals, there is no possibility of the corresponding analyses between regional economy and regional banking cost efficiency in long-term. This is the largest regret of this thesis.

However, in China it might be of lesser significance since the stock market and other financial tool development have come about mostly within recent decades, and the banking sector and its channels are still the most developed and major means of financing. Empirical proxies of banking development are partially capable of reflecting the financing industry in spite of in short-term.

Chapter Two

General Situation of Chinese Economy

2.1 Administrative and geographical divisions of Chinese regions

Before studying the economy and regional economy development of China, we should have a clear geographic concept of different levels of Chinese regional divisions. The administrative divisions and geographical division of China are changing along with different historical periods. According to *A Sixty Years Statistical Compendium for New China* and *China Year Book*, the division levels of administrative areas in China can be recognized as the following four (sorted in descending order): (I) Regions at Province, Autonomous Region, and Municipality level; (II) Regions at Prefecture level; (III) Regions at Country level; (IV) Regions at Town-ship level.

The borders and total amounts of these region divisions alternate as well. At the beginning of the establishment of the People's Republic of China (1949), the number of regions at province, autonomous region, and municipality level is 50, while this number went to 33, including Hong Kong Special Administrative Region, Macao Special Administrative Region, and Taiwan, by the end of 2010.

But the economic and statistical data of Hong Kong, Macao, and Taiwan are out of *A Sixty Years Statistical Compendium for New China* and *China Year Book*. The limitation is not only that the data collection is difficult. The legal system, policy, as well as economic growth mode are different, so most researches are faced with mainland regional disparity. Therefore, in this thesis the data in calculation only covers the mainland regions at province, autonomous region, and municipality level, by default.

In the statistical analysis part of this thesis, by the year end of 2010, there were 31 regions at province, autonomous region, and municipality level, 333 regions at prefecture level, 2,856 regions at country level, and 40,906 regions at town-ship level. After centuries of economic growth studies, there is a consensus that the economic growth, to some degree, depends on local resource endowment. And it is obvious that the growth unbalance in one thing is reflected in district deviation. Most researches divided the provinces into three regions rather than four (Zhao & Ma, 2006). Therefore, following the region congregate of former researchers, the author divides the mainland administrative regions into three major regions by geographical division: the East Region, the Middle Region, and the West Region.

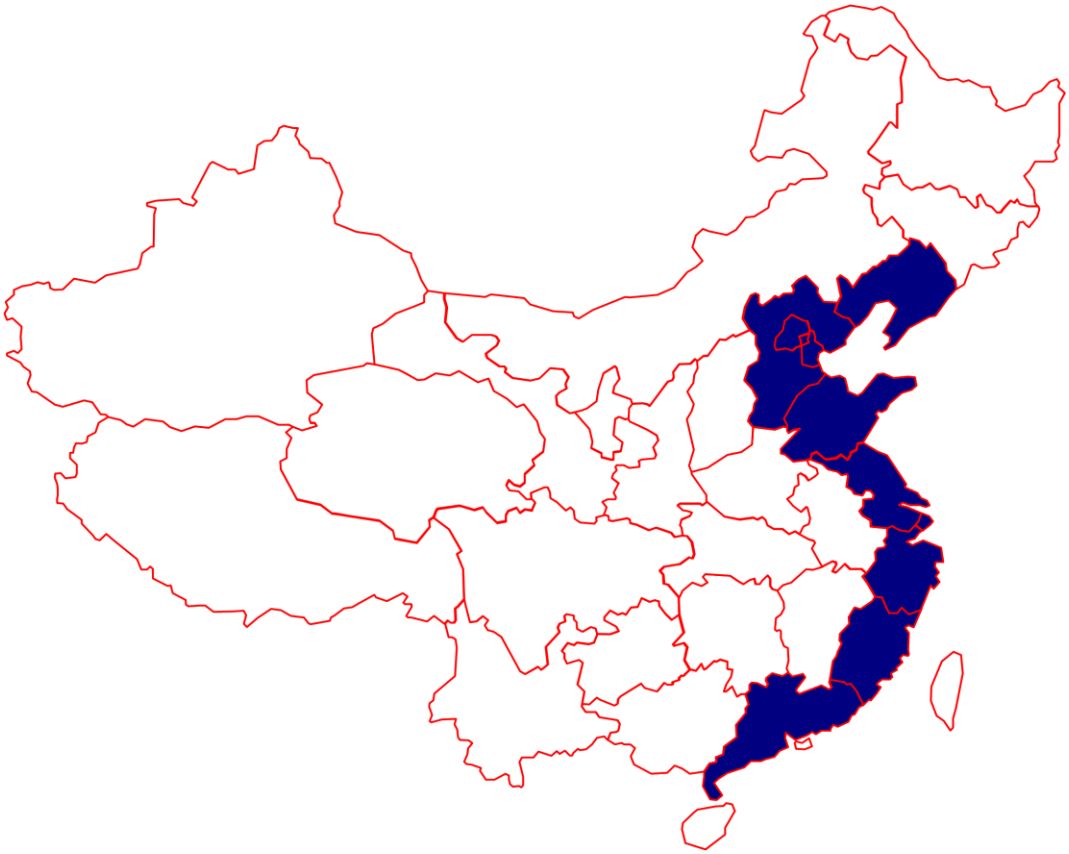


Figure 2.1: The Geographic East Region

The East region in this thesis includes 9 provinces and municipalities: Beijing (municipality), Tianjin (municipality), Heibei (province), Liaoning (province), Shandong (province), Jiangsu (province), Shanghai (municipality), Zhejiang (province), Fujian (province), and Guangdong (province).

Three of the four municipalities are located in this region.

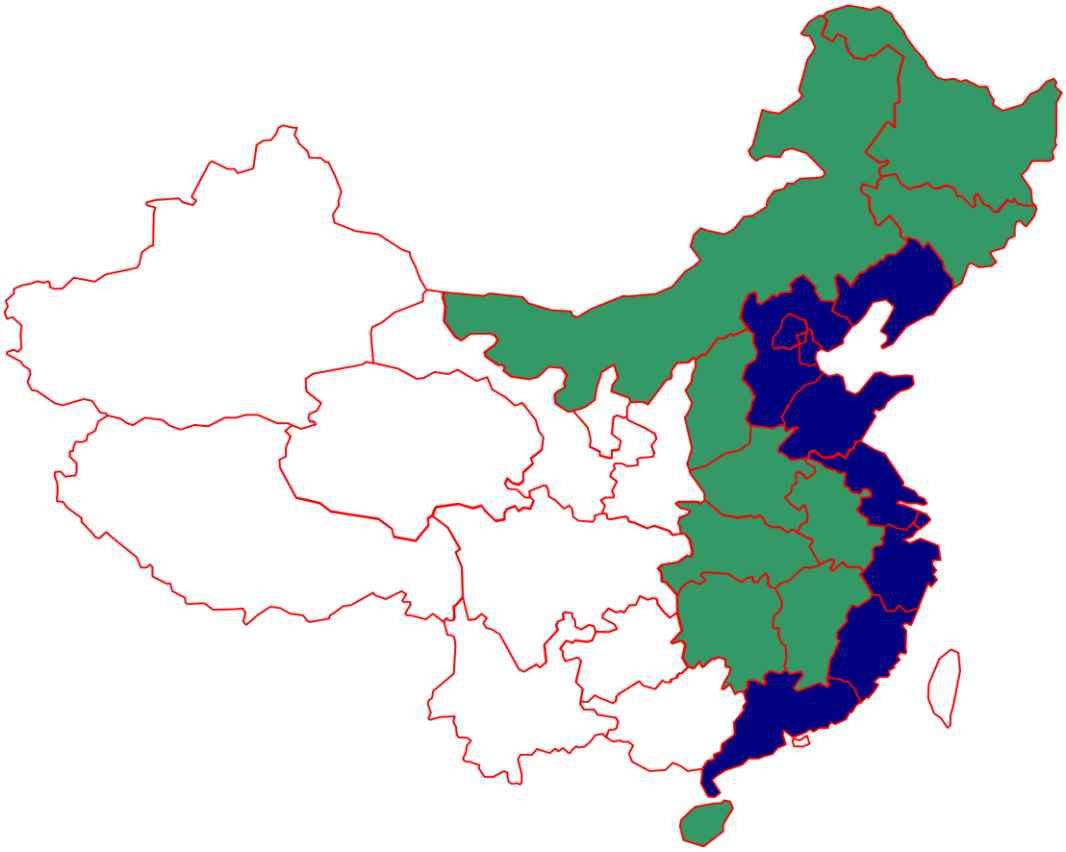


Figure 2.2: The Geographic Middle Region

The Middle region in this thesis includes 10 provinces and autonomous regions: Heilongjiang (province), Jilin (province), Neimenggu (autonomous region), Shanxi1 (province), Henan (province), Hubei (province), Hunan (province), Jiangxi (province), Anhui (province), and Hainan (province).

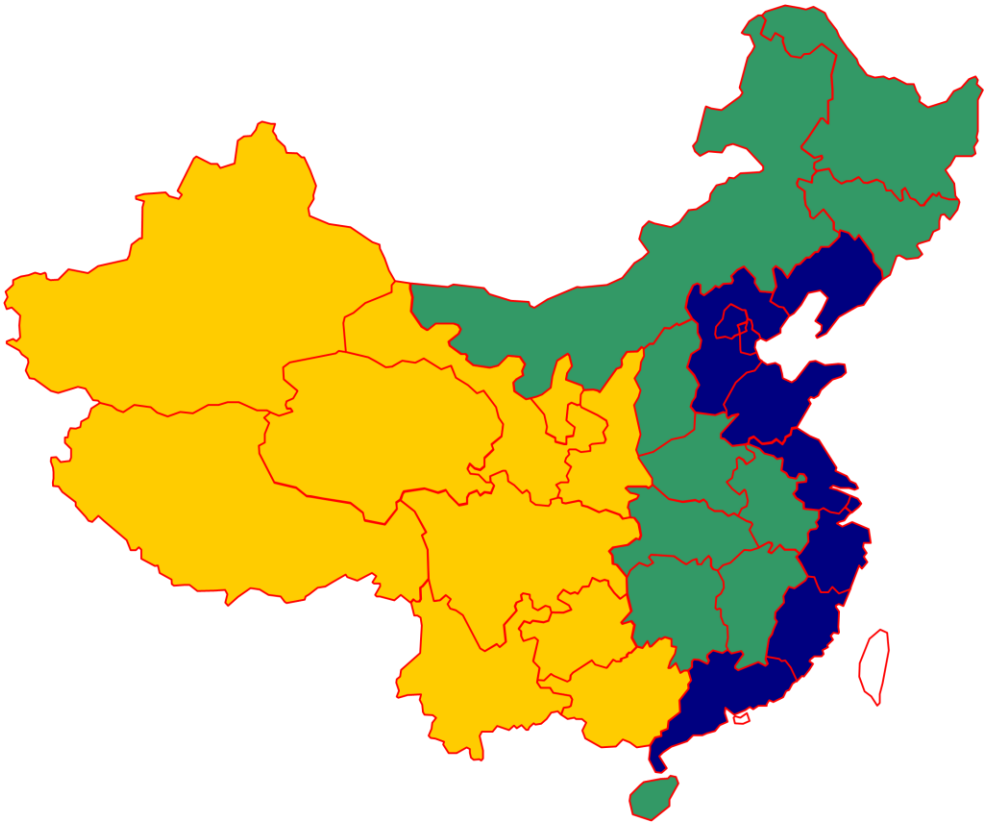


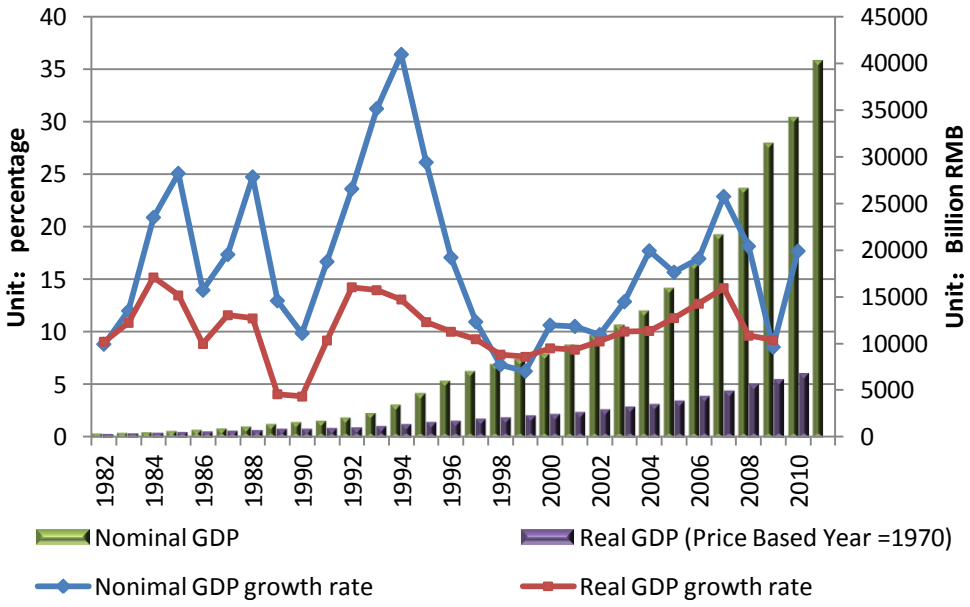
Figure 2.3: The Geographic West Region

The West region in this thesis includes 11 provinces, autonomous regions, and municipalities: Ningxia (autonomous region), Qinghai (province), Shanxi3 (province), Sichuan (province), Xinjiang (province), Tibet (province), Yunnan (province), Chongqing (municipality), Gansu (province), Guizhou (province), Guangxi (autonomous region).

The only interior municipality (Chongqing) is located in this region. And two out of three autonomous regions are in this region.

2.2 Chinese GDP growth and population

Chinese economy robust growth amounts to well above 10 percent annually during the 1980s. The high speed of over 8 percent annually of the sustainable nominal GDP growth ratio has been maintained for more than two decades, which undergirds China's standing as the world's fastest-growing economy (see Figure 2.4). From 1978 to 2008, China's nominal GDP increased from 364.52 billion RMB to 40,120.2 billion RMB, which is over 110 times more than 30 years ago; nominal per capita GDP has also risen 60 times from 381 RMB to 22,689 RMB during this phase[7] (see Figure 2.4). China ascended to the second largest economic country according to its GDP in 2011.



Sources: *A Sixty Years Statistical Compendium for New China* and *China Year Book 2011*.

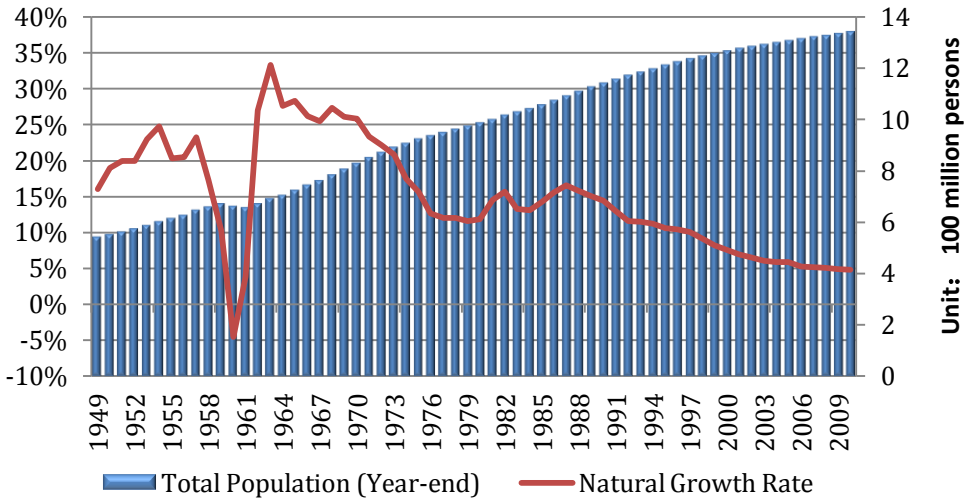
Figure 2.4: Nominal GDP and Real GDP (1978-2010)

[7] Source: *China Statistical Yearbook 2011*, National Bureau of Statistics of China (2011). Data are calculated at current prices.

China is one of the most densely populated countries in the world. The demographic factor in China's Great Economic Transformation cannot be ignored due to its huge number and significant influence of the labor force factor. The total population in the year end of 1949 is 541.67 million persons, but it doubles to 987.05 million persons in the year end of 1980, which is a net population increase of 435.19 million persons, not considering unusual nationwide death in the 1960s. There is a groove at the beginning of the 1960s. The net growth rate of the population is -4.57% in 1960 because of the Great Famine. And a special low growth rate of 3.78% featured in the next year. The natural growth rate soon recovered to 26.99% in 1962, and 33.33% in 1963. The natural growth rate of the population fluctuated in a volatile manner before the 1980s. However, along with population control policy, the natural growth rate has declined to below 20% since 1974 and later declined to below 10% since 1998. When referring to population factors in China, population policies should also be taken into consideration. China's birth control policy is well known and controversial in the world, which can be traced back to the 1960s. But in fact, it was not until 1983 that an absolute, nationwide 'One-Child Policy' was enacted and executed rigorously in various regions. Without regard for ethics and social problems, this birth control policy achieves marked results. The total fertility rate (TFR) sharply slants to a normal generational replacement level of 2.24 in the 1980s, which used to be 5.8 in the 1970s. Before too long, China has entered a period of low fertility level since the 1990s. Due to the rigorous 'One-Child Policy', China has witnessed dramatic demographic change of historic proportions.

After years of a continuing decreasing of the natural population growth rate, the total population was 1,016.54 million persons by the end of 1982, while it reached 1,340.91 million persons by the end of 2010. Net population growth was only 324.37 million persons in this period of nearly 30 years, which is obviously less than the former time period (1949-1980). From these aspects the population control works effectively.

Therefore, the experts are of the opinion that China has transformed from a 'demographic transitional' society, where mortality reductions led to rapid population growth but subsequent fertility reductions led to slower population growth, to a 'post-transitional' society, where life expectancy has reached new heights, fertility has declined to below replacement level, and rapid population aging is on the horizon. And in the not-too-distant future (a matter of a few decades), China's population will start to shrink, an unprecedented demographic turn in its history in the absence of massive wars, epidemics, and famines (Brandt & Rawski, 2008).



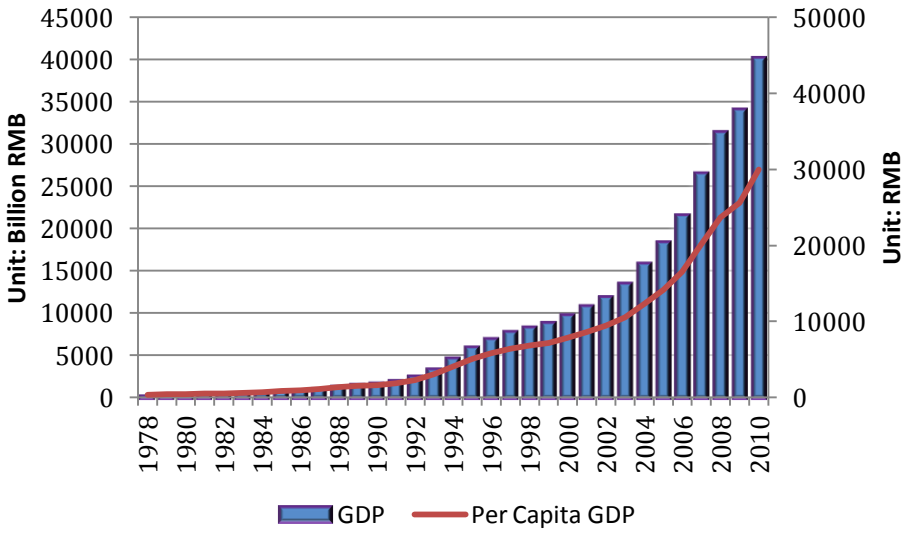
Sources: *A Sixty Years Statistical Compendium for New China* and *China Year Book 2011*.

Figure 2.5: Natural Population Growth Rate (1949-2010)

The cardinal number of total GDP was in a low productivity level during a long-term initial stage. The nominal GDP is only 67.9 billion RMB in 1952. It is not until 1986 that the nominal GDP exceeds 1000 billion RMB. More clearly, it took 35 years for the nominal GDP to grow to 1000 billion RMB. However, from

1986 to 2010, in only 25 years, nominal GDP grew to 39,298 billion RMB. The nominal GDP in 2008 is 40,326 billion RMB, which is over 590 times more than 60 years ago. The internal repressed driving force of economic development has been liberated since the Reform and Openness. But the Reform and Openness does not quickly result in high-speed GDP growth until the second half of the 1980s, owing to policy's response lag. Seeing that the cardinal number of total GDP was at a low productivity level and the cardinal number of population was at a high level, the increased absolute number of GDP was low in each year before the 1980s, and so is the per capita GDP. Later, a sustainable and stable high growth rate has increased the GDP total amount, with the effective policy of birth control, the per capita GDP increase every year (see Figure 2.6).

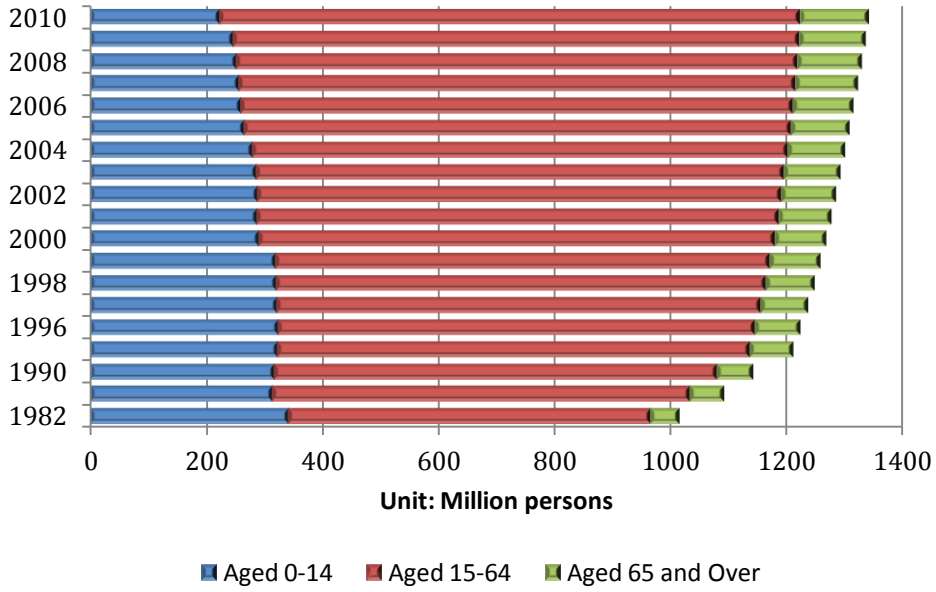
Due to a huge population cardinal, the declining lower natural population growth rate merely decelerates the growth speed of the total population, but barely has an effect on total population expansion. By the end of 2010, the total population reached 1,340.91 million persons, which is 2.5 times as many as in 1949, and 1.4 times as many as in 1978. The total population has increased by 378.32 million. The total population in 2010 is 1.39 times that of the year 1978. During the same time period from 1952 to 2010, China's nominal per capita GDP expanded from 381 RMB to 29,992 RMB, 79 times, the growth ratio of which is less than that of nominal GDP, which is over 110 times, raised from 364.52 billion RMB to 40,120.2 billion RMB in 30 years (see Figure 2.6).



Source: *China Year Book 2011*.

Figure 2.6: Growth of GDP and Per Capita GDP (1978-2010)

The population control policy not only slowed the growth speed of the total population, but also changed the natural structure of population composition (see Figure 2.7). The total amount of population during the working age (aged fifteen to sixty-five) has reached its peak in recent years, along with a sharp decline of adolescent (aged zero to fourteen) population and increased amount of aged population. Demographic bonus and aged society are also a prevalent topic for Chinese future sustainable development (Yao, 2010).



Sources: *China Year Book 2011*.

Figure 2.7: Age Composition of Population (1982-2010)

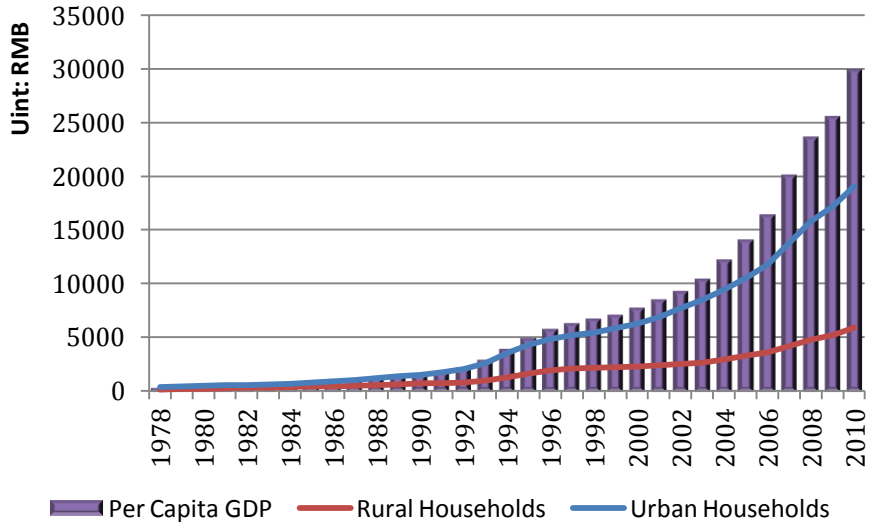
Among the grown population, the urban population has increased by 497.33 million, 3.88 times that of the year 1978, while the rural population has declined by 119.01 million, which is only 0.85 times that of the year 1978. The migration from rural to urban is obvious in the past decades. A leading international consultancy firm, McKinsey, has predicted in a report that China has seen steady yet rapid urbanization in recent years and is expected to have 221 megacities[8] and an urban population of about 1 billion by 2025.

[8] A megacity refers to any city that has more than 1 million people. Of the megacities, 10 would have a population of more than 10 million each, including Beijing, Shanghai, Chongqing, Shenzhen, Tianjin, Chengdu, Wuhan, Guangzhou, Hangzhou and Xi'an. *Report of the McKinsey Global Institute*. Source: http://www.globaltimes.cn/china/society/2010-10/583785.html.

2.3 Provincial inequality and urban-rural inequality

GDP is not a single indicator representing economy growth. And the final goal of economy development should not be the increasing statistical data, but rather the welfare advancing of citizens. And an ongoing debate continues as to whether this remarkable economic growth in China is driven mainly by productivity growth or by factor accumulation. Researchers have found that the accumulation of Chinese human capital was quite rapid and contributed significantly to economic growth and welfare, based on China's human capital stock of 1952-1999. According to the empirical evidence that by incorporating human capital, the growth of total factor productivity (TFP) has played a positive role in the reform period, while playing a negative role in the pre-reform period, the authors suggested that human capital accumulation and productivity growth should be given a priority for future sustainable economic growth and welfare improvement (Wang & Yao, 2003). There are lots of measurements for productivity and welfare growth, for example, education enrollment rate, public utilities utilization ratio, social security and medical care coverage rate, citizen sense of security, environment index, and so on. After decades of high-speed economic growth, the issues of life quality, social welfare, and equity sharpened. The varied yardsticks raised a debated topic of the income revenue allocation of 'wealth possession among citizen or wealth possession in nation'.

Here, for a brief view, this thesis simply employs comparisons of per capita GDP and per capita income to reflect the relationship of production, reproduction, and individual possession of output. The former one (per capita GDP) describes the output of production, and the later one (per capita income) represents the individual citizen possession of output. Although most parts of per capita income still go back to the cycle of reproduction, the measure of per capita income refers to distribution of wealth and has a limited view of income inequality.

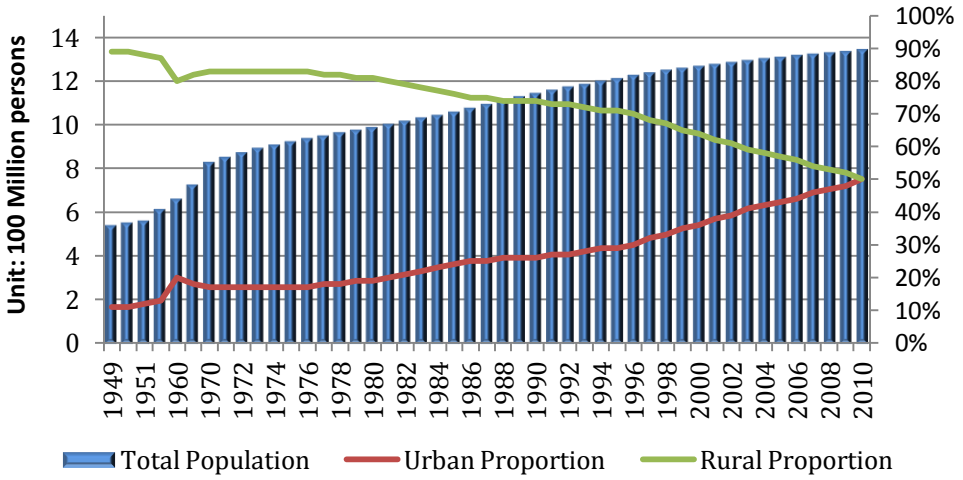


Sources: *A Sixty Years Statistical Compendium for New China* and *China Year Book 2011*.

Note: 1. The data here are nominal, unadjusted to price index
2. The Urban Households refer to per capita annual disposable income of urban citizens, while the Rural Households refer to net income of rural citizens.

Figure 2.8: Per Capita GDP and Per Capita Income (1978-2010)

From Figure 2.8, we easily found that the per capita GDP is higher than the per capita income of both urban households and rural households. Additionally, the urban households' per capita income is larger than the rural households. And the trends of them are diverging. The per capita income of the urban citizens climbs with the per capita GDP, though it does not tune in with the growth speed of per capita GDP. However, the per capita income of the rural citizens is not increasing too much when the reform goes in China.



Sources: *China Year Book 2011*.

Figure 2.9: Urban and Rural Population (1949-2010)

When we discuss per capita income, an important factor is population. More accurate per capita income should take urban and rural differences into consideration. And the urban-rural population structure has changed a lot in the past (more than half a century), owing to migration, policy influence, and so on. In 1949 the total Chinese population was 0.54 million, in which the urban population only occupied 10.64%. In other words, the vast majority of the population is rural population. But by the end of 2010, the population of urban citizens and rural citizens was half and half. The United Nations (United Nations Economic Commission for Europe 2007) forecasted that the urban population in Mainland China would increase to 827 million in 2025. The urban population is expected to grow at a faster pace than the total population. The percentage of the urban population would, therefore, increase to 57%. Besides the economic migration cause of labor force[9], the special *Hukou* System[10] of China has been playing a

[9] It refers to principles of resource self-allocation. The labor force flows to where there is a lack of them and the capital resource flows to where there is an abundance.

[10] The *Hukou* system was implemented initially in China in 1951. The major two types of *Hukou*, namely urban and rural, pertain to urban and rural population, respectively. Each individual is required to register in one, and only one, place of residence. The directive-marked use of the *Hukou* system prevents unplanned

crucial role (Liu, 2005). Another study of household surveys and aggregate data indicates that the differential gap of rural-urban consumption and income had decreased between 1978 and 1985, but soon continually increased to historically high levels. Therefore, scholars have argued that the rural reforms have successfully raised farmers' relative earnings, but urban-rural dualism has induced the disparity via labor flow restriction (Yang & Zhou, 1999).

Comparing the per capita income in urban and rural areas helps to understand the inequality of the East region and other interior regions. Six of the ten predicted metropolises (see Footnote 8) are located in the East region, only three of them are located in the West region, and the last one is located in the Middle region, without mentioning the hundreds and thousands of megacities and 'satellite' towns near these metropolises. And the industry cluster and industrial chain development are commonly contingent upon the urbanization. That is one majorly apparent reason why the East region is more developed than the Middle region and the West region.

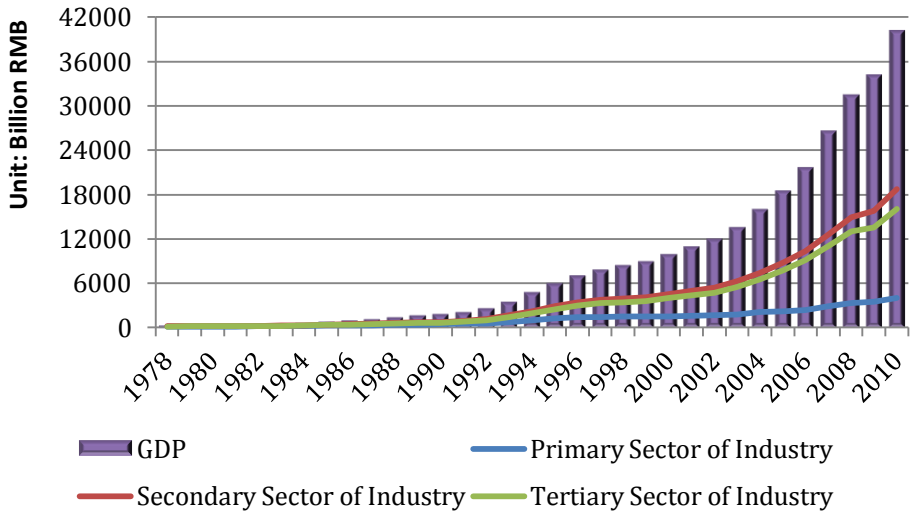
2.4 Chinese industry classification

Industry classification or industry taxonomy organizes companies into industrial groupings based on similar production processes, similar products, or similar behavior in financial markets. A wide variety of taxonomies are in use, sponsored by different organizations and based on different criteria [11]. Industrialization of the Chinese economy began in the early 1950s, just after the

migration over the rural influx to the cities and over intra-rural and intra-urban population movement. The strict central plan perspective requires the ability to allocate human resources not only at the enterprise and industrial levels, but also across geographic locations. The benefits associated with an urban *Hukou* are subsidized food and urban employment opportunities, which usually includes subsidized housing, healthcare, pension, and other benefits. In addition, an urban *Hukou* entitles its holders to the subsidized education system, welfare programs, and community cultural activities. Rural residents have no such entitlements. This *Hukou* category is set by the central government and applied all over the country. In other words, the *Hukou* system is a regional disparity influence factor customized by historical and political reasons. Therefore, the *Hukou* system was considered to be a necessary component of the centrally planned economy. But until the time of writing this thesis, the *Hukou* system was still not repealed or eliminated by the central government.

[11] What's an Industry? Poor's, S., http://www.standardandpoors.com/home/en/ap.

foundation of the People's Republic of China in 1949, and varies over the historical period. The recent classification of the Chinese three industries is a division according to the order of social productive activities. The products, taken directly from the department of nature, are known as the primary products. A series economic activities of obtaining the primary products are named as the primary industry, which usually and mainly consists of the Agriculture (including farming, forestry, animal husbandry, and fishery). The reprocessing department is called the secondary industry, which consists of the Industrial (including mining and quarrying, manufacturing, electricity, gas and water production, and supply industry) and the Construction. All the other industries, excluding the primary industry and second industry, are the tertiary industry, including circulating department and services department[12].

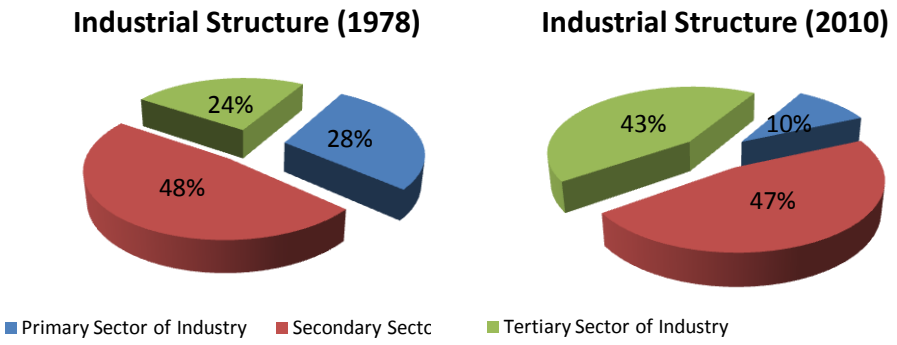


Sources: *China Year Book 2011*.

Figure 2.10: Industries Growth (1978-2010)

[12] The industry classification is translated from the website of National Bureau of Statistics of China, Source: http://www.stats.gov.cn/tjzd/tjzbjs/t20020327_14293.htm.

Although the amount of all the industries are increasing and the percentage of the three industries changes all the time, the percentage transfer appearently occurs between the primary and the tertiary industries (see Figure 2.11).



Sources: *China Year Book 2011*.

Figure 2.11: Changes of Industrial Structure (1978 & 2010)

This industry structure change can be attributed to two aspects. On the one hand, due to the caused industrialized aggregation effect, more metropolises emerge. And hundreds and thousands of the megacities and 'satellite' towns near these metropolises have been generated to surround and support these metropolises. On the other hand, we can go back to Figure 2.9 to see the urban-rural population structure change in the past decades. At the beginning of Reform and Openness (1979), the urban population was 18.96%, and increased 8.32% in 20 years. And by the year end of 1999, the urban population was 34.78%, and increased 15.82% in the second 20 years. But by the year end of 2009, the urban population was 49.95%, and increased 15.17% only in 10 years. This 39.31% rural to urban population undoubtedly decreases the primary working population.

2.5 Infrastructure investment and capital stock measurement

Evidence indicates that capital stock, human capital and physical infrastructure positively affected the level of aggregate output. And a redistribution policy in favor of the inland provinces implementing human capital and infrastructure can attract investment and overcome the bottlenecks of inland regions (Biggeri, 2003). Riding the country's economic expansion, China's transport and logistics industry has grown impressively in recent years, but is hugely complex and competitive. According to the Hong Kong Logistics Association, total logistics costs in 2009 were RMB 6.1 trillion, up from RMB 3 trillion five years earlier. China's move toward a more consumption-driven economy, combined with the improved accessibility of inland regions, has directed the industry's focus from being externally oriented toward meeting the needs of new internal markets. To avoid the bottlenecks in China's sustainable development caused by the desperate demand for infrastructure developments, public-private partnership (PPP) financing modalities have been identified as innovative tools for financing major infrastructure projects (Asian Development Bank 2005). Tens of thousands of companies are fighting for a share of this rapidly growing market, whose total value has more than doubled since the mid-2000s. The evidence shows that PPP can be considered a favorable option to help provide these rapidly demanded public works and services (Chan et al., 2010). While there are significant variations by region, overall logistics costs represented 18% of China's GDP in 2009, slowly dropping from 18.8% in 2004 (but still higher than many developed countries). 2.8% of foreign direct investment was directed to transport and logistics sectors[13].

The goods transported by China's logistics firms are being carried on a rapidly expanding transport network. China's physical infrastructure has developed

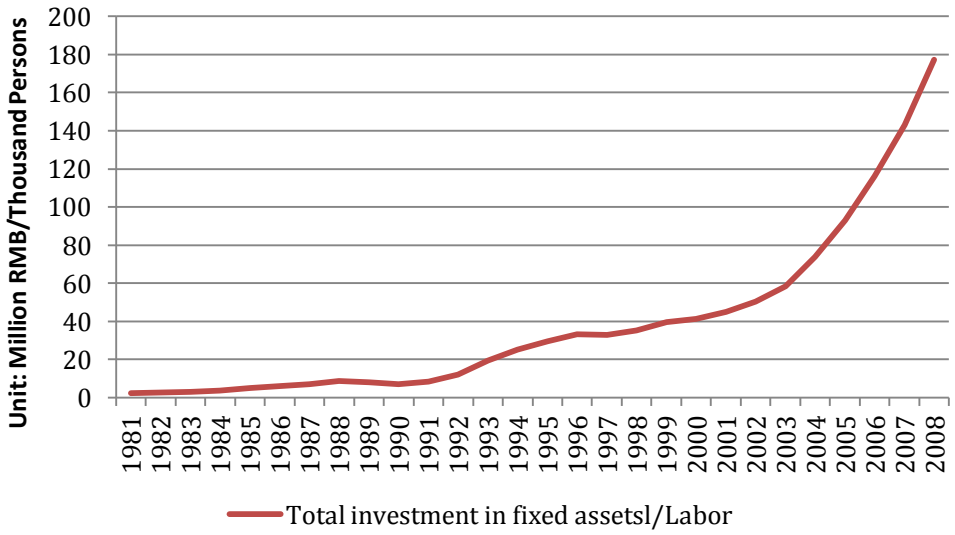
[13] Sources: *On the move in China: The role of transport and logistics in a changing economy*, KPMG (2011).

rapidly, but executives still recognize that regulatory and operational procedures often hinder efficiency. Expressways have been the leading beneficiary, with total mileage rising from just 16,300 kilometers in 2000 to around 70,000 kilometers in 2010, and the share of total freight carried by road transport has risen from 11 percent to 30 percent over the same period. Spending on railways has risen sharply, as has investment in inland waterways, especially since 2008 when the government launched an RMB 4 trillion stimulus program to counter the effects of the global financial crisis. Airports have been, and will continue to be, aggressively upgraded, though most improvements are aimed more at passengers than air freight.

Some evidences show the links between infrastructure investment and economic growth in China. Using panel data from a sample of 24 Chinese provinces (excluding municipalities) throughout the 1985 to 1998 period, the estimation of a growth model concludes that, besides differences in terms of reforms and openness, geographical location and infrastructure endowment account significantly for observed differences in growth performance across provinces. Furthermore, the results indicate that transport facilities are a key differentiating factor in explaining the growth gap (Démurger, 2001). Besides capital stock and human capital, physical infrastructure significantly positively affected the aggregate output level in China, and made a regional economic gap (Biggeri, 2003).

In another aspect, physical capital accumulation sped up in the reform period, owing to the high level of both investment and domestic savings. Investment in the Chinese industry had a significantly changing pattern between 1952 and 2008. Under the centrally planned economy, investment was fully funded by government and particularly concentrated in heavy industries. In the past reform period, by contrast, a growing part of investment was financed by household savings and oriented toward labor-intensive manufacturing industries. It is obvious from Figure 2.12 that the capital-to-labor ratio rose during the reform period, and accelerated

from the early 1990s, particularly rapidly from the 2000s. In other words, the financial reform largely increases the capital-to-labor ratio.



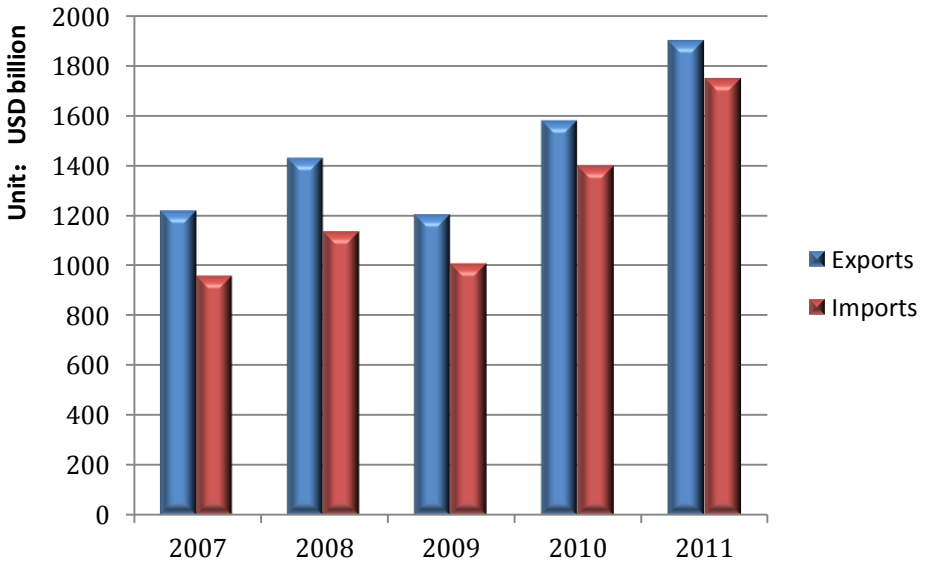
Sources: *A Sixty Years Statistical Compendium for New China* and *China Year Book*.

Figure 2.12: Capital-to-Labor Ratio (1981-2008)

This substantial increase in the capital-to-labor ratio reflects changes in the allocation of productive factors, for instance, substitution of capital for labor. The transfer of factors changes industrial structure, and further affects the productivity growth. Undoubtedly, the elimination of redundant workers in state-owned enterprises (SOEs) also increased the capital intensity of the industrial sector. Furthermore, China's increased exposure to foreign trade and FDI inflows has accelerated capital utilization over the last decade.

2.6 Openness and FDI

Some key features of China's fast growth since its market-oriented reforms and economic regime evolution have been ascribed to dramatic growth in international trade and the inflow of huge amounts of foreign direct investment (FDI), which are usually highlighted as main engines of China's growth performances (Démurger, 2001). The annual GDP growth speed has averaged around 9.3% since the mid-1980s and been sustained over the next several decades. Some authors have questioned the results' reliability of the statistical processes and estimations (Young, 2003; Young & Lan, 1997), and claimed that the sustainable growth rate might be 3.4 percentage points lower if the inward FDI declines in the future (Whalley & Xin, 2010). However, even during the recent financial crisis, the imports and exports maintain a steady growth, except for a break in 2009 (see Figure 2.13).



Sources: *China Year Book 2007-2011*.

Figure 2.13: Trade with Foreign Countries (2007-2011)

Chapter Three

Chinese Regional Unbalanced Economic Development

3.1 Introduction

A political slogan, 'When some people and some regions get rich first, others will be brought along and through this process, common prosperity of the entire population will be gradually achieved', was proposed by Chinese central government more than 30 years ago.

To deepen economic system reform and to line up with international convention, a progressively financial system reform naturally comes on therewith. Regarding the issuing of *Decision of the State Council on Reform of the Financial System*, improvement of the financial law system, deregulation of financial market entry, and removal of the financial operating boundary were put highly and pressingly on the agenda. As a notable achievement, *Commercial Bank Law* was enacted in 1995, ascribing to which local banks were permitted to accept foreign capital. Furthermore, China formally participated in WTO in 2001. And owing to the permission with WTO, foreign banks have been allowed to engage in RMB

business since 2006. A series of economic and financial reform processes are going to be completed step by step.

Having ascended to the second largest GDP country in 2011, China has achieved prosperity on an aggregate level. From the previous chapter, we know that China is a newly rising, emerging nation[14] and catches eyes all over the world because of its sustainable GDP growth rate and remarkable economic achievements since its Reform and Openness. From 1978 to 2008, China's GDP has increased from 364.52 billion RMB to 40,120.2 billion RMB, which is over 110 times more than 30 years ago; per capita GDP has also risen 60 times from 381 RMB to 22,689 RMB during this phase. There is no doubt that the reform target of 'let some people and some regions get rich first', which was proposed 35 years ago by the central government, has been achieved. However, another original political slogan of 'achieve national common prosperity through this reform process' was widely questioned because of income disparities and different growth speeds among regions (see Table 3.1). There is no doubt that the target of 'some people and some regions get rich first' has been achieved because of worldwide admitted, continuous and spectacular economic growth since the takeoff of the economic reforms in 1978, along with a progressive transition from a centrally planned to a market-oriented economy. However, how about the original target of the economic reform, that is, achieving 'common prosperity of the entire population' and constructing 'harmonious society'? Do the economic system reform and financial system reform help generate a 'harmonious society' or, instead, lead to economic disparity?

Seeing from a regional average level, by the end of 2010, the average

[14] Economists have not come to a consensus on a single definition of what makes a developed country and a developing country. And after decades of high-speed GDP growth, whether China has ranked among developed countries has no universally recognized verdict.

An emerging nation is a developing nation which is beginning to demonstrate significant industrialization. The term is used to indicate an intermediate stage between a developing nation, which often lacks significant industrialization, and a developed nation, which usually has a high Gross Domestic Product (GDP) and a high level of industrialization. Although there is no consensus definition of the term, many economists have identified China with the term 'emerging nation' to avoid dispute recently.

provincial GDP of the East region was RMB 2,337.19 million, 1.71 times that of the Middle region and 3.56 times that of the West region. However, by the end of 1978, which is the beginning year of the Reform and Openness, the average provincial GDP of the East region was RMB 15.70 million, only 1.31 times that of the Middle region and 2.60 times that of the West region (see Table 3.1). The East region has increased its nominal GDP 143.81 times while the national nominal GDP only has increased 110 times during the Reform and Openness process. As well as the East region has expanded the economic development gap with other regions.

Table 3.1: Average Provincial GDP of Other Regions Comparisons with the East Region's (1978 & 2010)

	End of 1978	**End of 2010**
Middle	1.31 times	1.71 times
West	2.60 times	3.56 times

Sources: *A Sixty Years Statistical Compendium for New China* and *China Year Book*.

The provincial evidence of the long-term (1952-2008) total GDP growth degree and average GDP growth speed tells a clearly supportive story of regional disparity (see Table 3.2). 'Total GDP Growth Degree' measures the provincial increased ratio of current nominal GDP (2008) to the original GDP in 1952, while 'Average GDP Growth Speed' averages the annual nominal GDP growth rate within each province. Six out of ten eastern provinces have occupied the front rank of 'Total GDP Growth Degree', and are followed by several western provinces. That is to say, compared with their initial nominal GDP, the nominal GDP of the eastern provinces at the top increases the most. Furthermore, regarding 'Average

GDP Growth Speed', the higher average GDP growth rate provinces are mostly located in the eastern region.

Table 3.2: Top 10 Provinces of High Local GDP Growth (1952-2008)

Total GDP Growth Degree (by Fixed Index)			Average GDP Growth Speed (by Chain Index)		
Beijing	167.38	East	Ningxia	1.8371	West
Guangdong	147.20	East	Beijing	1.1495	East
Fujian	108.94	East	Guangdong	1.1376	East
Zhejiang	106.46	East	Fujian	1.1319	East
Sichuan	87.53	West	Zhejiang	1.1310	East
Shandong	82.65	East	Neimenggu	1.1282	Middle
Jiangsu	75.09	East	Sichuan	1.1276	West
Ningxia	74.65	West	Shandong	1.1265	East
Qinghai	72.40	West	Qinghai	1.1247	West
Guangxi	69.52	West	Jiangsu	1.1242	East

Note: a. Calculated by *A Sixty Years Statistical Compendium for New China* and *China Year Book*.

b. This table includes top 10 provinces of high growth degree or high growth speed[15].

c. A fixed-base index is an index number in which the value of every period in a time series is directly related to the same value of one fixed-base period (resulting in an index for the given initial period = 1). Here, the fixed-base period is year 1952. Fixed index measures total local GDP multipliers.

d. A chain index is an index number in which the value of any given period is related to the value of its immediately preceding period (resulting in an index for the given period expressed against the preceding period = 1). Here, the period unit is one year. Average chain index is a mean of the chain index during the whole period, and here is 57 years. Average chain index measures the average annual growth speed of local GDP.

Several questions about reform effect and future regional economic growth

[15] Region division: See subtitle 2.1.

prediction are proposed, naturally: Will relatively poor regions remain poor for many generations? Will the rich provinces one hundred years later be the same economies that are relatively rich today? Will these regional growth inequality gaps remain steady, enlarge or diminish? Do the economic system reform and financial system reform help generate a 'harmonious society' or, instead, lead to economic disparity? Is there any automatic force that leads the provinces and regions to convergence over time in the levels of per capita GDP? How do the economic factors such as financial activity, capital stock, labor force, and industrial structure impact on the convergence of China's economic growth? How much do the basic foundation of a society, like the education level, and the degree of infrastructure influence the economic growth speed?

The most appropriate economic concept to describe 'achieve national common prosperity' should be 'convergence'. Whether and when the goal of 'achieve national common prosperity' will be realized relies on the existance of regional economic growth convergence and the convergent degree and speed. Therefore, in this chapter the author focuses on the 'common prosperity' issue by convergence (or divergence inversely) analyses. In addition, factors which have played a crucial role in provoking Chinese unprecedented rapid economic growth are also taken into consideration.

3.2 Reviews of previous studies

Broadly speaking, convergence studies have plenty of methodologies, both theoretical and empirical. This thesis mainly adopts methodologies of δ convergence and β convergence. General δ convergence methodologies, including Relative Mean Deviation (*RMD*), Gini Coefficient, Coefficient of Variation (*CV*), Herfidhal-Hirshman coefficients (*HHI*), Theil coefficients (*TEC*), Mean Logarithm Deviation (*MLD*), and so on, are common and rough ways to view the relationship among the observers. The *RMD* indicator quantifies the mean difference in

comparison to the size of the mean. In terms of the Lorenz curve, half of the *RMD* indicator is defined as the Gini coefficient. Both are dimensionless measurements. One disadvantage of both the *RMD* indicator and Gini Coefficient is that they cannot reflect the effect of Pigou-Dalton income transfer[16].

Since the 1950s, there has already been a lot of authors showing great interest in the degree of divergence and convergence across countries, economies or regions. Solow (Solow, 1956) and Cass (Cass, 1965) employ a per capita growth rate to illustrate that the growth rate of per capita income in a country tends to be inversely related to its starting level, which is named 'absolute β convergence' thereafter. In particular, if countries are similar with respect to structural parameters for preferences and technology, poor countries then tend to grow faster than rich countries. Thus, there is a force that promotes convergence in levels of per capita income across countries (Barro, 1991). On account of various study observations, β convergence develops. Barro and Sala-i-Martin (Barro & Sala-i-Martin, 1992) and Sala-i-Martin (Sala-i-Martin, 1996) have applied and proven Solow's model (Solow, 1956) based on the data within or across some developed countries or regions, like the United States of America, counties of Japan, and countries of the European Community. Barro (Barro & Sala-i-Martin, 1990), Mankiw et al., (Mankiw, Romer, & Weil, 1992), and Barror and Sala-i-Martin (Sala-i-Martin, 1996) analyze the convergence based on data all over the world. Baumol and Wolff (Baumol & Wolff, 1988) empirically analyze the absolute β convergence and conditional β convergence in low-income countries.

Even though foreign economists and scholars have been interested in convergence issues for many decades, it was not until the end of last century that the convergence debate about China captured the attention of mainstream

[16] Dalton, H. (1920) offers a set of principles to comprehend shifts in an income distribution, thereby providing a more compelling theoretical basis for understanding relationships with incomes. Dalton proposed the condition that if there is an income transfer from one richer to one poorer, so long as that transfer does not reverse the ranking of the two, it will result in greater equity on a social level (Dalton, 1920). This principle has come to be known as the Pigou-Dalton principle (Sen, 1997).

macroeconomic theorists and econometricians. Discussions partly attributed to Chinese economic success hadn't emerged until the 1980s, and partly owe to the omitting and unpublished statistical data before the 1980s. Along with dramatic economic achievement, issues of China's regional inequality and regional economic growth convergence (or divergence inversely) have caught the attention of scholars abroad, and academic literatures about regional economic growth convergence have emerged extensively since the 1990s.

Categorized by the data utilization difference, the issue of income convergence within Mainland China has been investigated by the cross-sectional approach (Chen & Fleisher, 1996; Démurger, 2001; Jian, Sachs, & Warner, 1996), by the time series approach (Yao & Zhang, 2001; Zhang & Kanbur, 2005), as well as by the more frequently used panel data approach (Lei & Tam, 2009; Jian, Sachs, & Warner, 1996; Lin, 2011a; Pedroni & Yao, 2006; Weeks & Yao, 2003), to name a few. According to some research evidence, a cross-sectional approach to income convergence is subject to bias (Bernard & Durlauf, 1996; Durlauf & Johnson, 1995; Pedroni & Yao, 2006). Although Tianlun Jian et al. have used panel data to measure the conditional convergence, considering only an agricultural share and coastal dummy as control variables is a weakened point (Jian, Sachs & Warner, 1996).

To summarize the results of β convergence studies only, scholars (Shen & Ma, 2000; Lin & Liu, 2005; Fang & Yang, 2006) claim that absolute convergence does not exist in China in the whole sample phase from 1978. But when the author treats 1990 as a critical line of all the samples, the whole samples (from 1978 to 2000) are divided into two phases. Then the author found that the prophase of Chinese provincial income is conditional convergence, and even has some absolute convergence characteristics (Wei, 1997). But otherwise the later phase of conditional convergence is obviously weakened and even shows a somewhat divergent trend (Liu, 2001). Jeffrey et al. first examine the absolute convergence of the whole sample period, from 1952 to 1993. The empirical results show that

the absolute nationwide per capita income convergence does not exist in the long-term (1952-2003) and short-term Cultural Revolution period (1965-1978), but exists in the initial phase of Central Planning and short term of the post-reform period (1952-1965 and 1978-1993) (Jian, Sachs, & Warner, 1996). The evidence of absolute convergence in the post-reform period (1978-) is various. Some scholars show that it does not exist (Fang & Yang, 2006; Shen & Ma, 2000; Lin & Liu, 2005), while Jian proves that it does exist (Jian, Sachs, & Warner, 1996), as a result of different time phase choosing and model setting. Because of this discrepancy, the thesis is an attempt to use newly released provincial data to investigate the result of recent Chinese economic growth.

Chen and Fleisher have got the evidence that convergence is conditional on physical investment share, employment growth, human-capital investment, foreign direct investment, and coastal location, using cross-sectional and panel data from 1978 to 1993 (Chen & Fleisher, 1996). And the empirical results of the augmented Solow growth model show a modest declining of the coefficients of variation, except the coast/non-coast income differential.

Other convergence analyses are applied to China. Some scholars have addressed the income convergence issue of Mainland China (Pedroni & Yao, 2006; Yao & Zhang, 2001), while others have taken additional objectives of Hong Kong and Macao (Henry, Lei, & Tam, 2009; Lei & Yao, 2008), both of which are based on Stochastic Convergence that was initially suggested by Carlino and Mills (Carlino & Mills, 1993). The non-stationary panel techniques in the study of Pedroni et al. provide empirical support that the long-term tendency since the Chinese Reform and Openness has been continuing to diverge on a provincial level. The divergence happens nationally and within various regional and political subgroups, and cannot be attributed to the degree of preferential open-door policies among regions (Pedroni & Yao, 2006). Other approaches, for example, the System Generalized Method of Moments (Weeks & Yao, 2003), the Metric Entropy Measure (Maasoumi & Wang, 2008), and the Markov Transition Matrix

(Sakamoto & Islam, 2008), have prevailed in investigating the possibility of income convergence in China.

Along with economic growth convergence (or divergence inversely) discussion, causes and factors of regional growth disequilibrium have also been debatably and comprehensively questioned and studied by scholars. Some support that higher initial schooling and life expectancy, low fertility, lower government consumption, better maintenance of the rule law, lower inflation, and improvements in the terms of trade enhance the growth rate (Barro, 1996). Some argue that openness and huge investments in physical and human capital push the rapid growth of Chinese and Asian newly industrialized economies (Yao & Zhang, 2003). This dissertation takes them into comprehensive consideration.

3.3 Hypotheses and models of convergence

3.3.1 δ^2 convergence

The special delta convergence method, namely δ^2 convergence, deduces the deviation degree of objective indicators within one economy system by comparing the δ^2 results of starting point and ending point results of the δ^2 convergence equation. If the δ^2 value of a certain indicator is larger at the starting point than at the ending point for a certain time period, the δ^2 convergence of this indicator exists in this phase. Otherwise the δ^2 convergence of the indicator does not exist. The δ^2 convergence equation is as follows:

$$\delta_t^2 = \frac{1}{n}\sum_{i=1}^{n}\left(\log y_{it} - \frac{1}{n}\sum_{i=1}^{n} y_{it}\right)^2 \tag{3.1}$$

where y_{it} represents time t, the quantity of the indicator in region i. Here, Chinese provincial per capita GDP is applied as the indicator y_{it}.

Hypothesis 3.1*: If the δ^2 values of provincial per capita GDP are declining*

during a certain time period, nationwide economic growth convergence exists based on province level comparison. Adversely, the climbing δ^2 values of provincial per capita GDP represent national divergent economic growth trends.

3.3.2 *HHI-TEC* analyses

HHI and *TEC* are usually measures of the size of firms in relation to the industry and are also used as indicators of the closeness of the competition or monopolisation among these rivals. *HHI* is defined as the sum of the squares of the market share of the 50 largest firms (or summed over all the firms if there are fewer than 50) within the industry, where the market shares are expressed as fractions. The *TEC* index is also a statistic used to measure economic inequality. Mathematically, *HHI* is a convex function under the influence of a large share, but *TEC* is a concave function under the influence of a small share. Decreases in the index of either *HHI* or TEC generally indicate a loss of concentrating power and an increase in competition, whereas increases in the index imply the opposite. But the *HHI* index weights large-scale individuals greater than small ones, while the *TEC* index weights small-scale individuals greater than large ones, according to their definitions. Therefore, the *HHI* index is particularly sensitive to mirror the proportional changes of large-scale individuals, and the *TEC* index is particularly sensitive to reflect the proportional changes of small-scale individuals. In other words, a single value of either *HHI* index or *TEC* index can reflect the size gap among the competitors. But the combination of the *HHI* ratio and *TEC* ratio can consider the trends (or transfer effect) of both the large-scale individual side and small-scale individual side. Therefore, the author creatively employs the combination of *HHI* and *TEC* ratios as an approach to estimate where the transfer effect derived from.

Hypothesis 3.2.1*: If only either single HHI or single TEC is increasing over the economic growth period, the convergence does not exist. In other words, it is a divergent economic growth trends.*

Hypothesis 3.2.2*: If TEC is steady but HHI is increasing over the divergent economic growth period, the transfer effect outflows are mainly happen among rich provinces. If HHI stands still but TEC is increasing over the divergent economic growth period, the transfer effect outflows mainly happen among poor provinces.*

Statistically, either GDP or per capita GDP is a measurement of output within a special statistical scope. Therefore, they are indicators of flow quantity within a certain year. And whether the GDP or per capita GDP increases or decreases in region A, it does not matter the GDP or per capita GDP amount in region B in the same period. For this reason the concept of 'transfer effect flow' of GDP or per capita GDP among regions does not exist. Here, the author just borrows the word 'flow' to draw an analogy on the economic growth speed varying among regions for a long time period. For example, when the poor regions grow slower than the rich regions, it seems there is some kind of 'transfer effect flow' from the poor regions to the rich regions. The analogy of 'transfer effect flow' can also be explained as concentrating proceedings or decentralizing proceedings. When the poor regions grow slower than the rich ones, it is concentrating proceedings, which will deduce the poor region being poorer and the rich region being richer. Otherwise the decentralizing proceedings mean the 'transfer effect flow' is from the rich regions to the poor regions. In other words, the concentrating proceedings of 'transfer effect flow' lead to divergence, while the decentralizing proceedings cause convergence. If both *HHI* and *TEC* indicators fluctuate in the same trends, the transfer effects happen within richer regions as well as within poor regions.

The computing formulas of *HHI* and *TEC* are as follows:

$$HHI_t = \sum_{i=1}^{n} \left(\frac{y_{it}}{\sum_{i=1}^{n} y_{it}} \right)^2 \tag{3.2}$$

$$TEC_t = \sum_{i=1}^{n} \left(\frac{y_{it}}{\sum_{i=1}^{n} y_{it}} \cdot \log \left(\frac{y_{it}}{\sum_{i=1}^{n} y_{it}} \right) \right) \tag{3.3}$$

where y_{it} represents time t, the quantity of indicator in region i. The author applies annual nominal GDP as an indicator under this subtitle.

3.3.3 β convergence

On the basis of the above statement, the δ^2 coefficient indicator describes the transfer effects, but cannot distinguish these transfer effects happening among the developed regions or developing regions. The *HHI-TEC* approach partly settles the transfer direction issue. However, this method is obscure to judge the convergence. What's more, both methods cannot reflect influence factors of economic growth and convergence degree. To overcome the shortcomings of former δconvergence analyses and to investigate regional disparity degree and influence factors in China, β convergence analysis is applied.

According to neoclassical economic growth theory, the diversity of per capita income among countries or economies results from the different capital-to-labor ratio (*K/L*). Assuming the saving rate is constant, the lower the *K/L*, the faster the growth of *K/L*, namely the faster growth rate occurs in poor areas rather than in rich ones. If the elements move freely among regions, the liquidity of elements accelerates the convergence among regions. As Figure 3.1 shows, *k** represents the economic growth rate equilibrium point, with k_1 being the position of the poor

region and k_2 being the position of the rich one. Both k_1 and k_2 will converge to k^*.

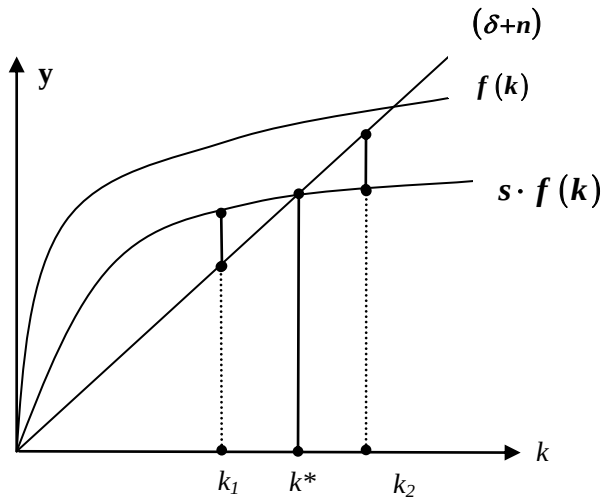


Figure 3.1: Convergence Concept

The model only applies the initial per capital income, and the end per capital income is called *unconditional or absolute β convergence.* Baumol et al. (Baumol & Wolff, 1988) first give out an estimation equation about *unconditional convergence*, as follows:

$$\ln\left(\frac{y_{it}}{y_{it0}}\right) = u_i + v_i + \beta_1 \ln y_{it0} + \varepsilon_{it} \tag{3.4}$$

Here, i represents area, t represents ending time, and t_0 represents initial time; therefore, y_{it0} represents initial per capita output in each region, and y_{it} is per capita output in the ending period in each area. ε_{it} is the zero mean and homoscedasticity random error term.

Obviously, the β_1 coefficient of Equation 3.4 is only related to the initial and the ending per capital output, and has nothing to do with other factors. When β_1 is negative, the absolute convergence exists; otherwise the convergence does not

exist.

As we have referred at the beginning of this chapter, influence factors of Chinese regional disparity are another concern. Besides initial per capita income, we consider additional conditions or factors affecting the local development, such as how the natural endowments of resources like labor force growth rate and physical capital stock level influence the per capita income growth (Wei, 1997). Do the industry structure change, the financial activity, and the degree of openness in the local area impact on the local growth? How many percentage influences of the regional education level and regional infrastructure level do we take in when valuing the per capita GDP growth disparity? Developing *absolute β convergence*, Barro and Sala-i-Martin (Barro & Sala-i-Martin, 1990, 1992) add economic influence factors – the *conditional β convergence* model is constructed.

Most researchers apply 'per capita income' as a dependent variable, but some others employ 'per capita output'. As common sense, the value of 'per capita income' is less than 'per capita output' in certain areas at same times. The superior point of choosing 'per capita income' is that it mirrors the reality of the living level. But a coin has two sides. More invisible influences, like social welfare, facilities, as well as government consumption, etc., impact on 'per capita income'. To simplify the model and to keep with the research objectives in the dissertation, 'per capita output' is employed as the dependent variable of this chapter.

The process of economic growth depends on the shape of the production function. To set a model of β conditional convergence, the author initially considers the neoclassical production function with the assumption that the output Y is determined by capital K, labor force L, and the technology level A, namely,

$$Y(t) = K(t)^{\alpha}\left[A(t)L(t)\right]^{1-\alpha} \quad , \quad 0 < \alpha < 1 \tag{3.5}$$

Suppose both the labor force level L and technology A are exogenous variables with the growth rate of n and g:

$$L(t) = L(0)\, e^{nt}$$
$$A(t) = A(0)\, e^{gt} \Pi_{j=1}^{N} R_j^{\gamma_j} \tag{3.6}$$

Here, R_j represents the alternative influences, such as the degree of economic openness, the change of industrial structures, or some policy variables, etc. γ_j represents the elasticity coefficients of technology level.

The effective per capita output and effective per capita capital are defined as follows:

$$\hat{y}(t) = \frac{Y(t)}{A(t)L(t)} \quad , \quad \hat{k}(t) = \frac{K(t)}{A(t)L(t)} \tag{3.7}$$

Then Equation 3.5 can be simplified as:

$$\hat{y}(t) = \left(\frac{K(t)}{A(t)L(t)} \right)^{\alpha} = \left(\hat{k}(t) \right)^{\alpha} \tag{3.8}$$

We know from the core equation of the Solow-Swan Model:

$$\dot{\hat{k}}(t) = s\left(\hat{k}(t) \right)^{\alpha} - (n + g + \delta)\hat{k}(t) \tag{3.9}$$

When the effective per capita capital stock is steady, let $\dot{\hat{k}}(t) = 0$, then the stable effective per capita capital $\hat{k}^*$ should be:

$$\hat{k}^* = \left(\frac{s}{n + g + \delta} \right)^{\frac{1}{1-\alpha}} \tag{3.10}$$

Putting (3.10) into (3.8), we can get the effective per capita output in a steady situation:

$$\hat{y}^* = \left(\hat{k}^* \right)^{\alpha} = \left(\frac{s}{n + g + \delta} \right)^{\frac{\alpha}{1-\alpha}} \tag{3.11}$$

Now we analyze how fast the actual effective per capita output $\hat{y}(t)$ will converge to its steady effective per capita output $\hat{y}^*$. Suppose $\hat{y}(t)$ is fluctuating around $\hat{y}^*$. Using Equation 3.8 and Equation 3.11, we can get the convergence

equation as follows:

$$\frac{d(\ln \hat{y}(t))}{dt} = \lambda\left[\ln \hat{y}^* - \ln \hat{y}(t)\right] \tag{3.12}$$

$d(\ln \hat{y}(t))/dt$ is the effective growth rate of per capita output, and $\lambda = (n+g+\delta)(1-\alpha)$ is the convergence coefficient. According to this equation, we can easily find that for a given economic steady state, which is stable and under equilibrium point, λ is positive. The current level is farther from the equilibrium, when the coefficient is larger and the local growth is faster, and vice versa.

The solution of Equation 3.12 is:

$$\ln \hat{y}(t) - \ln \hat{y}(t_0) = \left(1-e^{-\lambda\tau}\right)\left(\ln \hat{y}^* - \ln \hat{y}(t_0)\right) \tag{3.13}$$

$\hat{y}(t_0)$ is the initial point of per capita output $\tau = t - t_0$. τ is the duration of convergence, for example, if $e^{-\lambda\tau} = 1/2$, the change from $\hat{y}(t_0)$ to $\hat{y}(t)$ only takes half the time of the change from $\hat{y}(t_0)$ to $\hat{y}^*$; if the coefficient $\lambda = 0.05$, then $\tau = \ln 2/0.05 \approx 14$, namely it takes 14 periods to converge.

Putting Equation 3.11 into Equation 3.13, we can get:

$$\ln \hat{y}(t) - \ln \hat{y}(t_0) = \left(1-e^{-\lambda\tau}\right)\left[\left(\frac{\alpha}{1-\alpha}\right)\ln \frac{s}{n+g+\delta} - \ln \hat{y}(t_0)\right] \tag{3.14}$$

Putting Equation 3.6 into Equation 3.7, we can get:

$$\ln \hat{y}(t) = \ln\left(\frac{Y(t)}{A(t)L(t)}\right) = \ln\left(\frac{Y(t)}{L(t)}\right) - \ln A(t) = \ln y(t) - A(0) - gt - \sum_{j=1}^{N}\gamma_j \ln R_j \tag{3.15}$$

Then putting Equation 3.15 into Equation 3.14 and tidying the equation, we can get:

$$\begin{aligned}\ln \frac{y(t)}{y(t_0)} = &-\left(1-e^{-\lambda\tau}\right)\ln y(t_0) + \left(1-e^{-\lambda\tau}\right)\left(\frac{\alpha}{1-\alpha}\right)\ln s - \left(1-e^{-\lambda\tau}\right)\left(\frac{\alpha}{1-\alpha}\right)\ln(n+g+\delta) \\ &+ \left(1-e^{-\lambda\tau}\right)\ln A(0) + g(t-e^{-\lambda\tau}t_0) + \left(1-e^{-\lambda\tau}\right)\sum_{j=1}^{N}\gamma_j \ln R_j\end{aligned} \tag{3.16}$$

In Equation 3.16, hold $(1-e^{-\lambda\tau})\ln A(0)$ as a time-invariable individual difference, replace with u_i, hold $g(t-e^{-\lambda\tau}t_0)$ as an individual-invariable time effect, replace with v_t, and define the following parameters:

$$\beta_1 = -(1-e^{-\lambda\tau}) \ , \quad \beta_2 = (1-e^{-\lambda\tau})\left(\frac{\alpha}{1-\alpha}\right) \ , \quad \beta_3 = -(1-e^{-\lambda\tau})\left(\frac{\alpha}{1-\alpha}\right) \qquad (3.17)$$
$$\beta_{j+3} = (1-e^{-\lambda\tau})\gamma_j \qquad j = 1, 2, \cdots, N$$

According to Equation 3.16, the conditional convergence panel data model can be set as:

$$\ln(y_{it} / y_{i,t_0}) = u_i + v_t + \beta_1 \ln y_{i,t_0} + \beta_2 \ln s_{it} + \beta_3 \ln(n+g+\delta)_{it} + \sum_{j=1}^{N} \beta_{j+3} \ln R_{jit} + \varepsilon_{it} \qquad (3.18)$$

Here, i represents areas, t represents time, ε_{it} is zero mean and homoscedasticity random error term, y_{it} is per capita output in each area, and R_{jit} are other influence factors of economic growth, except for the capital saving ratio S_{it}, the labor force growth rate n, the technology advancement rate g, and the depreciation rate δ.

The perpetual inventory of Goldsmith (1951) is a widespread method of capital stock calculation. As never has China seen a nationwide general investigation on capital stock, this thesis adopts the perpetual inventory method, but is based on the basis year of 1952 (Zhang, 2008). But Zhang's work ends the calculation of capital stock in 2004, so that the author adopts his method and extends the capital stock to 2008. The equation should be:

$$K_{i,t} = K_{i,t\text{-}1}(1 - D_{i,t}) + I_{i,t} \qquad (3.19)$$

Here, i represents provinces, and t represents objective years; therefore, $K_{i,t}$ represents the capital stock in a certain province, and $K_{i,t\text{-}1}$ is a certain province's capital stock in the previous period. $I_{i,t}$ represents new investment in the objective year, and $D_{i,t}$ represents the depreciation rate of the objective year.

Being different from the Equation 3.4, new variables are added to Equation 3.18. R_{jit} is a group of control variables. Equation 3.18 discusses whether regions converge when the convergence speed is not only limited in initial and end per capital income, but also is impacted by other factors. Therefore, conditional convergence is a development of absolute convergence, due to taking control variables into consideration. Researchers (Barro & Sala-i-Martin, 1992; Mankiw, Romer, & Weil, 1992; Liu, 2001) apply various kinds of control variables to measure the conditional convergence model.

As we discussed, if the β coefficient of $y_{i,to}$ is negative, the convergence exists. Otherwise the regional economic growth diverges.

Hypothesis 3.3.1*: The coefficient of $y_{i,to}$ can be either negative or positive. If the coefficient of $y_{i,to}$ is negative, the β conditional convergence exists. If the coefficient of $y_{i,to}$ is positive, the β conditional convergence does not exist. In other words, the economic growth trend among regions is divergent. The absolute value of coefficient $y_{i,to}$ represents a convergent (or divergent) degree – the larger the absolute value, the faster the convergent (or divergent) trends.*

According to Equation 3.17, with $0<\alpha<1$ and as a presetting condition, if the coefficient of $y_{i,to}$, namely β_1, is negative, β_2 will be positive, and β_3 will be negative. Otherwise, if the coefficient of $y_{i,to}$, namely β_1, is positive, β_2 will be negative, and β_3 will be positive.

Hypothesis 3.3.2*: The coefficients of $ln(S_{it})$ should be opposite to the coefficient of $y_{i,to}$, and the coefficient of $ln[(n+g+\delta)_{it}]$ should be the same to the coefficient of $y_{i,to}$.*

Former researches have empirically provided several influences of the productive factors. For example, reforms and openness, infrastructure, and local endowment account for significant provinicial economic performance differences.

In addition, transport facilities are a key differentiation factor in explaining the regional growth disparity (Démurger, 2001). Evidences also show that higher initial schooling and improvements in terms of trade enhance the economic growth rate (Barro, 1996), and great amount inputs of infrustructure and labor force push the rapid growth of China and other Asian newly industrialized economies (Yao & Zhang, 2003). Inheriting and improving on previous studies, especially the researches on the Chinese situation, this thesis mainly applies the following control variables: financial development, industry structure effects, education level, infrastructure development level, and openness degree. According to equation deducing processes and previous researches, the signs of these control variables are demonstrated in Table 3.3.

3.4 Data descriptions and variable definitions

Based on previous researches, the author uses the neoclassical growth model as a framework, applying the experience and suggestion of the N. Gregory Mankiw, Divid Romer and David N. Weil model (MRW in short) (Mankiw, Romer, & Weil, 1992) and Solow model (Solow, 1956) to set an empirical model for Chinese national economic growth β convergence analysis of different political phases. Advancing from previous researches, panel data rather than pool data is used in regressions. Based on Equation 3.18 and inheriting the geographic segmentation method from Chapter 1, three regions are set as cross-sections, and the provinces within each region are the dimensions. Here we use data from *A Sixty Years Statistical Compendium for New China* and *China Year book*. As Chong Qing was separated from Si Chuan Province as a municipality in 1997, we still count the date of Chong Qing and Si Chuan as one unit in empirical analysis. After cancelling the samples of Zhe Jiang, Hai Nan and Tibet Provinces, which are serious data omitted in the past-1978 phase, we get 3 cross-sectional groups (the East, the Middle, and the West), each of which has 9 identifiers. The evidence is

not only limited in the post-reform period since 1978, but is also expanded to 1952. The factors of economic growth are prudently selected as well.

Generally, the choice of a fixed-effects model or random-effects model should be discussed through a Hausman test to verify our choice at first. Wooldrige (2003) points out that if the individual differences are unobservable, it is better to choose the fixed-effects model. And we have just 3 cross sections, but 11 coefficients need to be estimated, random-effects estimation requires the number of cross sections to be larger than the number of coefficients. So we have to choose the fixed-effect model.

Table 3.3: Variable Definitions and Explanations of β conditional convergence

Variables	Definitions	Formula	Sign	Explanations
$ln(y_{i,t}/y_{i,t0})$	Economic Growth Speed	*ln*[Subsequent Per Capita GDP/ Initial Per Capita GDP]		(Dependent variable)
$ln(y_{i,t0})$	Initial Per Capital GDP	*ln*[Initial Per Capita GDP]	-/+	Convergence / Divergence coefficient
$ln(S_{it})$	Capital Stock Rate	*ln*[Capital Stock/ GDP]	+	
$ln[(n+g+\delta)_{it}]$	Labor Force Growth Rate: n Technology Growth Rate: g Deprecation Rate: δ	*ln*[(n+0.5) / GDP] n= (Total Number of Employed Persons – Last Year Total Number of Employed Persons)/ Last Year Total Number of Employed Persons	-	The scholars usually (Mankiw, Romer, & Weil, 1992; Sakamoto & Islam, 2008) set the sum of technological growth rate g and depreciation rate δ as a constant, 0.05.
$ln(Fin_{it})$	Banking Industry Scale	*ln*[(Deposit + Loan)/ GDP]	+	
$ln(IS_{it})$	Industry Structure	*ln*[(Output of Secondary Industry and Tertiary Industry) / GDP]	+	
$ln(EI_{it})$	Schooling Rate	*ln*[(Student Number of High School and Secondary School)/ Population]	+	
$ln(BI_{it})$	Transport Facilities	*ln*[(In Operation Length of Railways and Highways / Population]	+	
$ln(EX_{it})$	Openness Degree	*ln*[Total Imports and Exports/ GDP]	+	

3.5 Empirical results of convergences

3.5.1 δ^2 convergence

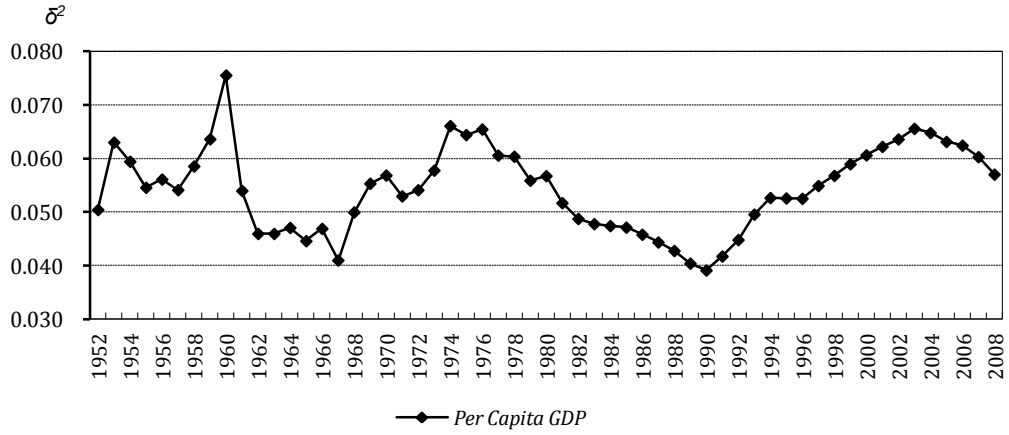
According to Equation 3.1, the annual δ^2 values are shown in Table 3.4:

Table 3.4: Per Capita GDP δ^2 Convergence (1952-2008)

Year	Per capita GDP	Year	Per capita GDP	Year	Per capita GDP
1952	0.0504	1971	0.0530	1990	0.0391
1953	0.0630	1972	0.0541	1991	0.0417
1954	0.0594	1973	0.0578	1992	0.0448
1955	0.0546	1974	0.0661	1993	0.0496
1956	0.0561	1975	0.0644	1994	0.0526
1957	0.0541	1976	0.0654	1995	0.0526
1958	0.0585	1977	0.0606	1996	0.0525
1959	0.0636	1978	0.0604	1997	0.0549
1960	0.0755	1979	0.0559	1998	0.0568
1961	0.0540	1980	0.0567	1999	0.0589
1962	0.0460	1981	0.0517	2000	0.0606
1963	0.0460	1982	0.0487	2001	0.0622
1964	0.0471	1983	0.0478	2002	0.0636
1965	0.0446	1984	0.0474	2003	0.0656
1966	0.0469	1985	0.0471	2004	0.0648
1967	0.0410	1986	0.0458	2005	0.0631
1968	0.0500	1987	0.0444	2006	0.0624
1969	0.0553	1988	0.0428	2007	0.0603
1970	0.0568	1989	0.0404	2008	0.0570

Sources: *A Sixty Years Statistical Compendium for New China* and *China Year Book.*

And to observe the whole δ^2 convergence or divergence trends of Chinese economic growth more clearly, a fifty-seven-year long-run line diagram is charted as Figure 3.2:



Sources: *A Sixty Years Statistical Compendium for New China* and *China Year Book.*

Figure 3.2: Trend of Per Capita GDP δ^2 Convergence (1952-2008)

From Figure 3.2 we find that the δ^2 value of provincial per capita GDP is wave-shaped in the long term. Therefore, it is difficult to assert whether the long-run δ^2 convergence tendency is convergent or divergent by the curve shape. However, backtracking the definition of δ^2 convergence, in other words, judging the δ^2 convergence only by the δ^2 values of the starting point and the end points, the per capita GDP δ^2 trend of the whole sample is divergent, because the δ^2 coefficient value of the end point is 0.0570 in 2008, which is a little higher than the starting point value of 0.0504 in 1952. That is to say, long-term δ^2 convergence of provincial level per capita GDP from 1952 to 2008 does not exist.

However, the periods of δ^2 coefficients value less than those of 1952 appear more than occasional frequencies, for example, from 1962 to 1968, and from 1982 to 1993 (see Table 3.4). And a maximal value of 0.0755 is obtained in 1960, whereas a minimum value of 0.0391 emerged in 1990. Therefore, only consentrating on the whether the long-term δ^2 convergence of Chinese economic growth exist among provinces is an incomplete result. More details and

fragmented periods need to be investigated.

Observing Figure 3.2 by segments, the trend of provincial per capita GDP δ^2 values is characterized by unsteadiness and irregularity in the pre-reform period of 1952-1977, with relatively large annual fluctuations. In contrast, the δ^2 value trend in the post-reform period of 1978-2008 has distinctive line. Spotting the δ^2 values in particular policy time points of 1952, 1978, 1994, and 2008[17], the results of whether the Chinese economic growth δ^2 convergence exists or not in particular reform phases gains. To be viewed clearly, the selected critical results of δ^2 convergence are concluded as the following table:

Table 3.5: Selected Critical Results of δ^2 Convergence

Period	Historical Event	Starting	Ending	Result
1952-2008	Whole Sample Period	0.0504	0.0570	Divergence
1952-1978	Pre-Reform Period	0.0504	0.0604	Divergence
1978-2008	Post-Reform Period	0.0604	0.0570	Convergence
1978-1994	First Phase of Post-Reform	0.0604	0.0526	Convergence
1994-2008	Post-Financial-Reform	0.0526	0.0570	Divergence
2002-2008	Post-WTO	0.0636	0.0575	Convergence

3.5.2 *HHI-TEC* analyses

From Table 3.5 we get a simple result in which the divergent Chinese economic growth periods are more frequent and longer than the convergent ones. The results of transfer effects among provinces were only illustrated as convergence or divergence. And only three special political periods (from 1978 to

[17] Year 1978 is regarded as the beginning of Chinese economic reform and openness, and year 1994 is regarded as the beginning of Chinese financial system reform and openness (See subtitle 1.3.1).

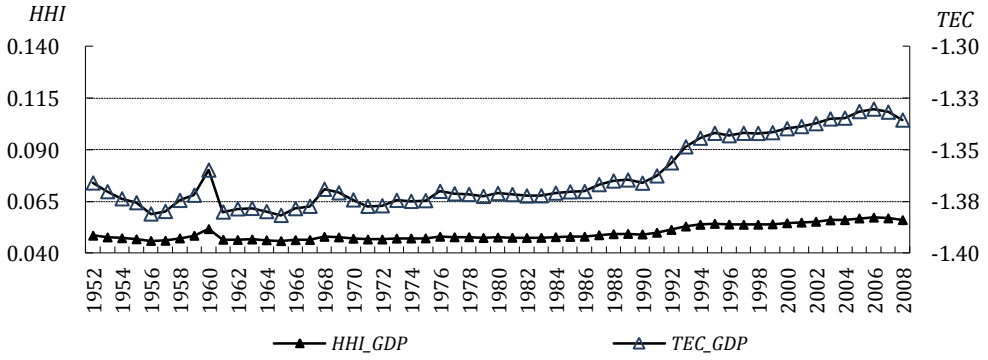
1994, from 1978 to 2008, and from 2002 to 2008) have δ^2 convergence results. Although the δ^2 convergence indicator describes the result of transfer effects, it cannot distinguish whether the convergent results are contributed by the transfer effects flow within the more developed regions or within the less developed regions, or from the more developed regions to less developed ones. The indicator comprising the *HHI* and *TEC* ratio is a better solution to these problems.

From Table 3.5 we get that the whole sample period provinicial economic growth is divergent. Judging their general trends separately, both the *HHI* and *TEC* trends are ascending during long term (1952-2008), although the shape of *HHI* is not as clear as *TEC* (See Figure 3.3).

In terms of time phase comparison, the shapes of lines is relatively gentle during the period of 1960 to 1990. In other words, the divergence aggravates from 1990. Obviously, the transfer effect of 'concentrating to rich ones' strengthens in the post-1990 period. The major policy change in this phase is that China turns its main strength to speed up financial system reform.

By comparing the *HHI* and *TEC* results of provinicial per capita GDP in Figure 3.3, the *TEC* trend increases while *HHI* trend stands still in the post-financial peridod (1994-2008). According to hypothesis 3.2.2, the outward 'transfer effect flow' is mainly from the bottom poor provinces, rather than from the not-so-poor provinces (relatively larger per capita GDP individuals). In other words, the sharpening curve of *TEC* in the post-financial-reform period (1994-2008) means a concentration degree increase mainly from the bottom poor provinces to the top rich provinces. The transfer effect from the poorest provinces to the richest regions induces regional gaps enlarging in the post-financial-reform period. This is an empirical explansion of that the gap between the West region and the East region enlarged more than the gap between the Middle region and the East region (See Table 3.1). If this transfer trend continues, the poor provinces are getting poorer and the rich ones are becoming richer, which is kind of like the

'Matthew effect'. Achieving the target of 'national common persperity' will be farther away.



Sources: *A Sixty Years Statistical Compendium for New China* and *China Year Book.*

Figure 3.3: Regional Concentration Ratio trends (*HHI* and *TEC*) of GDP (1952-2008)

3.5.3 β convergence

The regression results of Equation 3.18 are shown as Table 3.6. All the coefficients of $y_{i,t0}$ are negative, which means that the conditional β convergence exists in the long term (1952-2008), the post-reform term (1978-2008), and the post-financial-reform term (1994-2008). The absolute coefficient value of the post-reform term (1978-2008) is larger than 1 and is the largest to all coefficients of $y_{i,t0}$. We can infer that the economic reform accelerates regional economic growth convergent speed. However, the coefficient of the post-financial-reform term (1994-2008) is -0.470 (ignoring the import-export effect), the abusolute value of which is less than that of the whole sample period (0.911). All these coefficients are significant at a 1% level. The evidence denotes that the post-financial-reform period slows down convergent speed.

The coefficients of $ln(S_{it})$, $ln(FL_{it})$, $ln(IS_{it})$, and $ln(BI_{it})$ show positive results, which coincides with our pre-experience. Increasing the capital stock rate, scale of banking industry deposit and loan, output percentage of secondary industry and tertiary industry, and transport facilities stimulates regional economic growth. But the coefficient of $ln[(n+g+\delta)_{it}]$ is significantly positive during 1994-2008, which is opposite to the pre-experience. The hypothesis of Equation 3.18 is 'suppose the saving rate is under stable'. However, the ratio of *K/L* is not stable since post-1990s (see Figure 2.12). Therefore, the effective per capita capital stock cannot be stable in decades. The coefficient of $ln(EI_{it})$ is significantly negative in the phase 1978-2008, and even insignificant during 1994-2008, but it is significantly positive in the long-run period (1952-2008). Therefore, we can not deny the positive effect of education in long-term. According to other researches, it is the 'initial schooling rate' that improves economic growth (Barro, 1996). Lagging effect is a major character of education. On the one hand, ten years of the Cultural Revolution just before the Reform and Openness had a lagging negative effect on economic growth. On the other hand, this dissertation adopts 'annual schooling rate of high school and secondary school'. It takes several years before these students turn into qualified labor force. What's more, the less educated people who experienced the Cultural Revolution are still the major labor force in economic growth. Therefore, this impact lasts and influences not only the beginning of post-reform period (1978-1993), but also the recent period (1994-2008). That is to say, the results of schooling rate of high school and secondary school is logical. The effects of openness are added in the periods of 1978-2008 and 1994-2008. But the coefficient of $ln(EX_{it})$ is insignificant.

Table 3.6: Empirical Results of Conditional β Convergence

Independent variables $ln(y_{it0}/y_{it})$					
Explanatory variables	**1952～2008**	**1978～2008**	**1978～2008**	**1994～2008**	**1994～2008**
$ln(y_{it0})$	-0.911*** (-14.913)	-1.215*** (-17.735)	-1.246*** (-16.932)	-0.470*** (-5.478)	-0.436*** (-4.493)
$ln(S_{it})$	1.032*** (17.452)	1.187*** (11.984)	1.173*** (11.741)	0.567*** (4.964)	0.614*** (5.210)
$ln[(n+g+\delta)_{it}]$	-0.288*** (-4.692)	-0.314*** (-4.221)	-0.314*** (-4.217)	0.223*** (3.766)	0.216*** (3.647)
$ln(Fin_{it})$	0.103*** (6.696)	0.083*** (5.248)	0.080*** (5.078)	0.061*** (4.177)	0.062*** (4.289)
$ln(IS_{it})$	1.164*** (7.209)	5.811*** (18.380)	5.861*** (18.374)	2.309*** (5.178)	2.213*** (4.926)
$ln(EI_{it})$	0.260*** (8.462)	-0.103*** (-2.699)	-0.104*** (-0.928)	0.001 (0.031)	0.008 (0.179)
$ln(BI_{it})$	0.279*** (5.856)	0.035 (0.592)	0.036 (0.620)	0.296*** (5.747)	0.289*** (5.584)
$ln(EX_{it})$			0.007 (0.497)		-0.025 (-1.579)
Observes	1539	837	837	405	405
R^2	0.632	0.709	0.709	0.498	0.501
Adjusted R^2	0.629	0.705	0.705	0.487	0.489
F-test	291.146***	223.343***	201.229***	43.553***	39.595***

Sources: *A Sixty Years Statistical Compendium for New China* and *China Year Book.*

Note: *represents significance value less than 0.1, **represents significance value less than 0.05, and ***represents significance value less than 0.01.

3.6 Results

Using both δ convergence methodologies of provincial level data and β convergence methodology of regional level panel data, this chapter strives to verify the outcome of economic system reform and financial system reform. Whether the reforms have achieved the initial slogan of 'common prosperity of the entire population' and 'constructing a harmonious society' is the chief objective of this chapter. The evidence comprehensively displays regional economic growth convergence (or divergence inversely) and influence factors.

Being different from former literatures, panel data rather than cross-sectional data is a creative point of conditional β convergence approach.

Three regions (the East region, the Middle, and the West region) are set as cross sections, and provinces within each region are treated as dimensions. What's more, the evidence is not only limited in the post-reform period since 1978, but has also expanded to the beginning of the establishment of People's Republic of China in 1952. δ convergence and β convergence methodologies provide crossover work of convergence analyses.

According to δ^2 convergence results, the long-term (1952-2008) provincial economic growth is weakly divergent in China with lots of fluctuations, but the post-reform period (1978-2008) provincial economic growth is δ^2 convergent. The convergence situation of the post-reform (1978-2008) is clearly displayed as three phases according to δ^2 convergence trends. The δ^2 convergence exists in the first phase of post-reform (1978-1994) and in post-WTO period (2002-2008). But during 1994 to 2001, the provincial level per capita GDP growth shows divergence.

Viewing from Table 3.7, the Chinese regional convergence (or divergence) co-proves by δ^2 convergence and β convergence. The provincial level economic growth is δ^2 divergent in the long-term (1952-2008) and in the post-financial-reform period (1994-2008). Although the provincial level δ^2 convergence in the post-reform period (1978-2008) is weak (See Table 3.5), the regional level β convergence is robust and significant (See Table 3.6).

Table 3.7: Comparisons of δ^2 Convergence and β Convergence Results

Periods	δ^2 convergence	β convergence
1952-2008	Divergence	Convergence
1978-2008	Convergence	Convergence
1994-2008	Divergence	Convergence

According to β convergence results, all the sample periods show

significantly convergent trends of different degrees. The absolute value of β convergence coefficient is larger than 1 in the post-reform period (1978-2008), is 0.911 in the long-term (1952-2008), and is 0.470 in the post-financial-reform period (1994-2008) (ignoring the import-export effect). All these coefficients are significant at a 1% level. Evidence comes out that the β convergent degree of the post-reform period (1978-2008) is the strongest, and that of the post-financial-reform term (1994-2008) is the weakest, even weaker than the long-term (1952-2008). In other words, the Open and Reform enhances the regional level convergence, and thereby coincides with the initial political slogan of 'achieve national common prosperity'. In contrast, the financial system reform slows down convergent speed.

What's more, the evidence that the *HHI* and *TEC* is relatively gentle before the 1990s but steepen since the post-1990 period supports the results denoted by other methodologies that the financial reform has changed the convergent trend since the Reform and Openness. In addition, the sharper increasing trend of *TEC* than *HHI* in the post-financial peridod (1994 to 2008) infers that the 'transfer effect outflow' is mainly from the bottom of poor provinces rather than those not-so-poor (or less rich) provinces.

The determinants help to understand the situation that the Open and Reform policy enhances the regional level convergence, but the financial system reform slows down convergent speed. Increasing the capital stock rate, the scale of banking industry deposit and loan, the percentage of secondary industry and the tertiary industry, and the transport facilities significantly stimulates regional economic growth. Ten years of the Cultural Revolution just before the Reform and Openness has a lagging negative effect on economic growth. And this impact lasts and influences the significance of the recent period (1994-2008). The core influence factor of financial development will be discussed in the following chapters from different aspects as well as other determinants of education level, openness, and infrastructure development.

Chapter Four

Economic and Financial Determinations of Foreign Capital Distribution in China

4.1 Introduction

Cross-border investment is one of the most universal and salient features of the global economy in the present day. It is commonly shown in the literatures that inflow of FDI is one of the most important channels, which accelerates and enhances the economic growth of FDI receipt countries. The issues revolving around FDI and local economic growth of the receipt country or region within one country or across countries have been long under debate globally since the last century. Where or which industry has the highest return rate is the question of greatest concern to the international investors. But to the academic scholars and to the policy makers of receipt countries, what advantages have been brought with FDI utilization or multinational corporations (MNCs[18]), and how to attract more continuous foreign capital are the core subjects.

[18] The multinational enterprise (MNE) is considered a major and effective form of FDI. Caves defines it as an enterprise that controls and manages production establishments – plants – located in at least two countries (Caves, 2007). Foreign direct investment (FDI) is conducted by multinational corporations (MNCs), which are generically defined to include all firms with operations (production, sales or services) in more than the economy (Ramstetter, 2010b).

Earlier literatures of FDI distribution determinants revolve around the relationship between the multinational enterprise (MNE) activities and the real-world economic growth trends (Caves, 2007). The research aspects and methodologies of FDI distribution determinants vary according to different research goals. One research stream asserts that the escalating competition degree in host countries makes the enterprise search for an overseas market, for example, labor force cost inflation, technology updating and innovation, and skill spillover (Blomström, Kokko, & Zejan, 1994; Buckley, Clegg, & Wang, 2007; Liang, 2007; Qi et al., 2009); a second stream asserts that a favorable economic policy and investment environment in the receipt countries, like preferential tax or duty, profitable exchange rate, lower wage rate, higher productivity, and export background, attracts FDI (Hutchinson, 2008).

This thesis adopts the second view of distribution determination of the foreign capital receipt side for the research objective of how the foreign capital is distributed among Chinese regions. The author creatively applies a concept of 'aggregate foreign capital utilization' instead of FDI in regression. FDI represents the foreign direct investment in a certain area, including the realized capital and the amount still on the contract. Being different from FDI, 'aggregate foreign capital utilization' only consists of the utilized amount of foreign capital, which is a more accurate criterion in foreign capital investment. And the utilization of foreign capital in China will be categorized by two major statistical criteria in this thesis: foreign capital utilization in various economic industries, and foreign capital invested in the financial industry in the form of foreign bank institution assets. By examining the determinants of foreign capital utilization in the entire Chinese industry and Chinese banking industry, a better understanding of foreign capital distribution in China is obtained. Least Squares (LS) and Instrument Variables (IV) are employed separately in each case.

With significantly exogenous results of the Davidson-MacKinnon test of the instrument variables, the independent variables of 'Public Stock Market Scale', 'Fixed Assets Investment', 'Education level', as well as the

geographical dummy variables of both 'East' and 'Middle' are found to have a significantly positive effect on the dependent variable of 'Aggregate Foreign Capital Utilization' in China. As a crucial financing approach in China, the business scale variable of the banking industry, which is defined as 'Loans and Deposit Scale' in this chapter, shows an insignificant effect on 'Aggregate Foreign Capital Utilization' in both LS and IV models. But the business efficiency variable 'NPL Ratio' illustrates a significant influence on it, in spite of at 10% significant level. On the other hand, all the financial variables show a significantly positive impact on 'Foreign Bank Institution Assets' in different models.

A pluralistic, developed financial institution with an underdeveloped banking system (large scale but low efficiency) attracts foreign rivals in the banking industry. But majority proportions of foreign capital were injected in the real economic industry by the attraction of local infrastructure development and education level upgrading. The whole financing industry plays a relatively inferior but important role in foreign capital attraction.

4.2 Review of previous FDI studies and foreign capital utilization in China

4.2.1 Foreign capital utilization in Chinese economic growth

Some FDI researches show that the trend correlations between cumulative FDI-GDP ratios and economic growth were common among FDI receipt countries in 1996-2000 as well as both FDI receipt countries and host countries in 2007-2009 (Ramstetter, 2010a). Regarding China, since the mid-1980s, Chinese GDP growth performance has averaged around an annual 9.3% GDP growth rate, and even reached 9.0%[19] in the cold season of the world economic market in 2009, according to official data. It cannot be exempt from the

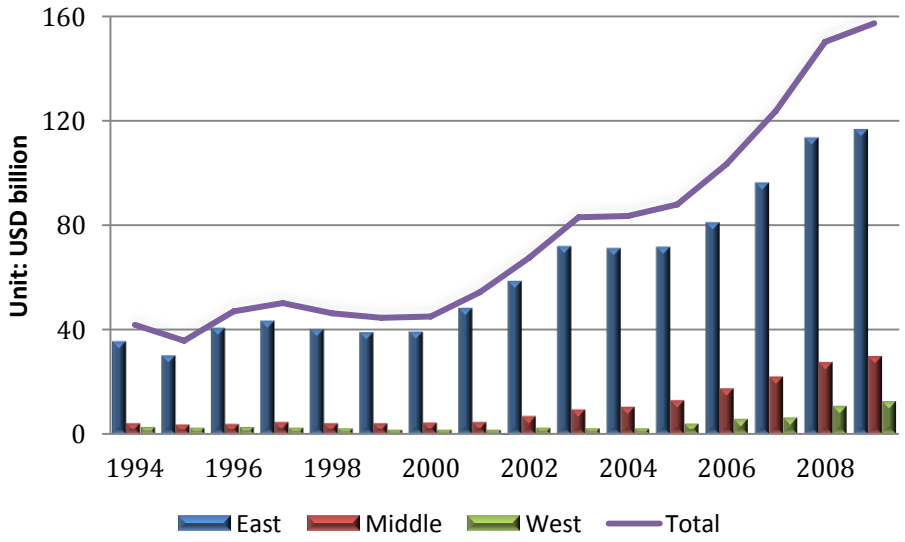
[19] Chinese government adjusted its GDP data based on a national survey conducted in 2010.

ordinary rules of foreign investment, which has given rise to plenty of causality and determinant studies. Whether this growth performance is sustainable over the next several decades, and how we assess the contribution of inward FDI to China, has also been actively debated both inside and outside China. The main questions about China are as follows:

Does Chinese growth depend on inward FDI? The evidence affirms the answer. Many scholars believe that foreign capital has played a largely positive role in China's economic development during the past 30 years. The current paradigm of globalization even aggravates a worldwide chain reaction when economic fluctuations take place within China, because the rapid genesis parvenu, even to some common-sense extent, is linked to international economic cooperation and division. How much of the Chinese growth is from the contribution of MNCs or FDI? They argue that FDI generates more benefits than simply solving the capital shortage problem. Rather it also provides better access to advanced technologies for the local economy (Ge & Chen, 2008; Fung et al., 2009; Whalley & Xin, 2010). Indirect productivity gain through spillover is another invisible advantage derived from FDI. Employing the two-input (labor and capital) Malmquist Total Factor Productivity (MTFP) method, researchers (Qi et al., 2009) set up DEA models to analyze productivity differences of Chinese enterprises with and without foreign investors. The result confirms substantial productivity differences among provinces. And FDI is a significant explanatory variable in some provinces. The foreign invested enterprises (FIEs) and joint venture enterprises have accounted for over 50% of China's exports and 60% of China's imports, and contributed over 40% of China's economic growth in 2003 and 2004. The evidence of a Two-stage Growth Accounting Decomposition (TGAD) approach indicates that without this being inward, the Chinese growth rate may have been around 3.4 percentage points lower since the early 1990s (Whalley & Xin, 2010).

The large quantity of FDI attraction and utilization in China can be traced back to the 1980s. Chinese economic reform processes promote FDI inflows

(Fung, Iizaka, & Tong, 2002). As a country in transition, China has become the largest recipient of foreign capital. Are there any level differences of FDI and economic growth among provinces or regions? Extremely unbalanced regional distribution of foreign capital utilization can be seen in Figure 4.1. From 1993 to 2005, the eastern region had about 85 percent of the FDI in China, peaking in 2000 at almost 92 percent (Li, Hou & Chan, 2008). There are three obvious stages of FDI boom in the past 30 years. The first boom began at the start of the 1990s and was ended by the Asian Financial Crisis that busted out in 1997. With a small margin decreasing in the following two years, the total amount of FDI utilization has rocketed since the new century.



Note: Calculated by *A Sixty Years Statistical Compendium for New China* and *China Year Book*.

Figure 4.1: Total Amount of Foreign Capital Actually Utilized (1994-2009)

What is the crucial determination of regional unbalanced distribution of total foreign capital utilization within China? By employing robust Ordinary Least Squares (OLS), Li et al. (Li, Hou & Chan, 2008) set up a random-effect model and fixed-effect model separately. But rather than employing the national data, only eleven provinces in the eastern region were selected. The

evidence indicates that market size and labor quality had a positive, significant, and quantitatively large effect on FDI in the eastern China during the period of 1993 and 2005. Liu and Li (Liu & Li, 2001) made a regional division between coastal and interior regions, and the empirical evidence shows that the growth of output is positively related to the growth of foreign investment in the coastal regions via the efficiency improvement of capital reallocation and liberalization in both financial and real economy sectors.

Arising from benefits of more than thirty years of openness, special policy and FDI, the eastern coast regions have become the most important destinations for cross-border direct investment. It is also a large part of China's trading activities with the rest of the world. The southeast and the coastal areas are still the dominant market of foreign capital utilization even now (see Figure 4.1), but a slow process of spreading and diffusion of foreign capital investment has been taking place recently. Therefore, the author hopes to find the underlying determinants of foreign capital utilization in China from the empirical results of this study. To develop the research of Li et al., the province samples of this thesis are not limited to the Chinese eastern region. All the provinces with foreign capital investment are taken into comparisons, along with geographical division of the three regions to coincide with the previous chapters.

With regards to financial development measurement, researches have applied various definitions and variables. The most frequently used concepts are the size of financial intermediaries and the relative credit degree of commercial banks. Inheriting these viewpoints, this thesis adopts four financial development variables in two aspects. One sort is the financial scale, and the other is credit efficiency. And the measure variables are different from former researches. One of the previous studies takes the ratio of liquid liabilities of the financial system divided by GDP as the size of financial intermediaries, and applies the ratio of bank credit divided by bank credit plus central bank domestic asset as the relative credit degree. It is obvious here that the financial intermediaries are only limited to the banking industry. However, the major

financing approach in China is still the financial intermediaries, especially the banking industries. Keeping an eye on other financing approaches is a comprehensive view when measuring the financial development. Therefore, in this chapter, three major enterprise domestic financing approaches are taken into consideration: the loans from financing intermediaries, the stock market financing, and other non-financing institution financing. Having been a major financing approach for a long period, financing institutions of an intermediary act more than credit creating. Therefore, roles from both sides of deposit absorbing and loan granting are combined to weight the financial intermediary development. Absolutely, the functions of financial intermediaries, in the representation of commercial banks, are more than these. Besides the scale measurement of financial intermediaries, its credit efficiency measurement is also meaningful. That is the adoption reason of 'NPL ratio'. The second financing approach of enterprises is being publicly listed on the stock market. The Chinese stock exchange market was newly established at the end of the last century[20]. And the locations of these two scant stock exchange markets are Shanghai and Shenzhen, both of which are in the East region according to the region division of this thesis. Although the business volumes and market values of stock exchange markets have soared to an incomparable amount nowadays, finance from the stock exchange market is still scarce to enterprises in bulk. Therefore, the variable of regional number proportions of public listed corporations is indicating the stock exchange market financing approach of local financing development. Credit proportion from non-financial institutions is applied as a financing approach supplement, indicating the financing diversification within one region.

Another difference point in this chapter is that the author replaces the 'credit degree' measurement with the 'credit efficiency', which is NPL ratio. To specify the difference of these two concepts, the 'credit degree' denotes the credit creation by measuring the credit-to-asset ratio, which is another form of financial scale measurement. However, by using 'NPL ratio', the industrial

[20] The Shanghai Stock Exchange was founded on November 26th, 1990 and was in operation on December 19 of the same year. The Shenzhen Stock Exchange was founded on December 1st, 1990.

efficiency is brought into models.

Moreover, besides carrying on the independent variables of market size, labor quantity (reflects as education level in this chapter), and financial development, other control variables like industry structure, infrastructure development, and openness degree, dummy variables of geographical location, and the year dummy are added into regression. A multi-factor economic environment model is set to measure the distribution factors of foreign capital in China.

4.2.2 Foreign bank branches and operational environment changes

In the aspect of openness, the banking industry reform has had an obvious characteristic of 'begin with preferential polity in certain area' and 'progresively impelled'. The proceeding of gradually opening up to foreign bank branches can be summarized in the following three aspects: (I) In terms of institution type, the form of representative office is firstly approved, and then the operational branches; (II) In terms of district, the approval starts from the Special Economic Zone, then the eastern coast region, finally national wide; (III) In terms of business scope, approval is given only to foreign currency transaction at first, then spread to RMB operation.

1979-1982: The Bank of Tokyo-Mitsubishi is the first one to set up its representative office in Beijing. Then totally 31 foreign financial institutions established their representative offices in China during this time.

1982-1985: Foreign financial institutions are experimentally approved to establish their operational branches in the Special Economic Zone (which is in the East region). Busness scope, however, is limited to foreign currency transaction.

1985: The *Management Regulations of the Special Economic Zone of*

Foreign Banks and Joint venture Banks[21] was issued. The legal status of foreign financial operational branches in Special Economic Zones is confirmed by this regulation. This also marks the direction of financial openness in normalization.

1990: Shanghai, which is the first non-Special Economic Zone city, was approved to introduce foreign bank operational branches.

1996: The *Provisional Rules Governing the Conduct of RMB Business by Foreign Financial Institutions in Pudong, Shanghai*[22] was issued.

1997: According to the *Provisional Rules Governing the Conduct of RMB Business by Foreign Financial Institutions in Pudong, Shanghai*, nine qualified foreign financial institutions are approved to operate RMB business in Pudong, Shanghai.

1998: Eight qualified foreign financial institutions are additionally approved to operate RMB business in Pudong, Shanghai.

2000: In total, thirty-two qualified foreign financial institutions are approved to operate RMB business in Pudong, Shanghai by the year-end.

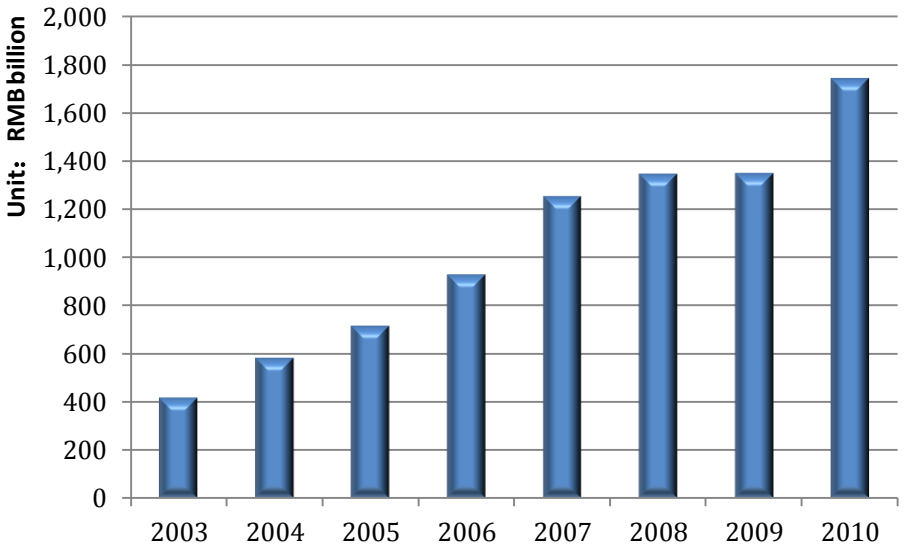
2006: approval of foreign financial institutions operating RMB business is expanded to national scope.

From the beginning of experimental approval of foreign financial institutions to operate RMB business in Shanghai, it took 9 years to reach national wide realization, regardless of the fact that the approval in the Special Economic Zone is 10 years ahead of Shanghai. From the regional gap of foreign capital utilization, a rough idea from of the procedure of banking industry openness can be understood.

The relaxation of banking industry entry restriction in China is one of the promises of being a member of WTO. This transition made by China's banking sector has been one of the most rapid transformations of the country's banking sector in history. The assets of foreign bank branches have increased in the past

[21] Translated from Chinese by the author.
[22] Translated from Chinese by the author.

several years (see Figure 4.2). Data from China Banking Regulatory Commission (CBRC) indicates that at the end of 2003, the total assets for all foreign banking institutions were RMB 0.42 trillion, but tripled to RMB 1.74 trillion, which represented 1.83% of the aggregate total banking assets amount in China by the end of 2010. From Figure 4.2 we can see that the foreign banks' total assets grew steadily between 2003 and 2007, stalled in 2008 and 2009 at the time of the stimulus plan[23], and grew again in 2010. Between 2009 and 2010, the 127 foreign banking institutions operating in China grew their total assets by 29.13%. Overall market share, simultaneously, increased from 1.70% in 2009 to 1.83% in 2010.



Source: *CBRC Annual Report 2010*.

Figure 4.2: Total Assets of all Foreign Bank institutions in China (2003-2010)

[23] In late 2008, to help minimize the effects of the global finance and to stimulate the Chinese economy, the Chinese government announced a RMB 4 trillion stimulus plan. As a result, domestic bank lending grew dramatically at that time. The domestic bank lending prosperity, to a certain extent, suppressed the expansion of foreign banks. But some other reasons are declaimed by scholars and media, for example, *The Economists* has interviewed some executives of foreign banks and counted that the financial crisis tensed the capital chain of parent banks in original countries, which held back the expansion plan in invested countries.

To ensure safe and sound operations of foreign-funded banks and of the banking system at large, the CBRC has encouraged foreign banks with long-term commitment in the Chinese market to be incorporated locally in addition to maintaining local branches, commonly known as the local incorporation policy (LIP)[24].

It is well known that before 2006, foreign bank branches were not approved to manage RMB business in most area, and business scope of foreign bank branches in China was strict. However, the locally incorporated foreign bank (LIFB) branches (in the capital formation of either WFOE or joint venture) are approved to operate RMB business with Chinese citizens. The locally incorporated character of foreign bank institutions is a requirement condition for participating in RMB business competition with domestic banks. Meanwhile, the requirements of minimum capital and the loan-to-deposit ratio of these locally incorporated foreign banks (LIFBs) is stricter than other foreign bank institution statuses (Table 4.1).

[24] *The Regulation of People's Republic of China on the Administration of Foreign-funded Banks*, Nov. 11, 2006, issued by the State Council of the People's Republic of China.

Implement of the Regulations of the People's Republic of China on the Administration of Foreign-funded Banks, Nov. 24, 2006, issued by CBRC.

Both regulations, which signified the removal of all non-prudential restrictions on foreign banks, came into effect on December 11th, 2006. Foreign banks are encouraged to set up locally incorporated subsidiaries or convert their current branches into subsidiaries based on their business strategy in China.

With such policy in place, the CBRC was able to exercise a full authority in handling the assets of a locally incorporated foreign bank when its parent bank suffered from a bankruptcy crisis. This policy is believed to be helpful to home country regulators in fending off the risk contagion from foreign banks' overseas operations, maintaining the stability of the domestic financial system, and protecting the interests of domestic depositors.

Table 4.1: Incorporation Requirements for Foreign Bank Institutions

Requirements	Foreign Bank Branch Office	Locally Incorporated WFOE[25] or Joint Venture Banks
RMB business to Chinese citizens	Subject to CBRC approval, cannot provide RMB business to Chinese citizens except for acceptance of deposits in excess of RMB 1 million	Subject to CBRC approval, can provide RMB business to Chinese citizens
Minimum capital	Minimum operating fund of RMB 200 million	Minimum registered capital of RMB 1 billion in freely convertible currency.
Statutory reserves	Must set aside 30 percent of operating fund for statutory reserves	No requirement
Loan-to-deposit ratio	No restriction	Must be less than 75 percent (however, a grace period to 31 December 2011 is provided)

Source: *Mainland China Banking Survey 2006* by KPMG.

Despite owing to this LIP, which has encouraged foreign banks to establish or transform former representative offices into locally incorporated subsidiaries since 2006, some banks withdraw their assets. But the total number of locally incorporated foreign banks (LIFBs) has grown greatly since the initial batch of incorporations was approved in December 2006. By the end of July 2010, there were 40 LIFBs in China from 14 countries and regions all around the world. These LIFBs accounted for 87% of all foreign banking assets. The advisory institution of PricewaterhorseCoopers believes the number of LIFBs will be raised to 40-50 in 2012[26]. By the same time, 74 banks from 25 countries and regions have established 90 foreign bank branches.

Because of the transforming status or label of foreign bank institutions around 2006, all the foreign branches are unified under the same name of 'foreign bank institutions' in this thesis, which represents all the legally admitted foreign bank institutions in China. Many foreign banks regard

[25] WFOE: Wholly Foreign-owned Enterprises, including Wholly Foreign-owned Banks (WFOB) and Wholly Foreign-owned Companies (WFOC) (see Table 4.2).
[26] Source: *Foreign Banks in China 2010*, PricewaterhouseCoopers HK, June 2011.

competition from domestic banks as their most difficult threat from the Chinese banking industry. Therefore, this thesis estimates the foreign bank institution assets distribution determinations only on the basis of financial institutions.

The distribution determination discussion of foreign bank institution assets is a creative point of this chapter. Foreign bank institution assets are a special kind of foreign capital utilization, which is only inward in the banking industry. The foreign capital utilization being mainly in the real economic industries rather than in the financial sectors. And the foreign bank branches in the Chinese banking industry only having a 2% market share by asset measurement. Owing to a relatively small impact raised by foreign bank institution assets, only considering financing factors is sufficient and more reasonable than applying the variables of an economic environment. Therefore, the influence factor analyses of foreign bank branches only rely on the financing industry and geographical classification.

Table 4.2: Foreign Banking Institutions in China (as of the end of 2010)

Units: Number of banks

Types/Ownership	Foreign banks	Foreign banks			Total
		Wholly foreign-owned banks (WFOB)	Joint-venture banks	Wholly foreign-owned financial companies (WFOC)	
Locally incorporated institutions (LII)		37	2	1	40
LII branches and subsidiaries		223	7		230
Foreign bank branches	90				90
Total	90	260	9	1	360

Source: *CBRC annual report 2010*.

Although the operating restriction rises, and the operating competition aggravates, the foreign banks continue to extend their employment base as they expand their business scope and net work in China (see Table 4.3).

Table 4.3: Foreign Bank Operations in China (2004-2010)

Units: Number of banks, RMB billion, percent

Item/Year	2004	2005	2006	2007	2008	2009	2010
Number of Institutions[a]	188	207	224	274	311	338	360
Foreign Bank Institution Assets	582.3	715.5	927.9	1,252.5	1,344.8	1,349.2	1,742.3
As of the Total Banking Assets	1.84	1.91	2.11	2.38	2.16	1.71	1.85

Note: a. Including headquarters, branches and subsidiaries.

In the 2011 survey of PwC[27], the 42 interviewed banks employ 34,166 people; it only totaled 29,739 in 2009[28]. The group of 42 interviewed banks collectively expects to increase employment by 53% to 52,312 by 2014. As expected, staff turnover, which had dropped in 2009, picked up in 2010, with trends similar to total assets expansion. Finding senior, qualified, and experienced personnel remains a challenge for the entire financial sector, and even more combative for foreign participators.

In many previous empirical studies, labor quality was measured by such criteria as wage rate, experience, and diligence (Li, Hou & Chan, 2008). Education level rather than these variables will be used as a proxy for labor quality. From the author's view, the education level is more adequate than all these factors, since it does not rely on a local base wage rate. And finance is a more knowledge- and technology-requiring industry than others.

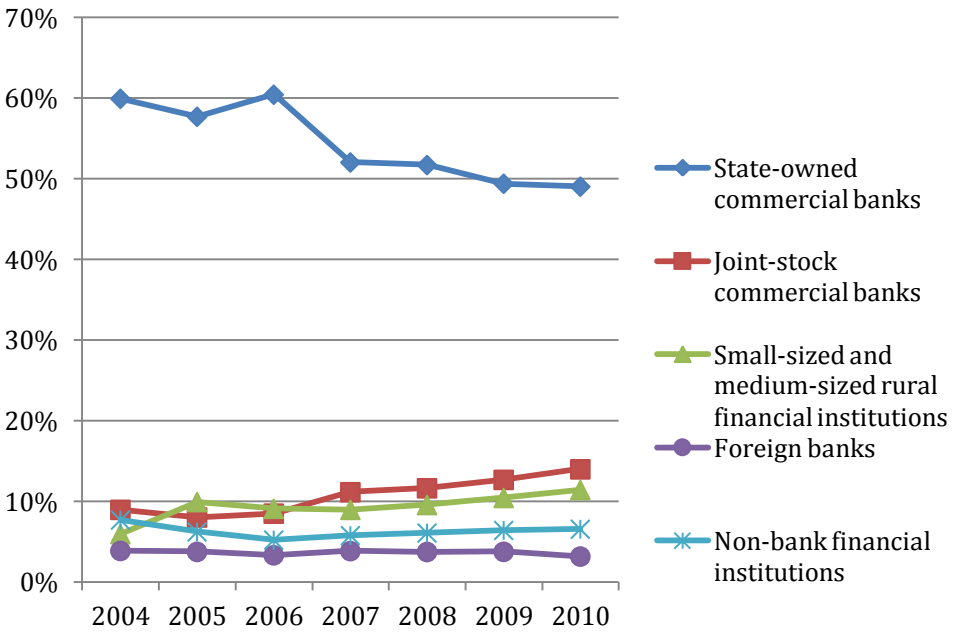
As matters stand, the development of a foreign bank has higher speed and

[27] Source: *Foreign Banks in China*, PricewaterhouseCoopers HK, June 2011.
[28] The pool of survey participants is marginally different, but PwC claimed in the report that this change did not have a significant impact on the overall number of employees.

quality than the banking industry average level. Deposits and loans of foreign banks were RMB 1.06 trillion and RMB 0.91 trillion in 2010, respectively, although the market share of deposits and loans of foreign banks within the banking industry is as less as 1.45% and 0.19%[29], respectively, which is much less than other types of bank institutions (see Figure 4.3). However, the growth rate of foreign bank loans and deposits is 44% and 26.26%, while the loan growth rate of the entire Chinese banking institutions is only 19.65% in the same time period. Concurrently, the liquidity ratio of foreign banks was calculated at 61.49%, but was 43.7% of the whole banking industry and 42.2% of the commercial banks[30]. The NPL ratio of foreign banks at the end of 2010 was 0.53%, which was much lower than 2.4% of the whole banking industry. The capital adequacy ratio (CAR) of foreign banks is 18.98%, and the core-CAR is 18.56%. Meanwhile, the assets weighted industrial average CAR and average core-CAR are 12.2% and 10.1% respectively. Therefore, risk control and risk resistance capability of foreign bank institutions are better than domestic rivals.

[29] Total deposits and loans of banking institutions are RMB 73.34 trillion and RMB 50.92 trillion in 2010, respectively.

[30] Commercial Banks: include large commercial banks, joint-stock commercial banks, city commercial banks, rural commercial banks and foreign banks.

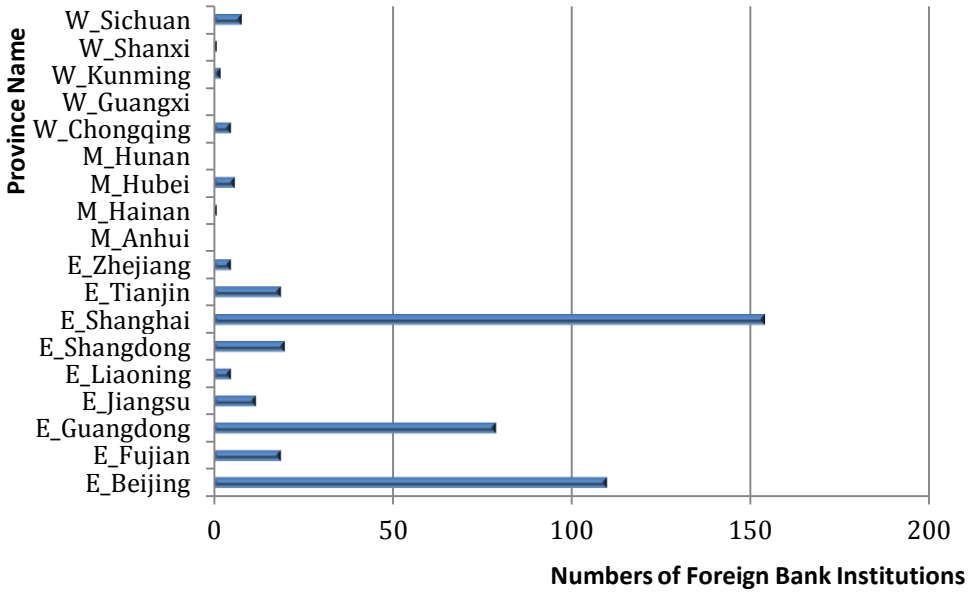


Source: *CBRC Annual Report 2010*.

Figure 4.3: Market Shares (by Total Asset) of Banking Institutions (2004-2010)

Briefly, the foreign bank branches or locally incorporated institutions (LII) could be characterized as smaller market shares by assets, but have faster growth and prudent risk control. Therefore, the study of regional distribution determination of foreign bank institution assets is helpful for covering the vacancy of foreign capital utilization in a special industry of finance, as well as providing consultation for domestic banking institutions and foreign investors who are interested in entering the Chinese banking industry.

Just like the regional disequilibrium existing in the physical production industries, the financial industry also comprises unbalanced development among Chinese provinces (Lin, 2011a, 2011b). The regional disequilibrium distribution of foreign bank branches is more serious than other financial institutions as well as other industries (see Figure 4.4).



Source: *Chinese Regional Financing Operating Main Report (Chinese title, translated by the author).*

Note: The vertical axis contains the names of foreign bank institution-located provinces or directly governed municipalities and their associated region. For example, E_Beijing refers to the directly governed municipality, Beijing, which is categorized as an eastern region in this chapter. In a similar abbreviated way, M refers to the Middle region and W represents the Western region.

Foreign Bank Institutions here include branch banks and locally incorporated foreign banks. Foreign bank institutions were only found in 18 provinces or directly governed municipalities by the end of 2006. To be detailed, the foreign bank institutions had widely distributed their branches in 21 metropolises or cities, and had their representative offices in 23 metropolises or cities respectively.

Figure 4.4: Numbers of Foreign Bank Institutions Inside Regions (2006).

From Figure 4.4 we find that the metropolises of Shanghai, Beijing, Shenzhen, Guangzhou, and Tianjin appear to have the highest concentration characters of foreign bank branches and representative offices[31]. The foreign bank institutions are located in the metropolises of the eastern (like Beijing, Shanghai, etc.), the coastal (like Guangdong, Shenzhen, etc.) or relatively more developed interior metropolises (like Chongqing, Chendu, etc.). Seven of these metropolises and cities housed 136 branches, which accounted for 86.1% of the total amount. The concentration degree of foreign bank institution assets is

[31] Owing to local incorporation policy, the status of 'foreign bank representative office' has faded since 2006. A new status of 'foreign bank branch' or 'local incorporated cooperation' emerges.
(Source: News from Xinhua news website:
http://news.xinhuanet.com/fortune/2006-11/29/content_5406214.html).

higher than that of foreign capital utilization in the real economy.

However, this concentration degree has declined recently. According to CBRC, at the end of 2010, foreign banks had outlets in 45 cities in 27 provinces. In 2003 they had outlets in just 20 cities. Therefore, the study of spread path and distribution determinations of foreign bank institutions is meaningful for prediction as well as policy suggestion for supervising authorities.

4.3 Specification of regressions

As pointed out in the previous section, all the defined control variables and dummy variables are applied in the LS and IV regressions of aggregate foreign capital utilization in the Chinese economy. That is, on account of determinant analyses of foreign capital utilization in the entire industry, economic indicators of industry structure variable, market size variable, infrastructure development variable, openness degree variable, as well as education level variable are considered in regression models (See Table 4.4).

Table 4.4: Hypotheses and Sign Predictions of Regressions of Aggregate Foreign Capital Utilization in Chinese Economy

Independent variables	Prediction	Hypothesis
2.1: Tertiary Industry Development		
Tertiary Industry GDP Contribution	+/-	If foreign capital is mainly utilized by the tertiary industry, the sign should be positive, otherwise be negative (effect of substitution).
2.2: Financial Development		
Loans and Deposit Scale	+	If the business scale of a banking institution has a positive effect in attracting and utilizing foreign capital, the sign of coefficient should be positive (fund demand and fund turnover); otherwise it will be negative.
NPL Ratio	+	If the local credit is worse (lower NPL ratio), the competitive strength of a foreign bank institution will be higher, and the comparative advantage is superior. The sign should be negative; otherwise it will be positive.
Public Stock Market Scale	+	If the scale of the stock exchange market has a positive effect in attracting and utilizing foreign capital, the sign of coefficient should be positive (fund demand and fund turnover); otherwise it will be negative.
Other Financing Credit Scale	+	If the scale of other financing credit has a positive effect in attracting and utilizing foreign capital, the sign of coefficient should be positive (fund demand and fund turnover); otherwise it will be negative.
2.3: Market Size		
Retail Sales of Consumer Goods	+	If the production of foreign capital utilization aims at local market consumption, the sign of coefficient should be positive; otherwise it will be negative.
2.4: Infrastructure Development		
Fixed Assets Investment	+	If the infrastructure development degree, which is measured by fixed assets investment, has a positive effect in attracting and utilizing foreign capital, the sign of coefficient should be positive; otherwise it will be negative.
2.5: Openness		
Import and Export	+	If the openness degree, which is measured by the total scale of import and export, has a positive effect in attracting and utilizing foreign capital, the sign of coefficient should be positive; otherwise it will be negative.
2.6: Education Level		
Education level	+/-	If the education has a positive effect in attracting and utilizing foreign capital, the sign of coefficient should be positive; otherwise it will be negative (labor force cost effect).
2.7: Dummy Variables		
East	+	If the geographical advantage of the east and coast area has a positive effect in attracting and utilizing foreign capital, the sign of coefficient should be positive; otherwise it will be negative.

Studies of FDI distribution across countries or among regions has been commonly discussed for decades. The objective of foreign bank institution distribution is rare in previous researches. It is difficult to theoretically predict how the economic factor impacts on the site selection of foreign banking institutions. The admittance restriction loosening and financial operating boundary casting off of the Chinese banking industry has increased foreign capital inward flow more than ever, especially in the form of foreign bank branches and locally incorporated foreign banks (LIFBs).

The core independent variables of all the regressions are the financing variables, which are employed in determinant measurements of regional distribution of both aggregate foreign capital utilization and foreign bank institution assets. The four financing developments are especially the only control variables in the regressions of foreign bank institution assets. It is worth mentioning that the variable group of financial development indicates a different meaning of regression measurements of aggregate foreign capital utilization in the Chinese economy (see Table 4.4) and foreign bank institution assets in the Chinese banking industry (see Table 4.5). As a small fraction of the tertiary industry, the scale of any financing approach, either by banking institutions, by the stock exchange market, by the non-financing institutions, or even by foreign capital investment, only reflects the fund demand and fund turnover. To be more specific, the foreign capital utilization flows to various industries in all possible economic fields. In other words, the financial industry is only a small segment of financing flows of aggregate foreign capital utilization. Particularly as an even smaller segment of aggregate foreign capital utilization of financing flows, the foreign bank institution assets have a merely finite share of contribution to GDP growth. In addition, as a small share participator of banking institutions (about a 2% market share measured by assets), and strict business scope limitation of industrial restriction for a long time, the credit amount as well as percentage supplied by foreign bank institutions is also of small influence to enterprises. Therefore, local financial institution rivals and competitors have a more significant influence on foreign

bank institutions rather than other economic factors.

The market effect of substitution from the business scales of other financing approaches is unavoidable when predicting the signs of financial development variables. The sign prediction swings between positive and negative.

The more serious slanting distribution of foreign bank branches in the East region than the slanting aggregate foreign capital utilization distribution, as illustrated in the previous description, weights the possibility of significantly positive coefficients of dummy variable East.

Table 4.5: Hypotheses and Sign Predictions of Regressions of Foreign Bank Institution Assets in Chinese Financial Industry

Independent variables	Prediction	Hypothesis
2.2: Financial Development		
Loans and Deposit Scale	+/-	If the business scale of a banking institution has a positive effect in attracting and utilizing foreign capital, the sign of coefficient should be positive; otherwise it will be negative (effect of substitution).
NPL Ratio	+	If the local credit environment is worse (higher NPL ratio) and benefits foreign capital utilization, the sign should be negative; otherwise it will be positive.
Public Stock Market Finance	+/-	If the scale of the stock exchange market has a positive effect in attracting and utilizing foreign capital, the sign of coefficient should be positive; otherwise it will be negative (effect of substitution).
Other Financing Credit Scale	+/-	If the scale of other financing credit has a positive effect in attracting and utilizing foreign capital, the sign of coefficient should be positive; otherwise it will be negative (effect of substitution).
2.7: Dummy Variables		
East	+/-	If the geographical advantage of the east and coast area has a positive effect in attracting and utilizing foreign capital, the sign of coefficient should be positive; otherwise it will be negative.

4.4 Data description and variable definitions

Table 4.6 gives exact definitions and statistic descriptions of average and

standard deviation of variables used in determination analyses of foreign capital distribution in China. Firstly, two statistic criteria of foreign capital utilization are adopted: aggregate foreign capital utilization[32] in the Chinese economy (annual flow amount) and foreign capital only inward in the financial industry, which is measured by the foreign bank institution assets (year-end stock amount). The logarithm level of national percentage of these two statistic criteria are employed as dependent variables, and named as 'Aggregate Foreign Capital Utilization' and 'Foreign Bank Institution Assets' separately. The 'Aggregate Foreign Capital Utilization' is a gross quantity of foreign capital utilization in all industries, while 'Foreign Bank Institution Assets' only contains bank assets of foreign bank institutions, neglecting the status of these institutions. The logarithm level of ratio or national percentage is also used for independent variable adjustment. The logarithm level functions indicate the elasticity of foreign capital utilization and elasticity of foreign bank institution asset allocation, respectively.

The distribution determinants are categories as control variables and dummy variables in all regressions. But only the dependent variable of 'Aggregate Foreign Capital Utilization' applies six groups of control variables: the level of regional tertiary industry development measured by regional GDP proportion that is contributed by the tertiary industry; the variable group of levels of regional financial development; the national market size proportion measured by 'Retail Sales of Consumer Goods'; the level of regional infrastructure development measured by national 'fixed asset investment' proportion; the openness degree of a regional economy measured by the ratio of regional import and export divided by regional GDP[33]; and the regional educational level measured by national proportion of high school student enrollment. The dependent variable of 'Foreign Bank Institution Assets' is only estimated by the financial group control variable and the dummy variables.

[32] Foreign Capital Utilization measures real usage of foreign investment, which is less than the contract amount of foreign investment.

[33] Although the variable of regional GDP proportion contributed by net export is better than the one used in this thesis, the sum of the provincial export amount is not equal to national statistical results. A statistical measurement approach and repetitive counting are probable. Therefore, this thesis adopts regional nominal GDP as a steady dominator.

Data of foreign capital utilization and control variable groups (except for finance) are relatively easier to obtain through the *Statistical Yearbook of China* and the *China Sixty Years Compendium of Statistics*. Data collection of Chinese financial institutions is comparatively difficult. The source combination of the *Chinese Regional Financing Operating Main Report*, the *Almanacs of China's Finance and Banking*, and other reliable public sources is taken as a reference. Supervising records of foreign bank branches or representatives is no more than 10 years. What's more, the distribution of foreign bank branches is obviously slanted toward the East region, especially in Shanghai and Beijing (see Figure 4.4). As illustrated in the previous description, 94.83% of the foreign institutions stood in the East region in 2006, 34.53% in Shanghai and 24.66% in Beijing. The amount of bank assets totaled as much as 82.62% in 2006.

The exact definitions and statistic descriptions of average and standard deviation of these variables are demonstrated in Table 4.6. And pairwise correlations of all the variables are measured as a pre-regression test (see Table 4.7).

Table 4.6: Variable Definitions

Varibales	Formula
1: Dependent Variables	
Foreign Capital Utilization Aggregate	*ln*(Regional Actually Utilized Foreign Capital/ National Actually Utilized Foreign Capital)
Foreign Bank Institution Assets	*ln*(Regional Foreign Bank Institution Assets/ National Foreign Bank Institution Assets)
2: Independent Variables	
2.1: Tertiary Industry Development	
Tertiary Industry GDP Contribution	*ln*(Regional Nominal Tertiary Industry GDP/ Regional Nominal GDP)
2.2: Financial Development	
Loans and Deposit Scale	*ln*(Sum of Loans and Deposits of Regional Financial Institutions/ Regional Nominal GDP)
NPL Ratio	*ln*(Regional Non-performing Loan Percentages)
Public Stock Market Scale	*ln*(Numbers of Regional Public Listed Corporations/ Numbers of National Public Listed Corporations)
Other Financing Credit Scale	*ln*(Regional Non-financial Institution Credit Financing/ Regional Financial Institution Loans)
2.3: Market Size	
Retail Sales of Consumer Goods	*ln*(Regional Retail Sales of Consumer Goods/ Regional Nominal GDP)
2.4: Infrastructure Development	
Fixed Assets Investment	*ln*(Regional Investment in Fixed Assets/ Regional Nominal GDP)
2.5: Openness	
Import and Export	*ln*(Regional Sum of Import and Export/ Regional Nominal GDP)
2.6: Education Level	
Education level	*ln*(Regional Student Enrollment of Higher Education/ National Student Enrollment of Higher Education)
2.7: Dummy Variables	
Y2005	if Year is 2005, Y2005=1, otherwise=0
Y2006	if Year is 2006, Y2006=1, otherwise=0
Y2007	if Year is 2007, Y2007=1, otherwise=0
Y2008	if Year is 2008, Y2008=1, otherwise=0
East	if the province is in the East region, East=1, otherwise=0
Middle	if the province is in the Middle region, Middle=1, otherwise=0

Note: N represents total observations, n represents sample province numbers (cross section), and T represents sample year range.

Table 4.7: Pairwise Correlation Coefficients Matrix

Variables	Foreign Capital Utilization Aggregate	Foreign Bank Branch Assets	Tertiary Industry GDP Contribution	Loans and Deposit Scale	NPL Ratio	Public Stock Market Scale	Other Financing Credit Scale	Retail Sales of Consumer Goods	Fixed Assets Investment	Import and Export	Education level
Aggregate Foreign Capital Utilization	1.000										
Foreign Bank Institution Assets	0.708	1.000									
Tertiary Industry GDP Contribution	0.126	0.452	1.000								
Loans and Deposit Scale	0.253	0.376	0.221	1.000							
NPL Ratio	-0.265	-0.251	-0.304	-0.220	1.000						
Public Stock Market Scale	0.755	0.710	0.351	0.368	-0.267	1.000					
Other Financing Credit Scale	0.242	0.162	0.024	-0.931	-0.013	-0.303	1.000				
Retail Sales of Consumer Goods	0.535	0.277	0.281	0.214	-0.043	0.425	-0.214	1.000			
Fixed Assets Investment	-0.298	-0.535	-0.343	-0.160	-0.165	-0.540	0.2060	-0.156	1.000		
Import and Export	0.497	0.760	0.507	0.232	-0.274	0.654	-0.117	0.152	-0.495	1.000	
Education level	0.768	0.406	-0.106	0.433	-0.124	0.683	-0.490	0.537	-0.263	0.230	1.000

4.5 Empirical analyses

4.5.1 Determinants on 'Aggregate Foreign Capital Utilization'

Firstly, least square (LS) estimates are employed to measure the influence factors of 'Aggregate Foreign Capital Utilization' (see Table 4.8). Our regression employs balanced macro-economy panel data of 29 Chinese provinces and municipalities[34] during the period of 2005-2009, totaling 145 observations. Owing to the major study objective is financial determinations , and owing to the banking industry plays a leading role in enterprises' financial activities, the core independent variables are the measures of scale and efficiency of the banking industry, represented as the variables of 'Loans and Deposit Scale' and 'NPL Ratio'.

The R-squares of Model A2 is only 0.007 while the R-squares of Model A1 is 0.848. So that the goodness of fit of Model A2 is not as well as Model A1 (see Table 4.8). Business scope of banking industry is a small share within the tertiary industry. What's more, the national output of the tertiary industry only contributed 43% GDP in 2010 (see Figure 2.11). In other words, the tertiary is also merely a part of economic activities, and this percentage declines in some provincs, especially in the West region. The efficiency of this small share industry (NPL ratio) should be less power of influence when compared with other economic variables. And because of multi-collinearity, the important geographcal dummies were omitted. Therefore, viewing from a model design, Model A1 is better than A2 to illustrate the financial determination in 'Aggregate Foreign Capital Utilization'.

According to the exogeneity test result of instrument variable 'Loans and Deposit Scale' on the instrumented variable 'NPL ratio' by the Davidson-MacKinnon test, the F statistic is 3.032 with a P-value of 0.085,

[34] Original data of Xinjiang province (in the West region) is omitted. Chongqing municipality belongs to Sichuan province in this chapter.

which rejects the null hypothesis at a 10% significance level (see Table 4.8 and Table 4.9). The null hypothesis of the Davidson-MacKinnon test is that an OLS estimator of the same equation would yield consistent estimates. A rejection of the null indicates that endogenous effects on the estimates are meaningful, that is, endogeneity among the regressors would have deleterious effects on OLS. Therefore, instrumental variable techniques are required, and the coefficients of instrumental variables are better to explain the determinants than the coefficients of OLS. But Model A1 is not OLS regression. In other words, we can compare the results of the GLS model (Model A1) and the 2SLS model (Model A3) for banking industry determinants on aggregate foreign capital utilization analysis. In addition, the degree of freedom equals to zero, which illustrates that the equation of Model A3 is exactly identified.

The evidence of both models are similar. The coefficient of 'Tertiary Industry GDP Contribution' is insignificant in Model A1 & A3 (see Table 4.9), that is, the determinant of the tertiary industry development is weak in attracting foreign investment. There are two possible causes of this result. In one aspect, foreign investment probably prefers other industries rather than the tertiary industry, for example, manufacturing, which is contained in the secondary industry. And from Chapter 2, having been regarded as a powerful manufacturing country with the globally known label of 'made in China', half of GDP contribution comes from the secondary industry (see Figure 2.10). In other aspect, the changed share percentage of tertiary industry contribution to GDP is insufficiently large only within five years; therefore, 'Tertiary Industry GDP Contribution' shows insignificant results. However, solution and verification to this possibility is limited to the availablity of data source. The measurement of regional aggregate foreign capital utilization did not begin until the early 1990s. And the statistical data available for the financial industry, especially the non-financing institutions and foreign bank institutions, started even later. But the industry structure changes have been lasting more than thirty years (see Figure 2.11).

'Fixed Assets Investment' and 'Education Level' denote significantly

positive effects on ‘Aggregate Foreign Capital Utilization’, while ‘Retail Sales of Consumer Goods’ and ‘Import and Export’ do not. Therefore, the determinant of domestic market consumption is not a majorly attracting foreign investment factor. In contrast, infrastructure investment and education level, which represent capital stock and human resource investment in a certain region, respectively, impact more on utilizing foreign investment. Moreover, the space dummy variables of both ‘East’ and ‘Middle’ show significantly positive results, while the intercept is not. The foreign capital prefers the East region and the Middle region.

The financial determinants are not as important as prediction. The core independent variable of ‘Loans and Deposit Scale’ is insignificant . But the ‘Public Stock Market Scale’ illustrates significantly positive result in Model A3, although only at a 10% significance level. It results insignificant in Model A1. Anyway, 5% significant level or less is typically adopted as significat result. Therefore, the financial determinats is insignificant in both GLS model and IV model.

Table 4.8: Ordinary Least Square (OLS) and General Least Square (GLS) Estimates on 'Aggregate Utilized Foreign Capital'

Independent Variables	Aggregate Foreign Capital Utilization	
	Model A1	Model A2
	Random-effects GLS regression	Fixed-effects regression
Tertiary Industry GDP Contribution	0.004 (0.01)	-1.047 (-1.22)
Loans and Deposit Scale	0.011 (0.07)	
NPL Ratio		0.250* (1.90)
Public Stock Market Scale	0.213 (1.50)	-0.065 (-0.40)
Other Financing Credit Scale	0.149 (0.90)	0.180*** (3.68)
Retail Sales of Consumer Goods	0.291 (0.61)	-0.261 (-0.47)
Fixed Assets Investment	0.794** (2.41)	1.041*** (2.79)
Import and Export	-0.019 (-0.27)	-0.077 (-1.08)
Education Level	0.983*** (5.89)	0.427 (0.63)
Year 2005	0.218 (1.08)	-0.011 (-0.05)
Year 2006	0.306* (1.82)	-0.036 (-0.16)
Year 2007	0.230 (1.49)	-0.149 (-0.66)
Year 2008	0.174 (1.21)	0.046 (0.34)
East	2.245*** (6.23)	(omitted)
Middle	1.173*** (4.07)	(omitted)
Intercept	-0.209 (-0.20)	-3.746 (-1.23)
Sigma_u	0.534	1.780
Sigma_e	0.349	0.345
Number of Observations	145	145
R-squares	0.848	0.007
F test	-	F(28,104) =11.37 Prob > F = 0.000
Wald Statistics	$\chi^2(14)$=219.93 Prob.>$\chi^2(14)$ =0.000	-
Hausman Test	$\chi^2(12)$=9.91 Prob>$\chi^2(12)$ =0.624	$\chi^2(12)$=24.15 Prob.>$\chi^2(12)$ =0.019

Note: *represents significance at 10%, **represents significance at 5%, and ***represents significance at 1%.

Table 4.9: Two-Stage Least Square (2SLS) Estimates of 'Loans and Deposit Scale' on 'Aggregate Foreign Capital Utilization'

Independent Variables	Aggregate Foreign Capital Utilization (Model A3)	
	G2SLS random-effects IV regression	
	First stage	Second stage
Tertiary Industry GDP Contribution	1.185*** (3.91)	0.233 (0.23)
Loans and Deposit Scale		-0.103 (-0.17)
NPL Ratio	-0.188*** (-3.32)	
Public Stock Market Scale	0.058 (0.82)	0.278* (1.90)
Other Financing Credit Scale	-0.959** (-46.87)	0.038 (0.06)
Retail Sales of Consumer Goods	0.517* (2.13)	0.335 (0.63)
Fixed Assets Investment	0.304* (1.85)	0.882** (2.04)
Import and Export	0.023 (0.66)	0.011 (0.15)
Education Level	-0.142*** (-1.88)	0.960*** (5.85)
Year 2005	-0.609*** (-6.39)	0.122 (0.23)
Year 2006	-0.325*** (-3.14)	0.236 (0.61)
Year 2007	-0.277*** (-2.76)	0.169 (0.48)
Year 2008	-0.378*** (-5.96)	0.129 (0.44)
East	0.053 (0.34)	2.152*** (6.54)
Middle	-0.137 (-1.15)	1.144*** (4.33)
Intercept	1.415*** (3.19)	0.318 (0.25)
Number of Observations	145	145
sigma_u		0.544
sigma_e		0.462
Wald Test	χ2(14)=2735 Prob.>χ2(14)=0.000	χ^2(14)=298.53 Prob.>χ^2(14)=0.000
R-squares		0.852
Hausman Test	χ^2(14)=6.59 Prob.>χ^2(14)=0.884	
Davidson-MacKinnon Test of Exogeneity	F(1,103)=3.032 Prob.> F(1,103)=0.085	
Instrumented	Loans and Deposit Scale	
Instruments	Tertiary Industry GDP Contribution, Public Stock Market Scale, Other Financing Credit Scale, Retail Sales of Consumer Goods, Fixed Assets Investment, Import and Export, Education Level, Year 2005, Year 2006, Year 2007, Year 2008, East, Middle, NPL Ratio.	

Note: *represents significance at 10%, **represents significance at 5%, and ***represents significance at 1%.

4.5.2 Determinants on 'Foreign Bank Institution Assets'

After the analyses of determinations of total foreign capital utilization in real economy field, we turn to financial industry analyses. As previous study, General Least Square (GLS) estimates are firstly employed to measure the influence factors of 'Foreign Bank Institution Assets' (see Table 4.10). Being different from determinant analyses on 'Aggregate Foreign Capital Utilization', only financial industry influence factors are applied in 'Foreign Bank Institution Assets' models. But similar to previous regressions, both business scope variable 'Loan and Deposit Scale' and credit efficiency variable 'NPL Ratio' are employed to represent the banking industry determinants. However, the observations shrink to 75, as some provinces or autonomous regions do not have a foreign branch (at least not listed in the above-mentioned public statistic material). And this lack of foreign bank institutions in provinces in certain years omits data from the sample scope.

Comparing Model B1 and Model B2, the variables of 'Public Stock Market Scale' and 'East' are significantly positive in both models (at 5% level). From previous study of financial reform and financial openning-up proceeding, the preferential policy favours the East region. In other words, the openness degree significantly influences 'Foreign Bank Institution Assets'. The 'Loans and Deposit Scale' of banking industry scale is significantly positive in Model B1 while the 'NPL Ratio' of banking industry credit efficiency is not in Model B2. The stock exchange market, following the banking industry, has become another major financing approach. The 'Public Stock Market Scale' is singnificantly positive in both Model B1 and Model B2 at 5% level.

According to the exogeneity test result of instrument variable 'NPL ratio' on the instrumented variable 'Loans and Deposit Scale' by the Davidson-MacKinnon test, the F statistic is 5.068 with a P-value of 0.029, which rejects the null hypothesis at a 5% significance level (see Table 4.11). Therefore, instrumental variable techniques are required, and the coefficients of instrumental variables are better to explain the determinants than the

coefficients of OLS. But Model B1 are not OLS regression. As previous study, we can compare the results of the GLS model (Model B1) and the 2SLS model (Model B3) for analyses of banking industry determinants on foreign banking institution assets. In addition, the degree of freedom equals to zero illustrates that the equation of Model B3 is exactly identified.

Comparing the GLS models (Model B1 & B2) and 2SLS model (Model B3), the significant financial determinants are changed in these models. Viewing from a business scope, 'Public Stock Market Scale' in Model B3 is insignificant to attract foreign banks, so is the 'East' dummy (see Table 4.11). But both of which are significant variables in Table 4.10. Observing from business efficiency, 'NPL Ratio' is significantly in Model B3 while is not in Model B2. The 'Other Financing Credit Scale' demonstrate a significantly positive effect in Model B3 only (see Table 4.11). We can infer from Model B3 that the scale and efficiency of the banking industry as well as other financing credit approach effectively support the financing industry attracting foreign bank institutions. And the East region weakens its influence on attracting foreign bank insitution because of policy restriction. According to financial reform and openness studies, the origial approval of setting up foreign financial operational branches is restricted in a small area of the East region (the Special Economic Zone). It takes one decade to suplement other eastern cities and takes nearly another decade to national wide. Therefore, the regional difference is insignificant.

Table 4.10: General Least Square (GLS) Estimates on 'Foreign Bank Institution Assets'

Independent Variables	Foreign Bank Institution Assets	
	Model B1	**Model B2**
	Random-effects GLS regression	**Random-effects GLS regression**
Loans and Deposit Scale	2.003** (2.08)	
NPL Ratio		0.241 (0.80)
Public Stock Market Scale	0.806** (2.27)	0.786** (2.12)
Other Financing Credit Scale	0.689 (1.35)	0.883 (1.61)
Year 2005	0.643 (1.31)	0.328 (0.61)
Year 2006	0.437 (1.07)	0.017 (0.03)
Year 2007	0.513 (1.40)	0.044 (0.09)
Year 2008	0.153 (0.43)	-0.094 (-0.27)
East	1.951** (2.38)	2.175** (2.51)
Middle	-0.799 (-0.73)	-1.174 (-1.05)
Intercept	-4.167** (-2.16)	-2.073 (-1.26)
Sigma_u	1.204	1.252
Sigma_e	0.685	0.713
Number of Observations	75	75
R-squares	0.676	0.660
Wald Statistics	$\chi^2(9)=36.67$ Prob.>$\chi^2(9)=0.000$	$\chi^2(9)=34.17$ Prob.>$\chi2(9)=0.000$
Hausman Test	$\chi^2(7)=5.30$ Prob.>$\chi^2(7)=0.624$	$\chi^2(7)=2.38$ Prob.>$\chi2(7)= 0.936$

Note: *represents significance at 10%, **represents significance at 5%, and ***represents significance at 1%.

Table 4.11: Two-Stage Least Square (2SLS) Estimates of 'NPLs Ratio' on 'Foreign Bank Institution Assets'

Independent Variables	Model B3	
	G2SLS random-effects IV regression	
	First stage	Second stage
Loans and Deposit Scale	3.304*** (5.81)	
NPL Ratio		1.203** (2.17)
Public Stock Market Scale	0.393** (3.02)	0.092 (0.19)
Other Financing Credit Scale	-0.398*** (-2.37)	1.475** (2.38)
Year 2005	1.132*** (6.41)	-0.267 (-0.43)
Year 2006	1.505*** (10.23)	-0.994 (-1.37)
Year 2007	1.527*** (10.92)	-0.934 (-1.37)
Year 2008	0.618*** (4.59)	-0.218 (-0.61)
East	-1.016 (-0.92)	3.273 (0.91)
Middle	0.727 (0.46)	-1.330 (-0.26)
Intercept	-1.762 (-1.47)	-4.662 (-1.33)
Number of Observations	75	75
sigma_u		6.450
sigma_e		0.758
Wald Statistic	$\chi2$ (9)=551 Prob.>$\chi2$(9)=0.000	$\chi2$ (9)=13.26 Prob.>$\chi2$(9)=0.151
R-squares		0.540
Davidson-MacKinnon Test	F(1,52)= 5.068 Prob.> F(1,52)=0.029	
Hausman Test	$\chi2$ (7)=0.99 Prob.>$\chi2$(7)=0.995	
Instrumented	NPL Ratio	
Instruments	Public Stock Market Scale, Other Financing Credit Scale, Year 2005, Year 2006, Year 2007, Year 2008, East, Middle, Loan and Deposit Scale.	

Note: *represents significance at 10%, **represents significance at 5%, and ***represents significance at 1%; underscore mean is instrumented by instrument variables.

4.6 Results

This chapter strives to study the location determinants of foreign investment in China from new angles. Finding two kinds of nexus, one is between aggregate foreign capital distribution and Chinese local economic growth, the other connection is between foreign bank asset allocation and Chinese local financial development, is our main intention. Therefore, factor influences in both a real economic environment and financial industry are under observation. FDI determinant studies are a common topic. But by distinguishing the utilization of foreign investment in the banking industry from total foreign capital utilization, and by measuring the financial industry determinants only for foreign bank site selection, the author creatively acquires financial determinants of foreign bank distribution in China at a provincial level.

Strongly balanced panel data of Chinese provinces, autonomous regions and municipalities from 2005 to 2009 is used to estimate locational factors of the total foreign capital utilization and those of the foreign bank institution assets. The determinants of total foreign capital utilization are divided into six groups. And the influences of foreign bank total assets are only selected within the financial industry. The logarithm level of original data is used to get empirical results of influencing elasticity. With significantly exogenous results of the Davidson-MacKinnon test of the instrument variables, Least Squares (LS) and Instrument Variables (IV) are separately employed for each foreign capital utilization analysis case.

According to the IV approach, 'Public Stock Market Scale', 'Fixed Assets Investment', 'Education level', as well as both geographical dummy variables of 'East' and 'Middle' are found to have a significantly positive effect on 'Aggregate Foreign Capital Utilization' in China. As a major financing approach in China, both the banking industry variables of 'Loans and Deposit Scale' and 'NPL Ratio' seem less important to aggregate foreign capital attraction than the 'Public Stock Market Scale' in a real economic environment. The whole group of financial determinants are not as important as economic

variables. ‘Fixed Assets Investment’ and ‘Education Level’, which are the same to some previous researches, are significantly attractive factors of foreign capital. Different to predict, ‘Retail Sales of Consumer Goods’ and ‘Import and Export’ are insignificant to dependent variables of ‘Aggregate Foreign Capital Utilization’. The mreket determinants of domestic consumption and export are not as important as infrastructure investment and education level in attracting the foreign investment factor.

All these empirical results are based on the Chinese situation from 2005 to 2009, which has an obviously different result from previous studies. The regional restriction of foreign institution branches has been gradually relaxing. During the study period, overcapitalization and ‘real estate hot’ are popular subjects. And the central government and PBoC have issued administrative policies to suppress the continuously increasing house prices and inflation. Real estate construction always affects companies with physical industry growth, for example, cement, iron, and other manufacture of building materials. Therefore, it is natural that ‘Fixed Assets Investment’ demonstrates a positive significance.

Being different from real economic evidence, financial determinants illustrate a significant effect on ‘Foreign Bank Institution Assets’ distribution. Viewing from a business scope, ‘Loan and Deposit Scale’ (Model B1) and ‘Public Stock Market Scale’ (Model B1 and Model B2) are significantly positive to attract foreign banks. Regarding business efficiency, ‘NPL Ratio’ and ‘Other Financing Credit Scale’ demonstrate a significantly positive effect in Model B3. That is to say, a large but low-efficiency banking institution and, simultaneously, a pluralistic financial industry attract foreign banks as a revival. It is woth mentioning that the East region weakens its influence on attracting foreign bank insitution when comparing to real economic foreign capital attraction, because of policy restriction of financial industry. As a result, policy is an crucial factor.

When considering both dependent variables of foreign capital utilization together, real economic determinants, for example, fixed assets investment and

education level upgrading, are more important than financial determinants in attracting total foreign investment. However, within the financial industry, 'Public Stock Market Scale' is more significant than other financial variables. In summary, physical industry development is more attractive to foreign investment than pure financial institutions. This evidence probably has two origins. One cause may be the restrictions of foreign shareholders in financial institutions. The other is that the profit rate of physical industry investment is higher than financial industry, so that the foreign capital prefers to invest in the real economic industries. The former reason has a larger reasonable possibility in the current Chinese situation. Therefore, we cannot exclude the possibility that the financial variables turn to a significant effect in the near future, as the deregulation of the financial market entry and removal of financial operating boundary has started since 2006.

The methodology of this chapter provides a new perspective for both foreign investors and Chinese authorities. A comparison summary of financial influences is demonstrated as followings:

Table 4.12 Financial Influence Comparisons

	Aggregate Foreign Capital Utilization				**Foreign Bank Institution Assets**					
	LS Model A1		IV-2SLS Model A3		LS Model B1		LS Model B2		IV-2SLS Model B3	
Loans and Deposit Scale	Positive	Insignificant	Negative	Insignificant	Positive	5%	-	-	-	-
NPL Ratio	-	-	-	-	-	-	Positive	Insignificant	Positive	5%
Public Stock Market Scale	Positive	Insignificant	Positive	10%	Positive	5%	Positive	5%	Positive	Insignificant
Other Financing Credit Scale	Positive	Insignificant	Positive	Insignificant	Positive	Insignificant	Positive	Insignificant	Positive	5%

Owing to various limitations, some flaws cannot be ignored in this chapter and need further improvements. The first problem revolves around the data and variable selection. This limitation mainly emerges in foreign bank data collection. It is well known that China has enacted reform and opened itself to a market-oriented resource allocation economy during the past 30 years, but the release of foreign investment in the Chinese financial industry had not loosened until recent years, after the country joined WTO. As a result, a sufficiently long amount of time's worth of data concerning foreign banks is unavailable, which has become the largest issue affecting panel data analysis. What is more, the hesitant propulsion of foreign financial institution branches in the interior area leads to a reality that the foreign institution branches concentrate in a few cities, which also makes the cross-sectional samples insufficient. This restriction of drawing from such a small sample not only limits the selection of econometric methods, but also may lead to a biased or inconsistent result. Because of a short time series and small sample, the lagged effects of dependent and independent variable analysis are not suitable as well.

Chapter Five

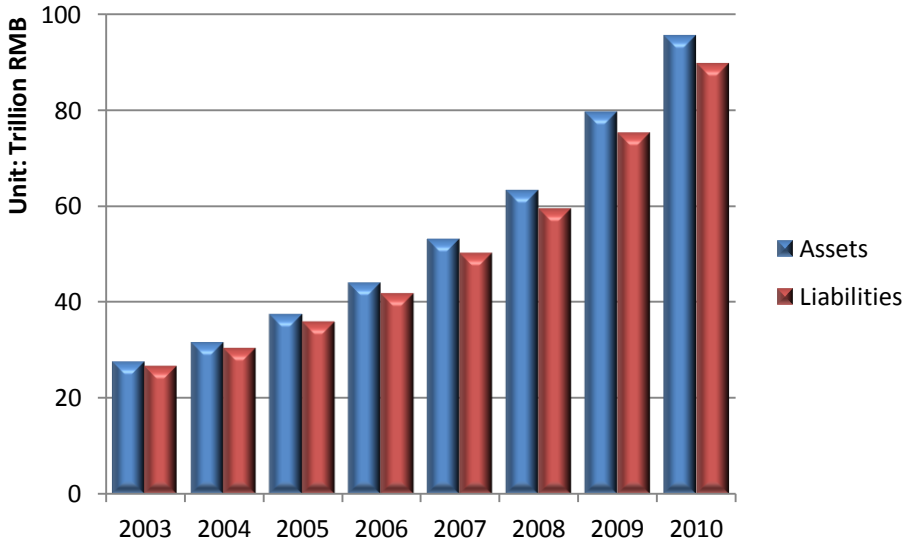
Transition Character and Cost Efficiency of Chinese Banking Industry

5.1 Introduction

5.1.1 General situation

To maintain Chinese high economic growth, huge financing is needed. It has been proven that aside from the legal environment, awareness of property rights and political pluralism, the financial markets are still associated with strong growth (Hasan, Wachtel, & Zhou, 2006). As a credit intermediation between lenders and borrowers, banks provide essential domestic and international financial services to consumers, businesses and government. A strong and resilient banking system is thus the foundationg for sustainable economic growth. Playing a crucial role in the modern financial system, the Chinese banking system is one of the largest and most complex amongst recent transitional countries, with many legacy and technological issues (Allen, Qian, & Qian, 2005; Fu & Heffernan, 2009).

The Chinese banking sector has largely withstood the recent financial crisis. By channeling the great amount of government stimulus packages, a large expansion of bank lending continued during the financial crisis. The rapid growth of lending from 2008 to 2009, in which loan books grew nearly 25 percent from RMB 32 trillion to RMB 42.6 trillion, and from 2009 to 2010, in which the loan balance raised 19.5 percent to 50.9 trillion, shows how the banking sector remains central for implementing government macroeconomic policy[35]. The total assets of Chinese banking institutions exceeded 95.31 trillion RMB, and the total liabilities of the banking sector amounted to 89.47 trillion RMB, which are 2.45 times and 2.37 times the quantities in 2003, respectively (see Figure 5.1).



Source: *China Banking Regulatory Commission (CBRC) Annual Report 2006-2010*.

Note: China's banking institutions in this chart comprise policy banks, state-owned commercial banks, joint-stock commercial banks, city commercial banks, rural commercial banks, rural cooperative banks, urban credit cooperatives, rural credit cooperatives, the postal savings bank, non-bank financial institutions, and foreign-funded banking institutions.

Figure 5.1: Total Assets and Total Liabilities of Banking Institutions (2003-2010)

[35] Source: *CBRC annual report*, China Banking Regulatory Commission.

As of the end of 2010, the Chinese banking sector consisted of 3 policy banks, 5 large commercial banks (Big Five banks[36]), 12 joint-stock commercial banks, 147 city commercial banks, and other institutions. It is an industry possesses nearly 4,000 banking institutions, 196,000 business outlets and 3 million employees. In terms of asset shares, large state-owned commercial banks and joint-stock commercial banks are the top large ones. These institutions respectively accounted for 49.20% and 15.64% of the total assets of the banking industry by the year end of 2010 (see Table 5.1).

[36] The name of 'Big Five banks' is frequently seen in literatures, which 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).

Table 5.1: Assets, Deposits, Loans, and Net Profit of Chinese Banking Institutions

Type of Institution	Information of Institutions (Dec. 31, 2010)		Assets (Dec. 31, 2010)		Deposits (Dec. 31, 2009)		Loans (Dec. 31, 2009)		Net Profit (Dec. 31, 2010)	
	No. of Institutions	No. of Staff	Billions of RMB	P[g]	Billions of RMB	P	Billions of RMB	P	Millions of RMB	P
Big Five commercial banks[a]	5	1,545,050	46,894.3	49%	38,647.61	52.70%	20,886.56	41.02%	515.12	57.29%
Joint-stock commercial banks[b]	12	237,158	14,903.7	16%	10,326.90	14.08%	6,310.58	12.39%	135.80	15.10%
Policy banks[c]	3	59,503	7,652.1	8%	2,247.04	3.06%	5,662.20	11.12%	41.52	4.62%
City commercial banks	147	206,604	7,854.9	8%	10,326.90	14.08%	6,310.58	12.39%	76.99	8.56%
Small and medium-sized rural financial institutions[d]	3350	881,476	14,168.4	15%	5,851.99	7.98%	3,909.42	7.68%	81.08	9.02%
Foreign banks[e]	40	36,017	1,742.3	2%	-	-	-	-	7.78	0.87%
Non-bank financial institutions [f]	212	24,908	2,089.6	2%	-	-	-	-	40.8	4.54%
Total	3769	2,990,716	95,305.3	100%	73,338.20	100%	50,922.6	100%	899.09	100%

Sources: *Almanac of China's Finance and Banking*, *China Banking Regulatory Commission (CBRC) 2010 Annual Report*, and *BankScope*.

Note: a. Includes Industrial and Commercial Bank of China, Agricultural Bank of China, Bank of China, China Construction Bank, and Bank of Communications. The names of the 'Big four commercial banks are relatively frequently seen in earlier literatures as one specialized group. But a new regulation, named 'The corporate governance and related supervisory guidance of state-owned commercial banks', issued by CBRC on May 16, 2006, announces the Bank of Communications to be the fifth one, in addition to the former four major state-owned banks. After the issuance of that regulation, the Bank of Communications has been recorded with the other big four commercial banks in official statistics. This means that the Bank of Communications has crossed the line from its place as the leading enterprise of joint-stock banks into a new role as the fifth state-controlled commercial bank since 2006.

b. Includes China CITIC Bank, China Everbright Bank, Huaxia Bank, Guangdong Development Bank, Shenzhen Development Bank, China Merchants Bank, Shanghai Pudong Development Bank, Industrial Bank, China Minsheng Banking Corporation, Evergrowing Bank, China Zheshang Bank, and Bohai Bank – 12 banks in total.

c. Includes Agricultural Development Bank of China, Export-Import Bank of China, and China development banks. They were named 'Large Commercial Banks' in the CBRC 2010 Annual Report.

d. Includes 85 Rural Commercial Banks, 223 Rural Cooperative Banks, 2,646 Rural Credit Cooperatives (RCCs), 395 New-type Rural Financial Institutions, and one Postal Savings Bank.

e. Refers to 40 locally incorporated foreign banks (LIFB), not including the 90 foreign bank branches.

f. Includes 107 Finance Cooperatives of Enterprise Groups, 63 Trust Companies, 17 Financial Leasing Companies, 13 Auto Finance Companies, 4 Money Brokerage Firms, 4 Consumer Financial Companies, and 4 Financial Asset Management Companies, etc.

g. P means percentage of the individual share of the total industry amount.

5.1.2 Evolution and Reformation

The formation of the Chinese banking system can be traced back to pre-independence years[37]. The evolution after the foundation of People's Republic of China is summarized in four stages, according to historical events and significant policy implementation, in this thesis to better understand the characteristics of the Chinese banking system.

Stage One: 1950-1977

The first period, from 1950 to 1977, is known as 'The Planned Economy Era' in China. Through imposing price procedure, framing labor remuneration policy, and restricting the profit transfer regime, the government controls and dominates a critical part of national production and income. During this pre-reform period, it was not only China's banking industry, but also the whole Chinese financial system, that was characterized by an all-inclusive mono-bank system. The People's Bank of China (PBOC), the only financial institution in that period, was directly owned and controlled by the Ministry of Finance. The PBOC controlled about 93% of Chinese banking industry assets, combined the roles of the central bank and commercial bank, handled almost all financial transactions all over the country, and served both cash and credit quantity to the plan-oriented physical production objectives laid down by the State Planning Commission[38] (Allen, Qian, & Qian, 2005; Hu et al., 2009). Some studies deny the role of a financial intermediary (which the PBOC had played), but rather only the role of the economy's accounting and settlement center. As a result, the PBOC was only allowed to distribute working capital loans, which were financed by the state budget, to enterprises. In other words, the role of the PBOC was extremely limited to resource allocation, though it was named after

[37] From the late nineteenth century to the early twentieth century, five of China's first modern banks were founded. By 1936 there were 28 major foreign banks that had set up branches in Shanghai, which was highlighted as the emergence of the financial center of China and Asia (Allen, Qian, & Qian, 2005).

[38] Cash plan means that households obtained their wages in cash from their work units through banks. Credit plan means that banks were obliged to provide working capital and investment funds to enterprises (Liu, 2005).

a bank (Hao, 2006).

Stage Two: 1978-1994

The second stage began with the starting of financial system restructuring and reforming of 1978. The onset of economic reform drives evolution within the banking industry. Scholars hold a prevalent view that the Chinese banking system, characterized by massive government intervention, poor asset quality and low capitalization, has started reform processes based on the three main pillars (García-Herrero, Gavilá, & Santabárbara, 2006): (I) Bank restructuring, through the cleaning up of non-performing loans (NPLs) and public capital injections, particularly in the four largest state-owned banks; (II) Financial liberalization, with the gradual flexibilization of quantity and price controls, the opening up of the barrier to foreign competition, and cautious steps toward capital account liberalization; and (III) Strengthened financial regulation and supervision, coupled with efforts to improve corporate governance and transparency.

At first, four specialized state-owned banks split from the PBOC to take over the PBOC's commercial business. Since then the PBOC has formally become and acted as China's central bank. Including the PBOC and these 'Big Four' state-owned banks, the so-called 'two-tier' banking system was formed. A financial intermediary with various kinds of ownership, for example, Urban Credit Cooperatives, local government-owned regional banks, and Rural Credit Cooperatives which are supervised by the ABC, emerging outside of the 'two-tier' system is another feature in this period. These new banking intermediaries took deposits and credited loans, which increased the competition but also induced higher levels of inflation (Allen, Qian, & Qian, 2005). In this stage, since each of the four specialized banks absolutely dominated in a superior position and was assigned to provide services to a designated sector or area[39], limited competition existed within the banking

[39] The Bank of China (BOC) took the business scope of transactions related to foreign trade and investment. The People's Construction Bank of China (CBC) specialized in transactions related to Plant,

industry. However, these oligopolistic features gradually weaken in the reform paces thereafter.

Stage Three: 1994-2001

Along with carrying out the policy of the '*Decision of the state council on reform of the financial system*', the third stage has raised the curtain. To stimulate competition amongst state-owned banks across the industry, the Chinese government enacted the *Commercial Bank Law* in 1995, and later progressively established three special policy banks[40] to release the specialized state-owned banks from policy loan tasks. As a result, the Big Four banks were no longer 'specialized' to a designated sector or area, but nominally and officially became 'commercial banks', which means that, to a certain extent, they could execute market-oriented objectives autonomously, make operation goals independently, take credit actions freely, and deal with profits or losses solely. In fact, the segregation of policy banks and commercial banks did not abruptly and swiftly change the situation of the Big Four banks, as the policy banks lacked sufficient branches and staff to entirely undertake the policy-lending missions at the inception of their establishment (Berger, Hasan, & Zhou, 2009; Hu et al., 2009). But, after more than ten years sharing with and removing political missions from the state-owned banks through various approaches, the 'historical burden' of the Big Four[41] has been reduced, which makes our comparisons between state-owned banks and joint-stock banks in this chapter more reliable and meaningful. Since the *Commercial Bank Law*

Property and Equipment (PPE) investment (primarily in manufacturing and infrastructure fields). The Agriculture Bank of China (ABC) was originally set up in 1979, with the main responsibility and objective of handling all banking business in rural areas, for example, receiving deposits in rural areas and providing loans to agriculturally producing projects and township industries. The Industrial and Commercial Bank of China (ICBC) was established in 1984 to deal with the rest of the commercial transactions of the PBOC, especially focused on commercial and industrial activities in urban areas.

[40] Three policy banks include the China Development Bank (CDB), The Export-Import Bank of China (EIBC), and the Agricultural Development Bank of China (ADBC). The China Development Bank (CDB) was chartered to provide long- and medium-term lending to construction projects of basic or pillar infrastructures. The Export-Import Bank of China (EIBC) and the Agricultural Development Bank of China (ADBC) were responsible for export and import financial support and rural area and agricultural development lending, respectively.

[41] The Bank of Communications (BoCo) was not included in the Big Five banks until 2006.

relaxed the industry entry restriction, dozens of city-level commercial banks, as well as urban and rural credit cooperatives, were approved to be set up by the authorities[42]. Although some of the banks were short-lived[43], most of them grew healthily and fast[44]. The new ownership entities provoke the diversification, competitiveness, privatization, and marketization of the Chinese banking industry, and have become the third tier of the Chinese domestic banks (Lin & Zhang, 2009).

Stage Four: 2001-present

The reform of the banking industry was unable to avoid being accelerated when China finally entered into the World Trade Organization (WTO) in December 2001. A new financial era with deeper liberalization and further diversification, certainly not lacking fierce mergers and acquisitions, is approaching at lightning speed. Both challenges and opportunities are awaiting domestic banks as well as foreign investors. China has taken a five-year transition (2002-2006), aiming at environmental changes in the post-WTO period, assigning and implementing laws[45], as well as setting up and launching supervisory institutions[46] into practice. Bundles of thorough adjustments were adopted by the industry until eventually opening the capital account and adopting a floating exchange rate as the requirement of WTO.

[42] The foundation of the China Minsheng Banking Corporation also heralded a new stage of the Chinese banking industry, because it is the first joint-stock bank with private industry shareholders, making it the only private bank in China in 1996. In 1987 the Shenzhen Development Bank (SDB) and the China Merchants Bank (CMB) were established, and were listed on the Shenzhen Stock Exchange and Shanghai Stock Exchange successively. SDB is the first trial of bank listing on the China exchange market.

[43] The Hainan Development Bank was set up in August 1995, with 30% shares held by Hainan Province government, but was shut down by the PBOC because of insolvency. However, it was not declared bankrupt. Instead, the central government staked out a claim of ICBC to discharge the overseas and domestic creditors. Amongst others, Hainan Bank was the first bank in the country to be shut down since the establishment of the People's Republic of China in 1949 (Wong and Wong, 2001).

[44] By the end of 1999, there were 12 joint-equity commercial banks, with total assets of RMB 1,447.7 billion, total deposits of RMB 1,031.4 billion, and total outstanding loans of RMB 695.7 billion. By the end of 2010, the total assets had been multiplied more than ten times to reach RMB 14,903.7 billion and with a 16% market share. Total deposits are RMB 10,326.9 billion of a 14.08% market share, and the total outstanding loans are RMB 6,310.6 billion of a 12.39% market share.

[45] New private banks and foreign bank branches were approved to set up and offer local currency services, namely RMB transaction business. Additionally, the ceiling on foreign investor shares of local banks rose up to 25% from the former 15%. All of the above occurred during the same year, 2003.

[46] The China Banking Regulatory Commission (CBRC) was established in 2003 to take over the bank supervision mission from PBOC.

As China moves further as a market-oriented economy, it demands new disciplines and predictions. The financial industry development, especially efficiency improvement, is necessary and urgent. At the beginning of the financial reform, state-owned banking institutions were the main regulating objectives. Nowadays, the private sectors and foreign participators have replaced these. The market share of pluralistic ownerships, particularly ever-expanding non-state-owned shares, increase, although the access to financial institutions has not completely opened yet. The total assets expansion of the non-state-owned commercial banks is nearly ten times that of the state-owned commercial banks during the period of 1996 to 2010. Their expansion of gross loans and employees reaches over twenty-seven times that of the state-owned ones (see Table 5.2).

Table 5.2: Business Changes of State-owned and Private Banks in China (1996 & 2010)

Unit: Billion RMB, persons

Items	1996	2010	Changes
Total assets of state-owned commercial banks [a]	5,563	46,894	842.94%
Total assets of non-state-owned commercial banks [b]	627	48,411	7717.36%
Total gross loans of state-owned commercial banks	5,356	20,887	389.98%
Total gross loans of non-state-owned commercial banks	289	30,036	10407.48%
Employees of state-owned commercial banks	1,726,482	1,545,050	89.49%
Employees of non-state-owned commercial banks	58,532	1,445,666	2469.87%

Sources: The 1996 data is from Hu et al. (Hu et al., 2009);

The 2010 data is from *Almanac of China's Finance and Banking 2010* and *China Banking Regulatory Commission 2010 Annual Report*.

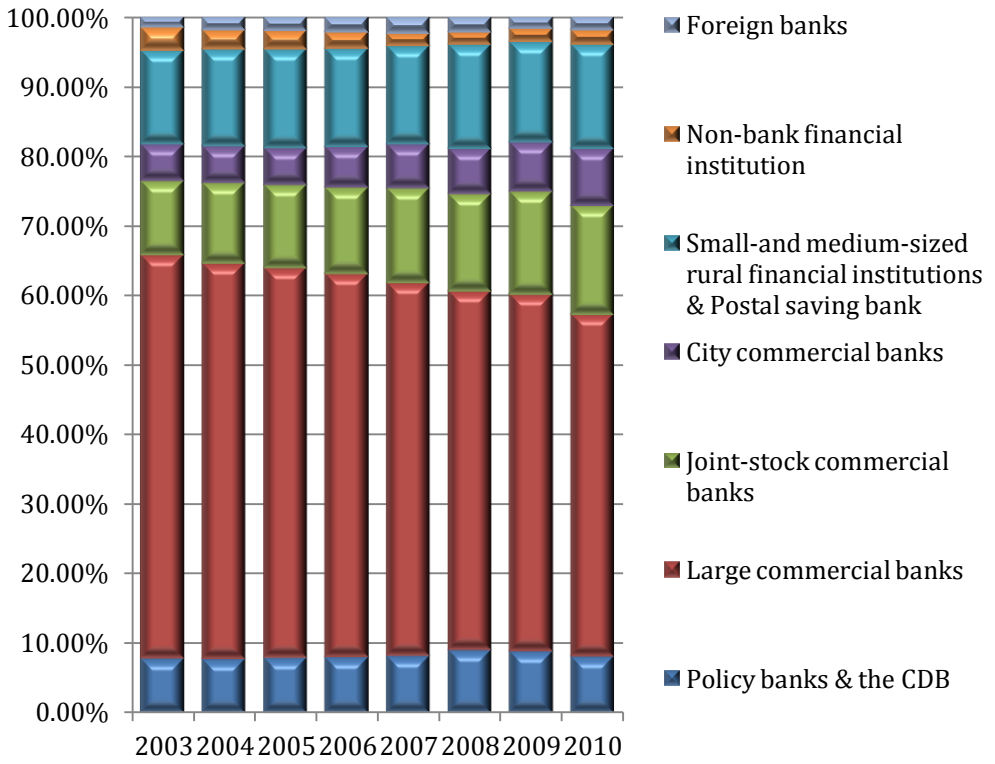
Note: a. 1996: Industrial and Commercial Bank of China, Agricultural Bank of China, Bank of China, and China Construction Bank (Big Four).

2010: Industrial and Commercial Bank of China, Agricultural Bank of China, Bank of China, China Construction Bank, and Bank of Communications (Big Five)

b. All the other banks exclude the Big Four in 1996 or Big five in 2010

The assets share of the state-owned commercial banks has been declining over the years. The reduced 8.83 percentage market shares of the state-owned commercial banks (measured by assets) from 2003 to 2010 are held by others. The fastest soaring type is the joint-stock commercial bank, with 4.94%

appreciation from 2003 to the end of 2010. The presence of enticing opportunities and emerging markets certainly attracts external investors as well. By the end of 2010, branches of foreign banks within China had increased to more than 90[47], and foreign shares of domestic banks have also doubly or triply risen in the past 10 years. By the year end of 2008, the market share (measured by total assets) of foreign banks is 2.13%. The absolute value was 0.42 trillion RMB in the year end of 2003, but was 1.74 trillion RMB in the year end of 2010 (clearly ascending) (see Figure 5.2).



Source: *China Banking Regulatory Commission (CBRC) Annual Report 2006-2010*.

Note: 1. China's banking institutions in this chart comprise policy banks, state-owned commercial banks, joint-stock commercial banks, city commercial banks, rural commercial banks, rural cooperative banks, urban credit cooperatives, rural credit cooperatives, the postal savings bank, non-bank financial institutions, and foreign-funded banking institutions.

2. The category of Small and medium-sized rural financial institutions & Postal saving bank includes Rural commercial banks, Rural cooperative banks, Urban credit cooperatives, Rural credit cooperatives, and New-type rural financial institutions & Postal savings bank.

Figure 5.2: Market Shares (by Assets) of Banking Institutions (2003-2010)

[47] Source: *CBRC Annual Report 2010*, China Banking Regulatory Commission.

Although the financial industry reform began in the 1980s, truly dramatic changes and official reforms have only come into being since 1994. For example, it was in the 1980s that the Big Four banks were successively set up to take over the commercial function of PBoC. The *Law of People's Bank of the People's Republic of China* was not enacted until March, 1995. This central bank law defined two major functions of the PBoC. Firstly , under the leadership of the State Council, the PBoC would establish and enforce monetary policy, and stabilize currency value, thereby promoting economic development; Secondly, it would implement supervision of financial institutions.

The timeline of reformation and development of the Chinese banking sector in recent decades is as followings:

December, 1993: The *Decision of the State Council on Reform of the Financial System* was issued to clarify main missions of financial reform.

Combing this decision and reform proceedings, the evolution and reformation of banking industry is along the trunk of marketlization and openness. The reform can be concluded in four aspects: (I) Separate commercial bank function from PBoC, confine central bank functions, and establish and reiform central bank system; (II) Transform specialized banks (refer to Big Four banks) to commocial banks and relax entry restrictions of various ownerships; (III) Gradually open up; (IV) Reform foreign exchange system.

1994: Three state policy banks were established to release the specialized state-owned banks from policy loan tasks.

1995: a. *Law of People's Bank of the People's Republic of China* was enacted to confine functions of central bank.

b. *Commercial Bank Law* was enacted. This law has two significant effects. The first is that it loosens banking industrial entry restriction. The second is that it officially defines the business pricipal of commercial banks that as independent in management and responsible for their own risk, account

balance, profits and losses. This definition enabled the transformation of the Big Four from specialized banks to commercial banks.

1996: Acquiruision, merging, and seperation started. More than 50,000 Rural Credit Cooperatives (RCCs) began to separate from ABC in this year. This separation objectively unloaded parts of the 'historical burden' of ABC. Various forms of rural banks emerged, for example, Rural Commercial Banks, Rural Cooperative Banks, and New-type Rural Financial Institutions. Urban Credit Cooperatives in cities merged thereafter to form Urban Cooperative Banks (renamed City Commercial Banks in 1998).

1998: a. To unload 'historical burdens', four Asset Management Companies (AMCs) were established to take over the non-performing assets (NPAs) from the four state-owned commercial banks.

b. A series of measures were placed into action in order to reinforce the central bank system. For example, instead of the revoked 31 provincial branches, 9 Inter-provincial PBoC branches were set up. The relationships between the PBoC and affiliated companies, financial institutions, and a variety of economic entities were completely voided.

c. To improve the Capital Adquancy Rate (CAR) of the Big Four banks, 270 billion RMB in special national debts were issued by the Central Budget.

1999: NPAs of 1,393.9 billion RMB, belonging to the Big Four banks were ditached for the first time and were taken over by the four AMCs.

2002: BoC was listed on Hong Kong Stock Exchange

2003: a. Hauxia Bank was listed on Shanghai Stock Exchange. Thereafter, bundles of commercial banks sought public listing Successively.

b. NPAs of the CCB, the BOC, and the ICBC (three of the Big Four banks) were detached for the second time and were taken over by the four AMCs.

2005: The BoCom and the CCB listed on Hong Kong Stock Exchange

2006: The BoC and the ICBC listed on the Hong Kong Stock Exchange.

2010: The ABC dual listed on the Shanghai and Hong Kong Stock Exchange was the world's largest ever IPO in terms of monies raised. By then all the Big Five banks have been listed on stock exchange.

5.1.3 Capital adequacy and performance

The evaluation of Chinese banking industry performance is well documented in literature, although a general consensus has not been achieved. On the one hand, some speculate that the Chinese banking industry is one of the weakest links in the economy and it will hamper future economic growth (Allen , Qian, & Qian, 2005). The reforming pace of the Chinese financial sector is regarded as lagging behind that of the economic system. The deficient legal system and financial system are counted as the Achilles' heel to the continuation of fast and sustainable economic development during the next few decades (Berger, Hasan, & Zhou, 2009). On the other hand, the CBRC have claimed that great efforts have been made to reduce non-performing loans (NPLs),[48] and Chinese banking industry efficiency has improved convincingly since the setup of China Banking Regulatory Commission (CBRC) in 2003.

According to the CBRC Annual Report 2010, after a series of reformations within Chinese banking industry, the bank capital strength has significantly improved. The overall weighted average capital adequacy ratio (WACAR) of China's commercial banks was -2.98% at the end of 2003, turned to positive in 2004, rose to 4.91% in 2005, then further jumped to 12.2% at the end of 2010. All the Big Five banks have exceeded the lowest CAR requirement of 8%, and ICBC is the highest within the Big Five banks (See Table 5.4). The risk resistance of Chinese banking industry had obviously strengthened.

The NPL ratio of all banking institutions diminished to 1.77% by the end of

[48] The NPLs were reduced from RMB 1.70 trillion (13.4% out of the gross loans) at the end of 2005, to RMB 1.25 trillion (6.2% out of the gross loans) at the end of 2007, and finally to RMB 1.24 trillion (1.13% out of the gross loans) at the end of 2010 (Sources: *CBRC Annual Reports 2010*. China Banking Regulatory Commission).

2011, and the NPL ratio of major commercial banks in the mainland has dropped more than 10 percentage points within 5 years[49]. The outstanding balance of NPLs in China's banking sector stood at RMB 1.05 trillion at the end of 2011, marking a decline of RMB 190.4 billion from the last year end. With respect to commercial banks only, total amounts of NPLs declined to RMB 433.6 billion by the end of 2010, down by RMB 73.2 billion from the last year end. At the same time, the NPL ratio dropped to 1.1%, with a decrease of 0.45%.

More powerful proof is that China and its banking sector have largely weathered the financial crisis and even experienced a rapid growth of assets from 2007 to 2009 (see Figure 5.1), without the emergence of systemic risk and the subsequent government support as observed in the West. Sixteen domestic banks[50] have listed on the Hong Kong market achieved a 31% growth in net profit after tax to RMB 346 billion. One key factor is that the Chinese banking sector has been increasingly supervised by the CBRC as it seeks to set even higher regulatory standards for China's banks through increased capital requirements, loan ratios and impairment rules to master the future growth potential for non-performing assets (NPA). Commercial banks had to continue to build up loan loss reserves to match loan growth. As of the end of 2011, RMB 1.19 trillion loan loss reserves were set aside; therefore, the provisioning coverage ratio increased by 60.4% and reached 278.1%, indicating further enhancement of the loss absorbency capacity of the banks[51]. Meanwhile, 390 commercial banks surpassed the minimum Capital Adequacy Rate (CAR) regulatory requirements of 8%.

[49] The NPLs were reduced from 17.9% (end of 2003) to 7.5% (end of June 2006).

[50] The sixteen listed in the Hong Kong market mainland banks are: Agricultural Bank of China, China Construction Bank, Bank of Communications, China CITIC Bank, China Merchants Bank, China Mingsheng Banking and Industrial & Commercial Bank of China (which are listed in both Shanghai and Hong Kong Stock Exchanges), and also Bank of Beijing, Bank of Nanjing, Bank of Ningbo, China Everbright Bank, Huaxia Bank, Industrial Bank, Shanghai Pudong Development Bank, and Shenzhen Development Bank (which are listed in the Shanghai Stock Exchange). Growth analysis was calculated based on the results of those banks which have provided comparative figures. (Source: *Listed banks in China: 2010 interim results*, KPMG).

[51] Source: *CBRC Annual Report*, China Banking Regulatory Commission.

5.2 Reviews of previous studies

Bank efficiency is a general measurement item of the comprehensive capability of commercial bank performance. The scope of this item could include market competitiveness, resource allocation, and sustainable development, etc. In terms of methodology definition, it could be technical, scale, cost-based or profit-based efficiencies (Yin, Shang, & Broadbent, 2010) measured by parametric or non-parametric methods, such as data envelop analysis (DEA) or stochastic frontier analysis (SFA).

Literatures on banking efficiency measurement have proliferated since the 1960s (Benston, 1965; Frederick & Neil, 1969). The trunk stream of scale efficiency has been used since the 1960s, scope efficiency since the 1970s, and X-efficiency from the 1990s, and the most commonly used methods in recent decades are Frontier Approach Analyses (FAAs). FAAs have two major branches: Parametric and Non-parametric approaches. The Non-parametric Methods, like the Data Envelopment Analysis (DEA) and the Free Disposal Hull (FDH), and the Parametric Methods, like the Stochastic Frontier Approach (SFA), the Distribution-Free Approach (DFA), and the Thick Frontier Approach (TFA), are both limited by their own drawbacks. The Parametric Methods take behavioral assumptions as a prerequisite and are, therefore, committed to the probability of function specification error (Berger & Humphrey, 1997). Inversely, the Non-parametric Methods ignore the influence of price and accidental events, but win the advantage of a lack of need for cost or production function assumption. But from another perspective, without function assumption and price adjustment, these efficiency estimations can lose touch with reality.

The consistency tests are used for methodology selection as a priority. Berger & Humphrey surveyed 130 FAA studies of 21 countries' financial institutions and found that these various efficiency methods do not necessarily yield consistent results. They give critical suggestions to modify these approaches toward more accuracy and consistency (Berger & Humphrey, 1997). The emerging markets are the research objectives as well, for example,

Pakistan (Bonin, Hasan, & Wachtel, 2005). The inconsistency results of frontier analyses have also been echoed by other literatures (Bauer et al., 1998; Ferrier & Lovell, 1990). However, some other literatures reject this inconsistency hypothesis. By proposing a set of consistency conditions that frontier efficiency measures might meet, various FAA studies escape the claim of possible inconsistency (Bauer et al., 1998). Based on the data of 683 U.S. banks over the period of 1977-1988, evaluating and comparing with four of these major approaches, DEA, SFA, TFA, and DFA, the work (Berger & Mester, 1997) provides mixed evidence as to whether the Parametric Methodologies are consistent with one another or whether the Non-parametric ones simply depend on consistency conditions. After comparisons of former researches, our approaches in this article mainly rely on the parametric method of SFA. For China, SFA analysis of banking efficiency is well used by scholars, but the research objectives or sample periods are different. For example, Berger et al. (Berger, Hasan, & Zhou, 2009) estimate both cost and profit efficiency frontiers to assess relative efficiency and the influence of minority foreign ownership of Chinese banks.

Many studies of bank ownership demonstrate the obvious characteristics of transition economies. The most common findings of cost efficiency analyses for developing nations are that, generally speaking, private domestic banks and foreign banks are more efficient than state-owned banks (Micco, Panizza, & Yañez, 2007), and that local banks with foreign investors also perform better than those with none (Berger, Hasan, & Zhou, 2009). Based on the data of Central and Eastern European countries, such as Croatia, the results show that new private and privatized banks, contrary to some expectations, are not the most efficient banks (Kraft, Hofler, & Payne, 2006). A cross-country comparison of 28 developing nations illustrates that private domestic banks rank higher in efficiency than the state-owned banks (Berger, Hasan, & Klapper, 2004; Berger, Hasan, & Zhou, 2009). The empirical results of Thailand (Okuda & Rungsomboon, 2006) also support this common consensus. When focusing on the Chinese banking industry, by applying a panel of

Chinese (domestic) private, foreign and state ownership banks over 1997-2004, the results illustrate that the Big Four are less profitable and less efficient than the other two types of banks (Lin & Zhang, 2009). Another frequently cited Chinese banking efficiency work, covering 1994-2003, obtains a similar rank order of bank efficiency (Berger & Humphrey, 1997). These cost efficiency studies investigate the banking industry cost efficiency stretching across the pre-WTO period and post-WTO period. The regulations and deepening reformation of the bank privation and marketization since 2001 may have changed the efficiency of the Chinese banking industry somehow.

Some new evidences have proposed that the banks with state-owned ownership in China have higher profit and better performance than non-state-owned banks. In terms of profitability on the basis of the whole industry, the Big Five banks achieved an aggregate net profit of RMB 515.12 million in 2010, taking a 57.29% market share. The total profit market share of the Big Five banks is larger than its assets'. But the profit shares of joint-stock banks and policy banks are less than their assets' shares (see Table 5.1). The Big Five banks were also lower than the industrial average NPL ratio of 2.43% by the end of 2009. Therefore, reconsidering the cost efficiency in the post-WTO period is necessary for Chinese banking industry evaluation.

To help the regulatory authority, policy makers, domestic banks, and external investors know the comparative efficiency advantages and optimal efficiency upgrading channels of the major part of Chinese banks, this chapter, therefore, brings updated substantial evidence on the efficiency rank of bank categories and bank individuals in the post-WTO period. Do the Big Five banks or the policy banks still have lower cost efficiency than the private-owned ones, as inferred by former research? Which single bank takes the highest ranking, or falls to the lowest efficiency order, in a particular year?

Table 5.3: Assets, Deposits, Loans, and Net Profit of the Big Five State-owned Banks (as of December 30, 2009)

Banks[c]	Assets		Deposits[a]		Loans[b]		Net Profit	
	Millions of RMB	Percentage of total	Millions of RMB	Percentage of total	Millions of RMB	Percentage of total	Millions of RMB	Percentage of total
ICBC	11,785,053	27.83%	9,771,277	28.47%	5,728,626	26.72%	129,350	31.04%
CCB	9,623,355	22.72%	8,001,323	23.31%	4,819,773	22.48%	106,836	25.64%
ABC	8,882,588	20.97%	7,497,618	21.84%	4,138,187	19.30%	65,002	15.60%
BOC	8,751,943	20.66%	6,685,049	19.74%	4,910,358	22.91%	85,349	20.48%
BoCom	3,309,137	7.81%	2,372,055	6.91%	1,839,314	8.58%	30,211	7.25%
Totals	42,352,076	100.00%	34,327,322	100.00%	21,436,258	100.00%	416,748	100.00%

Source: *Mainland China Banking survey 2010 (KPMG)*.

Note: a. Refers to Total Deposits from Customers before Allowances for Impairment Losses
b. Refers to Gross Advances to Customers
c. ICBC: Industrial and Commercial Banks of China; CCB: China Construction Bank; ABC: Agricultural Bank of China; BOC: Banks of China; BoCom: Bank of Communications

Table 5.4: Indicators of Bank Performance for Big Five State-owned Commercial Banks (as of 2009)

Percentage

Banks	Size and Strength Measures		Performance Measures							Asset Quality Measures	
	CAR[a]	Liquidity ratio[b]	Net loan-deposit ratio[c]	Non-interest income ratio[d]	Net interest income ratio[e]	Cost-income ratio[f]	Net Interest Margin[g]	ROA	ROE	NPLs ratio[h]	Provision coverage ratio[j]
ICBC	12.36	30.70	57.14	20.47	2.09	38.78	2.26	1.10	19.05	1.54	2.54
CCB	11.70	49.63	58.65	20.62	2.20	38.91	2.41	1.11	19.11	1.50	2.63
ABC	10.07	40.99	53.50	18.28	2.04	48.76	2.28	0.73	18.96	2.91	3.06
BOC	11.14	45.30	71.76	27.21	1.82	42.48	2.04	0.98	15.65	1.52	2.30
BoCom	12.00	28.02	75.95	17.11	2.01	38.84	2.29	0.91	18.37	1.36	2.06

Source: Mainland China Banking Survey 2010 (KPMG)

Note: a. In accordance with the respective regulatory guidelines

b. In accordance with the respective regulatory guidelines

c. Equal to Net Loans/Total Deposits; Net Loan equal to Gross Advances to Customers less Provisions for Loan Losses

d. Equal to Non-interest Income/Total Operating Income; Non-interest Income equal to all Operating Income not included in Net Interest Income

e. Equal to Net Interest Income/Total Assets; Net Interest Income equal to Interest Income less Interest Expenses (including Interest Income from Investments or Investment Income where interest income from investment is not specifically disclosed)

f. Equal to Operating Expenses/Total Operation Income

g. Equal to (Interest Income less Interest Expenses)/Average Interest Bearing Assets.

h. Equal to Gross NPLs/Gross Advances to Customers; Gross NPLs mean Gross Non-performing Loans, which are equal to non-performing or impaired loans.

i. Equal to Provision/Gross Advances to Customers.

5.3 Models and variable definition

5.3.1 Stochastic Frontier Approach

Cost efficiency measures how well a bank is predicted to spend its inputs relative to a 'best-practice' bank producing the same outputs under the same environmental conditions. That is, cost efficiency measures how close to the minimum cost a bank is, where the minimum cost is determined by best performers in the sample. We estimate efficiency levels by specifying the commonly used translog cost functional form. For convenience we show the cost function following Berger's formulation (Berger, Hasan, & Zhou, 2009):

$$\begin{aligned}\ln(C / w_2 z)_{it} = {} & \delta_0 + \sum_j \delta_j \ln(y_j / z)_{it} + \frac{1}{2}\sum_j \sum_k \delta_{jk} \ln(y_j / z)_{it} \ln(y_k / z)_{it} + \beta_1 \ln(w_1 / w_2)_{it} \\ & + \frac{1}{2}\beta_{11} \ln(w_1 / w_2)_{it} \ln(w_1 / w_2)_{it} + \sum_j \theta_j \ln(y_j / z)_{it} \ln(w_1 / w_2)_{it} \\ & + \text{year dummies}_{it} + \ln u_{it} + \ln v_{it}\end{aligned} \tag{6.1}$$

Where i and t index the bank and year, respectively, k=1,…, 4 index the four output variables, and $\delta_{jk} = \delta_{kj}$. C represents the bank's total cost; Ys represent the banks' outputs, and z represents the banks' inputs. There are four outputs, two input prices, and one fixed input (see Table 5.5). We regard the total loans, total deposits, liquid assets, and other earning assets as four outputs, and treat the total earning assets as the only input. The divisions of interest expenses to total deposit and non-interest expenses to fixed assets are looked upon as deposit interest cost (w_1) and fixed assets cost (w_2), the input prices. According to the translog form equation, the $\ln u_{it}$ term represents a bank's efficiency level and $\ln v_{it}$ is a random error that incorporates general measurement error. The normalization by the bank's total earning assets reduces heteroskedasticity, and allows banks of any size to have comparable residual terms from which the efficiencies are calculated. The normalization by the last input price ensures price homogeneity.

Table 5.5: Definitions of Input, Output, and Environmental Variables

Variables	Definition	Unit	Explanation
C	Bank's total cost	Million RMB	The sum of total interest expenses and total non-interest expenses
Y_1	Total loans	Million RMB	Output: The gross loans minus reserves for Impaired Loans/ NPLs and impaired loans
Y_2	Total deposits	Million RMB	Output: The amount of deposits & short-term funding
Y_3	Liquid assets	Million RMB	Output: Liquid assets from balance sheet
Y_4	Other earning assets	Million RMB	Output: Other earning assets from balance sheet
w_1	Deposit interest cost	Percentage	Input prices/ Interest expenses to total deposit
w_2	Fixed assets cost	Percentage	Input prices/ Non-interest expenses to fixed assets
Z	Total earning assets	Million RMB	Input/ Total earning assets from balance sheet
YEAR	Year dummies	Years	Year dummies for each bank (Year 2002-Year 2008)
STATE	Bank classification	0 or 1	STATE = 1 represents the state-owned Big Five (or Four) banks; otherwise STATE = 0
JOINT	Bank classification	0 or 1	JOINT = 1 represents the twelve joint-stock banks; otherwise JOINT = 0
FOREIGN_P	Foreign share percentage	Percentage	The capital share percentage of foreign investors
FOREIGN_S	Foreign share dummy	0 or 1	FOREIGN_S = 1 represents foreign share existence; otherwise FOREIGN_S = 0
TA	Total assets	0.01 RMB	Total assets from balance sheet/100
NPL	Non-performing loans ratio	Percentage	The NPLs divided by the gross loans

Note: For the aim of regression coefficients being comparable, the total assets (TA) are set to the same order of magnitude as NPLs.

Firstly, we obtain the absolute value of cost inefficiency $Eff(te)_{it}$ via Stochastic Frontier Approaches (SFA). Then a bank's relative cost efficiency level is determined by comparing its actual cost efficiencies to best-practice minimum cost in the same year, under the meaning of how relative cost efficiency is when under the same macro-economic conditions. That is:

$$Eff\ (re\_lev)_{it} = Eff\ (te)_{mint} / Eff\ (te)_{it} \quad (6.2)$$

Here *i* and *t* index the bank and year, respectively. Equation 6.2 helps to find out the relative disparities among the selected samples.

We also use the relative rank of cost efficiency based on an ordering of the bank's cost efficiency in each year. The relative level cost efficiencies are put in rank order for a year, and converted to a uniform scale over the [0,1] interval to make the ranks comparable across years. More specifically, the efficiency levels of each observation are ranked in ascending order and converted to a uniform scale over [0,1] using the formula $(order_{it}\text{-}1)/(n_t\text{-}1)$, where order is the place in ascending order of the bank's residual in that year and n_t is the number of the sample banks in that year. The bank with the highest residual has the best rank of 1, which is $[(n_t\text{-}1)/(n_t\text{-}1)]$, and the bank with the lowest residual has the worst rank of 0, which is $[(1\text{-}1)/(n_t\text{-}1)]$.

$$Eff(re\_rank)_{it} = \left(Order_{it} - 1\right) / \left(n_t - 1\right) \quad (6.3)$$

where $Order_{it}$ is the place in ascending order of the *i* th bank in the *y* th year in terms of its cost efficiency level, and n_t is the number of banks in year *t*. Thus, the bank *i*'s relative efficiency rank in year *t* gives the proportion of the other sample banks in that year with a lower efficiency level (e.g., a bank in year *t* with an efficiency level better than 80% of other banks in the sample has a rank of 0.80). The calculation of Equation 6.3 will help to address the order or the sequence of the cost efficiency of the sample. Additionally, the author attaches the standard deviation and range of both the relative cost efficiency levels and ranks all over the sample to measure the diversity of bank efficiency.

5.3.2 Ownership influences and government interventions

After assessing absolute values and relative values of cost efficiency, finding out influence (or intervention) factors of cost efficiency is the next step. The influence factor of majority ownership is considered at first (Lin, 2012). Do the state-owned ownership and the private ownership (represented by joint-stock banks) have significant influences on banking cost efficiency? The dummy variables of both state-owned ownership (STATE) and private ownership (JOINT) are employed. The variable STATE here only refers to the Big Five banks, not including the policy banks, and the JOINT variable refers to the joint-stock banks. Explanations of these two dummies are shown in Table 5.5.

Before officially becoming a member of WTO, the Chinese government decided to unload parts of the 'historical burden' off the state-owned banks. Initially, 270 billion RMB in special national debts were issued by the Central Budget to implement the capital of four large state-owned commercial banks in 1998. Thereafter, emphasizing the non-performing assets (NPAs), four Asset Management Companies (AMCs) were set up to take over the dispatched NPAs[52] of the Big Four respectively. If ignoring the disposal issue of these NPAs and debts, the risk resistance capacities of these large state-owned commercial banks were strengthened by government interventions. However, questions of effects and consequences are put forward. Does the risk resistance capacity improvement really raise the profitability or only operate the balance sheet?

The government's direct interventions are only aimed at state-owned banks, and happened just before and after participating in WTO. The major government intervention objective is raising the CAR of the Big Four by asset injection and NPA dispatching. The capital injection happened in 1998. But

[52] The first dispatching happened from 1999 to 2000. 1,393.9 billion RMB non-performing assets were detached. The other dispatching was from 2003 to 2005, specially aimed at the China Construction Bank (CCB), the Bank of China (BOC), and the Industrial and Commercial Bank of China (ICBC). After a series of processes and reformation, the capital adequacy ratio of these three banks rose to 3.84%, 4.62% and 4.69%, respectively, at the end of 2005.

there are two occasions of NPL dispatching. The first is from 1999 to 2000. These two government direct interventions are out of the sample period. But the other dispatching was from 2003 to 2005, which just falls in the sample period. After this secondary time dispatching, the capital adequacy ratio of the China Construction Bank (CCB), the Bank of China (BOC), and the Industrial and Commercial Bank of China (ICBC) rose to 3.84%, 4.62% and 4.69%, respectively, at the end of 2005 (see Footnote 54). Certainly, besides NPL dispatching, stricter scrutiny and supervision over the whole banking industry are also in parallel. For example, credit control to meet the CAR requirement is a common way of 'government guide'[53].

As no significant evidence shows that capital injection was carried on again during the sample period and that no significant evidence shows the supervisor intervening in total assets expansion of banking institutions, the author supposes that the total asset expansion relies on the decisions of banking institutions during the post-WTO period. But the NPL ratio is intervened by CBRC, either in a direct dispatching way for state-owned banks or by administrative restrictions on credit scales for the industry. Therefore, the author applies two variables to estimate the influence of market and government intervention. 'TA' represents market-oriented total asset expansion. And 'NPL' represents government intervention on the credit aspect, dispatching NPLs from the Big Five banks or guiding the credit scale of the whole banking industry. The definitions and explanations of these two variables can be seen in Table 5.5.

China's ascension to the World Trade Organization is regarded as the vehicle that can open the economy to foreign bankers and a new era of market-driven efficiency. With a commitment to open up Chinese banking markets to foreigners by the end of 2006, since December 2003, foreign banks have been allowed to own up to 25% of a Chinese financial institution, and since 2005, foreigners have been able to buy a limited number of shares in

[53] During the process, banking institutions were required to appropriately control the aggregate credit supply, improve credit structure, and well manage the pace of credit extension (Source: *CBRC annual report 2010*, China Banking Regulatory Commission).

three of the four big state-owned banks[54] (in which the Chinese government continues to hold controlling stakes). Then, influences of minority ownership of foreign shareholders should be considered as well. The foreign shares of state-owned banks and joint-stock banks are demonstrated in Table 5.6. The foreigner investors wave their stakes in the state-owned commercial banks year by year; for example, they increased the share in Industrial and Commercial Bank of China from 8.45% in 2006 to 15.01% in 2008, but reduced to 7.20% in 2009 again. But their stock-occupying percentages in most joint-equity banks are increasing (see Table 5.6). Therefore, two variables, FOREIGN_P and FOREIGN_S, are employed to reflect the influences of foreign shares within domestic commercial banks of state-owned banks and joint-stock banks. The definition and formula of these variables are shown in Table 5.5. In addition, year dummies are used to avoid potential systemic estimation biases of technological progress, abrupt economic growth or regulatory environment changes.

[54] Source: *CBRC Annual Report*, China Banking Regulatory Commission.

Table 5.6: Foreign Investors in Mainland Chinese Banks (Big Five Banks and Joint-Stock Banks only)

Chinese Domestic Banks	Year	Foreign Investor	Stake purchased	
			As a percentage	As USD million
Industrial and Commercial Bank of China (ICBC)	2006	Goldman Sachs, American Express, Allianz Group	8.45%	3800
	2007	Goldman Sachs, American Express, Allianz Group, etc [a].	12.23%	5498
	2008	Goldman Sachs, American Express, Allianz Group, etc.	15.01%	5704
	2009	American Express, Goldman Sachs, Allianz Investments (Luxembourg)	7.20%	7159c
	2010	Goldman Sachs, American Express, Allianz Investments III Luxembourg Sarl	5.06%	6278f
Bank of China (BOC)	2006	Royal Bank of Scotland, Merrill Lynch, Li Ka-Shing, etc.	21.84%	6675
	2007	Royal Bank of Scotland, Merrill Lynch, Li Ka-Shing, etc.	24.37%	7554
	2008	Royal Bank of Scotland, Merrill Lynch, Li Ka-Shing, etc.	20.04%	6414
	2009	The Bank of Tokyo-Mitsubishi UFJ Ltd., Li Ka Shing, Asian Development Bank (ADB)	1.60%	600d
	2010	Li Ka Shing, Asian Development Bank (ADB), The Bank of Tokyo-Mitsubishi UFJ Ltd.,	1.60%	624
China Construction Bank (CCB)	2006	Bank of America, Temasek Holdings	14.20%	3960
	2007	Bank of America, Temasek Holdings	14.20%	3960
	2008	Bank of America, Temasek Holdings	15.85%	5829
	2009	Bank of America, Temasek Holdings, Fullerton Financial Holdings	23.45%	19198[d]
	2010	Bank of America, Fullerton Financial Holdings, Reca Investment Limited	16.94%	17684[g]
Bank of Communications (BoCom)	2006	Hong Kong and Shanghai Banking Corporation (HSBC)	19.90%	1747
	2007	Hong Kong and Shanghai Banking Corporation (HSBC)	19.90%	2027
	2008	Hong Kong and Shanghai Banking Corporation (HSBC)	19.90%	2027
	2009	Hong Kong and Shanghai Banking Corporation (HSBC)	19.90%	2027
	2010	Hong Kong and Shanghai Banking Corporation (HSBC)	18.60%	-
CITIC Bank Corporation	2006	Banco Bilbao Vizcay Argentaria(BBVA)	5.00%	648
	2007	Banco Bilbao Vizcay Argentaria(BBVA), Mizuho Bank	5.18%	699
	2008	Banco Bilbao Vizcay Argentaria(BBVA), Mizuho Bank	5.18%	686
	2009	Banco Bilbao Vizcay Argentaria(BBVA), Mizuho Bank	10.18%	2884
	2010	BBVA, Gloryshare Investments Limited, Mizuho Corporate Bank	20.10%	6030
Everbright Bank	2006	IFC	4.90%	19
	2007	Asian Development Bank (ADB)	1.90%	20

(Con't) Table 5.6: Foreign Investors in Mainland Chinese Banks (Big Five Banks and Joint-Stock Banks only)

Chinese Domestic Banks	Year	Foreign Investor	Stake purchased	
			As a percentage	As USD million
Everbright Bank	2008	Asian Development Bank (ADB)	2.00%	20
	2009	Asian Development Bank (ADB)	2.00%	20
	2010	-	-	-
Hua Xia Bank	2006	Deutsche Bank, Sal Oppenheim, Pangaea Capital Management	20.88	690
	2007	Deutsche Bank, Sal Oppenheim	13.98%	462
	2008	Deutsche Bank, Sal Oppenheim	17.78%	1141
	2009	Deutsche Bank, Sal Oppenheim	17.78%	1141
	2010	Deutsche Bank	17.12%	5360[k]
Minsheng Banking Corporation	2006	IFC, Temasek Holdings	6.20%	133
	2007	IFC, Temasek Holdings	4.23%	133
	2008	IFC, Temasek Holdings	4.23%	133
	2009	IFC	0.93%	23
	2010	-	-	-
Guangdong Development Bank	2006	Citigroup, IBM	24.74%	862
	2007	Citigroup, IBM	24.74%	862
	2008	Citigroup, IBM	24.74%	3265
	2009	Citigroup, IBM	24.74%	804[e]
	2010	Citigroup Inc. IBM Credit LLC	24.74%	1061[h]
Shenzhen Development Bank	2006	Newbridge Capital, GE Capital	25.28%	250
	2007	Newbridge Capital	15.80%	150
	2008	Newbridge Capital	16.70%	150
	2009	Newbridge Capital	16.07%	150
	2010	-	-	-
Industrial Bank	2006	Hang Seng Bank, IFC	24.98%	325
	2007	Hang Seng Bank, IFC, GIC Special Investments of Singapore	19.98%	325
	2008	Hang Seng Bank, IFC, GIC Special Investments of Singapore	19.98%	325
	2009	Hang Seng Bank, IFC, GIC Special Investments of Singapore	19.98%	325
	2010	Hang Seng Bank, Tetrad Bentures Pte Ltd.	16.61%	270

(Con't) Table 5.6: Foreign Investors in Mainland Chinese Banks (Big Five Banks and Joint-Stock Banks only)

Chinese Domestic Banks	Year	Foreign Investor	Stake purchased	
			As a percentage	As USD million
Shanghai Pudong Development Bank	2006	Citigroup, IBM	4.60%	67
	2007	Citigroup, IBM	3.78%	67
	2008	Citigroup, IBM	24.74%	3265
	2009	Citigroup	3.78%	67
	2010	Citibank Overseas Investment Corporation	3.39%	67
Evergrowing Bank	2006	-	-	-
	2007	United Overseas Bank (UOB)	20.00%	44[b]
	2008	United Overseas Bank (UOB)	15.38%	113
	2009	United Overseas Bank (UOB)	15.38%	113
	2010	United Overseas Bank (UOB)	12.06%	280[j]
Bohai Bank	2006	-	-	-
	2007	Standard Chartered	19.99%	123
	2008	Standard Chartered	19.99%	123
	2009	Standard Chartered	19.99%	123
	2010	Standard Chartered	19.99%	123

Source: The data are collected from *KPMG Mainland China Banking Survey 2006-2010*; the missing data are calculated using *China Banking Regulatory Commission Annual Report*, *Bankscope*, and annual financial report of each bank. The exchange rate of CNY/USD was according to BOC website.

Note: a. Only the top three largest foreign shareholders are listed in this table when the foreign investors in one Chinese bank are more than three.
b. The equity of the Evergrowing Bank is 1621 mil CNY, and the exchange rate of CNY/USD was 7.81 on 31st, December, 2006.
c. The equity of ICBC is 678,934 mil CNY (from *Bankscope*), and the exchange rate of CNY/USD was 6.83 on 31st, December, 2009.
d. The equity of CCB is 559,020 mil CNY (from *Bankscope*), and the exchange rate of CNY/USD was 6.83 on 31st, December, 2009.
e. The equity of Guangdong Development Bank is 22,190 mil CNY (from *Bankscope*), and the exchange rate of CNY/USD was 6.83 on 31st, December, 2009.
f. The equity of ICBC is 821,657 mil CNY (from *ICBC Annual Financial Report*), and the exchange rate of CNY/USD was 6.62 on 31st, December, 2010.
g. The equity of CCB is 691,365 mil CNY (from *ICBC Annual Financial Report*), and the exchange rate of CNY/USD was 6.62 on 31st, December, 2010.
h. The equity of Guangdong Development Bank is 15,370 mil CNY (from *Guangdong Development Bank Annual Financial Feport*), and the exchange rate of CNY/USD was 6.62 on 31st, December, 2010.
i. The equity of Evergrowing Bank is 42,881 mil CNY (from *Evergrowing Bank Annual Financial Report*), and the exchange rate of CNY/USD was 6.62 on 31st, December, 2010.
j. The equity of Huaxia Bank is 35,496 mil CNY (from *Huaxia Bank Annual Financial Report*), and the exchange rate of CNY/USD was 6.62 on 31st, December, 2010.

5.4 Sample selection and data source description

Looking at the Bankscope data source, the CBRC Annual Report, and the Chinese Almanac of Finance, we can obtain unbalanced annual panel data of these 20 Chinese banks for the period of 2002-2009, totaling 143 observations. The basic data source of our analysis is Bankscope. Additionally, we collected or double-checked the data from other sources referred to above. The information of foreign shareholders comes from the Mainland China Banking Survey 2006-2010 by KPMG. Annual reports provided by individual banks via their websites are used as supplementary materials as well. After that we used the Consumer Price Index (CPI) of 1990 as a base to adjust the accounting data. All the absolute values of the variables used in econometric analyses are inflation-adjusted to the base year of 1990. Additionally, we applied the correspondent year-end exchange rate to the data, denominated in foreign currencies to make sure the collected data is all denominated in RMB. For the regression section, as far as the purpose of readability of the coefficients is concerned, we use the unit of 10 million RMB for the variables of total assets and non-performing loans.

Although mass literatures are concerned about banking efficiency, the objectives are differently selected or intercepted. The work of Berger et al. (Berger, Hasan, & Zhou, 2009) covers 94% of Chinese banking assets, involving the Big Four, nine of eleven joint-stock banks, sixteen commercial banks (out of one hundred and thirteen banks at the year end of 2003), six joint-venture bank, and two foreign banks, totaling thirty-seven individual banks from five types of bank. Amongst our three nationwide bank groups, the Big Five banks are known as the ‘first tier’ of the domestic banks, with more than 49% total industry assets and with 57% net profit of the banking industry. The 12 joint-stock banks are known as the ‘second tier’ of domestic banks, owning about 16% of total assets. These two tiers, plus policy banks, which control 8% of industry assets, construct our analysis samples. Nevertheless, the reformation of privatization and marketization has been undergoing since the end of the last century, and the total asset market share of these three kinds of

bank decreased to 71.25% by the end of 2009 (see Table 5.7). Taking a panoramic view of the Chinese banking industry in the year end of 2010, at least 73% total assets, 69.84% total deposits, 64.53% loans, and 77% net profit of Chinese banking industry market shares are occupied by these top 20 banks (see Table 5.1). In other words, in spite of the fact that only 20 sample banks were selected out of more than three thousand bank branch outlets in the mainland, this group takes advantage of overwhelming market coverage of the Chinese banking industry. The sample selection is sufficient and reliable enough to support the results of Chinese banking industry efficiency assessment and to influence factor analyses. Furthermore, the cost efficiency analyses of these historically lasting, large-sized, and nationwide bank samples in this chapter carve out a way and lend a worthwhile and beneficial precedent to the similar efficiency assessments of those newly established, small-sized, and locally located commercial banks (which only take a minor market share of the Chinese banking industry).

Table 5.7: Total Assets of Banking Institutions (2003-2010)

Unit: Billion RMB

Institutions/Years	2003	2004	2005	2006	2007	2008	2009	2010
State-owned commercial banks[a]	650.9	763.7	959.7	1,354	1,582.4	1,960.8	2,196.2	2,861.1
Joint-stock commercial banks	97.7	114.3	133.5	190.4	339.2	441.4	564.0	816.6
Policy banks and the China development banks	95.7	111.8	152.3	172.6	357.8	380.6	406.3	436.3
City commercial banks and urban credit cooperatives	50.3	60.4	85.9	126.5	194.7	271.6	360.4	482.4
Small-sized and medium-sized rural financial institutions[c]	13.2	75.9	165.3	204.1	272.7	362.8	464.2	667.0
Foreign banks	40.8	49.4	62.5	74.7	117.2	142.0	167.4	185.4
Non-bank financial institutions	141.7	98.2	103.6	117.1	175.6	231.0	285.5	383.3
Total Banking Institutions	1,063.9	1,273.7	1,662.7	2,239.4	3,039.6	3,790.0	4,444.1	5,832.2
Market share of the top three categories	79.36%	77.71%	74.91%	76.67%	74.99%	73.42%	71.25%	70.54%

Source: *CBRC Annual Report 2010*, adjusted by CPI (Based year = 1990)

Note: a. Big Four banks before 2006, and Big Five banks after 2006.
b. The group definition is the same as Table 5.1

Most banking efficiency studies exclude the policy banks (Berger & Humphrey, 1997; Lin & Zhang, 2009). The concern of including three policy banks as observations in this chapter is for the sake of the following aspects:

First and foremost, the policy banks are sizable institutions in the Chinese industry. They accounted for 7.86% of total banking assets in 2003, increased to their peak of 8.94% in 2007, and lost parts of their market share (8.03%) by the end of 2010[55]

The policy banks always tightly follow the administrative guides. Because of the sole ownership and politically assigned loans, the policy banks were always unexpectedly speculated to be the most inefficient group. However, the performance of Chinese policy banks is more impressive than their 8% market share. Influenced by the global financial crisis, a significant number of banks saw declines in profit, while many others had increases in profit that were small compared to profit growth from 2007 to 2008. However, according to the KPMG survey, the largest increases were achieved by policy banks (48.4%), outperforming the Big Four commercial banks (20.7%), joint-stock banks (14.7%), and city commercial banks (9.6%).

As described before, unlike other countries, all the Chinese policy banks were newly set up in 1994, contemporaneously or even later than the establishment of joint-stock banks and other small and medium-sized banks in China. Therefore, 'no historical burden' is a substantial feature of policy banks.

Additionally, the Chinese policy banks are announcing their intention to become retail banks, fully international banks, as well as expand into other areas of the financial services sector, such as investment banking and fund management. Certainly, the conditions are in place for them to readjust their roles and functions and undergo this transformation. As an effort to further commercialize, China's policy banks have continued a pace of restructure[56],

[55] Source: *CBRC Annual Report 2006-2010*, China Banking Regulatory Commission.

[56] China Development Bank (CDB) was the first to officially restructure on December 11th, 2008 into a commercial joint-stock banking institution under the ownership of the Ministry of Finance and Central Huijin Investment Corporation. However, CDB has not been granted the right to accept deposits from individuals, as other commercial lenders can, although it can take in deposits from corporate clients. Nonetheless, it will continue to rely on bond issuances in the interbank market to an extent and this will

business scope transformation[57], and overseas business expansion[58]. The role of policy banks has undergone substantial changes. They have revised its Articles of Association, replenished capital, and improved corporate governance and risk controls, allowing it to apply similar loan assessment tools to any other commercial banks[59]. Their business has become increasingly market-based, with government-directed business decreasing and self-initiated business increasing[60].

Although they will still function, to some extent, as policy lenders and will continue to raise capital through the Ministry of Finance Bonds, these banks are now being pushed to focus more on profitability. Therefore, the Chinese policy banks can be recognized as a newly set up bank of individuals with a mixed character of both policy banks and commercial banks. Evidences have reported that although state-owned banks are the least efficient and foreign-owned banks the most efficient, the newly private domestic banks outperformed foreign-owned banks in some cases (Bonaccorsi di Patti & Hardy, 2005). In this chapter the author tries to measure whether there is any special evidence for Chinese policy banks.

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be aided by the fact that its sovereign rating has been maintained (Source: CDB moves closer to full commercial bank status, December 17th, 2008, South China Morning Post)

Agriculture Development Bank of China (ADBC) has been explicitly ruled out of a full restructuring along the lines of CDB in the near future (Source: Agricultural Development Bank of China: No Restructuring Plan, June 11th, 2009, Dow Jones Chinese Financial Wire).

[57] The Export-Import Bank of China (ExIm Bank) is undergoing a similar transformation to CBD; it has voiced its intention to commercialize and has begun to widen the scope of its operations since March 2009. It is expected by the PBoC that, at the first stage, the transformation will involve the bank operating both its policy banking business and commercial banking business as separately managed units. In this way it can continue to focus on boosting foreign trade and economic cooperation by providing policy financing, foreign government loans and foreign aid-oriented concessional loans (mostly for infrastructure development) while pursuing other more commercial endeavors (Source: the Export-Import Bank of China website: www.eximbank.gov.cn).

[58] CDB has voiced its intention to become a fully international bank, opened its first branch outside the mainland in Hong Kong on 29 July 2009, and set up offices in Russia and Egypt in 2009 and in Venezuela and Brazil in 2010 (Source: China Development Bank opens first overseas branch in HK, August 3rd, 2009, Xinhua China Money).

Internationalized development for ADBC is the memorandum of understanding signed with National Australia Bank in August 2008 to cooperate in the field of rural banking expertise and staff training. This cooperation may eventually be extended into areas like trade finance, agricultural infrastructure finance, and the development of banking products (Source: NAB sets China alliance with farm policy lender: Australian bank aims to begin by learning, then pursuing ventures, August 11th, 2008, The Wall Street Journal Asia).

[59] Source: *CSRC Annual Report 2009*, China Securities Regulatory Commission.

[60] Source: *Mainland China Banking Survey 2010*, KPMG.

Table 5.8: Descriptive Statistics of Input and Output Variables

Unit: RMB Million

	N	Minimum	Maximum	Mean	Std. Deviation
Input: Total Earning Assets (Z)	134	7,096	8,568,147	1,380,649	1,804,858
Output: Loans (Y_1)	134	3,557	4,070,066	707,116	862,184
Output: Deposits (Y_2)	134	302	8,051,976	1,214,789	1,724,918
Output: Liquid Assets (Y_3)	134	1,769	1,755,812	226,526	324,762
Output: Other Earning Assets (Y_4)	134	3,440	4,409,614	592,624	915,803
Input prices: Deposit interest cost (w_1)	134	0.006	6.35	0.10	0.56
Input prices: Fixed assets cost (w_2)	134	0.18	3.10	1.07	0.54

Table 5.9: Pearson Correlations of Input and Output Variables

	Total Earning Assets	Loans	Deposits	Liquid Assets	Other Earning Assets
Input: Total Earning Assets (Z)	1.000				
Output: Loans (Y_1)	0.973	1.000			
Output: Deposits (Y_2)	0.973	0.903	1.000		
Output: Liquid Assets (Y_3)	0.907	0.844	0.909	1.000	
Output: Other Earning Assets (Y_4)	0.978	0.922	0.980	0.919	1.000

The descriptive statistics and Pearson correlations of the cost efficiency input and output variables are shown in Table 5.8 and Table 5.9. The input and output variables have a high correlation relationship with each other. The descriptive statistics of cost efficiency influence factores are shown in Table 5.10.

Table 5.10: Descriptive Statistics of Some Regression Independent Variables

Unit: Percentage, 0.01 RMB

	N (Overall)	n (Between)	Minimum	Maximum	Mean	Std. Deviation
FOREIGN_P	50	14	0.009	0.253	0.153	0.077
TA	134	20	0.001	0.880	0.143	0.186
NPL	134	20	0.007	0.220	0.027	0.029

5.5 Empirical analyses

5.5.1 Absolute and relative values of cost efficiency

The author uses State 11.0SE to obtain the coefficients of Equation 6.1, and illustrates the estimation results in Table 5.11. The absolute values of cost inefficiency $Eff(te)_{it}$ are predicted through regression. Higher $Eff(te)_{it}$ value means more waste of the cost expenditure of a certain individual bank in a certain year. The mean of $Eff(te)_{it}$ is 1.171, with a standard error of 0.103 during the whole sample period (see Table 5.12). Then, by applying Equation 6.2 and Equation 6.3, relative values of cost efficiency $Eff(re\_level)_{it}$ and relative ranks of cost efficiency $Eff(re\_rank)_{it}$ are obtained (See Table 5.13 and Table 5.14). The mean of the relative level values of cost efficiency $Eff(re\_level)_{it}$ is 0.883, with 0.035 as its standard error, and the mean of the relative rank values of cost efficiency $Eff(re\_rank)_{it}$ is 0.5 (because it is the mean of the rank order sequence), with 0.308 as its standard error (see Table 5.12).

Table 5.11: Coefficients of Independent Variables Using Translog Cost Function

Independent variables	Coefficients (Standard deviation)	Independent variables	Coefficients (Standard deviation)	Independent variables	Coefficients (Standard deviation)		
$\ln(y_1/z)_{it}$	2.482*** (0.749)	$\frac{1}{2}\ln(y_1/z)_{it}\ln(y_4/z)_{it}$	0.597* (0.342)	Year 2002	0.247*** (0.072)	sigma_u2	0.008 (0.006)
$\ln(y_2/z)_{it}$	4.047*** (0.471)	$\frac{1}{2}\ln(y_2/z)_{it}\ln(y_3/z)_{it}$	-0.008 (0.241)	Year 2003	0.217*** (0.053)	sigma_v2	0.004 (0.000)
$\ln(y_3/z)_{it}$	-0.155 (0.405)	$\frac{1}{2}\ln(y_2/z)_{it}\ln(y_4/z)_{it}$	0.677** (0.269)	Year 2004	0.201*** (0.043)		
$\ln(y_4/z)_{it}$	1.106** (0.459)	$\frac{1}{2}\ln(y_1/z)_{it}\ln(y_4/z)_{it}$	-0.072 (0.177)	Year 2005	0.116*** (0.038)	Number of Obs	134
$\frac{1}{2}\ln^2(y_1/z)_{it}$	0.172 (0.386)	$\ln(w_1/w_2)_{it}$	2.855*** (0.280)	Year 2006	0.071* (0.031)	Number of Groups	20
$\frac{1}{2}\ln^2(y_2/z)_{it}$	0.814*** (0.128)	$\frac{1}{2}\ln(w_1/w_2)_{it}\ln(w_1/w_2)_{it}$	0.351*** (0.045)	Year 2007	0.021 (0.029)	Obs per Group	
$\frac{1}{2}\ln^2(y_3/z)_{it}$	-0.028 (0.062)	$\ln(y_1/z)_{it}\ln(w_1/w_2)_{it}$	0.608*** (0.173)	Year 2008	-0.016 (0.023)	Min	2
$\frac{1}{2}\ln^2(y_4/z)_{it}$	0.170 (0.167)	$\ln(y_2/z)_{it}\ln(w_1/w_2)_{it}$	0.543*** (0.072)	δ_0	4.944*** (0.906)	Avg	6.7
$\frac{1}{2}\ln(y_1/z)_{it}\ln(y_2/z)_{it}$	2.093*** (0.660)	$\ln(y_3/z)_{it}\ln(w_1/w_2)_{it}$	0.015 (0.063)	sigma2	0.0112 (0.006)	Max	8
$\frac{1}{2}\ln(y_1/z)_{it}\ln(y_3/z)_{it}$	-0.469 (0.460)	$\ln(y_4/z)_{it}\ln(w_1/w_2)_{it}$	0.175* (0.091)	gamma	0.682 (0.166)	Wald Chi^2	2463.01***

Note: This table shows the frontier regressions of cost efficiency, with standard errors clustered at the bank level, referring to Equation (6.1) in the data and methodology section. Absolute values of standard errors of the coefficients of the independent variables are shown in the parentheses. ***, **, and * are significant at 1, 5, and 10 percent significance levels, respectively.

Table 5.12: Empirical Results of Cost Efficiency

	Observes	Mean	Std. Dev.	Min.	Max.
$Eff(te)_{it}$	134	1.171	0.103	1.020	1.436
$Eff(m)_{it}$	134	0.133	0.076	0.005	0.268
$Eff(u)_{it}$	134	0.134	0.075	0.193	0.268
$Eff(re\_level)_{it}$	134	0.883	0.075	0.730	1.000
$Eff(re\_rank)_{it}$	134	0.500	0.308	0.000	1.000

Note: This table shows the predicted results of frontier regressions of cost inefficiency.
te, me, and u represent the different predicted methods offered by Stata 11.0SE.
$u=-\ln\{E(u_{it}|v_{it})\}$, $m=-\ln\{M(u_{it}|v_{it}), M(u_{it}|v_{it})=-u_i$, if $u_i>=0$, 0 otherwise$\}$, $te=E\{\exp(-u_{it}|v_{it})\}$ separately.

The average and range values in the relative level of efficiency of each year are shown at the bottom of Table 5.13. Owing to the fact that changes of the relative rank efficiency and its standard deviation mainly depend on the alteration in numbers of the bank other than the sequence resorting of the individuals (see Table 5.14), we only show the relative level efficiency values of individual banks from 2002 to 2009 in Table 5.13, excluding the relative rank efficiency values of individual banks. The average values of the relative level cost efficiency are around 0.88 across all of the sample years. The steady fluctuation around 0.88 suggests that, on average, banks waste about 12 percentage points of the cost efficiency compared to the best-practice bank under the same macro-economic environment. The low volatility of the whole sample period breaks the prediction made by former literature that the domestic banking system will suffer by the foreign banks rushing into China, since China executed the promise with WTO in 2006 (Dobson & Kashyap, 2006). In other literatures, the depository financial institutions (banks, S & L, credit unions) have an average efficiency of around 0.77 (median 0.82) (Berger & Humphrey, 1997). Our result is around 0.88.

Table 5.13: Bank Efficiency Relative Level Values (2002-2009)

Ownership type/Year	Efficiency of relative level (Eff (re_level))							
	2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
1. Policy Banks and CDB								
a. China Development Bank	1.000	1.000	0.981	0.982	0.982	0.983	0.984	0.985
b. The Export-Import Bank of China	0.973	0.974	0.956	0.958	0.960	0.961	0.963	0.965
c. Agricultural Development Bank of China	0.881	0.886	0.873	0.878	0.883	0.888	0.892	0.896
Within group average	0.951	0.953	0.937	0.939	0.942	0.944	0.946	0.949
(St. Deviation)	(0.062)	(0.060)	(0.057)	(0.054)	(0.052)	(0.050)	(0.048)	(0.047)
Within group range	0.119	0.114	0.108	0.104	0.099	0.095	0.092	0.089
2. Big Five Banks								
a. Industrial and Commercial Bank of China	n.a.	0.825	0.816	0.823	0.830	0.836	0.843	0.849
b. Agricultural Bank of China	0.730	0.740	0.735	0.744	0.754	0.763	0.771	0.780
c. China Construction Bank	0.798	0.805	0.797	0.805	0.812	0.819	0.826	0.833
d. Bank of China	n.a.	0.780	0.773	0.782	0.790	0.798	0.805	0.813
e. Bank of Communications	n.a.	n.a.	n.a.	n.a.	0.796	0.803	0.811	0.818
Within group average	0.764	0.788	0.780	0.789	0.796	0.804	0.811	0.819
(St. Deviation)	(0.048)	(0.037)	(0.035)	(0.034)	(0.028)	(0.027)	(0.027)	(0.026)
Within group range	0.068	0.085	0.081	0.079	0.076	0.073	0.072	0.069
3. Joint-stock Banks								
a. Bank of Communications	0.779	0.787	0.780	0.788	n.a.	n.a.	n.a.	n.a.
b. China CITIC Bank	n.a.	n.a.	0.847	0.853	0.858	0.864	0.869	0.874
c. China Everbright Bank	0.996	0.996	0.977	0.978	0.979	0.980	0.981	0.982
d. Hua Xia Bank	0.938	0.941	0.925	0.928	0.931	0.934	0.936	0.939
e. China Minsheng Banking Corporation	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.868	0.874
f. Guangdong Development Bank	0.880	0.885	0.872	0.877	0.882	0.887	0.891	0.896
g. Shenzhen Development Bank	0.947	0.949	0.933	0.936	0.938	0.941	0.943	0.945
h. China Merchants Bank	0.851	0.857	0.846	0.852	0.858	0.864	0.869	0.874
i. Industrial Bank	n.a.	n.a.	1.000	1.000	1.000	1.000	1.000	1.000
j. Shanghai Pudong Development Bank	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.855	0.861
k. Evergrowing Bank	n.a.	n.a.	0.944	0.946	0.948	0.951	0.953	0.954
l. China Zheshang Bank	n.a.	n.a.	0.850	0.856	0.861	0.867	0.872	0.877
m. China Bohai Bank	n.a.	n.a.	n.a.	n.a.	0.762	0.771	0.779	0.787
Within group average	0.899	0.903	0.897	0.901	0.902	0.906	0.901	0.905
(St. Deviation)	(0.078)	(0.075)	(0.069)	(0.066)	(0.071)	(0.068)	(0.063)	(0.060)
Within group range	0.217	0.209	0.220	0.212	0.238	0.229	0.221	0.213
Full sample in average	0.888 (0.092)	0.879 (0.088)	0.877 (0.081)	0.882 (0.078)	0.879 (0.079)	0.884 (0.076)	0.886 (0.070)	0.890 (0.067)
Full sample range	0.270	0.260	0.265	0.256	0.246	0.237	0.229	0.220

Note: This table shows the descriptive statistics of cost efficiency levels. Relative levels of cost efficiency of the full sample and subsamples are grouped by majority ownership categories. The definition of majority ownership is the same as described in Table 5.1. The relative level of cost efficiency is calculated based on the stochastic frontier approaches (SFA) of translog function of four outputs and one input, as shown in Table 6. Standard deviations of full samples and each group are shown in parentheses below the estimated mean. We use the whole sample relative level cost efficiency to calculate the within group values. Because Bank of Communications was classified as one of the joint-equity banks before 2006, and later became a fifth state-owned commercial bank, we sort it as its classification in an individual specified year. And some data missing banks are replaced with 'n.a.'.

As we have already known, the levels are more accurate, but the rank sequences are more comparable over time, so we list the rank order in the light of all sample ranks as well as the subcategories (see Table 5.14). The ranks in Table 5.14 demonstrate the dramatic and interesting results of the whole selection of samples. The policy banks are the most efficient, while the Big Four or Five banks are the least efficient. The cost efficiency rank result of a bank individual shows that the bank with the highest efficiency is the China Development Bank (CDB) in 2003, which is one of the policy banks. This sequence has been altered to the Industrial Bank (IB) since 2004, which is one of the joint-stock banks. Still, the China Development Bank (CDB) occupies the second most efficient position of the sample banks from 2004 to 2009. The most inefficient banks are the Agricultural Bank (ABC), the China Bohai Bank (CBB) and the Bank of China (BOC), two of which are large state-owned commercial banks.

The least cost-efficient one, the Agriculture Bank of China, with RMB 9,499.5 billion assets, RMB 7,4976.2 billion deposits, and 4,138.2 billion loans, 24,064 branches, and 30,089 ATMs covering the mainland, is one of the Big Five banks and has the historical burdens of low efficiency. Not only the financial indicators of assets, deposits or loans, but also the branches, staff and the duration – all these comparison items of the two similar low-cost efficiency banks are meaningless. And just before the bottom line, ahead of the Agriculture Bank of China, is the China Bohai Bank, which was set up in 2006; it is the first nationwide joint-equity bank since the establishment of People's Republic of China. Moreover, it is the first Chinese financially funded joint-stock bank, but it brought in foreign strategy investors during the set-up stage. By the end of 2009, it had RMB 117.52 billion assets, RMB 15.59 billion deposits, and 69.74 billion loans. The 11 subsidiaries and 29 branches of Bohai Bank distribute in 10 mainland metropolises. Therefore, let's turn our eyes to another similarly relative latecomer. China Zheshang Bank, the first joint venture with a foreign investment bank in China (not nationwide when set up, but now spread to more than 60 branches all over China), was set up in

1993, with RMB 194.1 billion assets, RMB 144.8 billion deposits, and 103.3 billion loans by the end of September 2010, and produces better cost efficiency than China Bohai Bank. Another joint-equity bank worth paying attention to is Industrial Bank, which was set up in 1988, of RMB 1,494 billion total assets, and is the most efficient bank in our samples. According to British Banker Journal, it has been on the top of the Chinese banking industry Profits on Average Capital (ROAE) List since 2006. The valuable points of these three joint-equity banks are that they all have foreign investors and their performances produce lower cost efficiency than others. The related foreign shareholder information can be found in the Table 5.6.

With regard to individual banks, the bank with the highest efficiency was the China Development Bank before 2003, which is one of the policy banks in China. However, the Industrial Bank, which is one of the joint-stock banks in China, has taken first place in this ranking since 2004. This replacement in position is not due to technological advances, but rather because of the omission of data of the Industrial Bank before 2004. Still, China Development Bank occupies the second position in the sample period of 2004 to 2009, which is inconsistent with the theoretical hypothesis that policy banks are less efficient than commercial banks. This result is interesting, but the cause or reason of this result needs more data and theoretical material to determine, and is again outside the scope of our discussions.

We also find that although several bank samples are inserted when time passes by, the original order of the former sequence does not alternate unless the new entries defer them. In Table 5.13, the range of each category and the whole sample decline over time, except the Big Five banks. The individuals with the declined ranges converge in the sample period. The Big Five banks have the lowest range over the sample period, while the ranges of the joint-stock banks are nearly triple. That indicates that the cost efficiency difference within the joint-stock banks is larger than that within the Big Five banks.

Table 5.14: Bank Efficiency Rank Sequencing (2002-2009)

Ownership type/Year	Overall Samples								Within Groups							
	2002	2003	2004	2005	2006	2007	2008	2009	2002	2003	2004	2005	2006	2007	2008	2009
1. Policy Banks and CDB																
a. China Development Bank	1	1	2	2	2	2	2	2	1	1	1	1	1	1	1	1
b. The Export-Import Bank of China	3	3	4	4	4	4	4	4	2	2	2	2	2	2	2	2
c. Agricultural Development Bank of China	6	6	8	8	8	8	8	8	3	3	3	3	3	3	3	3
Observes within group	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
2. Big Five Banks																
a. Industrial and Commercial Bank of China	n.a.	9	13	13	13	13	15	15	n.a.	6	10	10	10	10	12	12
b. Agricultural Bank of China	11	13	17	17	18	18	20	20	8	10	14	14	15	15	17	17
c. China Construction Bank	9	10	14	14	14	14	16	16	6	7	11	11	11	11	13	13
d. Bank of China	n.a.	12	16	16	16	16	18	18	n.a.	9	13	13	13	13	15	15
e. Bank of Communications	n.a.	n.a.	n.a.	n.a.	15	15	17	17	n.a.	n.a.	n.a.	n.a.	12	12	14	14
Observes within group	2	4	4	4	5	5	5	5	2	4	4	4	5	5	5	5
3. Joint-stock Banks																
a. Bank of Communications	10	11	15	15	n.a.	n.a.	n.a.	n.a.	6	6	10	10	n.a.	n.a.	n.a.	n.a.
b. China CITIC Bank	-	-	11	11	11	11	11	11	n.a.	n.a.	8	8	8	8	8	8
c. China Everbright Bank	2	2	3	3	3	3	3	3	1	1	2	2	2	2	2	2
d. Hua Xia Bank	5	5	7	7	7	7	7	7	3	3	5	5	5	5	5	5
e. China Minsheng Banking Corporation	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	13	13	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	10	10
f. Guangdong Development Bank	7	7	9	9	9	9	9	9	4	4	6	6	6	6	6	6
g. Shenzhen Development Bank	4	4	6	6	6	6	6	6	2	2	4	4	4	4	4	4
h. China Merchants Bank	8	8	12	12	12	12	12	12	5	5	9	9	9	9	9	9
i. Industrial Bank	n.a.	n.a.	1	1	1	1	1	1	n.a.	n.a.	1	1	1	1	1	1
j. Shanghai Pudong Development Bank	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	14	14	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	11	11
k. Evergrowing Bank	n.a.	n.a.	5	5	5	5	5	5	n.a.	n.a.	3	3	3	3	3	3
l. China Zheshang Bank	n.a.	n.a.	10	10	10	10	10	10	n.a.	n.a.	7	7	7	7	7	7
m. China Bohai Bank	n.a.	n.a.	n.a.	n.a.	17	17	19	19	n.a.	n.a.	n.a.	n.a.	10	10	12	12
Observes within group	6	6	10	10	10	10	12	12	6	6	10	10	10	10	12	12
Observes	11	13	17	17	18	18	20	20	11	13	17	17	18	18	20	20
Full sample range	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.270	0.260	0.265	0.256	0.246	0.237	0.229	0.220

Note: This table shows the rank order of cost efficiency among all the samples of each year and within groups. Because Bank of Communications was classified as one of the joint-equity banks before 2006, and later became a fifth state-owned commercial bank, we sort it as its classification in a specified year. And some data missing banks are replaced with 'n.a.'.

5.5.2 Ownership influences

From previous discussion, we have already established that the profit market share of the Big Five banks is larger than their assets, but the profit share of joint-stock banks is less than their asset shares (see Table 5.1). The profitability of state-owned ownership seems better than the private (what joint-stock ownership represents). However, from Table 5.13 and Table 5.14, we know that the state-owned banks are less efficient than the joint-stock ones. Is this only an occasional situation or a significant discrepancy in the sample period? Do the profitability and cost efficiency always have this discrepancy between the state-owned banks and the joint-stock banks?

To further clearly identify the discrepancies by econometric description and to set off a standard reference for the following influence factor studies of banking total asset expansion and NPL ratio change, new panel regressions of Model S1 and Model J1 are set up. Model S1 and Model J1 are full sample regressions, having 20 banks from 2002 to 2009. Another reason for separately discussing the regression of majority ownership in advance is the data-collection issue. Until December 2003, foreign banks have been allowed to own up to 25% of a Chinese financial institution, and until 2005, foreigners could buy a limited number of shares in three of the four big state-owned banks (see Footnote 54). Therefore, the foreign minority ownership is a small part within the Chinese banking industry. What's more, the number of observers will be acutely reduced in both cross section dimension and time series dimension by adopting the minority ownership. Model S1 and Model J1 can give an extensive majority ownership influence description of the whole banking industry in the post-WTO period.

In fact, the independent variable STATE is collinear with JOINT. Owing to multi-collinearity, one of the majority ownership variables (STATE or JOINT) has to be omitted. Therefore, the majority ownership influence of state-owned or non-state-owned is obliged to be discussed in two regressions. The same

dependent variable, $Eff(re\_level)_{it}$, is applied to both Model S1 and Model J1. Model S1 and Model J1 only measure the influence of bank ownership (STATE or JOINT) with year dummies. Policy banks are neither attached to the category of state-owned banks nor the group of joint-stock banks, because of its disputed role and outstanding cost efficiency discussed in previous chapters. That is to say, Model 1s only discusses a single influence factor of bank ownership, wherein the author treats the policy banks and joint-equity banks as a control group in Model S1, and treats the policy banks and the Big Five state-owned banks as a control group in Models J1. The state-owned majority ownership shows a positive significance to cost efficiency. Moreover, we have not measured the ownership influence of policy banks with other variables or separately because of multi-collinearity. The influences of majority ownerships to cost efficiency are estimated. And the empirical results are shown in Table 5.15.

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Table 5.15: Cost Efficiency Influence Factor of Majority Ownership (2002-2009)

Independent Variables	Dependent Variables $Eff(re\_level)_{it}$	
	Model S1 (Fixed Effect)	**Model J1 (Fixed Effect)**
STATE	0.015*** (3.000)	Omitted
JOINT	Omitted	-0.015*** (0.005)
YEAR 2002	-0.012*** (-4.64)	-0.012*** (0.003)
YEAR 2003	-0.010*** (-3.94)	-0.010*** (0.003)
YEAR 2004	-0.022*** (-9.34)	-0.022*** (0.002)
YEAR 2005	-0.017*** (-7.27)	-0.017*** (0.002)
YEAR 2006	-0.014*** (-6.03)	-0.014*** (0.002)
YEAR 2007	-0.009*** (-3.91)	-0.009*** (0.002)
YEAR 2008	-0.005** (-2.10)	-0.005** (0.002)
Constant	0.890*** (423.79)	0.902*** (0.003)
N	134	134
Clusters	20	20
F-statistics	470.31***	779.33***
R-square	0.184	0.033
Corr(u_i, Xb)	-0.524	-0.305
Hausman test	Non-positive	30.14***

Note: This table shows the panel regression results of cost efficiency by Stata 11.0SE, with the standard error of the coefficients shown in the parentheses. ***, **, and * are significant at 1, 5, and 10 percent significance levels, respectively. The null hypothesis of the Hausman specification test in this table is that the systematic difference of individual-level effects measured by a fixed-effects model or random model is insignificantly different. And when the Hausman test is non-positive, the fixed-effect model will be selected.

The coefficients of all the independent variables are significant in Model 1s, which infers that the ownerships of both state and joint stock significantly affect the banking cost efficiency. However, the signs of the ownership variable coefficients are different. The coefficients of STATE are significantly

positive, while the coefficients of JOINT are significantly negative to the same relative level-dependent value, $Eff(re\_level)_{it}$, at a similar 1% significance level. It seems opposite to the results of Table 5.13 and Table 5.14, but coincides with Table 5.1. Combing the results of Table 5.13, Table 5.14, and Table 5.15, an inference of majority ownership of state-owned and non-state-owned is deduced. The state ownership is propitious to cost-efficiency 'improvement' of the whole industry (including policy banks, the Big Five banks, and the joint-stock banks in this thesis), but the state-owned banks have the lowest efficiency rank in the industry. This 'improvement' is probably caused by the big asset share of the Big Five banks. However, Table 5.1 and Table 5.4 weaken this cause, for the higher-than-average industrial profitability of the Big Five banks. And whether this 'improvement' is real progress or operated by government intervention will be discussed in the following government intervention section. Regardless of the possible 'improvement' method, the state-owned majority ownership significantly promotes the cost efficiency of the banking industry.

Since the restriction relaxation agreement with WTO, debates about influences of foreign banks or foreign shareholders of local banks have prevailed. But until writing this thesis, the foreign capital in the banking industry, either invested in the foreign banking institutions or as a minority ownership of the domestic banks, is still very small. In the former cost efficiency rank section, we have already established that the three banks of lowest cost efficiency have foreign participators. Whether the foreign investment is insignificant to cost efficiency is the study goal of this section.

Owing to most banks lacking foreign shareholders, pooled data of individual banks is employed for foreign minority ownership measurement. The influence of foreign shareholders is firstly applied to a full sample scope (see Table 5.16, Model F_p and Model F_s), then to the state-owned banks (see Table 5.16, Model S_p and Model S_s), and the joint-stock banks (see Table 5.16, Model J_p and Model J_s). No foreign shareholder information is reported within policy banks by the former referred data source. Therefore, the

author only separately investigates the influence of foreign shareholders within the state-owned banks and joint-equity banks in the measurement of both percentage value and dummy. The dependent variables of all the modes in this section are similarly $Eff(re\_level)_{it}$.

Table 5.16: Cost Efficiency Influence Factors of Ownerships (2006-2009)

Independent Variables	Dependent Variables Eff(re_level)it					
	Model F_p	**Model F_s**	**Model S_p**	**Model S_s**	**Model J_p**	**Model J_s**
Sample Scope	**Full sample**		**Big Five banks**		**Joint-stock banks**	
STATE	-0.097*** (-5.72)	-0.163*** (-10.70)				
JOINT	Omitted	-0.058*** (-4.28)				
FOREIGN_P	-0.052 (-0.49)		-0.127* (-1.91)		-0.042 (-0.29)	
FOREIGN_S		0.034*** (2.89)		0.048*** (4.58)		0.031* (1.77)
YEAR 2006	0.007 (0.31)	-0.012 (-0.81)	-0.017 (-1.56)	-0.024* (-1.72)	0.022 (0.62)	-0.011 (-0.48)
YEAR 2007	0.001 (0.03)	-0.011 (-0.72)	-0.008 (-0.74)	-0.017 (-1.19)	0.006 (0.18)	-0.013 (-0.54)
YEAR 2008	-0.003 (-0.15)	-0.012 (-0.84)	-0.001 (-0.09)	-0.009 (-0.66)	-0.003 (-0.10)	-0.019 (-0.80)
Constant	0.922*** (45.56)	0.950*** (81.18)	0.845*** (72.79)	0.782*** (127.52)	0.917*** (32.38)	0.894*** (84.60)
N	50	134	16	34	34	76
F-statistics	6.71***	22.82***	1.97	5.94***	0.15	0.043
R-square	0.433	0.519	0.417	0.450	0.020	0.79

Note: This table shows the pooled regression results of cost efficiency by Stata 11.0SE, with the standard error of the coefficients shown in the parentheses. ***, **, and * are significant at 1, 5, and 10 percent significance levels, respectively.

The evidence of Model F_p and Model F_s shows that during the sample period of 2006 to 2009, the majority ownership of both STATE and JOINT display a significant effect on cost efficiency, while the foreign minority ownership of FOREIGN_S is significantly positive to the cost efficiency. But

the foreign minority ownership of FOREIGN_P is insignificant. In the same period, the foreign minority ownership, measured by dummy (FOREIGN_P), is significantly positive within both state-owned banks as well as the joint-stock banks. The values of F statistics of Model S_p and Model J_p are insignificant, and the observer number of Model S_p is only 16. For this reason the results of Model S_s and Model J_s are more appropriate for 'foreign shares within bank majority ownership' discussion. From Model S_s and Model J_s, the foreign minority ownership of FOREIGN_S is also significantly positive to the cost efficiency both within the state-owned banks and the joint-stock banks.

In other words, opposite to the majority ownership, foreign share is significantly positive to cost efficiency improvement of the whole banking industry as well as within the Big Five banks and within the joint-stock banks. But only the effect of foreign shares reflects in 'participation', not in the percentage (for the percentage of foreign shares is merely small). And the significant levels of the whole industry and of within the state-owned banks (1%) are lower than those of within the joint-stock banks (10%). The influence of foreign shares impacts more effectively on the cost efficiency of the Big Five banks than of the joint-stock banks. And because the state-owned banks take a larger pie of the whole banking industry, the evidence of the state-owned banks certainly impacts more on the whole banking industry than others.

5.5.3 Market influences and government interventions

To measure the Big Five aimed interventions of NPLs detaching and the whole banking industry-pointed 'window guidance' credit quantity control, the author applies two new variables to estimate the influence of market influence and government intervention. 'TA' represents market-oriented total asset expansion. And 'NPL' represents government intervention on credit aspect, dispatching NPLs from the Big Five banks or guiding the credit scale of the whole banking industry.

The author only adopts the majority ownership independent of STATE in the following analyses. Firstly, the state-owned banks take a bigger market share than others. Then it is the Big Five banks which have a contradiction of profitability and cost efficiency rank. Thirdly, the targets of government intervention of capital injection and NPLs distaching are the 'historically burdened' Big Five banks. Fourthly, the foreign shareholder variables of the joint-stock banks are also not as significant as of the state-owned banks. The essential reason for multi-collinearity has been repeated in previous regression analyses.

The government interventions are estimated in Table 5.17.

Table 5.17: Cost Efficiency Influence Factors of Market and Government Intervention (2002-2009)

Independent Variables	Dependent Variables Eff(re_level)it			
	Model S1 (Fixed Effect)	**Model S2 (Fixed Effect)**	**Model TA_s (Fixed Effect)**	**Model TA_jp (Fixed Effect)**
Sample Scope	**Full sample**		**Big Five banks**	**Joint-stock banks Policy banks**
STATE	0.015*** (3.000)	0.015*** (0.026)		
TA		0.068*** (0.009)	-0.219 (-1.70)	0.744*** (8.73)
NPL		0.025 (0.021)	0.019* (1.99)	0.031 (1.62)
YEAR 2002	-0.012*** (-4.64)	-0.001 (0.003)	-0.052*** (-8.77)	-0.004* (-1.72)
YEAR 2003	-0.010*** (-3.94)	0.001 (0.003)	-0.042*** (-7.82)	-0.001 (-0.28)
YEAR 2004	-0.022*** (-9.34)	-0.012*** (0.002)	-0.048*** (-9.35)	-0.013*** (-6.17)
YEAR 2005	-0.017*** (-7.27)	-0.008*** (0.002)	-0.037*** (-8.41)	-0.009*** (-4.54)
YEAR 2006	-0.014*** (-6.03)	-0.007*** (0.002)	-0.028*** (-7.95)	-0.006*** (-3.23)
YEAR 2007	-0.009*** (-3.91)	-0.004* (0.002)	-0.020*** (-7.25)	-0.003* (-1.76)
YEAR 2008	-0.005** (-2.10)	-0.001 (0.002)	-0.011*** (-4.73)	-0.001 (-0.42)
Constant	0.890*** (423.79)	0.873*** (0.003)	0.832*** (95.70)	0.873*** (352.41)
N	134	134	34	130
Clusters	20	20	5	20
F-statistics	470.31***	686.71***	1353.35***	1011.45***
R-square	0.184	0.291	0.170	0.1984
Corr(u_i, Xb)	-0.524	-0.688	-0.055	-0.591
Hausman test	Non-positive	Non-positive	Non-positive	Non-positive

Note: This table shows the panel regression results of cost efficiency by Stata 11.0SE, with the standard error of the coefficients shown in the parentheses. ***, **, and * are significant at 1, 5, and 10 percent significance levels, respectively. The null hypothesis of the Hausman specification test in this table is that the systematic difference of individual-level effects measured by a fixed-effects model or random model is insignificantly different. And when the Hausman test is non-positive, the fixed-effect model will be selected.

Panel data of individual banks from 2002 to 2009 is employed for market influence and government intervention measurement. The dependent variables of all the modes in this section are similarly $Eff(re\_level)_{it}$. The influence

estimation is briefly divided into three sample scopes. Firstly, the whole industry influence is estimated by a full sample scope (see Table 5.17, Model S2), setting Model S1 as a comparison. With the majority ownership of the Big Five banks (STATE), both the independent variable of total assets (TA) and non-performing loan ratio (NPL) are added to Model S2, for the reason that the Big Five banks have a powerful impression on the cost efficiency of the whole industry. TA shows significantly positive results, but NPL is insignificant. In other words, referring to the whole banking industry, the government intervention is not as effective as the market factor during 2002 to 2009. The dummy variables of YEAR 2002, YEAR 2003, and YEAR 2008 all turn out to be insignificant in Model S2. Considering the lag effect of NPL dispatching during 2003 to 2005, the left significant dummies show an important systemic change in the banking industry. In other words, the government intervention effect impacts on the market significantly during 2004 to 2007, as well as 2009, but does not reflect in a direct way of NPL change.

The second sample scope is the Big Five banks only (see Table 5.17, Model TA_s). Owing to within the state-owned bank investigation, all the samples have the same majority ownership. Therefore, the ownership variable is no longer used here. Model TA_jp (see Table 5.17, Model TA_jp) has the same independent variable alternation. According to previous description, second NPL dispatching was achieved during this period. Three of the Big Five banks have an obvious CAR improvement. According to empirical results, the coefficient of TA is insignificant, while the coefficient of NPL is significant at a 10% level. The government intervention of secondary time NPL dispatching for the Big Five banks during this period significantly increased the cost efficiency within the Big Five banks. But the market effect did not. From previous description (see Figure 5.2), the market share of the state-owned banks has been shrinking all along.

And the third sample scope is a combination of joint-stock banks and policy banks (see Table 5.17, Model TA_jp). The government intervention aimed at this combination is usually named ‘window guidance’, which is credit

amount control in this thesis. Therefore, the author only separately investigates the influence of ‘window guidance’ through the variable of NPL. The evidence illustrates that NPL is insignificant, whereas TA is significantly positive. In other words, government intervention in these banks is not as useful as in the state-owned banks. After all, ‘window guidance’ is not a direct intervention.

In all three sample scopes, market orientation (TA) has a more significant effect on cost efficiency improving than the government intervention (NPL). And direct NPL dispatching is not a reasonable and reliable way to improve banking cost efficiency.

Table 5.18: Summary of Influence factors

Samples		Influence factors		Observation scope							
				Whole industry		Big Five banks		Joint-stock banks		Policy banks	
Period	Arrangement			Sign	Significant level	Sign	Significant level	Sign	Significant level	Sign	Significant level
2002-2009	Panel data	Majority Ownership	State-owned	Positive	1%	-	-	-	-	-	-
			Joint-stock	Negative	1%	-	-	-	-	-	-
2006-2009	Pooled data	Majority Ownership	State-owned	Negative	1%	-	-	-	-	-	-
			Joint-stock	Negative	1%	-	-	-	-	-	-
		Minority Ownership	Foreign share (Percentage)	Negative	Insignificant	Negative	10%	Negative	Insignificant	-	-
			Foreign share (Participation)	Positive	1%	Positive	1%	Positive	10%	-	-
2002-2009	Panel data	Majority Ownership	State-owned	Positive	1%	-	-	-	-	-	-
		Market-oriented	Asset expansion	Positive	1%	Negative	Insignificant	Positive	1%		
		Government-guided	NPL ratio	Positive	Insignificant	Positive	10%	Positive	Insignificant		

5.6 Results

By using unbalanced panel data of Chinese banks over the period of 2002-2009, this chapter assesses both the absolute values and the relative values of the banking cost efficiencies. Individual level and majority ownership category level of the bank cost efficiency are ranked. With covering 77% of industry net profit or 73% of the industry asset bank sample, the author applies the Stochastic Frontier Approach (SFA) to make sure the conclusion reflects the current situation of Chinese banking industry cost efficiency as much as possible. Besides, various influence factors of cost efficiency measurement are discussed through regression models, either in panel data or in pooled data.

The main goals of this chapter are to help fill in the gaps and vacancies of the research literature in three directions. First of all, former works usually exclude the policy banks in empirical analyses, but they are included in this paper. The reasons for adding the policy bank samples are discussed in the section of sample selection and data source description. The alternating usage of both panel data and pooled data in the regression section is a secondary data arrangement improvement. Panel data is a better way to refocus on the comprehensive situation of the Chinese banking industry. However, the newly started foreign section in the industry is the lack of data. Therefore, pooled data was employed to estimate the foreign shareholder influence. Another new point is the period interception of 2002 to 2009, which is a post-WTO period for China. Masses of reforms have been completed, and new policies are issued.

The creation within the cost efficiency measurement is the sample organization. The former researches focus on which type of ownership wins the highest efficiency (Berger, Hasan, & Klapper, 2004; Berger, Hasan, & Zhou, 2009; Lin & Zhang, 2009; Micco, Panizza, & Yañez, 2007; Yildirim & Philippatos, 2007). After generally inheriting from them, the bank individual of cost efficiency, with a label of majority ownership, is ranked. Through bank individual ranking, an important outcome was found. The lowest three banks all have foreign shares. Private domestic banks are found to be more efficient than state-owned banks in the former Chinese banking industry studies, which

mainly rely on the data of the pre-WTO period. A new result illustrates that the policy banks are more efficient than both the state-owned and the joint-stock commercial banks. This result is unexpected but not unreasonable, for the policy banks are under a transform and restructure to a more market-oriented and commercialized feature (discussed in Section 5.3). But is this an occasional phenomenon in a certain sample period (2002-2009)? Would it form a persistent development? Cost efficiency causes are discussed for this reason. If policy banks are higher ranked and the government market intervention plays a significantly essential role, the cost efficiency is 'operated'.

Besides ranking the bank efficiency, the author strives to find out the influence factors on cost efficiency. Chinese banking industry panel data of 2002 to 2009 was employed for the majority ownership and government intervention measurements, while pooled data of 2006 to 2009 was used for the minority ownership influence estimation, for the short foreign shareholder duration within the Chinese banking industry. The results of all the factors are summarized in Table 5.18.

As predicted, all the majority ownerships show significant results with cost efficiency. The majority joint-stock ownership is negative to cost efficiency improvement during 2002-2009. In contrast, the majority state ownership displays positive roles during 2002-2009, but becomes negative during the period of 2006-2009. An opposite effect of the state ownership occurs to the cost efficiency during 2006-2009. Considering the government intervention of direct NPL dispatching from the Big Five banks during 2003 to 2005, a reasonable suspicion of the cost efficiency of the Big Five banks as 'operated' is proposed. In fact, although the government directly intervene in the NPL of the Big Five banks and indirectly 'window guide' the credit scale of the banking industry to control the NPL ratio, and although the Big Five banks hold half of the market shares within the industry, the cost efficiency influence of NPL ratio change is insignificant during the whole sample period of 2002 to 2009. Besides, there was only a slight impact on the Big Five banks (at a 10% significance level). The result empirically illustrates that simply 'removing

away' is not a good solution for the NPLs, despite having historical problems.

Another finding of cost efficiency influence is the minority ownership of foreign shares within the domestic banks. The foreign share percentage demonstrates insignificant results in the whole banking industry as well as within the joint-stock banks. Only 10% significance appears in the Big Five banks, with a negative effect. However, the foreign share participating shows a significantly positive effect on all observations. In a word, the foreign participation in domestic banks helps the improvement of cost efficiency, but there is still a lack of weight force.

The market-oriented force plays a significant role in cost efficiency provoking for the whole industry, except the Big Five banks. And with the comparison of total asset influence and NPL rate interference, market-oriented force dominates the cost efficiency determination during the post-WTO period, in spite of government intervention co-existing. It is reasonable to accept the hypothesis that the financial reform of liberation and marketization has a significant achievement.

Chapter Six

Conclusions

6.1 Overall summary

The main work of this dissertation can be recognized as a composition of three parts: China's regional economic growth trends and influence factors, determinations of provinicial foreign investment attraction and utilization at the aggregate level and at the banking industry level, and Chinese banking institution cost efficiency and influence factors. Foreign capital and the banking industry are conducted as the major external and internal financing approaches of Chinese economic growth. To be briefer, regional economic growth and financial development are at the core of studies.

Income disparity and economic convergence are nowadays, more than ever, spotlighted. Scholars have noted that the 'Reform and Open' policy since 1978, which is aimed at alternating a centrally planned economy to a market-oriented economy and promoting its economy to international economic activity, has encouraged rapid economic growth at the expense of inequality prevailing across the provinces, regions, as well as urban-rural differences. However, the evidences of this dissertation prove that it is the 'Financial System Reform' policy since 1994, which is aimed at participating WTO, utilizing foreign capital, and being geared to international market, rather than the 'Reform and Open' policy, has enlarged the regional economic gaps. Studies have also

concluded that Chinese regional divergence was largely due to geographic and policy factors. The earliest coastal provinces benefited from preferential policy are the richest and fastest growth ones. And the following beneficiaries have also maintained an expeditious growth speed, all of which are better than the West region (See Table 3.1). Measuring the disparity degree and forecasting the future growth trends among regions is an effective examination of the reform targets of 'lessen polarization', 'achieve common prosperity', or 'constructing a harmonious society'. The evidence denotes that the 'Reform and Open' policy since 1978 has enhanced the regional convergence, but the 'Financial System Reform' since 1994 has slowed down this convergent speed. And financial factors are found to be significantly positive to economic growth. However, evidence also shows that the δ^2 divergence reversed to convergence in the post-WTO period (2002-2008). After participating in WTO (2001), preferential openning-up policy is no more limited in the Special Economic Zone and some easten cities. The foreign capital restrictions in financial industry is gradually relaxed. As a result, the interior regions receive more preferential policy than before. Therefore, the 'Mathew effect' (polarization) slows down again.

By mobilizing saving, allocating investment, spreading risk, and providing liquidity to firms, finance is an effective way to improve resource availablility and reduce economic costs (Boyd & Prescott, 1986; FitzGerald, 2006). Therefore, it supports long-term sustainable economic growth. Owing to integrated features of finance, both external foreign capital and internal domestic fund are utilized in the real economic field. Meanwhile, both foreign bank institution assets and minority foreign shares within domestic banks live within the Chinese banking industry. Two financing channels of external foreign capital utilization and internal banking industry finance are employed for Chinese financial development analyses. What's more, both foreign capital investors (foreign shares within the Chinese domestic banks) and foreign rivals (foreign banking institution assets) are considered in estimations. Therefore, intersected measurement of external and internal financing approaches is an

important innovation of this dissertation.

Different to well-supervised foreign capital activities, government interventions and influences are ambiguous and difficult to distinguish. Usually, scholars adopts case studies for policy analysis. Econometrically measuring the government interventions within the financial industry is another creative issue of this dissertation. By comparing the deposit side and credit side, the government direct intervation and indirect ‘guidance’ is estimated.

The solutions to main issues in each chapter are concluded as followings:

Table 6.1 Thesis Summary

	Chapter 3	Chapter 4	Chapter 5
Objectives	1. Convergence 2. Influence factors (especially the financial factor) of regional economic growth	1. Determinants of regional aggregate foreign capital utilization 2. Determinants of regional foreign banking institution assets	1. Cost efficiency 2. Ownership influence 3. Government intervention and market influence
Sample Arrangement	Balanced panel data	Balanced panel data	1. Unbalanced panel data 2. Pooled data
Main Period	1952-2008 1978-2008 1994-2008	2005-2009	2002-2009 2006-2009
Cross Section	Region	Province	Bank
Methodology	δ^2 convergence *HHI-TEC* β convergence	OLS GLS IV	SFA OLS GLS
Main Conclusions	1. δ^2 convergence exists in the post-reform period (1978-2008), the first stage of the post-reform period (1978-1993) , but does not exist in the post-financial reform period (1994-2008). 2. β convergence significantly exists in all periods with different degrees. The strongest β convergence exists in the post-reform period (1978-2008). The weakest β convergence exists in the post-financial reform period (1994-2008). 3. *HHI-TEC* index illustrate that the 'transfer effect outflow' in the post-financial reform period (1994-2008) is mainly from the bottom poor provinces. 4. Financial factor is significantly positive to economic growth (at 1% level).	1. 'Public Stock Market Scale' is the only significantly positive factor to regional 'Aggregate Foreign Capital Utilization' (at 10% level). 2. All measured financial factors of 'Loans and Deposit Scale', 'NPL Ratio', 'Public Stock Market Scale', and 'Other Financing Credit Scales' are significantly positive to regional 'Foreign Banking Institution Assets' (at 5% level) in different models. 3. Both the geographical dummies of 'East' and 'Middle' are significantly positive to the 'Aggregate Foreign Capital Utilization' (at 1% level).	1. The policy banks are the most cost efficiency, while the Big Five banks are the least. 2. The majority ownerships of both the state-owned and the joint-stock are significantly negative to cost efficiency (at 1% level). The minority ownership of foreigners (measured by participating dummy) is significantly positive to cost efficiency (at 1% level), but lacks of weight strength. 3. Government intervention of credit control is insignificant. Market-oriented total asset expansion is significantly positive (at 1% level) to cost efficiency, measured on banking industry level.

6.2 Policy implications

China's banking system is regularly derided as being wretched, with academic accounts evoking the image of ‘an elephant mired in a swamp’. However, this dissertation mainly focuses on the post-WTO period and gains a different result. In spite of an incomplete law and market with government intervention, the improvements of the Chinese financing industry by financial reform, especially the banking industry, is observable (compared with its historical performance). And the significantly positive role of the Chinese banking industry in economic growth and in attracting foreign capital to real economy is separately verified in Chapter 3 and Chapter 4.

Although the reform is still ongoing, the preliminary assessment indicates that there has been an improvement in the soundness of the Chinese banking system. Asset quality has improved, particularly in the recapitalized banks; the non-performing loan (NPL) ratio of major commercial banks on the mainland has dropped from 17.9% at the end of 2003 to 2.44% by the end of 2010, marking a declining amount of RMB 169.6 billion from the last year end. But part of NPL ratio declining is achieved by the government interventions. And there is a high risk of a new build-up of NPLs. Therefore, banking industry reform and cost efficiency improvement are essential demands for sustainable economic growth in future decades.

From the previous summary, the cost efficiency of policy banks ranks ahead of the joint-stock banks and the state-owned banks. Even influenced by the global financial crisis, a significant number of banks saw declines in profit, while the policy banks saw increases. In most other studies of other countries, the private-owned banks are usually more efficient. Given the features of ‘newly established’, and in spite of ‘restructuring to more commercialized’ by replenishing capital, improving corporate governance, and reinforcing risk controls, the government-directed business and political lending are still the major operating scopes of the policy banks. However, according to the KPMG survey, the largest increases in profit were achieved by policy banks (48.4%), outperforming the Big Four commercial banks (20.7%), joint-stock banks

(14.7%), and city commercial banks (9.6%). Therefore, further real improvement of the commercial banks is reasonable and demanded.

China Development Bank always ranks in front of the policy banks, or remains within the top two of the whole sample. We can also find that within the state-owned category and the policy category, efficiency will be low when the scope of bank business is faced toward agriculture (See Table 5.14). Similar results can also be found in Table 5.3 and Table 5.4. The Big Five banks rank in different orders, depending on the comparing item. BoCom wins in the aspect of asset quality measurement, and ICBC advances in adequateness of capital. However, ABC seems to be the weakest point of the Big Five banks (see Table 5.4). If the state-owned banks generate net profits at 100%, the share of ABC is the least (only 15.60%), compared with other three similar asset-size state-owned banks (ICBC 31.04%, CCB 25.64%, BOC 20.48%). The cost-income ratio and the non-performing loan ratio of ABC are the highest amongst the Big Five banks (See Table 5.4). The weakness of cost efficiency is presumed as the agriculture or rural area-faced business. Empirical results prove this presumption (See Table 5.14). So that improving the cost efficiency of agriculture or rural area-faced is a compensation to the whole banking industry cost efficiency. In another aspect, the profit margin of agriculture limits the cost efficiency of rural area-faced loan. However, the banking industry moves forward steps to marketed-oriented and emphasizes profitability, both the commercial banks and the policy banks will be reluctant to lend the agriculture loan, which will hurt the agriculture industry and enlarge the disparity of urban area and rural area. Therefore, preferential policy, for example, reducing tax and increasing subsidies, to less profitable industry (agriculture) is more suitable to cover the cost efficiency loss of the agriculture faced or rural area faced business and to achieve ‘common persperity’.

The government credit control intervention shows a significant manipulating effect within the Big Five banks (at a 10% level). We know that the abrupt downsizing of NPLs in 2003-2005 was achieved by moving NPLs off the state-owned balance sheet. The direct injection of capital from the

central government also reduced the percentage of NPLs on the balance sheet. All of these NPL ratio decreases have no connection with technology advancement or internal cost control improvement. Despite that detaching the NPLs is a quick and visible way to reduce the overburdening issue of the state-owned banks, at least the moral-hazard problem will be generated. With government intervention of NPLs, the Big Five banks have been released from their deficit pressure and ultimately are less responsible or irresponsible for their historical losses. Much worse, if the NPL ratios were to rise again, it would be natural for the banks to operate under an anticipation of capital injection or NPL detaching once again. By placing a stake in the government, the state-owned banks will be 'too big to fall'.

On the one hand, as the Big Five banks are the main force of the Chinese domestic banks, it is skeptical whether these government macro-controls are profitable for a bright future of the Chinese banking industry. And who will pay the bills of those detached NPLs, issued bonds for banking capital injection, and a probably ill effect to sustainable development of 'operated cost efficiency advancement' is a hanging issue. The declining β convergence degree and the δ^2 divergence result since the starting of financial reform is a vigilance to government activities within the banking industry, as long as the reform goal is still 'achieving national common prosperity'.

On the other hand, the CBRC tends to use banking regulation not only as a tool to control risks, but also as a way to accommodate the state's macroeconomic policy. Therefore, the government intervention power and effect is far beyond the estimation of this dissertation. The ceiling on foreign investor shares of local banks is limited to 25% right now. In addition, the number of domestic banks owning foreign shares is small. If increasing the foreign share ceiling will raise the risk of bank governance, approving more domestic banks to attract foreign shares can be considered. Foreign banks are seeking to develop a competitive advantage in the areas such as foreign exchange, commercial banking and international fund transfer. So that internal governance, technology and management improvement within domestic banks

are an avoidable way to increase essentially core competitive strength in globalizing business.

But viewing from another aspect, the financial reform (1994-2008) enlarges economic growth gaps among regions, as well as slowing down convergence speed (Chapter 3). Meanwhile, the geographical dummy variables of East and Middle show significantly positive effects on foreign capital attraction (Chapter 4). A reasonable doubt is proposed by the author that the policy favor in the eastern coastal, such as various restrictions of foreign capital in financial industry in interior area, has led to a capital allocation imbalance. According to Figure 2.12, the capital to labor force ratio has been soaring since 1990s. In other words, the input ratio significantly changed since the financial reform. The affection of capital laregely increased in economic growth. And the evidence of this dissertation also has proved that capital stock has significantly positive impact on economic growth (See Table 3.6). The preferential policy (more than the scope of foreign capital utilization in financial industry) benefits the Special Economic Zone (located in the East region) and some certain cities (for example, Shanghai, Guangzhou and Beijing, which are all in the East region) has enlarged the regional economic growth gaps, has induced convergence speed slowing down, and has deviated from the way to 'common persperity'.

Introducing competition, especially external foreign force, into banking industry is proved to be an effective approach to cost efficiency improvement. Evidence also shows that the δ^2 divergence reversed to convergence again in WTO period (2002-2008), when the interor regions is gradually opening up with the regional policy discrepancy and barriers elimiting. The foreign capital in the form of banking assets is no longer leagally restricted in the Special Economic Zone and some eastern cities since participating WTO. As a result, the interior regions increasingly receive compariable preferential policy with the East region. Therefore, the 'Mathew effect' (polarization) slows down again.

However, foreign capital generally emphasizes profitability. If the

government does not work out any measure except for deregulating, foreign capital may still maintain in the East region, for the East region is more developed, facilited, and familiar to the foreign investors. Arising from benefits of more than thirty years of openness, special policy and FDI, the eastern coast regions have become the most important destinations for cross-border direct investment. It is also a large part of China's trading activities with the rest of the world. The eastern region had accounted for about 85% of the FDI in China, and even peaked to 92% in 2000 (Li, Hou, & Chan, 2008). The southeast and the coastal areas are still the dominant market of foreign capital utilization even now (see Figure 4.1). As a result, the economic disparity between regions must be accelerated. To narrow the enlarged regional gaps, the government should take a feasible and practical measure which induces foreign capital to financial market in less developed region. Additionally, the preferential policy attracts capital more than from foreign investors. A redistribution policy, focusing on human capital and infrastructure, in favor of the inland provinces can attract investment and overcome the bottlenecks of inland regions (Biggeri, 2003). As a first step, tax reduction or subsidies for foreign investors who invest into financial institutions in the West or the Middle region is worth considering. On long terms, market-oriented competition should be the core reform orientation for the goals of both 'get rich' and 'achieve national common prosperity'.

In summary, a fairly competitive environment and well-developed legal system are necessary conditions for growth of the banking industry. Based on priciples of market-oriented fairness and competition, appropriate policy favours the less developed regions at the present stage is a reasonal compensation for enlarged regional gaps induced by financial reform. Then, besides reasonable and suitable national industry protection, more foreign investors should be introduced to improve the technological and administrative efficiency level of domestic banks. Furthermore, various ownerships and operating styles of banks or other financial institutions should be added to encourage competition. Additionally, the policy banks should take over and share responsibility of the policy-aimed lower profitable financial activities

from the state-owned banks. Only in this way will the state-owned banks be able to perform more like commercial banks. As to the banks themselves, inventive improvement of efficiency is necessary and critical, regardless of whether the environment is favorable or adverse. And from the macro-economic growth aspect, financial preferential policy favors the less developed area and the lower profitiable industry may help alter this 'convergence slowing down' situation. In other words, to achieve 'common persperity', preferential policy should benefits the less developed region and the less profit margin industry. The policy should act as a hand of 'giving assistance' instead of 'making a beauty even more perfect'.

6.3 Scope for further research

Disparity within the real economic growth is a prevailing topic. Besides regional convergence discussion, urban-rural disparity as well as FDI distribution among industries also help to understand the Chinese economic growth. The activities of the Chinese financial section link and smooth the capital flow of economic growth, whereby triggering the economic growth.

Cost efficiency and corresponding influences within a sample scope of 20 major Chinese banks are illustrated in this dissertation. In other literatures, the world-wide depository financial institutions (banks, S & L, credit unions) have an average efficiency of around 0.77 (median 0.82) (Berger & Humphrey, 1997). The result of sampling Chinese banks' relative cost efficiency is around 0.88, which seems higher than that of other countries. However, this inference cannot be derived directly. Firstly, Table 5.13 shows the relative level cost efficiency of individual banks, which assumes that the cost efficiency of the one with the best practice in any certain year equals 1, and the cost efficiency of other banks is divided by it to obtain the relative level cost efficiency of each individual (see Equation 6.2). Therefore, the relative results seriously depend on the sample scope selection. Therefore, higher relative level cost efficiencies of our results do not directly infer that the Chinese banking

industry is more efficient than that of other countries, unless we put the world banks into relative cost efficiency comparison.

Other inquiries of other banking institutions arise. Do these results permeate through the whole Chinese banking industry? How have performance and banking efficiency been in China in the most recent decade? Which bank and which ownership-type bank are the most efficient in China, besides the analyzed 20 banks? Compared with large banks, are the city commercial banks, the small and medium-sized rural financial institutions, as well as the foreign banks more cost-efficient or less cost-efficient? Are the most significant influence factors of cost efficiency analogous to the whole Chinese banking? For these reasons, sample extension and more detailed study will be required.

The financial development could be many dimensions. The author has already applied the classical financial indicators of 'Loans and Deposit Scale', 'NPL Ratio', 'Public Stock Market Scale', and 'Other Financing Credit Scales'. But other indicators of financial development are weighting their importance in the stage of finance. The inflation-negative rates lead to some depositors looking for alternatives to bank deposits, such as through investments in real estate and wealth management products. The continued growth of non-interest income is an indicator of diversification into other areas of the financial services sector. CBRC have reported that the financial leasing firms have seen their assets increase 25-fold from 2007 to RMB 364 billion at the end of 2010. Merger and acquisition activity, leasing, fund management, insurance, private banking, and trust subsidiaries have become key profit contributors and have grown significantly in terms of their size relative to their parent banks. China has also become the largest credit and debit card market, as well as being one of the fastest-growing e-market places. The diversified development of the Chinese banking industry calls for various research aspects.

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Note:

1. The political slogan of ‘when some people and some regions get rich first, others will be brought along and through this process, common prosperity of the entire population will be gradually achieved’ (in Abstract, Page 1, Page 9, and Page 43) was quoted from *Jiang Zemin’s Speech at the Meeting Celebrating the 80th Anniversary of the Founding of the Communist Party of China*. Jiang Zemin, who is the general secretary of the Central Committee of the Communist Party of China (CPC), delivered an important speech before an assembly gathered in the Great Hall of the People in Beijing July 1, 2001 to mark the 80th anniversary of the founding of the Party.
(http://www.china.org.cn/e-speech/a.htm).

2. The political slogan of ‘let some people and some regions get rich first’ (in Page 44) is quoted from Deng Xiaoping.
(http://www.brainyquote.com/quotes/authors/d/deng_xiaoping.html).

Deng Xiaoping never held office as the head of state or the head of government, but served as the *de facto* leader of the People's Republic of China from 1978 to the early 1990s. He developed ‘Socialism with Chinese characteristics’ and Chinese economic reform, also known as the ‘socialist market economy’, and opened China to the global market.
(http://en.wikiquote.org/wiki/Deng_Xiaoping).

3. The political slogan of ‘harmonious society’ was proposed by Hu Jingtao. He was General Secretary of the Communist Party of China from 2002 to 2012 and Chairman of the Central Military Commission of the CPC from 2004 to 2012. His current term as President ends in March 2013.
(http://wpedia.goo.ne.jp/enwiki/Hu_Jintao).