Discussion paper

# DOES BANKING COMPETITION ALLEVIATE OR WORSEN CREDIT CONSTRAINTS FACED BY SMALL AND MEDIUM ENTERPRISES? EVIDENCE FROM CHINA

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# Does Banking Competition Alleviate or Worsen Credit Constraints Faced by Small and Medium Enterprises? Evidence from China

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**Abstract**

Banking competition may enhance or hinder the financing of small and medium enterprises. Using a survey on the financing of such enterprises in China, combined with detailed bank branch information, we investigate how concentration in local banking market affects the availability of credit. We find that lower market concentration alleviates financing constraints. The widespread presence of joint-stock banks has a larger effect on alleviating these constraints, than the presence of city commercial banks, while the presence of state-owned banks has a smaller effect. (83 words)

JEL Classification: D41; D43; G21

Key Words: Banking Competition; SMEs Financing; Credit Constraints

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## Abstract

Banking competition may enhance or hinder the financing of small and medium enterprises. Using a survey on the financing of such enterprises in China, combined with detailed bank branch information, we investigate how concentration in local banking market affects the availability of credit. We find that lower market concentration alleviates financing constraints. The widespread presence of joint-stock banks has a larger effect on alleviating these constraints, than the presence of city commercial banks, while the presence of state-owned banks has a smaller effect. (83 words)



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## I. Introduction

The impact of competition in the banking sector on the availability of credit for small and medium enterprises (SMEs) is a crucial policy and academic question that has again attracted widespread attention in light of global economic developments including the subprime crisis. Formal (bank) financing is associated with economic growth (Beck, Demirgüç-Kunt and Levine, 2005), while SMEs are often constrained in obtaining it (Beck, Demirgüç-Kunt and Maksimovic, 2008). Yet the determinants of this "financing gap" for SMEs have not yet been fully examined, in particular in the context of a developing financial system. Competition in the banking sector, for example, may be an important driver (Petersen and Rajan, 1995; Carbo-Valverde, Rodriguez-Fernandez and Udell, 2009).

To investigate the impact of competition in the banking sector on the availability of credit for SMEs in a developing economy, we employ nearly 4,000 responses to a unique stratified survey that was sent in 2006 to Chinese private enterprises. China provides an almost ideal setting to investigate the banking competition – SME financing gap nexus. China's economy is populated with a very large number of SMEs, which contribute substantially to the national economy.[1] At the same time SMEs in China are known to face major obstacles in access to financing, especially from the state-owned banks, yet the access to formal financing also matters (Ayyagari, Demirgüç-Kunt and Maksimovic, 2010; Cheng and Degryse, 2010).

[1] 4.3 million SMEs account for 99.30 percent of all firms at year-end 2004 and 74.70 percent of the industrial value added during 2004. The number of SMEs increased at an annual rate of 20.4 percent between 2001 and 2004 (Sources: *China Administration for Industry and Commerce* and *China Commission for Reform and Development*).

The Chinese government has long recognized the problem and tried to help SMEs in obtaining bank financing in the past decade. It even added SME financing to the national development agenda which resulted in the "SMEs Promotion Law" in 2003. However, SMEs financing difficulties persist according to a government report in 2005 based on a survey of 3,000 SMEs. Among the SMEs owners that responded, 79.50 percent of them rated financing environment as "not changed" or "deteriorating" compared with the years prior to 2005. Furthermore, this proportion was as high as 90.90 percent in the western China, which is relatively less developed. Hence SME financing difficulties may have never been fully solved by the implemented government policies. Therefore, to understand the determinants of SMEs financing is vitally important not only for academics but also for policy-makers.

We analyze the 3,837 responses from a 2006 survey of private enterprises that took place across all 31 regions (provinces, autonomous regions, and municipalities). The surveyed private enterprises are mainly SMEs according to the extant official Chinese definition. Either the entrepreneurs themselves or the main investors in the enterprises provide information on the financing gap faced by these firms.

We find that financing constraints are alleviated in those regions where banking markets are less concentrated, irrespective of whether concentration is measured by the Herfindahl–Hirschman Index (HHI) or the three-bank concentration ratio (CR3) based on bank branch presence. A decomposition of the HHI according to the presence of different types of banks, namely, the state-owned banks (national banks), joint-stock banks (regional banks) and city commercial banks (local banks), shows that the widespread, i.e., "un-concentrated", presence of joint-stock banks can better alleviate the credit constraints as compared to the presence of city commercial banks and state-owned banks.

This paper contributes to the literature by providing evidence on the effect of banking sector concentration (intended to measure the intensity of competition) on SME credit constraints in China. It is also the first study of its kind on emerging economies. For this purpose, we augment the survey with a new dataset of bank branches across China and employ a quantitative measure called the ratio of financing gap over credit demand to capture the information of credit constraints. The new measure is by nature more informative than traditionally used qualitative measures of credit rationing.

The rest of the paper is organized as follows. Section 2 gives an introduction of China's banking system. Section 3 presents the survey dataset and the banking market data. Section 4 defines the measures of the financing gap, presents the tested hypotheses and describes the methodology. Section 5 discusses the summary statistics for the variables of interest. Section 6 presents and interprets the regression results for various model specifications. Section 7 shows the instrumental variable regression, and section 8 conducts further robustness checks. Section 9 concludes the paper.

## II. China's Banking System and SMEs Financing

China's banking sector is dominated by four state-owned banks. As shown in Panel A of Figure 1, over half of all bank assets is owned by these four banks, which are also the largest

four banks in the country.[2] State-owned banks usually prefer providing funds for state-owned firms which are often very large firms in their own right, and show much less interest in financing SMEs. Berger, Miller, Petersen, Rajan and Stein (2005) show that small banks are better able (than large banks) to collect and act on soft information, while large banks are less willing to lend to firms with no financial records (such as small and young firms).

[Figure 1 here]

Besides the four state-owned banks, there are twelve joint-stock banks in China, whose sizes range from that of state-owned banks, as the largest joint-stock bank Communication Bank, and that of city commercial banks, as a new joint-stock bank Hengfeng Bank. Joint-stock banks can open branches freely all around the country, and their business orientation includes targeting SMEs, which is emphasized more than their state-owned counterparts.

On the "small end" of the banking market, there are the city commercial banks (112 in total at the end of 2005), most of which were restructured from urban credit cooperatives. Urban credit cooperatives came into being in the 1980s as the main providers of credit to SMEs, and were categorized as non-bank financial institutions by the Chinese government.[3] However, from the middle 1990s onwards the Chinese government restructured urban credit cooperatives and set

[2] See Table 1 for the total assets of the banks in 2005. The four state-owned banks are the largest banks in total assets. For example, total assets of the Industrial and Commercial Bank of China (ICBC) totaled about 790 billion USD at year-end 2005.

[3] According to the *Almanac of China's Finance and Banking* (1995), there were 5,229 urban credit cooperatives at the end of 1994. In later years, around 3,000 of them were restructured into 112 city commercial banks, which means that on average 26 (= 3,000 / 112) urban credit cooperatives were merged into one city commercial bank, while the remaining ones were merged with one of the rural credit cooperatives. There were around 600 urban credit cooperatives still in operation at the end of 2005, representing a market share of less than 0.60 percent in terms of branch numbers. Hence, although we include urban credit cooperatives in our analysis as a source of credit for SMEs, the exclusion of their branches when calculating our concentration measures is not likely to change our results substantially. Besides, there is a large population of rural credit cooperatives, trust and investment companies, finance companies, and three policy banks which are designed to provide loans to agriculture, infrastructure, and foreign trade respectively. As these institutions usually do not provide loans to SMEs, we exclude them from our analysis.

up city commercial banks in order to enhance financial stability. According to the financial regulation before 2006, city commercial banks could generally only operate within their headquarters cities, thus focusing exclusively on local banking markets and have a strong business orientation towards SME financing, which also correspond to their prior operations as urban credit cooperatives and their small sizes.

Table 1 shows the total assets of the banks in 2005. The joint-stock banks are smaller than the four state-owned banks, but larger than the city commercial banks. Furthermore, Panel B of Figure 1 shows the asset profiles of the twelve joint-stock banks, the 112 city commercial banks, as well as the 138 foreign banks, which account for 11.92, 5.44 and 1.91 percent of total bank assets in 2005 respectively. The most striking feature in Panel B of Figure 1 is that the market structure (in terms of total bank assets) has been improving steadily for joint-stock banks and city commercial banks during the 2003 to 2008 period.

[Table 1 here]

In parallel, competition in the banking market has intensified dramatically during the past decade. On the one hand, city commercial banks in China are still expanding, implying the fiercer competition in the credit market.[4] Due to their relatively small size and local business orientation, most city commercial banks target local SMEs. The booming of city commercial banks therefore provides a unique opportunity for us to investigate the effect of competition in the banking market on SME credit constraints. On the other hand, joint-stock banks compete with state-owned banks for large firms and with the city commercial banks for SMEs.

[4] A *Deutsche Bank* report by Hu and Yue (2007) predicts that "the city commercial bank is the fastest growing segment of China's banking sector in the years to come."

Competition in the banking market has increased substantially due to the joint-stock banks and city commercial banks' burgeon.

Different types of banks have different SME credit profiles. The Bank of Ningbo (NBCB), for example, a city commercial bank in eastern China, extended 66 percent of all its loans to SMEs in 2005; in contrast, the Industrial and Commercial Bank of China (ICBC), the largest state-owned bank, extended only 38 percent of its loans to SMEs in the same year. Figure 2 compares the loan size distribution for NBCB and ICBC in 2006. Around 35 percent of total corporate loans of NBCB carry a loan amount of less than 10 million RMB (about 120, 000 USD), while the proportion is less than 5 percent for ICBC. In addition, city commercial banks may be a vital source of formal financing for local SMEs.

Figure 3 presents the market share in 2006 of NBCB in Ningbo, its headquarter city. NBCB ranks fourth by total market share in the local credit market in 2006, which is surprisingly even higher than Bank of China, one of the four state-owned banks. Consequently, city commercial banks may play a vital role in SME financing in the local credit market. Similarly, joint-stock banks orient more of their lending towards SMEs than state-owned banks, when they also serve as important players in the local credit market.

[Figures 2 and 3 here]

In the following sections, we will introduce our credit constraint and banking competition measures, and investigate whether the intensity of banking competition is associated with the severity of SME credit constraints.

## III. Data

The data is composed of two parts: The SME survey dataset which was conducted in 2006, and hand-collected bank branch information.

### 3.1 SME Survey Dataset

A stratified survey dataset on Chinese private enterprises is available for the year 2006.[5] The survey comprises 3,837 observations, covering 31 regions (provinces, autonomous regions and municipalities) in China.[6] Li, Meng and Zhang (2006) use the same survey to examine the political participation of entrepreneurs, while we use the dataset to investigate the determinants of the firms' credit constraints.[7] According to the standard SME definition followed by the Chinese government,[8] 97.10 percent of the sample firms can be categorized as SMEs by total sales revenues. Consequently, the survey dataset can be used to investigate the SME financing after excluding the large firms.

[5] The data is obtained from University Service Center at The Chinese University of Hong Kong.

[6] The survey was initiated by four public institutes every two years since 1992: The China Administration for Industry and Commerce (government agency), the All-China Federation of Industry and Commerce (quasi-government agency), the China Private Economy Research Association (private research institute), and the United Front Work Department of CPC Central Committee (party agency).

[7] Li, Meng and Zhang (2006) use the data from the 2004 survey, while we use the data from 2006 survey. The questionnaire for the 2006 survey has better information on bank credit than the 2004 survey. Both rounds of survey were conducted by the same institutions applying consistent criteria. However, there is no firm identity record, rendering it impossible to combine 2004 and 2006 in a panel.

[8] According to the definition set by the China National Bureau of Statistics, SMEs have total sales revenues that are lower than 300 million RMB in industrial, construction, transportation and postal sectors, and lower than 150 million RMB in the wholesale, retail, accommodation, and catering sectors.

The questionnaire (we abridge in Table 2), which mainly asks about the entrepreneurs' background and other characteristics, including important questions on credit and firm characteristics which are shown in Table 2. The survey not only probes for the unfulfilled part of the firms' credit demand,[9] but also collects information on loans that are taken from banks, informal financing channels, individuals, and/or trading partners. Some accounting data is also being collected, such as equity, sales, and net profit.[10]

[Table 2 here]

The survey was conducted by the China Administration for Industry and Commerce and All-China Federation of Industry and Commerce. 4,300 SMEs, or about 0.10 percent of the whole SMEs population, were chosen as sample firms. Each institution was responsible for half of the questionnaires. The China Administration for Industry and Commerce selected the firms through its communication centers all over the country, while the All-China Federation of Industry and Commerce sampled proportionally from provinces, autonomous regions, and municipalities. All the questionnaires were filled out by trained surveyors during face-to-face interviews with the SMEs' entrepreneurs or main investors. In the end 3,837 questionnaires were completed and received, i.e., a response rate of 89.23 percent.

The survey used standard stratification methods, which insures the randomness of the sampling process. Generally speaking, the sampling process was based on the number of private firms at each stratification level. Firstly, the whole country was stratified in provinces, municipalities, or autonomous regions, and further in cities, districts or counties. Secondly, the sample firms were stratified by urban or rural regions and industries. Thirdly, the number of

[9] The survey does not distinguish between discouraged borrowers and rejected borrowers.

[10] The original questionnaire was sent out is in Chinese, but an English translation written by the authors is available upon request.

sample firms was allocated proportionally at each stratification level. Finally, the firms were selected randomly within each stratification level with equal distance in the name list. If entrepreneurs or main investors of a sample firm refused to partake in the survey or could not be reached, the surveyors substituted the firm with a neighboring firm in the name list.

### 3.2 Branch Information of State-owned Banks, Joint-stock Banks and City Commercial Banks

State-owned banks, joint-stock banks and city commercial banks have different organizational structures, which lead to different bank branch networks. State-owned banks have branches in almost every city.[11] Joint-stock banks are allowed to open branches freely anywhere in the country, but they usually focus on a certain region of the country.[12] According to financial regulations before 2006, city commercial banks could only open branches within their headquarters cities. Therefore, in terms of branch distribution, state-owned banks could be regarded as national banks, joint-stock banks as regional banks, and city commercial banks as local banks. Table 3 presents the total number of branches that provide corporation services in 2005.[13]

[11] For example according to its 2005 annual report the Agriculture Bank of China had over 28,000 branches located in many cities across China.

[12] For example, Shanghai Pudong Development Bank, a joint-stock bank headquartered in Shanghai, mainly focuses on the east China market. In contrast, Guangdong Development Bank, another joint-stock bank headquartered in Guangzhou, targets south China as its major market.

[13] Generally speaking, bank branches are categorized into two types: Corporate and Individual Service, and Individual Service Only. The former type can manage a corporate account, accept loan applications and make loan

[Table 3 here]

These banks are distinct in terms of not only the geographical footprint, but also the organization of the different banks. The four State-owned banks have five levels of branches, i.e., a *headquarters* (all in Beijing), a *provincial branch* (31 regions), a *city branch (*around 354 cities*),* a *county branch (*around 2,860 counties*)*, and a *business office*. We hand-collect all branch information from their official websites.

The twelve joint-stock banks have three levels of branches, i.e., a *headquarters,* a *province*, *municipality* or *city branch*, and a *business office*, and there is no limit on the number of new branches these banks are permitted to open. Joint-stock banks are similar to state-owned banks in terms of size and branch reach, while similar to city commercial banks in terms of their business orientation toward SMEs.

Finally, the 112 city commercial banks have two levels of branches, i.e., a *headquarters* and a *local branch*. Most of the city commercial banks have their own websites, with branch names and addresses on line. As city commercial banks could only operate in the local city market before 2006, we exclude those branches outside their headquarters cities in order to get close to the branch distribution in 2005.

The number of bank branches is merged with the survey data at the prefecture-level city based on firms' headquarters postcodes.[14] Hence we treat each city as a separate banking market,[15] and measure competition using the number of branches for each bank in the city.

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decisions, while the latter type can only provide services to an individual account holder. Depository and representative offices which provide solely the individual account service are excluded due to their irrelevance for SME financing.

[14] According to National Bureau of Statistics, there are about 354 prefecture-level cities in China, and each city has a population of 3.69 million and an area of 26, 346 square kilometers on average.

As the survey was conducted in 2006, we need the branch distribution at the end of 2005 in order to investigate the association of banking competition and SMEs financing. While all the branch information is obtained from the banks' current websites, the problem seems to be mostly relevant for state-owned banks, which have been shrinking in branch reach since 1997,[16] while joint-stock banks and city commercial banks have witnessed an expansion during the same period. It could lead to a downward measurement of concentration if we omit the state-owned branches closed after 2005, thus inflating the coefficients estimations, raising the necessity for us to adhere to a conservative interpretation of the regression results.

Based on the number of branches for state-owned banks, joint-stock banks and city commercial banks in each city, a Herfindahl-Hirschman Index (HHI) and a concentration ratio (CR3) can be calculated for each local credit market. Furthermore, HHI will be decomposed into three parts corresponding to bank types, so we can examine the heterogeneous effect across bank types on SME credit constraints.

## IV. Measurement, Hypotheses and Methodology

### 4.1 Measurement for Credit Constraints: Financing Gap Dummy and Financing Gap Ratio

[15] Due to the government imposed market segmentation by prefecture-level cities in China, firms are supposed to apply for loans from banks in the same city, even for firms that are located between two cities.

[16] Branch closures at the four state-owned banks have occurred for three reasons: 1) The Asian financial crisis in 1997 acted as an external contracting shock; 2) The Government has since 1998 nudged all state-owned enterprises to reform; 3) Foreign banks have started to enter and compete since 2001 following the Chinese government's commitment to the WTO agreement for the financial industry. Approximately 10 percent of the branches with corporation service closed during the 2005 and 2010 period.

Credit constraints can be measured by the likelihood of loan applications and denials (Cavalluzzo, Cavalluzzo and Wolken, 2002), access to bank finance (Beck, Demirgüç-Kunt and Martinez Peria, 2007) or the use of trade credit (Petersen and Rajan 1995).[17] Generally speaking, credit constraints arise from a shortfall in the supply of credit vis-à-vis the current demand for credit demand, or it means a financing gap exists.[18] Instead of recording loan applications and denials, the questionnaire of the survey asks directly about the demand for credit that is unfulfilled by the existing supply of credit, i.e., the financing gap. Figure 4 shows that a financing gap can exist in an incomplete market when the interest rate is highly regulated by a government as is the case in China.

[Figure 4 here]

Consequently, we can define a dummy variable (*DGAP*), which indicates whether a firm faces a financing gap, as:

*Financing Gap = Credit Demand for Expansion + Credit Demand for Operation (1)*

*DGAP=1, if Financing Gap>0; DGAP =0, otherwise (2)*

where *Credit Demand for Expansion* and *Credit Demand for Operation* are the amounts that are solicited in the survey. Put differently, the former one on the LHS is the credit demand for investment, while the latter is the credit demand for working capital. Both credit demand

[17] According to a World Bank policy report, access to financial services requires that the services are available in sufficient quantity and at an affordable price when economic agents need it. Similarly, credit constraints then imply a lack of sufficient credit at an affordable interest rate when economic agents need credit.

[18] The OECD SMEs Financing Gap Book stresses: "There is no commonly agreed definition of this gap, but the term is basically used to mean that a sizeable share of economically significant SMEs can't obtain financing from banks, capital markets, or other suppliers of finance. Furthermore, it is often alleged that many entrepreneurs or SMEs that do not currently have access to funds would have the capability to use those funds productively if they are available; but due to structure characteristics, the formal financial system does not provide finance to such entities."

amounts are reported by the firm, and in principle not included in the current outstanding credit balances that are surveyed in the subsequent question.

One strand of literature aims at disentangling the demand from the supply of credit using loan application and loan contract data. In contrast, Easterly (1999) defines financing gap at the country level, which is the difference between the required investment and the available resources. In addition, Cheng and Degryse (2010) use the amount applied and granted for one Chinese bank's credit card customers in order to measure the credit rationing. Similarly, Kirschenmann (2010) uses loan requested and granted to measure the tightness of credit rationing of the firms using data from a Bulgarian bank.

Although we do not have the loan application data, we do have the amount of loans outstanding at the end of year 2005. We then apply a similar definition to firms in order to get a measure of financing gap instead of an indicator measurement. A firm's required investment could be decomposed into available resources which are credit balances in Panel A of Table 2, and the financing gap defined above. In order to gain insight on the proportion of the required investment which faces credit constraints, we devise a quantitative measure, the *financing gap ratio* (*GAP*):

$$GAP = Financing\ Gap\ /\ [Financing\ Gap + Credit\ Balances] \qquad (3)$$

Where the *Financing Gap* is defined in equation (1) and the *Credit Balance* is the amount borrowed from all sources. In accordance with the questions reported in Panel A of Table 2, the *Credit Balance* is the summation of credit from State-owned Banks, Joint-stock Banks, City Commercial Banks and Credit Cooperatives, Informal Financing Channels, Individuals, and Foreign Banks.

GAP could provide a more accurate measure than DGAP. While DGAP captures the possibility of whether a firm is credit constrained or not, GAP characterizes the extent, or rather, the tightness of the credit constraint.

### 4.2 Measurement for Banking Competition: Herfindahl–Hirschman Index (HHI) and Concentration Ratio (CR3)

Competition in the banking sector can be measured by the banks' market share in the local credit market in deposits, loans, or the number of branches (Petersen and Rajan, 1995; Bikker and Haaf, 2002; Degryse, Laeven and Ongena, 2009). While deposit and loan market shares are not readily available in credit markets at the city level, number of branches in each city can be retrieved from the banks' websites. Following Degryse and Ongena (2007), for example, we measure the intensity of banking competition by the Herfindahl–Hirschman Index (HHI) and concentration ratio (CR3) using the banks' market shares in terms of number of bank branches.

Concentration measures are widely used to capture the intensity of competition in empirical banking research. The Structure-Conduct-Performance (SCP) approach is a popular paradigm which assumes that market concentration measures are good indicators of the intensity of competition (Scherer and Ross, 1990). Petersen and Rajan (1995), for example, use HHI by the market shares of deposits as a measure for competition. Market shares by bank branches are often highly correlated with the market shares by deposits or loans (Fischer, 2000), hence when the latter are not available, the HHI by branches can be a robust measure of the market power of

banks. Degryse and Ongena (2007), for example, calculate Herfindahl–Hirschman Index (HHI) as the summed squares of market shares of bank branches in a firm's headquarters city.

Although concentration and competitiveness cover different concepts (Claessens and Laeven, 2004), there is evidence that concentration impairs competitiveness (Bikker and Haaf, 2002). However, Carbo-Valverde, Rodriguez-Fernandez and Udell (2009) find that the Lerner Index is a better measure for banking market power, with which the HHI produces contradictory results on SMEs financing. In addition, Scott and Dunkelberg (2010) find that reports of increased competition by small firm owners is negatively related with the level and change in deposit concentration, while its effect on banking outcomes is independent of deposit concentration.

Generally speaking, the competitive environment of banks could be characterized by regulatory restrictions on competition, entry restrictions, and legal impediments to bank competition (Berger, Demirgüç-Kunt and Levine, 2004). These characteristics could be captured by non-structural measures of competition, such as the Iwata model, the Bresnahan model and the Panzar and Ross approach (Bikker and Haaf, 2002). Also, Boone (2008) proposes a new indicator for competition which is based on the performance and efficiency. These measures need data on credit demand, credit supply, and/or interest rates, which are not easily available for our analysis. Hence, but aware of all *caveats*, we will use market concentration as our only measure for the intensity of competition.

When calculating the HHI and CR3, we assume implicitly that all bank branches are homogeneous in efficiency. However, joint-stock banks and city commercial banks are usually more efficient than state-owned banks due to their ownership and organizational structure. On the one hand, joint-stock banks and city commercial banks have more discretion over loan

interest rate,[19] which renders them more flexible in extending loans to firms, especially to local SMEs. On the other hand, joint-stock banks have no policy burdens as state-owned banks do,[20] and they can still benefit from business diversification nationwide compared with city commercial banks. Consequently, joint-stock banks could be more efficient than state-owned banks and city commercial banks.

In order to capture the heterogeneous effect of joint-stock banks and city commercial banks on competition, we define two components of HHI:

$$HHIJS = HHI * HHI_JS \tag{4}$$

$$HHICC = HHI * HHI_CC \tag{5}$$

where $HHI_JS$ is the proportion of HHI contributed by joint-stock banks, and $HHI_CC$ is the proportion of HHI contributed by city commercial banks, which is market shares of joint-stock banks and city commercial banks. So HHIJS and HHICC are the interaction terms of HHI and market shares of joint-stock banks and city commercial banks. Intuitively, joint-stock banks and city commercial banks may change the marginal effect of HHI on the financing outcome, which could be captured by an interaction term of HHI and their respective market shares.

[19] The People's Bank of China (the central bank) reformed the regulation on loan interest rate setting in 2004. For joint-stock banks and city commercial banks, the lower bound of the loan interest rate is 90 percent of the baseline interest rate, while there is no upper bound for loans to SMEs. Generally speaking, there is no upper bound for the loan interest rate for state-owned banks either, but their discretion in loan interest rate setting is more limited than is the case for the other two types of banks. Anecdotal evidence suggests that loan interest rates charged by joint-stock banks and city commercial banks are typically higher than those charged by state-owned banks while other loan conditions seem more equal.

[20] For example, state-owned banks are often required by the government to open branches in the western part of the country. Such expansion to serve the need of political considerations may lower the banks' profitability.

All the variable definitions are listed in Table 4. The first column is the variable category, including credit constraint measures, firm-specific variables and concentration measures, the second column lists the variable name and the third column lists the variable definitions.

[Table 4 here]

## 4.3 Hypotheses

The effect of competition on credit constraints is ambiguous in the literature. Generally speaking, the literature revolves around two competing views: The *information hypothesis* which emphasizes relationship lending, and the *market power hypothesis* which follows from the Structure-Conduct-Performance approach. On the one hand, in the *information hypothesis* fiercer competition may make it more difficult for banks to internalize the benefit of assisting opaque firms which in turn leads to more credit constraints (Petersen and Rajan, 1995).

Using a survey dataset of German manufacturing firms, Fischer (2000), for example, finds that more concentration leads to more information acquisition which further results in more credit availability. In addition, Zarutskie (2006) finds that more competitive banking markets drive firms to use less outside debt and more inside debt and equity, and that ─ consistent with the model of Petersen and Rajan (1995) ─ more intense competition leads to more credit constraints for young firms.

On the other hand, under the benchmark of *market power hypothesis* more competition in the banking market reduces the interest rate and hence increases the availability of credit to all firms irrespective of their opacity (Carbo-Valverde, Rodriguez-Fernandez and Udell, 2009).

More competition may lead to more credit availability in a market where as may be the case in China, corruption may be more common. According to World Bank Investment Climate Survey 2006, informal payments for loans are widespread in China. More banking competition may reduce lending corruption (Barth, Lin, Lin and Song, 2009), which can shift the credit supply to the right, reduce the interest rate and enhance credit availability. Consequently, we propose that more competition will lead to more credit availability, or fewer credit constraints.

We will test the *market power hypothesis* against the *information hypothesis*. Under the market power hypothesis, a more competitive banking market will lead to less binding credit constraints, i.e., a lower HHI and CR3 ratio will lead to a lower probability of credit constraints and a lower financing gap ratio. Our first hypothesis can therefore be stated as follows:

*Hypothesis 1: More competition leads to a less binding credit constraint.*

Whereby competition is measured by the HHI or CR3, and the credit constraints are measured by DGAP or GAP. Consequently, the predicted signs of HHI and CR3 are positive if the *market power hypothesis* holds, while CR3 are negative otherwise.

Small banks may have a comparative advantage in lending to SMEs (Jayaratne and Wolken, 1999) due to flatter organization structure. In China's banking market, small banks such as joint-stock banks and city commercial banks may in addition have more business orientation toward SMEs, which also have a more diversified ownership structure, i.e., privately owned instead of state-owned. Our second hypothesis can therefore be stated as follows:

*Hypothesis 2: Competition from regional banks (joint-stock banks) and local banks (city commercial banks) has a larger effect on credit constraints than competition from national banks (state-owned banks).*

The competition from joint-stock banks and city commercial banks are measured by HHIJS and HHICC defined in equations (2) and (3). As a result, the predicted signs for coefficients of HHIJS and HHICC should both be positive if they are more efficient in reducing credit constraints for SMEs than state-owned banks are. Furthermore, joint-stock banks may also dominate city commercial banks due to exposure to diversification benefits in the national market. Consequently, the coefficient of HHIJS should be larger than HHICC if joint-stock banks are more efficient than city commercial banks in reducing credit constraints.

## 4.4 Econometric Model

In order to test the two aforementioned hypotheses, we model the effect of banking competition on SMEs credit constraints through a linear specification:

$$Credit\ Constraint\ Measures_i = \beta_0 + \beta_1 Concentration_i + \sum_l \gamma_{il} Control_{il} + \sum_j Industry_j + \sum_k Region_k + \varepsilon_i \quad (6)$$

Credit constraints measures are DGAP and GAP; *Concentration* indices, i.e., *HHI* and CR3, measure banking competition; *Control* are firm specific control variables such as Size, ROE, Partnership, Limited Liability, and Corporation; *Industry* and *Region* stand for the set of industry and regional dummy variables .

In order to gain insight on whether a firm is credit constrained, we employ OLS and Probit specifications to equation (6). For the financing gap ratio, OLS specification may not be appropriate because of censoring. Figure 5 is a histogram of the financing gap ratio, which shows

considerable mass on zero and one. To examine the financing gap ratio we therefore use a Tobit model that accounts for left censoring at zero and for right censoring at one.

[Figure 5 here]

## V. Summary Statistics

Table 5 presents summary statistics for the credit constraints measures, and the explanatory and control variables. The sample firms have a mean ROE of 0.30, which indicates a high profitability for SMEs.

[Table 5 here]

The mean value of DGAP and GAP are 81.70 and 64.22 percent respectively. Put differently, 81.70 percent of the firms face credit constraints while 64.22 percent of the credit required by the firm is not met by credit supply, which is consistent with the usual claims by SMEs about their financing challenges.

The mean of HHI is 0.22, while CR3 has a mean value of 0.69.[21] Hence, the Chinese banking market is rather highly concentrated compared to other economies.[22] Furthermore, the proportion of HHI contributed by joint-stock banks is 3.00 percent and 6.35 percent for city

[21] The national HHI is 0.18, and the national CR3 is 0.66. The national average of HHI across 354 cities is 0.31, and the national average of CR3 is 0.80. Scott and Dunkelberg (2010) report a mean of 0.24 and standard deviation of 0.15 for the HHI based on deposit concentration, which is comparable with the value in our dataset.

[22] Bikker and Haaf (2002) report the national HHI (CR3) based on total banking assets in 1997 for 23 countries. The United States has the lowest HHI (CR3) that equals 0.02 (0.15), while Switzerland has the highest HHI (CR3) which equals 0.26 (0.72). For East Asian economies, South Korea's HHI (CR3) is 0.11 (0.45), while Japan's HHI (CR3) is 0.06 (0.39).

commercial banks, which indicates that the state-owned banks still dominate the banking market in terms of banks' branch reach.

## VI. Economic Importance of Banking Competition

Banking competition may enhance or deteriorate SMEs financing, depending on whether the *market power hypothesis* or the *information hypothesis* dominates. On the one hand, we examine the probability SMEs face credit constraints through DGAP. On the other hand, we investigate the tightness of these credit constraints through the GAP. Hence, DGAP provides a qualitative measure, while GAP provides a quantitative measure for credit constraints. Besides, both HHI and CR3 are used as concentration measures, while we decompose HHI by bank types in order to capture the heterogeneous effects. In order to tackle possible endogeneity concerns, we will employ an instrumental variable regression in the robustness check.

### 6.1 Financing Gap Dummy Variable

As shown in Table 6, DGAP, a dummy variable, indicates whether a firm faces credit constraints. We use OLS and Probit specifications to examine the effect of banking competition on the probability of the presence of credit constraints.

Table 6 presents regressions of the financing gap dummy with OLS and Probit specifications. Model (2) presents full model OLS estimation for banking competition. A decrease in the HHI from its 75 to 25 percentile will result in a 4.71 percentage point reduction of the probability of having credit constraints. Similarly, the Probit model (4) yields an 5.65 percentage point reduction in this probability. All model specifications show that more banking competition is associated with a lower probability of having credit constraints for SMEs.

[Table 6 here]

Firm size does not affect the probability of falling credit constraints, which is inconsistent with stylized facts that small firms are more likely to be credit constrained. However, alternative financing channels and governance mechanisms, such as reputation and relationships with wealthy family members, friends or suppliers, for example, are found to support China's private sector growth (Allen, Qian and Qian, 2005). As the growth of the private sector is mostly due to the growth of SMEs, a possible explanation for the above anomaly is that smaller firms can alleviate credit constraints through informal financing channels.

CR3, the market share of the three largest banks by the number of branches, can also be used to measure banking competition. Models (5) and (6) of Table 6 show the regression results when we substitute HHI with CR3. More intense banking competition, or a lower CR3, is associated with a lower probability that SMEs face credit constraints, which is similar with the results for HHI. According to model (5) in Table 6, a decrease of CR3 from the 75 to the 25 percentile is associated with a 5.51 percentage point reduction in the probability that credit constraints are present, while the predicted reductions in the Probit model (6) is 5.49 percentage points. The effect of banking competition on SMEs financing is not dependent on the choice of competition measure, which indicates the robustness of this correspondence.

## 6.2 Financing Gap Ratio

The GAP, or the financing gap ratio, characterizes the extent of credit constraints. While the existing literature typically focuses on whether firms are constrained, there is little empirical work on the size of the credit constraints that firms face. The unique dataset we employ allows us to examine the effect of banking competition on the size of the credit constraints.

Table 7 presents the OLS and Tobit estimation results for models with GAP being the dependent variable. HHI is significant at the 1 percent level across all model specifications, which is consistent with the results for the financing gap dummy in Table 6. If HHI decreases from its 75 to 25 percentile, the financing gap ratio will decrease by 3.93 percentage points in OLS model (2) of Table 7.

[Table 7 here]

Figure 5 shows that substantial observations have financing gap ratios that are clustered at zero and one. A Tobit model with left censoring at zero and right censoring at one is employed to tackle the problem, which is shown in model (4) of Table 7. If HHI decreases from the 75 to the 25 percentile, the financing gap ratio will decrease by 7.68 percentage points.

In summary, banking competition not only lowers the probability of credit constraints, but also reduces the extent of credit constraints and the financing gap ratio. These results are significant both in the statistical and economic sense.

Alternatively, model (5) and (6) of Table 7 present the regression results when CR3 is used as a measure for competition under OLS and Tobit model. CR3 is significant at the 5

percent level for OLS specification and 1 percent level for Tobit specification. Furthermore, a decrease of CR3 from the 75 to the 25 percentile will result in a 6.50 percentage point reduction of the financing gap ratio in the Tobit model (6) of Table 7. The choice of competition measure does not change the effect of banking competition on the financing gap ratio.

### 6.3 Decomposition of the HHI

Competition extent of different types of banks may result in heterogeneous effect on SMEs financing outcomes. Generally speaking, state-owned banks are less aggressive than joint-stock banks and city commercial banks, and their presence may lead to less efficiency in alleviating SMEs credit constraints. The heterogeneous effect could be captured by the interaction terms of HHI and their respective market shares. We decomposing the HHI into three parts, as illustrated in equations (4) and (5). Intuitively, the marginal effect of HHI could be heterogeneous across differently types of banks.

OLS model (2) in Table 8 shows that the presence of joint-stock banks are indeed more effective though statistically insignificant, and the presence of state-owned banks are less effective, than the presence of city commercial banks in reducing the probability of credit constraints. Probit model (4) yields qualitatively similar results with the OLS specification.

[Table 8 here]

To examine the economic significance of the heterogeneous marginal effect of banking competition, note from the OLS model (2) that the marginal effect of HHI will increase by 22.35 percent if joint-stock banks' market share increase from zero to its sample mean, and increase by

9.35 percent if city commercial banks' market share increase from zero to its sample mean. In short, joint-stock banks are more efficient, while state-owned banks are less efficient, than city commercial banks in reducing the probability SMEs face credit constraints.

Furthermore, we also examine the heterogeneous effect for financing gap ratio, which is presented in Table 9. The coefficient on the HHI is positive and significant at the 1 percent level for all model specifications, which is consistent with the results that more intense banking competition can alleviate SMEs credit constraints by reduce financing gap ratio.

[Table 9 here]

Model (2) of Table 9 yields significant positive coefficients for the interaction terms, HHIJS and HHICC, implying that joint-stock banks and city commercial banks are more efficient than state-owned banks in reducing the financing gap ratio. Furthermore, joint-stock banks are more efficient than city commercial banks as the coefficient on HHIJS is larger than the one on HHICC. In addition, Model (4) in Table 9 presents Tobit estimations with left censoring at zero and right censoring at one. Results are qualitatively similar with model (2).

The heterogeneous effect of banking competition on the financing gap ratio is also economically significant. If the market share of joint-stock banks and city commercial banks increase from zero to their sample mean, the marginal effect of HHI will increase by 33.96 percent and 9.81 percent respectively.

In sum, the marginal effect of the HHI depends on different types of banks for both the probability and size of the financing gap. Joint-stock banks have a larger effect, while state-owned banks have a smaller effect than the city commercial banks in alleviating the probability and size of SMEs' financing gap.

## 6.4 Relationship Lending versus Price Effect

Banking competition can enhance credit availability through increasing relationship lending (Degryse and Ongena, 2007), and lowering the interest rate. The positive effect of banking competition on SME financing could be caused by both channels. We will conduct further analysis to distinguish the mechanism for the positive effect.

As small and young firms have higher degrees of informational opacity, they are more likely to be involved in relationship lending. If the banking competition increases the credit availability through expanding relationship lending, we can predict that small and young firms will be affected more than their large and mature counterparts. We add interaction terms of concentration measures with firm size and age as is shown in Table 10.

[Table 10 here]

Models (1) and (3) of Table 10 show that the interaction terms are statistically positive, which is not consistent with the notion that smaller firms are more exposed to relationship lending. In addition, models (2) and (4) of Table 10 show that young firms are not more sensitive to the banking competition, which is inconsistent with the usual claim concerning relationship lending. We get similar results when looking at the heterogeneous effect across firm size and age for financing gap ratio in models (5) to (8) of Table 10.

In conclusion, there is no convincing evidence on the heterogeneous effect across firm size and age for banking competition. The positive association between banking competition and credit availability must come through the price channel, or rather, through lowering the interest

rate. Banking competition may lower the interest rate explicitly and increase credit availability, or implicitly lower the informal payment to loan officers, which may be common in China.

## VII. Instrumental Variable Regression

While more intense banking competition could help alleviate SMEs credit constraints, markets with more credit constrained firms may also attract more competing banks which could further increase the intensity of banking competition. This reverse effect could lead to endogeneity in the model specification of equation (6).

We instrument the concentration indices with the average value of neighboring cities in the same province. With each city treated as a separate market, the concentration indices of neighboring cities are not likely to affect local SMEs credit constraints due to transaction and information costs of cross-city lending.[23]

On the one hand, four state-owned banks have branches almost in every city, which also have clear business segmentation among cities. Hence if firms are to apply for loans from state-owned banks, they should visit local branches in their headquarters cities, which insures business segmentation among cities. On the other hand, city commercial banks do not have branches outside their headquarters cities, so that they are constrained to local credit markets.

[23] The distance between two cities in China is around 80 kilometers on average, with an average population of four million. As a result, SMEs are not likely to borrow from formal or informal financing channels in other cities, which make the concentration indices in other cities irrelevant to local SMEs financing.

However, branches of joint-stock banks can extend loans to firms outside the cities where they domicile, which may undermine the business segmentation among cities.[24] Petersen and Rajan (2002) document that the distance between banks and small firms is increasing in the US due to the improvement in lenders' productivity. However, banks in China are relatively inefficient in lending technology compared with the US, which may render small firms to rely exclusively on local banks. Furthermore, Degryse and Ongena (2007) find that more intense competition pushes banks to engage more in relationship lending which involves acquisition of soft information of firms, while Agarwal and Hauswald (2010) find that borrower proximity facilitates the collection of soft information which is primarily local.

As China's banking industry has been facing intensifying competition since the 1997 Asian financial crisis, joint-stock banks may also focus more on local firms in order to access soft information for relationship lending. Consequently, the business segmentation among cities may still hold even if joint-stock bank branches could lend across cities, which will lead to the irrelevance of concentration indices of neighboring cities for local SMEs financing.

In contrast, the concentration indices could be associated with the value of neighboring cities. Cities with intense competition could drive banks to turn for those with fewer competitors through opening new branches, which could affect the local concentration indices. In addition, the similarity of government regulation among nearby regions will also lead to the correlation of competition indexes. Consequently, the average concentration indices of neighboring cities are correlated with local concentration indices but uncorrelated with SMEs credit constraints, which makes these indices good instruments.

[24] Generally speaking, if a joint-stock bank has branches in a city, then firms should go to local branches for loan applications. For cities without branches, joint-stock banks often allocate them to the nearest cities where they have branches. It is especially the latter case that may weaken the business segmentation among cities.

Table 11 presents the instrument variable regressions for HHI. Model (1) of Table 11 shows that HHI is significant at the 1 percent level. In addition, model (2) of Table 11 shows the first stage regression, where the F-statistics is much larger than ten. The IV regression confirms that the relationship between banking competition and probability of credit constraints by ruling out the endogeneity concern.

[Table 11 here]

Similarly, we also conduct IV regressions for the financing gap ratio. Models (3) and (4) of Table 11 presents the IV estimations with the concentration indices instrumented with the average value for all neighboring cities. Model (3) yields positive coefficients for HHI significant at the 5 percent level, which confirms that more intense competition could reduce financing gap ratio. In addition, model (4) of Table 11 presents the first stage regression, where F-statistic is larger than ten. Hence IV regressions confirm the robustness of the claim that more intense banking competition could lead to a lower financing gap ratio.

In conclusion, our results are not changed by addressing the endogeneity problem. Banking competition can indeed alleviate the credit constraint by reducing both the probability and size of the financing gap.

## VIII. Further Robustness Check

On the one hand, we examine the heterogeneity between rural and urban firms. Generally speaking, rural firms may rely more on informal financing channels, while urban firms may rely

more on formal finance (Scott and Dunkelberg, 2010). However, it is also highly likely that rural firms may benefit more from the increase in competition as banks may enter the relatively unexploited rural financial market. Consequently, bank competition may affect rural firms more than urban ones. We add interaction terms for HHI and CR3 with a rural dummy variable and the estimation results are shown in Table 12. Models (1) to (3) show that there is no heterogeneity between rural and urban firms for the probability that firms face credit constraints. In contrast, models (4) to (6) show that the marginal effect of banking competition on the financing gap ratio is larger for rural firms than urban firms at conventional significance level. In summary, banking competition may indeed have a heterogeneous effect in alleviating credit constraints between rural and urban firms.

[Table 12 here]

On the other hand, Degryse and Ongena (2007) show that there is U-shaped effect of market concentration on relationship lending, and Presbitero and Zazzaro (2010) provide an explanation based on the organizational structure of the local credit markets. We examine the non-linear effect of the concentration indices by adding squared terms. Estimates are shown in Table 13. Models (1) to (3) show that the concentration indexes do not have non-linear effects on the probability of the presence of credit constraints. However, model (5) and (6) show that the squared terms are statistically significant at the 5 percent level both for HHI and CR3, although model (4) is still insignificant. It seems that banking competition has non-linear effects for the size of credit constraints, while not so for the probability of the presence of credit constraints.

[Table 13 here]

## IX. Conclusion

Banking competition can enhance SME financing by reducing both the probability of the presence of credit constraints and the magnitude of the credit constraints. While there are plenty of researches in the literature on the probability of the presence of credit constraints, little evidence has been reported concerning the magnitude of these constraints. Using a survey dataset on Chinese SMEs, we investigate how banking competition contributes to alleviating credit constraints both in terms of the probability that SMEs face credit constraints and in terms of the magnitude of the credit constraints.

On the one hand, we find that more intense banking competition is associated with a lower probability that SMEs face credit constraints, a finding that is robust to the different choices of concentration measurement and to instrumental variable estimation. On the other hand, more intense banking competition is also associated with a lower level of financing gap ratio, a finding we think that has almost never been reported before in the empirical literature. Moreover, we find that the regional banks (joint-stock banks) have a larger effect, while the national banks (state-owned banks) have a smaller effect, than local banks (city commercial banks) in reducing the probability SMEs that face credit constraints and on the magnitude of the credit constraints, i.e., the financing gap ratio. Put differently, banking competition by different types of banks can lead to heterogeneous effects on the credit constraints faced by SMEs.

While the information hypothesis predicts that creditors are more likely to finance credit constrained firms when credit markets are concentrated (Fischer, 2000; Petersen and Rajan, 2002;

Bergstresser, 2010), our evidence from China supports the market power hypothesis. Due to the difficulty in internalizing the benefit of relationship lending in a developing economy, transaction lending toward SMEs could be more common among banks. Our evidence from China casts doubts on the relationship between banking market structure and credit constraints in emerging markets, where more intense banking competition seems to help in alleviating SME credit constraints. In order to support SMEs in emerging economics such as China, a potential policy implication is to promote regional banks which have both the business orientation toward SMEs and proper regional diversification.

While the paper examines credit constraints from the quantity perspective, it is interesting to investigate how banking competition affects loan pricing. The interest rate profile may capture the mechanism of how banking competition affects credit constraints, say the relationship lending versus price channel. As there is no price information in this dataset, we leave such an investigation for future research with other new datasets.

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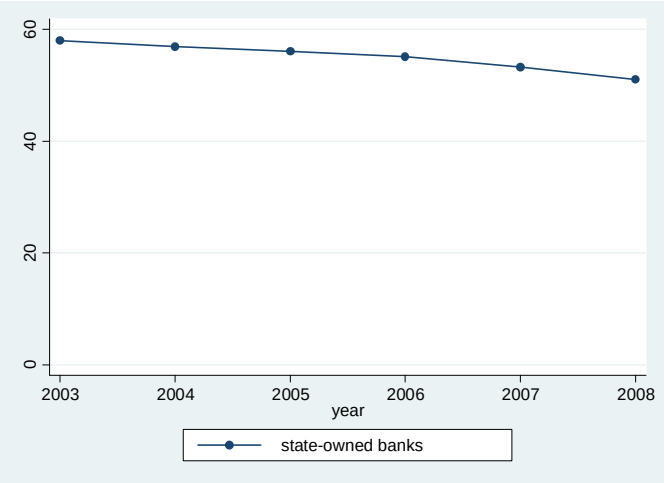
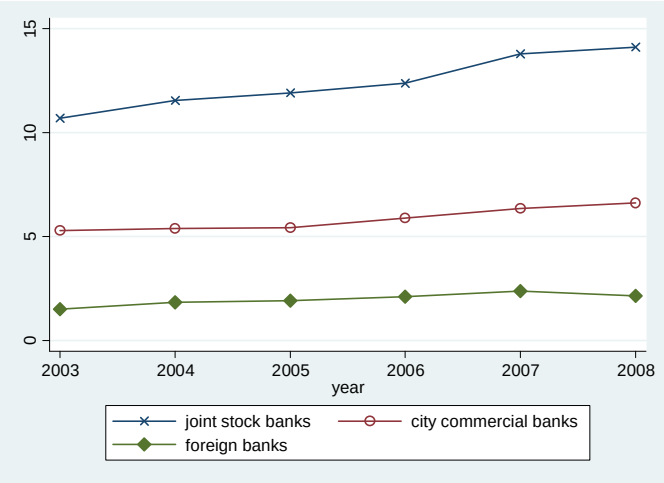
# Appendix




Panel A




Panel B

**Figure 1: Market Share of Banks (in Percentage Point) by Total Bank Assets.** Data is from the OECD Economic Survey 2010. Panel A is for state-owned banks, while Panel B is for joint-stock banks, city commercial banks and foreign banks.

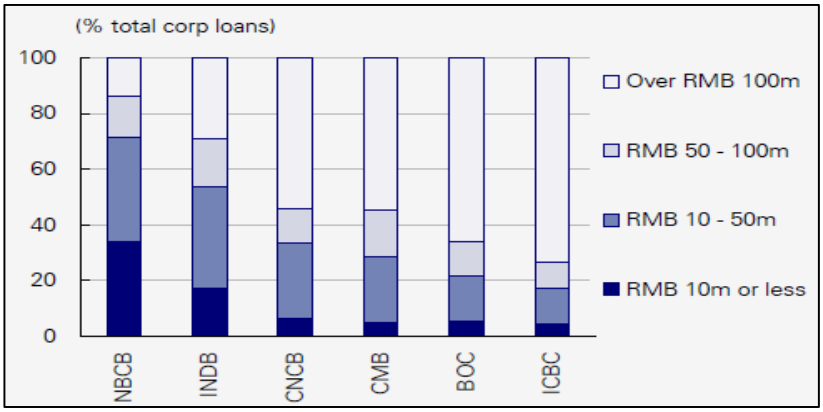



**Figure 2: Corporate Loan Size Distribution in 2006.** The figure is taken from the Deutsche Bank Report 2007. State-owned banks: ICBC and BOC (Bank of China). Joint-stock banks: CNCB and CMB. City commercial banks: NBCB and INDB.

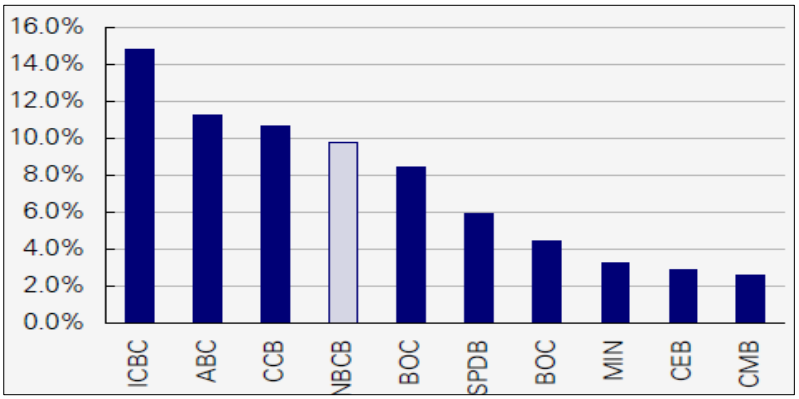



**Figure 3: Market Share of Banks in 2006 in NBCB's Headquarters City, Ningbo.** The figure is taken from the Deutsche Bank Report 2007. State-owned banks: ICBC, ABC, CCB, and BOC (Bank of China). Joint-stock banks: SPDB, BOC (Bank of Communication), MIN, CEB, and CMB. City commercial banks: NBCB.

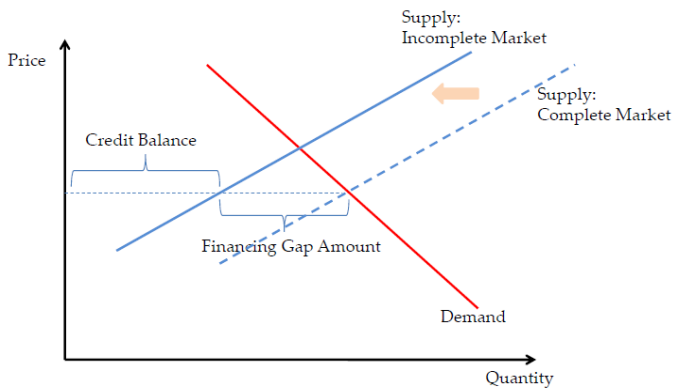



**Figure 4: Credit Demand, Credit Supply and Financing Gap.**

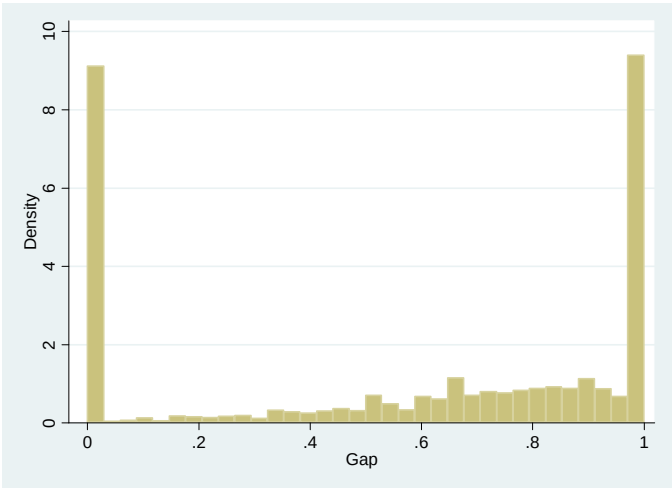



**Figure 5: Histogram of Financing Gap Ratio (GAP).**

**Table 1: Total Assets of Banks in China in 2005**

| Bank Type | Bank Name | Total Assets (RMB million) |
|---|---|---|
| State-owned Banks | Industrial and Commercial Bank of China | 6,373,791 |
| | Agricultural Bank of China | 4,771,019 |
| | Bank of China | 4,740,048 |
| | China Construction Bank | 4,584,154 |
| Joint-stock Banks | Bank of Communications | 1,423,439 |
| | China Merchants Bank | 734,613 |
| | China CITIC Bank Corporation | 594,993 |
| | Shanghai Pudong Development Bank | 573,523 |
| | China Minsheng Banking Corporation | 557,505 |
| | China Everbright Bank | 511,655 |
| | Industrial Bank | 475,094 |
| | Guangdong Development Bank | 345,445 |
| | Shenzhen Development Bank | 222,122 |
| | China Zheshang Bank | 21,846 |
| City Commercial Banks | Bank of Shanghai | 240,136 |
| | Bank of Beijing | 233,044 |
| | Bank of Jiangsu | 125,713 |
| | Bank of Tianjin | 69,119 |
| | Ping An Bank | 67,321 |
| | Bank of Nanjing | 49,911 |
| | Huishang Bank | 49,585 |
| | Bank of Hangzhou | 46,347 |
| | Bank of Ningbo | 42,429 |
| Policy Banks | China Development Bank Corporation | 1,898,699 |
| | Agricultural Development Bank of China | 850,210 |
| | Export-Import Bank of China | 204,793 |
| Rural Commercial Banks | Beijing Rural Commercial Bank | 128,233 |
| | Shanghai Rural Commercial Bank | 127,417 |
| | Dongguan Rural Commercial Bank | 87,524 |
| Foreign Banks | Bank of East Asia | 40,055 |
| | Evergrowing Bank | 36,971 |
| | United Overseas Bank | 8,234 |

Notes: Data is from Bankscope.

**Table 2: Survey Questionnaires**

**Panel A: Credit Demand and Credit Balance**

(1). At the end of year 2005, unfulfilled credit demand for firm expansion___

(2). At the end of year 2005, unfulfilled credit demand for firm operation___

(3). At the end of year 2005, the amount of loan outstanding from,

a. Four state-owned banks ___

b. Joint-stock banks___

c. City commercial banks and credit cooperatives ___

d. Informal financing channels ___

e. Individuals ___

f. Foreign banks ___

(4). Do other firms delay payment of trade credit or other loans to your firm? Amount ___

(5). Does your firm delay payment of trade credit or other loans to other firms? Amount___

**Panel B: Firm-level Variables**

| Year | Sales | Tax | Fees | Net Profit after Tax |
|---|---|---|---|---|
| 2000 | | | | |
| 2004 | | | | |
| National Economic Survey 2004 | | | | |
| 2005 | | | | |

**Table 3: Number of Branches with Corporation Service**

| Bank Type | Bank Name | Number of Branches |
|---|---|---|
| State-owned Banks | Agriculture Bank of China | 23,178 |
| | Industrial and Commercial Bank of China | 12,648 |
| | China Construction Bank | 10,976 |
| | Bank of China | 9,773 |
| Joint-stock Banks | Bank of Communications | 2,736 |
| | China Merchants Bank | 742 |
| | China Everbright Bank | 546 |
| | Shanghai Pudong Development Bank | 536 |
| | Guangdong Develoment Bank | 530 |
| | Industrial Bank | 528 |
| | China CITIC Bank Corporation | 420 |
| | Hua Xia Bank | 365 |
| | China Minsheng Banking Corporation | 361 |
| | Shenzhen Development Bank | 301 |
| | Hengfeng Bank | 91 |
| | China Zheshang Bank | 19 |
| City Commercial Banks | 112 City Commercial Banks | 6,643 |

**Table 4**

**Variable Definitions**

| Variable Category | Variable Name | Definition |
|---|---|---|
| Credit Constraints Measures | DGAP | =1 if credit demand > 0, = 0 otherwise. Credit demand = credit demanded for expansion and credit demand for operation |
| | GAP | GAP = credit demand / (credit demand + credit balance). Credit balance = credit from State-owned Banks + Joint-stock Banks + City Commercial Banks and Urban Credit Cooperatives + Informal Financing Channels + Individuals + Foreign Banks. It is defined as zero if both credit demand and credit balance is zero |
| Firm Specific Variables | SIZE | Firm size, calculated as log(1+sales), in 2004 |
| | Age | Firm age, calculated as 2006 minus the year of firm set up |
| | ROE | Return on equity = net income after tax over total equity, in 2005 |
| | Partner | Equals 1 if registered as partnership, 0 otherwise |
| | Limited Liability | Equals 1 if registered as limited liabilities firm, 0 otherwise |
| | Corporation | Equals 1 if registered as corporation with stocks, 0 otherwise |
| Concentration Measures | HHI | Herfindahl–Hirschman Index = $\sum_{k=1}^{K_i}\left(\#branch_k \Big/ \sum_{k=1}^{K_i}\#branch_k\right)^2$, $K_i$ is the total number of banks in city $i$ where the firm is domiciled |
| | HHI_JS | Market share of joint-stock banks, = $\sum_{j=1}^{J}\left(\#branch_j \Big/ \sum_{k=1}^{K_i}\#branch_k\right)^2$ /HHI, , J is number of joint-stock banks in local market, $K_i$ is the total number of banks in city $i$ where the firm domiciles |
| | HHI_CC | Market share of City Commercial Banks, = $\sum_{c=1}^{C}\left(\#branch_c \Big/ \sum_{k=1}^{K_j}\#branch_k\right)^2$ /HHI, , C is the number of city commercial banks in local market, $K_i$ is the total number of banks in city $i$ where the firm domiciles |
| | CR3 | Concentration Ratio for three Largest Banks = $\sum_{n=1}^{3}\left(\#branch_n\right) \Big/ \sum_{k=1}^{K_j}\#branch_k$ , n=1, …, 3 are the three largest banks by number of bank branches |

**Table 5**

**Summary Statistics**

| | Variable | N | Mean | Median | Std. Dev. | Min | p25 | p75 | Max |
|---|---|---|---|---|---|---|---|---|---|
| Credit Constraints Measures | DGAP | 1,519 | 0.8170 | 1 | 0.3868 | 0 | 1 | 1 | 1 |
| | GAP | 1,519 | 0.6422 | 0.7534 | 0.3673 | 0 | 0.4167 | 1 | 1 |
| Explanatory Variables | SIZE | 1,519 | 15.5403 | 15.6073 | 2.0247 | 0 | 14.3977 | 16.9066 | 19.5082 |
| | Age | 1,519 | 7.6616 | 7 | 4.2425 | 2 | 4 | 10 | 21 |
| | ROE | 1,519 | 0.2971 | 0.1200 | 0.5408 | -0.3830 | 0.0385 | 0.3058 | 3.8000 |
| | Partner | 1,519 | 0.0586 | 0 | 0.2349 | 0 | 0 | 0 | 1 |
| | Limited Liability | 1,519 | 0.6728 | 1 | 0.4693 | 0 | 0 | 1 | 1 |
| | Corporation | 1,519 | 0.0573 | 0 | 0.2324 | 0 | 0 | 0 | 1 |
| | HHI | 1,519 | 0.2169 | 0.2000 | 0.0753 | 0.1011 | 0.1718 | 0.2613 | 0.7813 |
| | HHI_JS | 1,519 | 0.0300 | 0.0183 | 0.0324 | 0.0000 | 0.0003 | 0.0439 | 0.2525 |
| | HHI_CC | 1,519 | 0.0635 | 0.0232 | 0.0895 | 0.0000 | 0.0044 | 0.1012 | 0.4214 |
| | CR3 | 1,519 | 0.6919 | 0.6746 | 0.1157 | 0.4118 | 0.6174 | 0.7941 | 1 |

Notes: All variables are defined in Table 4. DGAP equals one if the firm's credit demand is positive and equals zero otherwise; GAP is the financing gap ratio; SIZE is log(1+sales in 2004); Age is firm age; ROE is net income after tax over total equity; Partner, Limited Liability, and Corporation equals 1 if a firm is registered as partnership, limited liability firm and corporation respectively, 0 otherwise; HHI is the Herfindahl–Hirschman Index for all banks; HHI_JS is the market share of joint-stock banks; HHI_CC is market share of city commercial banks; CR3 is the three-bank branch concentration ratio; ROE is winsorized at the 1 and 99 percentile.

**Table 6: Effect of Concentration on Financing Gap Dummy (DGAP).** The table provides OLS and Probit estimations for the model,

$$DGAP_i = \kappa_0 + \kappa_1 Concentration_i + \sum_l \lambda_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \varepsilon_i$$

DGAP equals one if the firm's credit demand is positive and equals zero otherwise; HHI is the Herfindahl–Hirschman Index for all banks; CR3 is the three-bank branch concentration ratio; SIZE is log(1+sales in 2004); Age is firm age; ROE is net income after tax over total equity; Partner, Limited Liability, and Corporation equals 1 if a firm is registered as partnership, limited liability firm, and corporation respectively, 0 otherwise. Variable definitions are provided in Table 4. SIZE and ROE are winsorized at the 1 and 99 percentile. Pseudo R2 instead of R2, and marginal effects instead of coefficients are reported for models (3), (4), and (6). Robust standard errors clustered at the city level are in parentheses, significance * at 10%, ** at 5%, *** at 1%.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | OLS | OLS | Probit | Probit | OLS | Probit |
| HHI | 0.4631** | 0.5264*** | 0.5697** | 0.6309*** | | |
| | [0.190] | [0.186] | [0.238] | [0.237] | | |
| CR3 | | | | | 0.3121** | 0.3109** |
| | | | | | [0.136] | [0.135] |
| SIZE | | 0.0108 | | 0.0099* | 0.0100 | 0.0092 |
| | | [0.007] | | [0.006] | [0.007] | [0.006] |
| Age | | 0.0022 | | 0.0025 | 0.0020 | 0.0024 |
| | | [0.003] | | [0.003] | [0.003] | [0.003] |
| ROE | | -0.0392 | | -0.0364* | -0.0386 | -0.0358* |
| | | [0.026] | | [0.021] | [0.026] | [0.021] |
| Partner | | -0.0635 | | -0.0536 | -0.0658 | -0.0559 |
| | | [0.063] | | [0.062] | [0.063] | [0.062] |
| Limited Liability | | 0.0283 | | 0.0324 | 0.0267 | 0.0308 |
| | | [0.043] | | [0.042] | [0.043] | [0.043] |
| Corporation | | -0.0229 | | -0.0218 | -0.0255 | -0.0240 |
| | | [0.060] | | [0.060] | [0.060] | [0.061] |
| Constant | 0.8729*** | 0.6634*** | – | – | 0.5756*** | – |
| | [0.094] | [0.127] | – | – | [0.159] | – |
| Industry Dummy | Yes | Yes | Yes | Yes | Yes | Yes |
| Regional Dummy | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,519 | 1,519 | 1,519 | 1,519 | 1,519 | 1,519 |
| R2 | 0.033 | 0.044 | 0.036 | 0.047 | 0.043 | 0.045 |

**Table 7: Effect of Concentration on Financing Gap Ratio (GAP).** The table provides OLS and Tobit estimates with lower limit 0 and upper limit 1 for the following model,

$$GAP_i = \beta_0 + \beta_1 Concentration_i + \sum_l \gamma_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \varepsilon_i$$

GAP is the financing gap ratio, which is rescaled by multiplying by 100; HHI is the Herfindahl–Hirschman Index for all banks; CR3 is the three-bank branch concentration ratio; SIZE is log(1+sales in 2004); Age is firm age; ROE is net income after tax over total equity; Partner, Limited Liability, and Corporation equals 1 if a firm is registered as partnership, limited liability firm, and corporation respectively, 0 otherwise. Variable definitions are provided in Table 4. Pseudo R2 is reported for model (3), (4), and (6) instead of R2. Robust standard errors clustered at the city level are in parentheses, significance * at 10%, ** at 5%, *** at 1%.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | OLS | OLS | Tobit | Tobit | OLS | Tobit |
| HHI | 0.4370*** | 0.4396*** | 0.8582*** | 0.8581*** | | |
| | [0.135] | [0.129] | [0.266] | [0.255] | | |
| CR3 | | | | | 0.2224** | 0.3676** |
| | | | | | [0.101] | [0.167] |
| SIZE | | -0.0101* | | -0.0203** | -0.0108** | -0.0218** |
| | | [0.005] | | [0.009] | [0.005] | [0.009] |
| Age | | 0.0023 | | 0.0025 | 0.0022 | 0.0022 |
| | | [0.003] | | [0.006] | [0.003] | [0.006] |
| ROE | | -0.0026 | | 0.0027 | -0.0024 | 0.0030 |
| | | [0.019] | | [0.034] | [0.019] | [0.034] |
| Partner | | -0.1188*** | | -0.1909** | -0.1212*** | -0.1956** |
| | | [0.045] | | [0.076] | [0.044] | [0.076] |
| Limited Liability | | 0.0280 | | 0.0522 | 0.0256 | 0.0463 |
| | | [0.038] | | [0.065] | [0.039] | [0.066] |
| Corporation | | -0.0314 | | -0.0441 | -0.0341 | -0.0494 |
| | | [0.053] | | [0.087] | [0.053] | [0.087] |
| Constant | 0.6483*** | 0.7678*** | 0.6674*** | 0.9297*** | 0.7253*** | 0.8972*** |
| | [0.095] | [0.124] | [0.170] | [0.221] | [0.147] | [0.250] |
| Industry Dummy | Yes | Yes | Yes | Yes | Yes | Yes |
| Regional Dummy | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,519 | 1,519 | 1,519 | 1,519 | 1,519 | 1,519 |
| R2 | 0.028 | 0.039 | 0.012 | 0.018 | 0.037 | 0.016 |

**Table 8: Effect of Concentration on Financing Gap Dummy (DGAP) with Decomposition.** The table provides OLS and Probit estimations for the model,

$$DGAP_i = \kappa_0 + \kappa_1 HHI_i + \kappa_2 HHIJS_i + \kappa_3 HHICC_i + \sum_l \lambda_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \varepsilon_i$$

DGAP equals one if the firm's credit demand is positive and equals zero otherwise; HHI is the Herfindahl–Hirschman Index for all banks; HHIJS is the interaction term of HHI and market share of joint-stock banks; HHICC is the interaction term of HHI and market share of city commercial banks; Partner, Limited Liability, and Corporation equals 1 if a firm is registered as partnership, limited liability firm, and corporation respectively, 0 otherwise; SIZE is log(1+sales in 2004); Age is firm age; ROE is net income after tax over total equity. Variable definitions are provided in Table 4. Pseudo R2 instead of R2, and marginal effects instead of coefficients are reported for model (3) and (4). Robust standard errors clustered at the city level are in parentheses, significance * at 10%, ** at 5%, *** at 1%.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | OLS | OLS | Probit | Probit |
| HHI | 0.6670*** | 0.7602*** | 0.9656*** | 1.0673*** |
| | [0.213] | [0.214] | [0.330] | [0.332] |
| HHIJS | 5.2334 | 5.6647 | 7.9175* | 8.4138* |
| | [4.116] | [4.305] | [4.792] | [4.874] |
| HHICC | 0.9852** | 1.1404*** | 1.0579* | 1.2616** |
| | [0.447] | [0.406] | [0.635] | [0.590] |
| SIZE | | 0.0132* | | 0.0125** |
| | | [0.007] | | [0.006] |
| Age | | 0.0017 | | 0.0020 |
| | | [0.003] | | [0.003] |
| ROE | | -0.0391 | | -0.0366* |
| | | [0.026] | | [0.021] |
| Partner | | -0.0518 | | -0.0403 |
| | | [0.065] | | [0.061] |
| Limited Liability | | 0.0344 | | 0.0378 |
| | | [0.042] | | [0.040] |
| Corporation | | -0.0210 | | -0.0199 |
| | | [0.060] | | [0.060] |
| Constant | 0.7961*** | 0.5417*** | – | – |
| | [0.103] | [0.132] | – | – |
| Industry Dummy | Yes | Yes | Yes | Yes |
| Regional Dummy | Yes | Yes | Yes | Yes |
| Observations | 1,519 | 1,519 | 1,519 | 1,519 |
| R2 | 0.038 | 0.050 | 0.044 | 0.057 |

**Table 9: Effect of Concentration on Financing Gap Ratio (GAP) with Decomposition** The table provides OLS and Tobit for the following model,

$$GAP_i = \beta_0 + \beta_1 HHI_i + \beta_2 HHIJS_i + \beta_3 HHICC_i + \sum_l \gamma_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \varepsilon_i$$

GAP is the financing gap ratio; HHI is Herfindahl–Hirschman Index for all banks; HHIJS is the interaction term of HHI and market share of joint-stock banks; HHICC is the interaction term of HHI and market share of city commercial banks; SIZE is log(1+sales in 2004); Age is firm age; ROE is net income after tax over total equity; Partner, Limited Liability, and Corporation equals 1 if a firm is registered as partnership, limited liability firm, and corporation respectively, 0 otherwise. Variable definitions are provided in Table 4. Pseudo R2 is reported for model (3) and (4) instead of R2. Robust standard errors clustered at the city level are in parentheses, significance * at 10%, ** at 5%, *** at 1%.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | OLS | OLS | Tobit | Tobit |
| HHI | 0.8051*** | 0.8013*** | 1.4772*** | 1.4591*** |
| | [0.188] | [0.184] | [0.340] | [0.336] |
| HHIJS | 9.6709*** | 9.0713** | 15.5606** | 14.4924** |
| | [3.478] | [3.636] | [6.073] | [6.079] |
| HHICC | 1.2549*** | 1.2374*** | 1.7300** | 1.6667** |
| | [0.466] | [0.459] | [0.716] | [0.739] |
| SIZE | | -0.0070 | | -0.0155* |
| | | [0.005] | | [0.009] |
| Age | | 0.0016 | | 0.0014 |
| | | [0.003] | | [0.005] |
| ROE | | -0.0022 | | 0.0034 |
| | | [0.019] | | [0.034] |
| Partner | | -0.1037** | | -0.1669** |
| | | [0.045] | | [0.077] |
| Limited Liability | | 0.0357 | | 0.0634 |
| | | [0.036] | | [0.062] |
| Corporation | | -0.0272 | | -0.0376 |
| | | [0.053] | | [0.087] |
| Constant | 0.5175*** | 0.5953*** | 0.4566** | 0.6561*** |
| | [0.107] | [0.133] | [0.189] | [0.238] |
| Industry Dummy | Yes | Yes | Yes | Yes |
| Regional Dummy | Yes | Yes | Yes | Yes |
| Observations | 1,519 | 1,519 | 1,519 | 1,519 |
| R2 | 0.042 | 0.052 | 0.018 | 0.023 |

**Table 10: Relationship Lending v.s. Price Effect: Heterogeneity of Size and Age.** The table provides OLS and Probit estimation for DGAP,

$$DGAP_i = \beta_0 + \beta_1 HHI_i + \beta_2 HHI_i \times Size_i + \beta_3 HHI \times Age_i + \sum_l \gamma_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \varepsilon_i$$

And OLS and Tobit estimation for GAP,

$$GAP_i = \beta_0 + \beta_1 HHI_i + \beta_2 HHI_i \times Size_i + \beta_3 HHI \times Age_i + \sum_l \gamma_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \varepsilon_i$$

DGAP equals one if the firm's credit demand is positive, and equals zero otherwise; GAP is the financing gap ratio; HHI is Herfindahl–Hirschman Index for all banks; SIZE is log(1+sales in 2004); Age is firm age; ROE is net income after tax over total equity; Partner, Limited Liability, and Corporation equals 1 if a firm is registered as partnership, limited liability firm, and corporation respectively, 0 otherwise. Variable definitions are provided in Table 4. Pseudo R2 is reported for model (4)-(6) instead of R2. Robust standard errors clustered at the city level are in parentheses, significance * at 10%, ** at 5%, *** at 1%.

| | DGAP | | | | GAP | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| | OLS | OLS | Probit | Probit | OLS | OLS | Tobit | Tobit |
| HHI | -1.0457 | 0.3687 | -1.5676 | 0.4245 | -1.4802 | 0.0611 | -1.5918 | 0.4080 |
| | [0.970] | [0.357] | [1.158] | [0.462] | [1.044] | [0.276] | [2.130] | [0.550] |
| HHI × Size | 0.1062* | | 0.1478* | | 0.1296* | | 0.1637 | |
| | [0.064] | | [0.077] | | [0.068] | | [0.135] | |
| HHI × Age | | 0.0229 | | 0.0286 | | 0.0550 | | 0.0640 |
| | | [0.038] | | [0.049] | | [0.036] | | [0.069] |
| Size | -0.0114 | 0.0109 | -0.0196 | 0.0099* | -0.0372** | -0.0100* | -0.0545* | -0.0202** |
| | [0.015] | [0.007] | [0.016] | [0.006] | [0.015] | [0.005] | [0.029] | [0.009] |
| Age | 0.0021 | -0.0027 | 0.0024 | -0.0034 | 0.0022 | -0.0096 | 0.0024 | -0.0114 |
| | [0.003] | [0.010] | [0.003] | [0.011] | [0.003] | [0.010] | [0.006] | [0.018] |
| ROE | -0.0389 | -0.0396 | -0.0361* | -0.0368* | -0.0022 | -0.0036 | 0.0030 | 0.0017 |
| | [0.026] | [0.026] | [0.021] | [0.021] | [0.019] | [0.019] | [0.034] | [0.034] |
| Partner | -0.0664 | -0.0636 | -0.0584 | -0.0539 | -0.1224*** | -0.1191*** | -0.1947*** | -0.1911** |
| | [0.062] | [0.063] | [0.061] | [0.062] | [0.044] | [0.045] | [0.075] | [0.077] |
| Limited Liability | 0.0254 | 0.0281 | 0.0282 | 0.0320 | 0.0245 | 0.0275 | 0.0479 | 0.0514 |
| | [0.043] | [0.043] | [0.043] | [0.042] | [0.039] | [0.038] | [0.065] | [0.065] |
| Corporation | -0.0247 | -0.0220 | -0.0262 | -0.0210 | -0.0335 | -0.0292 | -0.0471 | -0.0420 |
| | [0.060] | [0.060] | [0.062] | [0.061] | [0.054] | [0.053] | [0.087] | [0.087] |
| Constant | 0.9973*** | 0.6953*** | – | – | 1.1755*** | 0.8443*** | 1.4489*** | 1.0194*** |
| | [0.229] | [0.154] | – | – | [0.243] | [0.139] | [0.494] | [0.249] |
| Industry Dummy | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Regional Dummy | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,519 | 1,519 | 1,519 | 1,519 | 1,519 | 1,519 | 1,519 | 1,519 |
| R2 | 0.045 | 0.044 | 0.050 | 0.048 | 0.042 | 0.041 | 0.019 | 0.019 |

**Table 11: Instrumental Variable Regressions.** The table provides instrumental variable (IV) estimates. The equations for Financing Gap Dummy (DGAP) are as follows,

$$DGAP_i = \kappa_0 + \kappa_1 HHI_i + \sum_l \lambda_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \varepsilon_i$$

$$HHI_i = \alpha_0 + \alpha_1 HHIA_i + \sum_l \mu_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \omega_i$$

And the equations for financing gap ratio (GAP) are as follows,

$$GAP_i = \beta_0 + \beta_1 HHI_i + \sum_l \gamma_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \varepsilon_i$$

$$HHI_i = \alpha_0 + \alpha_1 HHIA_i + \sum_l \mu_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \omega_i$$

DGAP equals one if the firm's credit demand is positive, and equals zero otherwise; GAP is the financing gap ratio; HHI is Herfindahl–Hirschman Index for all banks; HHIA is the average of HHI of neighboring cities in the same province; SIZE is log(1+sales in 2004); Age is firm age; ROE is net income after tax over total equity; Partner, Limited Liability, and Corporation equals 1 if a firm is registered as partnership, limited liability firm, and corporation respectively, 0 otherwise. Variable definitions are provided in Table 4. Coefficients are reported, with robust standard errors clustered at the city level in parentheses, significance * at 10%, ** at 5%, *** at 1%.

| Dependent Variables | DGAP | | GAP | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | 2nd stage | 1st stage | 2nd stage | 1st stage |
| HHI | 0.7031*** | | 0.5695** | |
| | [0.246] | | [0.272] | |
| HHIA | | 0.0033*** | | 0.0033*** |
| | | [0.0004] | | [0.0004] |
| SIZE | 0.0113* | -0.0018** | -0.0097* | -0.0018** |
| | [0.007] | [0.0009] | [0.005] | [0.0009] |
| Age | 0.0023 | -0.0005 | 0.0024 | -0.0005 |
| | [0.003] | [0.0004] | [0.003] | [0.0004] |
| ROE | -0.0387 | -0.0018 | -0.0022 | -0.0018 |
| | [0.026] | [0.0025] | [0.018] | [0.0025] |
| Partner | -0.0614 | -0.0114* | -0.1173*** | -0.0114* |
| | [0.062] | [0.0062] | [0.044] | [0.0062] |
| Limited Liability | 0.0318 | -0.0190*** | 0.0306 | -0.0190*** |
| | [0.043] | [0.0043] | [0.039] | [0.0043] |
| Corporation | -0.0206 | -0.0097 | -0.0296 | -0.0097 |
| | [0.060] | [0.0078] | [0.053] | [0.0078] |
| Constant | 0.6085*** | 0.2812*** | 0.7274*** | 0.2812*** |
| | [0.142] | [0.0205] | [0.146] | [0.0205] |
| Industry Dummy | Yes | Yes | Yes | Yes |
| Regional Dummy | Yes | Yes | Yes | Yes |
| Observations | 1,519 | 1,519 | 1,519 | 1,519 |
| F-Stat | – | 56.02 | – | 56.02 |
| R2 | 0.043 | 0.060 | 0.039 | 0.060 |

**Table 12: Heterogeneity between Rural and Urban Firms.** The table provides OLS and Probit estimation for DGAP,

$$DGAP_i = \beta_0 + \beta_1 Concentration_i + \beta_2 Concentraion_i \times Rural_i + \beta_3 Rural_i + \sum_l \gamma_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \varepsilon_i$$

And OLS and Tobit estimation for GAP,

$$GAP_i = \beta_0 + \beta_1 Concentration_i + \beta_2 Concentraion_i \times Rural_i + \beta_3 Rural_i + \sum_l \gamma_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \varepsilon_i$$

DGAP equals one if the firm's credit demand is positive, and equals zero otherwise; GAP is the financing gap ratio; HHI is Herfindahl–Hirschman Index for all banks; CR3 is the three-bank branch concentration ratio; Rural equals one if a firm locates in the rural area, 0 otherwise; SIZE is log(1+sales in 2004); Age is firm age; ROE is net income after tax over total equity; Partner, Limited Liability, and Corporation equals 1 if a firm is registered as partnership, limited liability firm, and corporation respectively, 0 otherwise. Variable definitions are provided in Table 4. Pseudo R2 is reported instead of R2 for model (2)-(3) and (5)-(6). Robust standard errors clustered at the city level are in parentheses, significance * at 10%, ** at 5%, *** at 1%.

| | DGAP | | | GAP | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | OLS | Probit | Probit | OLS | Tobit | Tobit |
| HHI | 0.5059** | 0.5779** | | 0.3696** | 0.6920*** | |
| | [0.193] | [0.239] | | [0.142] | [0.261] | |
| HHI × Rural | 0.1623 | 0.7800 | | 0.4920* | 1.6918** | |
| | [0.241] | [0.602] | | [0.294] | [0.782] | |
| CR3 | | | 0.2819** | | | 0.2794* |
| | | | [0.133] | | | [0.166] |
| CR3 × Rural | | | 0.4028 | | | 1.1901** |
| | | | [0.330] | | | [0.520] |
| Rural | -0.0493 | -0.2127 | -0.3756 | -0.1402* | -0.4115** | -0.8601** |
| | [0.060] | [0.154] | [0.316] | [0.072] | [0.160] | [0.350] |
| Size | 0.0110 | 0.0100* | 0.0093 | -0.0104* | -0.0209** | -0.0229** |
| | [0.007] | [0.006] | [0.006] | [0.005] | [0.009] | [0.009] |
| Age | 0.0022 | 0.0026 | 0.0025 | 0.0022 | 0.0024 | 0.0022 |
| | [0.003] | [0.003] | [0.003] | [0.003] | [0.006] | [0.006] |
| ROE | -0.0366 | -0.0346 | -0.0341 | -0.0008 | 0.0045 | 0.0043 |
| | [0.026] | [0.021] | [0.022] | [0.019] | [0.034] | [0.034] |
| Partner | -0.0697 | -0.0609 | -0.0625 | -0.1228*** | -0.1991** | -0.2039*** |
| | [0.065] | [0.064] | [0.064] | [0.045] | [0.078] | [0.078] |
| Limited Liability | 0.0278 | 0.0316 | 0.0300 | 0.0274 | 0.0510 | 0.0462 |
| | [0.044] | [0.043] | [0.044] | [0.040] | [0.069] | [0.070] |
| Corporation | -0.0216 | -0.0194 | -0.0217 | -0.0306 | -0.0417 | -0.0449 |
| | [0.061] | [0.062] | [0.062] | [0.055] | [0.090] | [0.090] |
| Constant | 0.6659*** | – | – | 0.7886*** | 0.9750*** | 0.9747*** |
| | [0.128] | – | – | [0.125] | [0.224] | [0.254] |
| Industry Dummy | Yes | Yes | Yes | Yes | Yes | Yes |
| Regional Dummy | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |
| R2 | 0.044 | 0.048 | 0.046 | 0.042 | 0.021 | 0.019 |

**Table 13: Nonlinear effects of Banking Competition.** The table provides OLS and Probit estimation for DGAP,

$$DGAP_i = \beta_0 + \beta_1 Concentration_i + \beta_2 Concentration_i - Squared + \sum_l \gamma_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \varepsilon_i$$

And OLS and Tobit estimation for GAP,

$$GAP_i = \beta_0 + \beta_1 Concentration_i + \beta_2 Concentration_i - Squared + \sum_l \gamma_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \varepsilon_i$$

DGAP equals one if the firm's credit demand is positive, and equals zero otherwise; GAP is the financing gap ratio; HHI is Herfindahl–Hirschman Index for all banks; CR3 is the three-bank branch concentration ratio; HHI-Squared and CR3-Squared are the squared terms of HHI and CR3 respectively; SIZE is log(1+sales in 2004); Age is firm age; ROE is net income after tax over total equity; Partner, Limited Liability, and Corporation equals 1 if a firm is registered as partnership, limited liability firm, and corporation respectively, 0 otherwise. Variable definitions are provided in Table 4. Pseudo R2 is reported instead of R2 for model (2)-(3) and (5)-(6). Robust standard errors clustered at the city level are in parentheses, significance * at 10%, ** at 5%, *** at 1%.

| | DGAP | | | GAP | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | OLS | Probit | Probit | OLS | Tobit | Tobit |
| HHI | 0.7940* | 0.1896 | | 0.3510 | -0.1727 | |
| | [0.475] | [0.914] | | [0.335] | [0.547] | |
| HHI-Squared | -0.4460 | 0.9355 | | 0.1477 | 1.8148** | |
| | [0.543] | [1.774] | | [0.396] | [0.717] | |
| CR3 | | | -0.8079 | | | -3.2905* |
| | | | [1.299] | | | [1.698] |
| CR3-Squared | | | 0.8252 | | | 2.6451** |
| | | | [0.931] | | | [1.206] |
| Size | 0.0107 | 0.0101* | 0.0098* | -0.0100* | -0.0198** | -0.0193** |
| | [0.007] | [0.006] | [0.006] | [0.005] | [0.009] | [0.009] |
| Age | 0.0022 | 0.0025 | 0.0024 | 0.0023 | 0.0026 | 0.0023 |
| | [0.003] | [0.003] | [0.003] | [0.003] | [0.006] | [0.006] |
| ROE | -0.0393 | -0.0364* | -0.0363* | -0.0025 | 0.0030 | 0.0026 |
| | [0.026] | [0.021] | [0.021] | [0.019] | [0.034] | [0.035] |
| Partner | -0.0640 | -0.0542 | -0.0580 | -0.1187*** | -0.1899** | -0.2002*** |
| | [0.063] | [0.061] | [0.061] | [0.045] | [0.077] | [0.076] |
| Limited Liability | 0.0286 | 0.0307 | 0.0282 | 0.0279 | 0.0506 | 0.0401 |
| | [0.043] | [0.042] | [0.042] | [0.038] | [0.065] | [0.065] |
| Corporation | -0.0232 | -0.0227 | -0.0258 | -0.0313 | -0.0436 | -0.0527 |
| | [0.060] | [0.060] | [0.061] | [0.053] | [0.086] | [0.086] |
| Constant | 0.6313*** | – | | 0.7784*** | 1.0513*** | 2.0946*** |
| | [0.141] | – | | [0.130] | [0.227] | [0.619] |
| Industry Dummy | Yes | Yes | Yes | Yes | Yes | Yes |
| Regional Dummy | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,519 | 1,519 | 1,519 | 1,519 | 1,519 | 1,519 |
| R2 | 0.044 | 0.047 | 0.046 | 0.039 | 0.046 | 0.018 |