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Banking Market Competition and SME Financing in China

Case Study across Chinese Provinces

Paper within Bachelor Thesis in Economics

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Abstract

Small- and medium-sized enterprises (SMEs) in developing countries are reported to encounter difficulties in accessing to formal external financing resource. Banking systems in this category of countries are either under-developed or newly reformed. The purpose of this paper is to investigate whether SME financing in China, measured by SMEs per capita, is affected by local bank competition, measured by number of banks per capita or share of foreign banks. Control variables such as Gross Domestic Product (GDP), level of infrastructure and geographic location are also included in the regression models.

The main findings are that: when disregarding the ownership of banks, bank competition has positive impact on SME financing across Chinese provinces, although the relationship is non-linear; and foreign banks do not significantly influence SME bank financing in China. The first finding generally support the conventional theories of industrial organization and the second one offers the basis for further arguments about the role of foreign banks in financing SMEs in China.

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1 Introduction

In this section the subject of this thesis will be introduced, a background of the study will be presented and the purpose of this thesis will be stated. A disposition will be provided as an overview of the structure of the thesis at the end of this section.

The heated topics of connections among bank competition, credit constraints on young firms and industry growth rate have been controversial subjects among economists. Conventional theories of industrial organization propose that bank competition impose positive effects on firms through an increase in credits available and a decrease in lending rate (that is, a decrease in the spread between deposit and lending rates). Black and Strahan (2002), for instance, is a supporter of this prediction. On the other hand, Petersen and Rajan (1995) has pointed out that market power contributes to the decrease in financial constraints on small- and medium-sized enterprises (SMEs) in the US.

Meanwhile, a sound small- and medium-sized enterprise sector is claimed to be crucial for sustainable economic development in newly industrialized countries (NICs), particularly for NICs undergo transition from planned to market economy (Junjie, Jining & Catherine, 2008). Although it is generally agreed that SMEs have significant contribution on a country's economic growth, this type of firms are subject to financing difficulties, particularly those in developing or transitional economies. There is little evidence of scarcity of financing for SMEs in most OECD (Organisation for Economic Co-operation and Development) countries, such as Australia, Canada, France, Germany, Italy, Japan, Poland, Sweden, Turkey, the UK and the US just to name a few. Whereas there is a wide-spread problem of SME access to finance in non-OECD countries (Organisation for Economic Co-operation and Development, 2006). This thesis emphasizes on banking market concentration and SMEs bank financing in China, one of the developing or transitional economies that achieved most rapid economic growth. The results of our regression models suggest a positive correlation between local bank competition and industrial SMEs across the Chinese provinces and foreign banks do not have significant impact on the Chinese industrial SMEs.

1.1 Background

The role of banking system is to accumulate capital and allocate credit among sectors in the economy through its capacity of collecting savings from depositors. Banks play the role as intermediary between supply and demand of credit. Banks also have the function of selecting the most worthy borrowers or entrepreneurs so that the scarce capital resource would be used more efficiently. Thus their role in screening profitable entrepreneurs and supplying funds is rather important. However, the level of competition among the banks would make the bank behave differently, therefore would affect its economic role.

Economists propose that monopolistic banks would have the ability to charge higher lending rate to borrowers and to pay lower rate of return to depositors. Higher lending rates would not only discourage entrepreneurial incentives but also increase the occurrence of risky projects. Higher interest rate on loans associated with lower supply of funds would also imply fewer investment and development which in turn would hinder

technology innovation and economic growth. This raises the issue of bank competition and the impact of its aspects on the overall welfare of the economy. In particular, the effect of bank competition on SME financial constraint is another interesting matter to investigate.

The possibility of accessing finance resource is critical for a firm to start up, grow and become more competitive. SMEs in developed economies and particularly in developing or transitional economies are said to experience difficulties in accessing to formal external finance resource. SMEs are distinguished from large firms and large enterprises for various factors. Ang (1991) has suggested that the securities of small firms are not publicly traded, owner-managers' investment cannot be diversified, owner-managers have only general rather than specific expertise, limited liability for SMEs is scarce, and SMEs often face high transaction costs. (cited in Holmes, Hutchinson, Forsaith, Gibson & McMahon, 2003).

The characteristics of SMEs have exposed several prospective of problems for lenders and investors. SMEs exhibit higher risk, severe agency problem, asymmetric information and higher vulnerability, they are not perceived by the formal financial institutions as credible borrowers. Although SMEs, particularly start-up firms and growing firms, require intensive funds for their investments, it is often the case that the funds or loans actually provided to SMEs are rather small. SME financial constraint is not a new issue not only for developing countries, but also for OCED countries. The term of financing gap was recognized and described by MacMillan (1931) as a situation which a small enterprise has expanded to a phase where it has used the maximum of short-term resource but could not come to the stage of being able to acquire longer term finance from commercial banks or by means of stock market floatation (cited in Holmes, Hutchinson, Forsaith, Gibson & McMahon, 2003).

Among the reasons why the authors select China as the research objective, one major motivation is that the country has achieved astonishing economic growth in the recent decades. According to National Bureau of Statistics of China, the country's Gross Domestic Product (GDP) growth rate reached the peak of 17% in 2007 (calculated at current prices), which is never been seen in the history and unlikely to be followed. This rapid growth rate is to a large extent contributed by the country's SMEs. As a matter of fact, more than 55% of China's GDP is generated by Chinese SMEs. In spite of the significance of SMEs, it has been reported that SMEs are having difficulties to access formal external credits. At present, the Chinese banking system is still greatly dominated by government regulations because of the country's political form. This gives rise to the disadvantage of Chinese SMEs when competing with large state-owned enterprises in terms of accessing formal external credits. However, as the result of open economy policy foreign banks discovered opportunities in the Chinese market and started setting up branches in China. In addition, China has been undertaking major financial system reforms during the past decades. Recognizing these changes might be important not only to reduce financing constraints of SMEs but also to enhance economic growth.

This paper focuses on the topic of the relationship between banking market competition and SMEs bank financing. The authors would like to seek answer to the following questions. *Does the number of industrial SMEs vary with the bank units across the provinces? Are the numbers of SMEs across these provinces positively correlated to foreign bank entry?*

1.2 Purpose

The emphasis of this paper is to analyze the impact of local banking market competition and foreign banks' entry on SMEs bank financing across the mainland China provinces.

1.3 Disposition

The remaining paper is organized as follows. Section 2 consists of a review of previous studies both on bank concentration and SME financing. In section 3, theories of bank concentration and bank competition are presented. Facts about Chinese SME financing and banking sector are discussed in section 4. Hypotheses and regression models are specified in section 5. The empirical findings from hypothesis testing are presented and analyzed in section 6. In section 7, the authors give a conclusion of the study which is followed by a list of references and appendix.

2 Literature review

In this section results and arguments from previous studies and researches conducted on relevant subjects to this thesis will be summarized.

There are a number of studies related to the impacts of bank competition and banking market structure on macro-economic development and on small and/or young firms. Shaffer (1998) has proposed that household income grow faster in the US cities with higher number of banks after controlling other determinant variables of income growth. Jayaratne and Strahan (1996) have found that both personal income and output growth were increased after the government has implemented the removal of US bank branching restrictions in several states in order to increase market competitiveness. The finding confirmed a positive effect of bank competition on economic growth.

On the other hand, Cetorelli and Gambera's research (2001) have demonstrated that bank concentration has negative effect on industry growth as a whole. Despite of this, a more concentrated banking industry would bring a deadweight loss in the credit market and result in decreased total funds available. The study focused on young firms which need external finance resource the most and found they had grown faster in a concentrated banking sector. The findings showed that the effects of banking market concentration across industry sectors are not homogeneous. In fact, young firms and several specific industries has benefited from a concentrated banking sector. This evidence supports the opinion of strong microeconomic relationship between firms and their creditors in the concentrated banking market.

On the firm level, the study of the effect of bank competition on firm credit accessibility has shown differently from various researchers. Bonaccorsi and Dell'Ariccia (2004) have observed that the growth of firm startups is higher in Italian provinces where banking sectors are significantly concentrated. On the contrary, Black and Strahan (2002) have researched on the impact of banking market structure on promoting entrepreneurial activity. Their study was done across industries and states in the US and discovered that the number of firm startups would be fewer when bank concentration of the states is higher. These studies demonstrated that the effect of bank competition and banking market structure is strong on firm startups or industry sectors that are considered to be informational obscure. In order to screen and select the worthy borrowers, banks would need to invest more on technologies

3 Theoretical framework

Theoretical framework includes the models and theories on which the selection of variables and formulation of the regression models of this thesis are based on.

3.1 Petersen and Rajan's (1995)

The model is built on the assumption that everyone is risk neutral and there are two types of agents, namely the high profile entrepreneurs and the low profile entrepreneurs that demand external financing resource. The high profile entrepreneurs could select either a risky project or a safe project at date 0 to invest. While the low profile entrepreneurs choose the risky projects. The scenario is that the high profile entrepreneurs cannot differentiate themselves from the low profile ones at date 0 and the bank does not know which type of agent they are dealing with until date 1, thus the entrepreneurs are forced to borrow at an interest rate that “insures” the bank against losses if they turn out to be low profile ones. The higher the lending rate, the lower the profit margin of the high profile entrepreneurs which in turn distorts the incentive of entrepreneurs, and thus, the more likely they would choose the risky projects. Therefore, adverse selection could cause moral hazard and credit rationing. In order to lower the cost of borrowing, the high profile entrepreneurs would seek for terms that could distinguish them from the low profile ones, for example, by credit rationing. As assumed, even if the low profile entrepreneurs have good projects at the beginning they could end up with failure, thus there is no second project in the subsequent investment and the bank will not give them more loans. The high profile entrepreneurs would borrow so little at date 0 that they can require higher amount of loans at lower interest rate from date 1 (Petersen & Rajan, 1995).

The result of the model is: when the market power of the bank increases, a larger share of future surplus of the firm's project can be retained by the bank, and even the low profile entrepreneurs could obtain loans at a lower initial interest rate.

3.1.1 Source of market power

In Petersen and Rajan's paper (1995), the source of market power is also discussed. They argued that the private information banks gathered through “relationship lending” and the geographical advantage of the banks contribute to the market power. The information advantage diminishes as the firms grow older, firms which have difficulties getting credits fulfill the monopoly of local banks, and the level of information asymmetries between inside lenders and outside lenders is difficult to be measured. These problems weaken the market power generated by informational advantage. Thus, the geographic distribution of banks is a better source of market power.

Identifying the source of market power is critical for the authors of this paper as well since it projects guidance for the proxy of market power, which is the local market concentration of banks, to be used measuring the bank power.

3.1.2 Bank lending strategy in concentrated market

Cetorelli (2001) has mentioned that young firms, in a market where monopolistic power exists, might receive more credits at better rates. Banks in a competitive market are not assured to obtain the future surplus from the uncertain projects of the young firms; therefore they might have to charge a higher rate. The reasoning is that, in a concentrated market, in order to attract more borrowers, especially good young entrepreneurs, the bank can offer low rates to build up relationship with successful entrepreneurs so that higher rates could be imposed in the future. The bank's confidence is based on the belief that the successful entrepreneur would not turn to its competitor banks in the future. On the contrary, a bank in a competitive market might not have the ability to retain successful borrowers in order to recover its loss on lower initial lending rate.

3.2 Relationship lending vs. transaction lending

Banks need to exam the level of market competition before investing in relationship lending. Relationship lending is more profitable for banks in highly concentrated market but not in a competitive market (this is consistent with the literature of banking competition). Boot and Thakor (2000) have suggested that when the bank can offer both relationship and transaction lending, a substitution effect could emerge across these two forms of lending. They elaborated a banking model associated with this substitution effect. The switch from transaction lending to relationship lending will vary, and this variation depends upon the source of the increased competition. Banks face competition from other banks and from the capital market where bond issues are underwritten. The findings are as follows: at lower level of interbank competition, there is more transaction lending than relationship lending; as the interbank competition increases to an intermediate level, transaction lending decreases and more relationship lending occurs, but each loan has less added valued for borrowers; when the competition intensifies, relationship lending and transaction lending declines. When banks face high competition from the capital market, relationship lending and total bank lending decline, but each relationship loan has higher added value for borrowers.

The analysis of Boot and Thakor's paper differs from the exiting literature in Petersen and Rajan (1995) in terms of banks' decisions on the amount of lending in total and on how much of the total lending to be allocated to the relationship and transaction lending respectively. Boot and Thakor (2000) have emphasized on the absolute and substitution effect of competition on relationship lending. They agreed with Petersen and Rajan that the absolute volume of relationship lending would decline as the numbers of bank increase (increase competition) but this is only for competition beyond a certain point (see Figure 3.1). Petersen and Rajan's model does not analyze at what level of competition banks find no profit to invest in relationship lending.

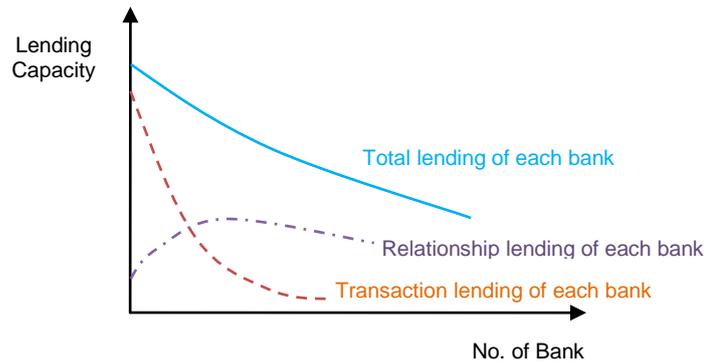


Figure 3.1 Lending capacity vs. bank competition

Source: Boot and Thakor (2000)

3.3 The “winner’s curse” in competitive market

The theoretical model extended by Shaffer (1998) on the basic models of Broecker (1990) and Nakamura (1993) has analyzed the “winner’s curse” in a bank. The paper pointed out another possible flaw associated with bank competition, that is, the average quality of bank assessment on potential borrowers would decline as the number of competitors in the market increases. It followed the perception that banks’ screening technologies may not precisely report the borrowers’ true characteristics. It was supposed that the screening model used by banks is inefficient and there is a certain probability that entrepreneurs of high quality may be mistaken as of low quality. Meanwhile, it is assumed that a bank cannot differentiate between a loan applicant who has been rejected by another institution and a newcomer loan applicant. In other words, the bank observes each applicant and decides to lend or not independently. The intuition behind this assumption is that banks communicate inefficiently or they would not like to have a free rider who could obtain informative signal of the types of loan applicants without paying. Consequently, loan applicants rejected could continue applying for loans at other banks. The higher the competition is in the market, the higher the probability that a low quality applicant receives credit. This is known as the “winner’s curse” in a competitive market where the bank provides the loan might encounter the lemon market. Regardless of the assumption, this model neglects that, in reality, banks tend to reach similar observations and decisions on the types of loan applicants. Banks could obtain the same information about loan applicants from consumer credit bureaus. Most likely, an applicant rejected by one bank would be rejected by another bank as well. Furthermore, the study has shown theoretically and empirically that an increase in the number of banks would increase the rate of expected loan loss, and that lending rate in a less concentrated market is higher than that in a more concentrated market.

3.4 Effects of market power

The pros and cons of market power is a great issue that has emerged from the most recent study of bank competition. Pagano (1993) has illustrated an economic growth model which shows the monopoly power in the market, with its ability to allow the banks charging higher lending rates but paying a lower deposit rate, would decrease the equilibrium quantities of funds for credit. Guzman (2000), on the other hand, has compared two identical economies, one with a monopolistic bank and the other with a competitive banking sector, in order to analyze the effect of banking market structure

on capital accumulation and economic growth. Guzman's finding shows that in a monopolistic market the bank would tend to ration credit strictly if credit rationing conditions are available. Market power could be important for efficient allocation of funds since the monopoly banks would have more incentive to perform screening tasks and to select high profile borrowers. In a competitive market, the availability of larger amount of funds might be accompanied by lower quality of screening processes since banks are competing to offer borrowings with lower costs. In other words, there is a tradeoff between allocating funds efficiently and quantity of credit available in the market. A smaller number of banks in the market would generate a higher incentive for screening; consequently, high quality borrowers could acquire more funds. Whereas, fewer banks would make the total quantity of credits available smaller.

3.5 Government ownership and the role of bank competition

As has been pointed out above that market power has positive effect on promoting young firms and entrepreneurs through establishing lending relationship. In addition, market power gives banks more incentive to perform efficient screening tasks. Despite of the benefits from market power, high market concentration could generate a dead-weight loss by lowering the quantity of loans supplied, and would enable the monopolistic banks to charge high lending rates.

However, in a market that is mainly dominated by state-owned banks and heavily regulated by governments, the positive impact of bank concentration may be questioned. Cetorelli and Gambera (2001) have studied the nonlinearity of bank concentration. The nonlinearity suggested that the overall economic growth would be highest at an intermediate value of bank concentration when the sectors need external financing the most could benefit from the strategy of lending relationship established by banks with market power. Moreover, Cetorelli and Gambera's study found positive impact of bank concentration diminishes when the nonlinearity is done in the market with large share of state-owned banks. It is argued that the state-owned banks might act as a cartel and might not aim for profit maximizing, thus they might not have incentive to establish lending relationship with potentially profitable entrepreneurs. Hence, the positive impact of bank concentration is likely to disappear in countries where the majority of banks are state-owned banks.

3.6 Effect of regulations on the role of bank competition

Petersen and Rajan (1995) have investigated the economic role of market power in concentrated market. Market power gives banks incentive to create strong lending relationship that benefits young firms or industry sectors which need external finance resource for further development and growth. Because of market power, banks would establish lending relationships with young firms without previous performance record or with high growth sectors such as software industry that are rather vulnerable. Banks would impose a lower lending rate so that they can extract the surplus profit from these borrowers in the future, though they have to bear initial information costs. The fact which differentiates a concentrated and a competitive market is that customer relationship is important for banks in concentrated market. In a competitive market, banks could not retain the potentially profitable entrepreneurs since they would look for cheaper credit supplier in the future. Thus, it is not necessary for banks to both estab-

lish initial lending relationship and bear initial information costs in a competitive market.

Due to government regulations which restrict banks' activity, banks are only able to hold claims on debt but not on equity. Cetorelli and Gambera (2001) have pointed out that in a competitive market, banks might also have incentive to establish lending relationship if they are allowed to hold claims on equity. In this case, banks would share firms' future surplus. The problem of free riding could be solved when banks hold equity stake in firms. It is necessary to study the influence of regulations on positive effect of market power in the concentrated market, though there is no substantial evidence found in the study that regulatory restrictions affect the role of banking market structure in general.

3.7 Effects of foreign banks' entry

Increases in capital supply and competition level are just two examples of the many effects of foreign banks bringing into the host country. Interestingly, it is said that foreign banks could reduce the connection lending, which is often seen in state-owned banks, in the host country (Giannetti & Ongena, 2005). According to La Porta, Lopez-De-Silanes and Shleifer (2002), state-owned banks are more likely to be subject to "political" issues, which results in inefficient allocation of the scarce capital resource. Foreign banks, on the contrary, have very few relations with local politicians and government-owned firms. As has been mentioned previously, positive effect of relationship lending in a concentrated market, that is dominated by state-owned banks, would be insignificant since state-owned banks might act as a cartel and conclude each other (Cetorelli & Gambera, 2001). Since foreign banks operate differently from domestic banks in the host country, they might remove the conclusion behavior in state-owned banks (Okuda & Rungsomboon, 2004).

Lehner and Schnitzer (2008) have demonstrated another effect of foreign banks' entry on domestic banking sector in the host country. The domestic banks would learn to operate more efficiently at the presence of foreign banks, thanks to technology spill-over. Foreign banks would transfer technologies to the host country when they enter the domestic market. This positive effect is based on the assumption that the foreign banks apply more sophisticated technology for screening than domestic banks. The study also found that the positive impact of technology spill-over from foreign banks would be higher when the host country has low level of market competition.

Giannetti and Ongena (2005) have concluded that foreign banks' entry might benefit large firms and multinational firms, since foreign banks are better at collecting and evaluating quantitative information rather than quality information and appear to lack local information. They also found that foreign bank promotes large firms' growth, rather than small firms', in sales, assets and leverage. Small- and medium-sized firms would benefit from the presence of foreign banks through their influence on the domestic banking system. Domestic market dominated by state-owned banks would face higher competition, that is, the state-owned banks would be forced to be profit motivated and operate efficiently through allocating resource efficiently and promoting development of domestic banking system. Clarke, Cull and Peria (2006) have studied the impact of foreign banks' entry on domestic financial constraints in emerging market economies

and found that the presence of foreign banks results in fewer financial constraints on small- and medium-sized firms.

Furthermore, Dell'Ariccia and Marquez (2004) have formulated a model in which credit is more accessible to borrowers with credible qualitative information at the presence of a high number of foreign bank entrance. They found that foreign banks' entry would increase the amount of loans provided to SMEs from private domestic banks.

4 The case of China

History and facts about Chinese SME sector and banking market are briefly presented in this section. Understanding the features and difficulties of China's SMEs and the structure of its banking system is essential for interpreting and analyzing the regression results.

4.1 SME financing in China

The Chinese economic policy has undergone a market-oriented transformation since the adoption of the reform and opening-up policy in 1978. At the end of 1990s the private sector was recognized to be an essential part of the Chinese economy. As recorded in China Statistical Yearbook 2001 and 2007, the number of SOEs had fallen by 41% between 2000 and 2006. SMEs owned by private persons have contributed greatly to China's rapid and sustained economic development ever since the privatization of state-owned enterprises (SOEs). In accordance with the Interim Regulations on SME Categorizing Criteria (2003), Chinese enterprises in different sectors must have the features as designated below in order to be recognized as SMEs.

1. *Industrial SME* should have no more than 2 000 employees, or with an annual revenue less than RMB 300 million, or with total assets less than RMB 400 million. Medium-sized enterprises in this sector should employ at least 300 people, with annual revenue and total assets more than RMB 30 million and 40 million respectively.
2. *SME in the construction sector* should employ no more than 3 000 people, or with an annual revenue less than RMB 300 million, or with total assets less than RMB 400 million. Medium-sized enterprises in this sector should have at least 600 employees, with annual revenue and total assets exceeding RMB 30 million and 40 million respectively.
3. *SME in the retail sector* should have at most 500 employees, or with an annual revenue less than RMB 150 million. Medium-sized enterprises in this sector should employ at least 100 people, with annual revenue more than RMB 10 million. *SME in the wholesale sector* should employ no more than 200 people, or with annual revenue less than RMB 300 million. Medium-sized enterprises in this sector should employ at least 100 people, with an annual revenue exceeding RMB 30 million.
4. *SME in the transportation sector* should employ no more than 3 000 people, or with an annual revenue less than RMB 300 million. Medium-sized enterprises in this sector should have 500 or more employees, with annual revenue more than RMB 30 million. *SME in the posts sector* should have less than 1 000 employees, or with an annual revenue less than RMB 300 million. Medium-sized enterprises in this sector should employ at least 400 people, with an annual revenue exceeding RMB 30 million.
5. *SMEs in the hotel and restaurant sector* should have less than 800 employees, or with annual revenue less than RMB 150 million. Medium-sized enterprises in this sector should employ at least 400 people, with annual revenue no less than RMB 30 million.

Accompanying the astonishing growth of the whole economy, the Chinese SME sector developed tremendously. SMEs have been playing an important role in China's economic reform and development and have become a growth engine in the economy. According to the information retrieved by Junjie et al (2008) from China's National

Development and Reform Committee, 99.3 per cent of the registered enterprises in China are SMEs, which contribute to 55.6 per cent of the Country's gross domestic product (GDP), 62.3 per cent of exports, 46.2 per cent of tax revenues and 75 per cent of employment opportunities.

Nevertheless, SMEs in China are still encountering obstacles with respect to external financing due to reasons such as inefficient financial structure, underdeveloped banking system, etc. External financial resources are inefficiently allocated to unbeneficial SOEs rather than those profitable private firms. According to Walter (2005), SMEs in China obtain only 12 percent of their working capital from bank loans. Another survey conducted in 2002 shows that about 55 percent of start-up firms are financed predominantly by owner-managers' personal wealth, while 31.6 percent of those firms are funded by borrowings from family or friends and the rest of the firms turned to bank and Rural Credit Cooperatives for loans.

SME in China faces difficulties in terms of access to financial resources due to the following reasons.

The country lacks appropriate financial institutions which provide adequate credit service for SMEs. Over 50 percent of total bank assets are held by four large state-owned commercial banks, meanwhile the state holds more than 95 percent of all bank assets from state-owned commercial banks, joint-stock commercial banks and city commercial banks. Since the state holds the lion's share of the bank assets and SOEs will most likely be rescued by the government if they are bankrupt, the majority of bank loans are attracted to large inefficient SOEs regardless of the large volumes of non-performing loans caused by them (Junjie et al, 2008). Thus, SMEs in China are more or less in competition for funds with SOEs.

In order to reduce informational problems in financing SMEs, banks commonly require appropriate collateral. Walter (2005) has given an example of the US, where 92 percent of SME debt is secured by collateral and 52 percent of it is guaranteed by the owner-managers of the firms. SMEs in developing countries do not have sufficient appropriate collateral to convince banks of their repayment ability.

The quality of loans is worsened by the lack of credit rating assessments for SMEs in China and low incentive of SMEs to be seen as credible and reliable. A credit assessment system for SMEs was proposed in 2001, which was expected to improve the information processing and credit situation of SMEs.

4.2 Banking market structure in China

In 1978, China began an economic reform intending to not only improve economic efficiency but also resource allocation. The banking system was, among other sectors, the main focus of the reform. From 1979 to 1992, the country has a "two tier" banking system, which consists of the People's Bank of China (PBOC), the central bank, and 4 state-owned banks, namely, the Industrial and Commercial Bank of China (ICBC), the Agricultural Bank of China (ABC), the Bank of China (BOC) and the China Construction Bank (CCB). Between 1949 and 1978, PBOC was the only bank that accepts deposits and makes loans. The four state-owned banks were closely connected to nonfinancial SOEs. By 1985, all five banks were able to provide services in deposits and loans to households and mainly SOEs. Between 1985 and 1992, the Chinese government al-

lowed small- and medium- sized commercial banks, the majority of which are joint-stock commercial banks, to join the market in order to encourage more competition. Thereafter, the Chinese banking system was complemented by 3 policy banks, 11 joint-stock banks, over 100 city commercial banks, 3 rural commercial banks and more than 35,000 rural credit coops (Xiaoqing, 2009). Up till 2006, there are 73 foreign banks from 22 countries has founded subdivisions in China, Citibank, Deutsche Bank, HSBC, Standard Chartered and UBS just to name a few among these foreign banks.

Despite the achievements in reforming banking system, China is subject to severe problems with bad debt because of its ambiguous bankruptcy procedures and the pressure on state banks of renewing or extending loans to SOEs. According to Xiaoqing (2009), the official amount of state banks' non-performing loans was reported to be 15.6% at the end of 2004. The level of moral hazard is high since borrowers are confident that the government would bail out any problem bank and are lack of incentive to perform profitably and pay back loans. Meanwhile, according to an inspection conducted by China's Banking Regulatory Commission (CBRC) in 2007, deficiencies such as misreporting the true value of bad loans, violating rules regarding loan decisions, failing to monitor outstanding loans, disregarding regulations and erroneous accounting practices are found in the 11 inspected banks. Thus, the next step of the banking system reform is emphasized on encouraging transparency and improving bank performance. At the end of 2005 and beginning of 2006, two state-owned banks started selling shares on the Hong Kong stock exchange. The partial privatization of these banks may more or less contribute to the reduction in the deficiencies mentioned above (Xiaoqing, 2009).

5 Empirical framework

In order to achieve the purpose of this thesis, empirical tests will be conducted. This section of the paper comprises four areas, which are stating the null hypothesis and alternative hypothesis, presenting the dependent variable and independent variables, presenting the method of data collection and introducing the regression models. Motivation of the selection of variables and regression models are discussed as well.

5.1 Hypothesis

Stating and testing the hypothesis would assist the authors in answering whether the share of SMEs is positively or negatively related to banking market concentration.

Null hypothesis 1: SMEs per capita and bank competition in each province are positively correlated.

Alternative hypothesis 1: SMEs per capita and bank competition in each province are not positively correlated.

$$H_0: \beta_1 > 0$$

$$H_1: \beta_1 \leq 0$$

If the null hypothesis is not rejected, the following implications could not be rejected. There would be positive relationship between SMEs per capita and the total amount of banks in the province.

In the second null hypothesis, the authors introduce the share of foreign banks as the independent variable. Since foreign banks are expected to operate differently from the domestic banks, the conclusion behavior in the domestic banks, particularly the state-owned banks, might be eliminated and the scarce capital resource might be allocated more efficiently. The intention of the second hypothesis testing is to investigate the relationship between the foreign banks and SMEs across the provinces.

Meanwhile, due to data limitation, the total number of banks in each province is used in the first hypothesis. However, this number fails to distinguish the ownership of banks. The share of foreign banks is considered to be a more specific variable that provides information on the ownership.

Null hypothesis 2: SMEs per capita in each province is positively related to high share of foreign banks.

Alternative hypothesis 2: SMEs per capita in each province is not positively related to high share of foreign banks

$$H^*_0: \beta_1 > 0$$

$$H^*_1: \beta_1 \leq 0$$

If the null hypothesis is not rejected, it implies that foreign bank entry has positive impact on SMEs per capita (or the credit accessibility of SMEs) in the province.

5.2 Selection of variables

The empirical analysis is based on a data set for light and heavy industries in the 31 mainland China provincial credit markets in 2007.

As stated in the previous section, bank competition has heterogeneity effects on the credit availability to informational opaque firms. The positive effect is that high competition would lead to more credit supply; while the negative effect is that it would make bank less willing in relationship lending to firms. Therefore, the authors would like to regress SMEs per capita on the measure of market concentration in order to estimate the net effect mentioned.

5.2.1 Proxies for market power

Bonaccorsi di Patti and Dell’Ariccia (2004) have regressed the rate of firm startups on the indicator of bank market power and other control variables. Herfindahl index of concentration in the deposit market, the absolute variation of the Herfindahl index in the period examined and the deposit market share of banks in the local market were included on the right-hand-side of their model to describe structural features of the local banking industry. Additionally, control variables such as population density, education, bank development, market size, indicator for the level of infrastructures and geographic dummy variable are included. Accordingly, the specification of the model has illustrated the rate of new firms in local market i as a function of market power in local banking sector and the control variables that indicate market characteristics.

The Herfindahl-Hirschman Index (HHI¹) is one of the commonly used indicators for measuring market concentration. HHI is a measure of size of the bank in relation to its industry in order to show the degree of the banking industry competition. The index takes into account of the market share of respective market competitors. Petersen and Rajan, in their research, use normalized HHI to measure the bank concentration. Koutsomanoli and Staikouras (2004) have defined HHI as “the sum of the squared market shares of the individual banks”. If the outcome figure is above a certain threshold, for instance 1,800 in the US, market concentration is considered to be high; while a small index, 1,000 in the US, implies a competitive banking industry where there is not any dominant bank in the industry.

Koutsomanoli and Staikouras (2004) have also suggested to use the bank concentration ratio (CR_k) as the measure of banking market concentration. This ratio “sums the market shares of the k largest banks allocating equal weighting to each bank”. Advocators of this measure have argued that a market led by a few number of banks is unlikely to be influenced by the total number of banks in the market. Phillips (1976) has disagreed with the usage of this concentration ratio because the ratio does not take into account

¹ $H = \sum_{i=1}^N S_i^2$ where S_i is the share of firm i in the market, N is the number of firms.

A normalized Herfindahl index is:

$$H^* = \frac{H-1/N}{1-1/N}$$
 the normalized Herfindahl index ranges from 0 to 1.

H^* index below 0.1 implies an unconcentrated index; between 0.1 and 0.18 is moderate concentration, and above 0.18 indicates high concentration.

the size inequalities within the leading banks in the market. As a result, the relationship between the concentration ratio and total number of banks is unstable and unclear.

Another indicator of banking market concentration is the number of banks in the local market. If each bank is identical and there are n banks, each bank will have $1/n$ market share. This measure of market concentration is inversely related to number of banks. The drawback of this measurement is that it ignores the unequal market shares of markets, therefore the number of banks could not reflect precisely the level of concentration (Koutsomanoli and Staikouras, 2004). Due to the limitation of data availability, the authors of this thesis use the number of banks per capita in each province as the closest proxy that represents market competition.

5.2.2 Variables

On the left-hand-side of the model, the dependent variable is SMEs per capita (SMEP-C_i) in heavy and light industries in each province. The motivation for selecting this type of SMEs is stated as follows.

In 2007, China's GDP reached a historical peak of 249.6 billion Yuan (calculated at current price) which is approximately 17% higher than that of 2006. The country's industrial enterprises contribute to over 43% of the country's GDP in the same year. Data in Table 5.1 are calculated at current prices in 100 million Yuan.

Table 5.1: GDP of 3 main categories of industry, 2000-2007;

(100 million Yuan)

Year	GDP	Primary Industry	Secondary Industry	Industry	Construction	Tertiary Industry
2005	183217.4	22420	87364.58	77230.78	10133.8	73432.87
2006	211923.5	24040	103162	91310.9	11851.09	84721.4
2007	249529.9	28095	121381.3	107367.2	14014.1	100053.5

Source: Data from China Statistical Yearbook 2008, National bureau of Statistics of China

Due to the economic significance of the industrial enterprises, the financing of this type of enterprises are of major importance and interest. According to China Statistical Yearbook 2008, the total number of industrial enterprises above designated size² in 2007 is 336 768, among which, when grouped by size, 333 858 are SMEs (that is, more than 99% of the total number). When classified by status of registration, there are 10 074 state-owned industrial enterprises and 177 080 private industrial enterprises respectively. (See Table 5.2)

² Industrial enterprises above designated size are those with annual revenue from principal business over 5 million Yuan.

Table 5.2: Number of Enterprises (grouped by different categories), 2007;

Item	Number of Enterprises (unit)
Total	336768
Grouped by Light & Heavy Industries	
Light Industry	146612
Heavy Industry	190156
Grouped by Size of Enterprises	
Large Enterprises	2910
Medium-sized Enterprises	33596
Small Enterprises	300262
By Status of Registration	
State-owned Enterprises	10074
Private Enterprises	177080

Source: Data from China Statistical Yearbook 2008, National bureau of Statistics of China

In addition, the Chinese economy undertook reform less than 30 years ago, and the private sector became important only from the end of 1990s. One may expect more relatively new or young SMEs than large growth firms. Thus, it is logical to conclude that the majority of industrial enterprises in China are young private SMEs. Furthermore, since the focus of the models is on the differences among 31 mainland China provinces rather than in the manner of a time-series, creation rate of new SMEs are not to be considered as the dependent variable. Taken into account of all these facts, SMEs per capita (SMEPC_{*i*}) is used on the left-hand-side of the function.

On the right-hand-side of the regression function, the independent variables are the measure of market concentration and three control variables. The amount of banks per capita in each province (BANKPC_{*i*}) and the share of foreign banks in each province (FORBANK_{*i*}) are used in the 1st and the 2nd model respectively. The per capita value of the amount of banks is taken with the intention to eliminate the unequal size effect of different provinces. Looking at the data of the number of banks, it is obvious that larger provinces with higher number of cities simply have more banks than smaller provinces or municipalities. By using the per capita value of the number of banks in each province, not only such inequality is removed but also the density of banking market is captured. Bonaccorsi di Patti and Dell’Ariccia (2004) have argued that bank market structure has an endogenous component because the number of banks would be greater in the area of more dynamic economies with higher number of new firms. Nevertheless, what really triggers the entrance and establishment of banks are the profitability of the firms in the area rather than only the quantitative amount of firms in the area. The authors of this thesis believe that the quantity of SMEs in the Chinese provinces is not an obvious indicator for the number of banks, and that variables BANKPC as the indi-

cator for market power and FORBANK have considerable influence on the number of SMEs.

The selected control variables would reflect the exogenous factors that influence SMEPC. Despite of the rapid overall economic growth rate in China, provinces differ considerably in terms of economic and infrastructure development. The inequality between coastal and in-land provinces is significant. Taking into account these features, provincial GDP per capita ($GDPPC_i$), provincial infrastructure level ($INFRA_i$) and a dummy variable ($COAST_i$) are included in the regression model. Telecommunication is a common and proper indicator for the level of infrastructure since business activities take place through communication among business actors. Thus, the number of mobile phone subscribers in each province is selected as the measure of INFRA. Besides, due to the fact that Chinese coastal provinces are richer than its in-land provinces, it is logical to expect the coastal provinces to attract higher level of entrepreneurship and thus to have larger number of SMEs. The dummy variable ($COAST_i$) is likely to capture this effect.

5.3 Data Collection

China, though one of the fastest growing economies in the world, is still a developing country with one-party-rule regime. Official data of a developing country is hard to access not only due to the lack of informational openness to the public but also because of its not-so-advanced information gathering technology and method. Difficulty in getting hold of the data needed, to a large extent, limit the selection of variables of the regression models. Data of all variables for 31 mainland China provinces in 2007 are exhibited in Appendix 1.

Data of the dependent variable SMEPC and the control variables GDPPC and INFRA are retrieved from Statistical Yearbook 2008 of each province, in which data of 2007 in various categories are actually presented.

The independent variables BANKPC in the 1st model and FORBANK in the 2nd model refer to the number of banks per capita and the share of foreign banks in a province. They represent the bank competition or market density of each province. Data of these two variables are not found in the Statistical Yearbook 2008 of most of the provinces, instead they are retrieved from the Journal of Financial Research 2007 of all provinces under question. Since the Statistical Yearbook 2008 and the Journal of Financial Research 2007 of all provinces are written in Chinese, only the data that are necessary for running the two regressions are translated and listed in Appendix 1. The original copies of the Yearbooks and the Journals can be provided upon request.

5.4 Regression models

Ordinary least squares (OLS) method is applied in estimating the parameters and coefficients of the models. Although the formulation of the models are inspired by Bonaccorsi di Patti and Dell'Araccia's (2004) study on bank competition and firm creation in Italy, the method of "trial and error" is applied when determining our models. The authors of this thesis have attempted to use linear and non-linear models, and to add and remove some variables based on the p-values of their coefficients.

The two regression models are stated as follows:

$$\begin{aligned} \text{1st Model: } \text{SMEPCs}_i &= \text{Constant} + \beta_1 \log(\text{BANKPC}_i) + \beta_2 \text{GDPPC}_i \\ &+ \beta_3 \log(\text{INFRA}_i) + \varepsilon_i \end{aligned}$$

$$\begin{aligned} \text{2nd Model: } \log(\text{SMEPCs}_i) &= \text{Constant} + \beta_1 \log(\text{FORBANK}_i) + \beta_2 \log(\text{GDPPC}_i) \\ &+ \beta_3 \log(\text{INFRA}_i) + \beta_4 \text{COAST}_i + \varepsilon_i \end{aligned}$$

6 Empirical findings

In this section regression results from the two models are presented, interpreted and analyzed. Theories stated in section 4 are applied in order to explain and justify the regression results.

6.1 Regression results

In the case of the 1st model, provincial SMEs per capita is regressed on total number of banks in the provinces, provincial gross domestic product per capita, level of infrastructure development in the provinces and the dummy variable differentiates whether the province is a coastal one or not. The regression result is presented in Table 6.1. The data used for the regression estimated are provincial data from 31 mainland China provinces in 2007. The significance level chosen is 5%.

Table 6.1: Regression result of the 1st model, 2007;

Parameter	Estimated Coefficient	P-Value
Constant	1.719559	0.2383
LOG(BANKPC)	0.842831	0.5846
GDPPC	0.0000766	0.0100
LOG(INFRA)	1.163340	0.1666
Dependent variable: SMEPC		
Included observations: 31		Adjusted R²: 0.51

Source: Made by authors

As can be seen from Table 6.1, all right-hand-side variables except GDPPC are insignificant at $\alpha = 0.05$ (that is, the p-values of BANKPC and INFRA are larger than 5% significance level). All these variables have positive signs which are consistent with our expectation. The positive sign of GDPPC indicates that provinces with higher GDP per capita have more firms. Therefore, the null hypothesis: $H_0: \beta_1 > 0$ cannot be rejected. To be more specific, provincial SMEs per capita increases when there are rises in the number of banks per capita, GDP per capita and the level of infrastructure. The value of adjusted R² signals whether the model is a good fit. In the case of the 1st model, 51% of the explanatory variables have explained for the dependent variable.

In order to control for model misspecification, heteroscedasticity and autocorrelation in the residuals, tests such as Ramsey RESET Test, White's Test and Breusch-Godfrey Serial Correlation LM Test are conducted. There is no sign of model misspecification, heteroscedasticity and autocorrelation, since the p-values of all three tests are greater than 5% significance level. The regression result of model 1 is reliable.

In the case of the 2nd model, logarithm of provincial SMEs per capita is regressed on share of foreign bank in provinces, logarithm of provincial gross domestic product per capita, logarithm of level of infrastructure development in the provinces and the dummy variable which differentiates whether the province is a coastal one or not. The re-

gression result is presented in Table 6.2. The data used for the regression estimated are provincial data from 31 mainland China provinces in 2007. The significance level chosen is 5%.

Table 6.2: Regression result of the 2nd model, 2007;

Parameter	Estimated Coefficient	P-Value
Constant	-17.03638	0.0017
LOG(FORBANK)	-0.250190	0.0440
LOG(GDPPC)	1.632407	0.0010
LOG(INFRA)	0.130343	0.6345
COAST	0.605424	0.2332

Dependent variable: LOG(SMEPC)

Included observations: 15 after adjustments **Adjusted R²:** 0.88

Source: Made by authors

Independent variables LOG(FORBANK) and LOG(GDPPC) are statistically significant at $\alpha = 0.05$ (that is, the p-values of these two variables are smaller than 5% significance level). All variables except LOG(FORBANK) have positive signs which are also consistent with our expectation. The positive sign of LOG(GDPPC) points out that Chinese province with higher GDP per capita attract more firms. Since the p-value of the coefficient of LOG(FORBANK) is smaller than 5% significance level and the sign of the coefficient is negative, the null hypothesis: $H^*_0: \beta_1 > 0$ can be rejected. Provincial SMEs per capita does not increase when there are rises in the share of foreign banks, while it increases with level of infrastructure in a coastal province. Approximately 88% of the explanatory variables have explained for the dependent variable. The regression estimations of both models exhibit non-linear relationship among the dependent and independent variables.

Meanwhile, the test results from Ramsey RESET Test, White's Test and Breusch-Godfrey's Test signals that there are no model misspecification, heteroscedasticity or autocorrelation problems in the 2nd model. For detailed results of these tests, please see Appendix 2.

6.2 Analysis of results

The regression result from the 1st model shows that the local bank competition has positive effect on SMEs in the case of Chinese provinces. As local bank competition increases, there is also an increase in SMEs per capita. Our result is not consistent with Petersen and Rajan's (1995) model, that is, lower level of competition gives incentive for banks to lend to informational opaque firms such as SMEs. Instead the result of the model is consistent with the conventional theories of industrial organization, that is, local market competition benefits the firms by increasing credit availability. Despite the difference in the results, one should bear in mind the fact that Chinese banking market is still dominated by state-owned banks. This brings about the result that positive effect

of market power diminishes as investigated by Cetorelli and Gambera (2001). The relationship between bank competition and number of SMEs is a non-linear one in our 1st regression model, which implies that the diminishing effect of bank competition on the number of SMEs prevails. The non-linear relationship is presented in Figure 6.1.

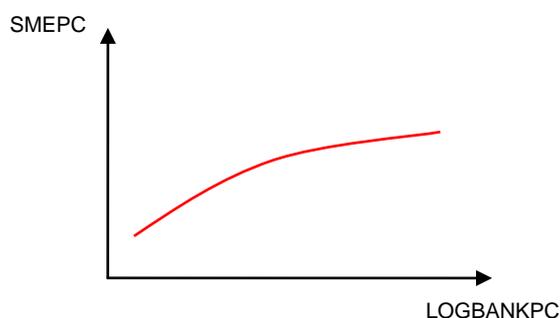


Figure 6.1 SMEs per capita vs. number of banks per capita.

Source: Made by authors based on EViews' plot of SMEs per capita and logarithm of bank per capita

The 2nd model also has the form of a non-linear relationship; its regression result is not consistent with the theory of foreign banks' entry. Our result shows that increase in the share of foreign banks does not have positive effect on the number of SMEs per capita. Although it is advocated that the presence of foreign banks would influence the domestic banking system by not only bring in more advanced technology but also imposing higher competition in the domestic banking market, significant influence of foreign banks in the Chinese provinces could not be observed. One possible explanation is that, in a market highly dominated by domestic state-owned banks, government regulations would limit the operation of foreign banks with the intention to protect the domestic banks. As a matter of fact, it is not until recently, foreign banks are allowed to handle deposits and loans in the Chinese currency, RMB Yuan. The positive influence of foreign banks' entry is offset by the limitation of their operation.

Furthermore, Boot and Thakor (2000) have pointed out that Petersen and Rajan's model (1995) had not investigated at which level of bank competition it is not profitable for banks to invest in relationship lending. One possible reason why the positive effect of market power on small and young firms in the Chinese provinces could not be observed is that banks in the US and China face different levels of competition. It could be the case that the US bank competition is beyond the intermediate level, while the Chinese banks faces lower level of competition. On the other hand, there is no single agreed definition of the intermediate level and intensive level of market completion as mentioned in Boot and Thakor (2000).

Nevertheless, a time-series analysis is recommended if one would like to investigate in detail the before-and-after effect of foreign banks' entry so as to make a more precise insight conclusion. In particular, one could use the share of loans granted to SMEs in each province as the independent variable instead of the number of banks or the share of foreign banks provided that such data are accessible.

7 Conclusion

The authors of this thesis will draw conclusions of the study based on the regression results

The purpose of this thesis is to analysis the relationship of local banking market competition and SMEs loan financing across the 31 mainland China provinces. According to the theories of bank competition, high banking market competition brings about higher credit accessibility and prevents monopolistic banks from charging high lending rates. While the negative effect of high banking market competition suggests that the banks would have less incentive in relationship lending to firms. The two models are formulated to investigate the overall effect of local banking market on SMEs per capita across Chinese provinces. The 1st model illustrates the correlation between the total number of banks per capita and SMEs per capita, whereas the 2nd model describes the correlation between the share of foreign banks and SMEs per capita. The empirical results confirm that local banks competition, regardless of ownership status, imposes a positive impact and that the share of foreign banks across provinces does not have positive effect on the Chinese industrial SMEs.

Although the purpose of this paper is achieved and the research questions are answered, the authors are aware of the limitations encountered during the collection of data. For instance, the HHI index of market concentration is possibly a better independent variable than simply the number of banks in terms of the measure of bank competition. The deposit market share of each bank in each province is crucial for the calculation of this index. Unsurprisingly, this number is not available. Therefore, the number of banks is selected instead. Another constraint occurs when the authors select the dependent variable. The number of new private SMEs per capita is better than the number of SMEs per capita because the private SMEs in China are subject to more constraints on accessing external financial resource and it is uncertain whether SMEs need the external finance to develop or to maintain its current business. The most relevant data that could be retrieved is the number of industrial SMEs per capita in each province.

For future studies on the relationship between bank competition and SME financing, the authors believe that the HHI index and the number of new private SMEs per capita could be considered as one of the independent variables and the dependent variable respectively. The ratio of private versus state-owned SMEs across Chinese provinces could also be considered as the dependent variable.

The authors investigate the banking market competition and industrial SMEs, whereas policy makers may be more interested in the overall effect of banking market competition on macro-economic growth. Therefore, the effect of bank competition across different industries and different Chinese provinces would be another interesting topic. Moreover, given that a country changes its regulation on banking sector at a point of time, the bank competition might as well vary, therefore time-series studies on the before-and-after effect of this change on the non-financial sectors would be feasible. Meanwhile, the result of our second regression model provides motivation for further study on the impact of foreign banks on SME financing in China.

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Appendix

Appendix 1 Data of variables

	No. of SMEs	Population (10,000)	SME per capita	GDP per capita
Beijing	6355	1633	3,891610533	58204
Tianjin	6309	1115	5,658295964	46122
Hebei	10729	6943	1,545297422	19877
Shanxi	4358	3392,58	1,284568087	16945
Inner Mongolia	3314	2405,1	1,377905285	2539,3
Liaoning	13669	4231,7	3,230143914	25729
Jilin	3947	2696,1	1,46396647	2701,3
Heilongjiang	2320	3824	0,606694561	18478
Shanghai	14993	1858,08	8,069082063	66367
Jiangsu	41481	7624,5	5,440487901	33928
Zhejiang	51412	4659,34	11,03418081	37411
Anhui	8039	6118	1,3139915	12044,8
Fujian	15093	3581	4,214744485	25908
Jiangxi	5992	4368,4125	1,371665336	12633
Shandong	35804	9367	3,822355076	27807
Henan	13365	9869	1,354240551	16012
Hubei	8910	6070	1,467874794	16206
Hunan	10146	6805,7	1,490809175	13518,1
Guangdong	41906	9449	4,434966663	33151
Guangxi	4380	5002	0,87564974	12555
Hainan	595	833,4358	0,713912217	12632,6
Chongqing	3885	3235,32	1,200808575	14660
Sichuan	10622	8815,2	1,204964153	12893
Guizhou	2568	3955,3	0,649255429	4721,77
Yunnan	2331	4432,8	0,525852734	7835
Tibet	443	273,59	1,619211228	12109
Shaanxi	3289	3748	0,877534685	14583,2
Gansu	48	2606,25	0,018417266	8757
Ningxia	749	610,2518	1,227362213	14649
Qinghai	462	551,6	0,837563452	47009
Xinjiang	1548	2095,19	0,738835141	16950

Appendix 1 Data of variables continued

	No. of foreign banks	No. of banks	Banks per capita	Share of foreign banks
Beijing	158	2826	1,730557257	0,055909413
Tianjin	14	2120	1,901345291	0,006603774
Hebei	0	8736	1,258245715	0
Shanxi	0	3810	1,123039103	0
Inner Mon- golia	0	4386	1,823624797	0
Liaoning	26	7113	1,680884751	0,003655279
Jilin	0	3776	1,400541523	0
Heilongjiang	0	4365	1,141474895	0
Shanghai	131	2602	1,400370275	0,050345888
Jiangsu	17	8810	1,155485606	0,001929625
Zhejiang	9	8469	1,817639408	0,001062699
Anhui	0	5718	0,934619157	0
Fujian	26	4416	1,233175091	0,005887681
Jiangxi	0	4957	1,134737161	0
Shandong	15	11012	1,175616526	0,00136215
Henan	0	9594	0,972134968	0
Hubei	5	5788	0,95354201	0,000863856
Hunan	0	7028	1,032663797	0
Guangdong	138	13481	1,426711821	0,010236629
Guangxi	0	4434	0,886445422	0
Hainan	1	894	1,072668105	0,001118568
Chongqing	9	3075	0,950446942	0,002926829
Sichuan	13	9920	1,125328977	0,001310484
Guizhou	0	3311	0,837104644	0
Yunnan	1	4284	0,966432052	0,000233427
Tibet	0	548	2,002997186	0
Shaanxi	4	5131	1,368996798	0,000779575
Gansu	0	3944	1,513285372	0
Ningxia	0	901	1,476439725	0
Qinghai	0	833	1,510152284	0
Xinjiang	0	2626	1,253346952	0

Appendix 1 Data of variables continued

	No. of mobile phone subscribers (10,000)	Subscriber per capita
Beijing	1598,3	0,978750765
Tianjin	738,29	0,662143498
Hebei	2251	0,324211436
Shanxi	1420,3689	0,418669243
Inner Mongolia	1046,9307	0,435296121
Liaoning	2097,2	0,495592788
Jilin	1311	0,486257928
Heilongjiang	1449,2	0,378974895
Shanghai	1776,5	0,956094463
Jiangsu	3313,2	0,434546528
Zhejiang	3529	0,757403409
Anhui	1410,0378	0,230473652
Fujian	1809	0,505166155
Jiangxi	1182	0,270578843
Shandong	3723	0,397459165
Henan	2915	0,295369338
Hubei	1941	0,319769357
Hunan	1890,9	0,277840634
Guangdong	7842,06	0,829935443
Guangxi	1370,94	0,274078369
Hainan	239,8888	0,287831168
Chongqing	1176,9	0,363766181
Sichuan	2400	0,272257011
Guizhou	646,2	0,163375724
Yunnan	268,9862	0,060680879
Tibet	73,7259	0,269475858
Shaanxi	1612,6583	0,430271692
Gansu	329,19	0,126307914
Ningxia	268,13	0,439376008
Qinghai	222	0,402465555
Xinjiang	808,3	0,385788401

Source: Data from China Statistical Yearbook 2008, National bureau of Statistics of China

Appendix 2 EViews' regression results and tests results

Model 1

1. Model specification and parameter estimation

Dependent Variable: SMEPC

Method: Least Squares

Date: 05/19/09 Time: 17:08

Sample: 1 31

Included observations: 31

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.719559	1.425817	1.206017	0.2383
LOG(BANKPC)	0.842831	1.523210	0.553325	0.5846
GDPPC	7.66E-05	2.76E-05	2.769140	0.0100
LOG(INFRA)	1.163340	0.818367	1.421539	0.1666
R-squared	0.558801	Mean dependent var		2.379806
Adjusted R-squared	0.509779	S.D. dependent var		2.452681
S.E. of regression	1.717265	Akaike info criterion		4.039257
Sum squared resid	79.62296	Schwarz criterion		4.224287
Log likelihood	-58.60848	F-statistic		11.39895
Durbin-Watson stat	1.219028	Prob(F-statistic)		0.000052

Source: Test results from EViews

Model selection is based on adjusted R-squared.

2. Diagnostic checking

- 1) Ramsey RESET Test is applied to check for model misspecification.

H_0 : No model misspecification

H_1 : Model misspecification

Ramsey RESET Test:

F-statistic	0.296231	Prob. F(1,26)	0.5909
Log likelihood ratio	0.351202	Prob. Chi-Square(1)	0.5534

Test Equation:

Dependent Variable: SMEPC

Method: Least Squares

Date: 05/26/09 Time: 16:37

Sample: 1 31

Included observations: 31

	Coefficient	Std. Error	t-Statistic	Prob.
C	2.045502	1.563968	1.307892	0.2024
LOG(BANKPC)	0.567436	1.624280	0.349346	0.7296
GDPPC	4.04E-05	7.22E-05	0.558998	0.5809
LOG(INFRA)	1.112232	0.834545	1.332741	0.1942

FITTED^2	0.051927	0.095406	0.544271	0.5909
R-squared	0.563771	Mean dependent var		2.379806
Adjusted R-squared	0.496659	S.D. dependent var		2.452681
S.E. of regression	1.740093	Akaike info criterion		4.092444
Sum squared resid	78.72599	Schwarz criterion		4.323732
Log likelihood	-58.43288	Hannan-Quinn criter.		4.167838
F-statistic	8.400427	Durbin-Watson stat		1.177740
Prob(F-statistic)	0.000173			

Source: Test results from EViews

2) White's Test checks for heteroscedasticity.

H_0 : No heteroscedasticity

H_1 : Heteroscedasticity

Heteroskedasticity Test: White

F-statistic	1.202142	Prob. F(9,21)	0.3444
Obs*R-squared	10.54070	Prob. Chi-Square(9)	0.3085
Scaled explained SS	31.94685	Prob. Chi-Square(9)	0.0002

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 05/26/09 Time: 16:41

Sample: 1 31

Included observations: 31

	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.526539	32.76643	-0.168665	0.8677
LOG(BANKPC)	21.79361	52.77085	0.412986	0.6838
(LOG(BANKPC))^2	5.684353	33.69561	0.168697	0.8676
(LOG(BANKPC))*GDPPC	0.000160	0.000880	0.182089	0.8573
(LOG(BANKPC))*(LOG(INFRA))	18.53353	25.66607	0.722102	0.4782
GDPPC	0.000211	0.000967	0.218046	0.8295
GDPPC^2	-4.60E-09	8.19E-09	-0.561895	0.5801
GDPPC*(LOG(INFRA))	-0.000201	0.000500	-0.401030	0.6924
LOG(INFRA)	1.210389	33.15177	0.036511	0.9712
(LOG(INFRA))^2	0.864629	7.677539	0.112618	0.9114
R-squared	0.340023	Mean dependent var		2.568482
Adjusted R-squared	0.057175	S.D. dependent var		7.380554
S.E. of regression	7.166456	Akaike info criterion		7.032396
Sum squared resid	1078.520	Schwarz criterion		7.494972
Log likelihood	-99.00214	Hannan-Quinn criter.		7.183184
F-statistic	1.202142	Durbin-Watson stat		1.890863
Prob(F-statistic)	0.344370			

Source: Test results from EViews

3) Breusch-Godfrey Serial Correlation LM Test checks for autocorrelation.

H_0 : No autocorrelation (zero lag)

H_1 : Autocorrelation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.602956	Prob. F(1,26)	0.0688
Obs*R-squared	3.772990	Prob. Chi-Square(1)	0.0521

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 05/26/09 Time: 16:44

Sample: 1 31

Included observations: 31

Presample missing value lagged residuals set to zero.

	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.118268	1.363114	-0.086763	0.9315
LOG(BANKPC)	0.432876	1.472469	0.293980	0.7711
GDPPC	2.93E-06	2.65E-05	0.110732	0.9127
LOG(INFRA)	0.060438	0.782208	0.077266	0.9390
RESID(-1)	0.366228	0.192940	1.898145	0.0688

R-squared	0.121709	Mean dependent var	-4.87E-16
Adjusted R-squared	-0.013412	S.D. dependent var	1.629140
S.E. of regression	1.640029	Akaike info criterion	3.973995
Sum squared resid	69.93210	Schwarz criterion	4.205284
Log likelihood	-56.59693	Hannan-Quinn criter.	4.049389
F-statistic	0.900739	Durbin-Watson stat	1.926840
Prob(F-statistic)	0.477849		

Source: Test results from EViews

Since all the p- values of the coefficients are greater than 5% significant level, we cannot reject the null hypotheses, meaning there are no model misspecification, no heteroscedasticity and no autocorrelation in the residuals.

Model 2

1. Model specification and parameters estimation

Dependent Variable: LOG(SMEPC)

Method: Least Squares

Date: 05/19/09 Time: 16:29

Sample (adjusted): 1 27

Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-17.03638	4.004974	-4.253806	0.0017
LOG(FORBANK)	-0.250190	0.108612	-2.303525	0.0440
LOG(GDPPC)	1.632407	0.354314	4.607228	0.0010
LOG(INFRA)	0.130343	0.265860	0.490269	0.6345
COAST	0.268854	0.211857	1.269035	0.2332
R-squared	0.916203	Mean dependent var		0.966308
Adjusted R-squared	0.882685	S.D. dependent var		0.932670
S.E. of regression	0.319452	Akaike info criterion		0.816782
Sum squared resid	1.020495	Schwarz criterion		1.052798
Log likelihood	-1.125863	F-statistic		27.33409
Durbin-Watson stat	1.667474	Prob(F-statistic)		0.000023

Source: Test results from EViews

Model selection is based on adjusted R-squared.

2. Diagnostic checking

- 1) Ramsey RESET Test is applied to check for model misspecification.

H_0 : No model misspecification

H_1 : model misspecification

Ramsey RESET Test:

F-statistic	0.102008	Probability	0.756722
Log likelihood ratio	0.169057	Probability	0.680951

Source: Made by authors based on EViews

- 2) White's Test checks for heteroscedasticity.

H_0 : No heteroscedasticity

H_1 : Heteroscedasticity

White Heteroskedasticity Test:

F-statistic	0.724939	Probability	0.738735
Obs*R-squared	13.56104	Probability	0.405467

Source: Test results from EViews

3) Breusch-Godfrey Serial Correlation LM Test checks for autocorrelation.

H_0 : No autocorrelation (zero lag)

H_1 : Autocorrelation

Breusch-Godfrey Serial Correlation LM Test :

F-statistic	0.001871	Probability	0.966441
Obs*R-squared	0.003118	Probability	0.955470

Source: Test results from EViews

Since all the p- values of the coefficients are greater than 5% significant level, we cannot reject the null hypotheses, meaning there are no model misspecification, no heteroscedasticity and no autocorrelation in the residuals.