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

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Abstract

Banking competition may enhance or hinder the financing of small and medium-sized 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, SME Financing, Credit Constraints

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1. Introduction

The impact of competition in the banking sector on the availability of credit for small- and medium-sized 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 such as China. Competition in the banking sector, for example, may be an important driver (Petersen and Rajan, 1995; Carbo-Valverde, Rodriguez-Fernandez and Udell, 2009).

The Chinese government has long recognized the difficulties SMEs face in obtaining financing and it has tried to help them in getting bank loans. SME financing was even added to the national development agenda, which in 2003 resulted in the "SMEs Promotion Law". However, SME financing difficulties may have never been fully solved by the implemented government policies. Therefore, to understand the determinants of SME financing in China is vitally important not only for academics but also for policy-makers.

To investigate the impact of competition in the banking sector on the availability of credit to SMEs in a developing economy, we employ the nearly 4,000 responses to a unique stratified survey that was sent to Chinese private enterprises in 2006 (mainly SMEs according to the extant official definition in the Chinese law). 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 their access to financing, not only from the state-owned banks, but also from other types of formal financing (Ayyagari, Demirgüç-Kunt and Maksimovic, 2010; Cheng and Degryse, 2010a).

We test the *Information Hypothesis* versus the *Market Power Hypothesis* with respect to the effect of banking competition on credit availability. 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). 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).

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. An analysis of the heterogeneous effect of the HHI according to the presence of the 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 better alleviates credit constraints as compared to the presence of city commercial banks or state-owned banks. The results basically support the validity of the *market power hypothesis* for China.

[1] 4.3 million SMEs account for 99 percent of all firms at year-end 2004 and 75 percent of the industrial value added during 2004. The number of SMEs increased at an annual rate of 20 percent between 2001 and 2004 (Sources: *State Administration for Industry and Commerce of China* and *National Commission for Reform and Development of China*).

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 and SME financing. Section 3 presents the dataset. Section 4 introduces the measures of the financing gap, the tested hypotheses and the methodology. Section 5 discusses the summary statistics for the variables of interest. Section 6 presents the estimates and establishes the economic importance of banking competition. Section 7 shows the instrumental variable regression. Section 8 conducts robustness checks. Section 9 concludes the paper.

2. China's Banking System and SME Financing

China's banking sector is dominated by four state-owned banks. As shown in Figure 1, about half of total banking assets were owned by these four state-owned banks in 2005, which are also the least efficient banks in China (Berger, Hasan and Zhou, 2009). State-owned banks usually provide funds to 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 without financial records (such as small and young firms).

[Figure 1 here]

In addition to the four state-owned banks, there are twelve joint-stock banks in China, who range in size between that of a large state-owned bank, and that of a city commercial banks. Joint-stock banks can open branches freely around the country and their business orientation includes targeting SMEs (in contrast to their state-owned counterparts that have less such orientation).

On the "small-sized end" of the banking market, there are 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.[2] However, from the middle 1990s onwards the Chinese government restructured urban credit cooperatives and set 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

[2] According to the *Almanac of China's Finance and Banking* (1995), there were 5,229 urban credit cooperatives at year-end 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.

business orientation towards SMEs, which also correspond to their prior operations as urban credit cooperatives and their small sizes.

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, resulting in fiercer competition in the credit market.[3] 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 to investigate the effect of competition in the Chinese 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. Competition in the banking market has increased substantially due to the joint-stock banks and city commercial banks' burgeon.

The Chinese financial system leads to substantial credit constraints for certain types of firms. Poncet, Steingress and Vandenbussche (2010) for example show that private firms are credit constrained in China while state-owned and foreign firms are not. Generally speaking, private firms are discriminated in the credit market, especially by the state-owned banks. In contrast, state-owned firms can gain access to bank loans easily due to their political connections though the loan allocation is often inefficient (Bailey, Huang and Yang, 2011). Furthermore, foreign firms can access credit through the internal capital market shared with their parent companies (Manova, Wei and Zhang, 2009).

[3] 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".

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 using a unique survey dataset.

3. 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.[4] The survey comprises 3,837 observations, covering 31 regions (provinces, autonomous regions and municipalities) in China.[5] 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.[6] Following the standard SME definition set by the Chinese

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

[5] The survey was initiated by four public institutes every two years since 1992: The *State Administration for Industry and Commerce of China* (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).

[6] 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

government,[7] 97 percent of the sample firms can be categorized as SMEs by total sales revenues. Consequently, after excluding the few large firms the survey dataset can be used to investigate the SME financing.

The questionnaire mainly asks about the entrepreneurs' background and other characteristics, including important questions on credit and firm characteristics. The survey not only probes for the unfulfilled part of the firms' credit demand,[8] 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, etc.[9]

4,300 SMEs, or about 0.10 percent of the whole SME population, were chosen as sample firms. The *State Administration for Industry and Commerce of China* selected the firms through its communication centers all over the country, while the *All-China Federation of Industry and Commerce* sampled proportionally from each region. Each institution was responsible for half of the number of questionnaires. 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 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 regions and further

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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.

[7] According to the definition set by the *National Bureau of Statistics of China*, 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.

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

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

in cities, districts or counties. Secondly, the sample firms were stratified by urban or rural regions and industries. Thirdly, the number of 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 participate in the survey or could not be reached, the surveyors substituted the firm with a neighboring firm in the name list.

3.2 Branches of State-owned, Joint-stock and City Commercial Banks

State-owned, joint-stock and city commercial banks have different organizational structures, which lead to different bank branch networks. State-owned banks have branches in almost every city.[10] Joint-stock banks are allowed to open branches freely anywhere in the country, but they usually focus on a certain region of the country.[11] 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.

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

[11] 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.

These banks are distinct in terms of not only their geographical footprint, but also their organization. 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. We retrieve all branch information from their official websites.

Finally, the 112 city commercial banks in 2005 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 online. 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. We collect the data from official bank websites, annual financial reports, government reports and a variety of other sources.

The number of bank branches is merged with the survey data at the prefecture-level city based on firms' headquarters postcodes.[12] Hence we treat each city as a separate banking market,[13] and measure competition using the number of branches for each bank in the city.

[12] 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.

[13] 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.

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 SME 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,[14] 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, we also interact HHI with the market shares of each type of banks, so that we can examine the heterogeneous effects of competition across bank types on SME credit constraints.

4. Measurement, Hypotheses and Methodology

4.1 Measurement for Credit Constraints: Constrained and Financing Gap Ratio

[14] Branch closures at the four state-owned banks have occurred for three reasons: 1) The Asian financial crisis in 1997 acted as an external contractionary 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).[15] Generally speaking, credit constraints arise from a shortfall in the supply of credit vis-à-vis the current demand for credit demand, i.e., it implies a financing gap exists.[16] 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.

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

Constrained=1, if Financing Gap>0; Constrained =0, otherwise (1)

Financing Gap = Credit Demand for Expansion + Credit Demand for Operation (2)

where *Credit Demand for Expansion* and *Credit Demand for Operation* are the respective amounts that are solicited from the firms in the survey. The first amount is the credit demand for investment, while the second amount is the credit demand for working capital. Both credit-demand 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 the financing gap at

[15] 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.

[16] The OECD SME 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."

the country level, which is the difference between the required investment and the available resources. In addition, Cheng and Degryse (2010b) use the amount applied and granted for one Chinese bank's credit card customers in order to measure 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.

While we do not have access to loan application data, we do have the amount of loans outstanding at the end of the year 2005. We then apply a similar definition to firms in order to get a measure of the financing gap instead of an indicator measurement. A firm's required investment could be decomposed into available resources which are credit balances, 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:

$$\textit{Financing Gap Ratio} = \textit{Financing Gap} / (\textit{Financing Gap} + \textit{Credit Balances}) \quad (3)$$

where the *Financing Gap* is defined in equation (2). *Credit Balance* is the amount borrowed from all sources, i.e. State-owned Banks, Joint-stock Banks, City Commercial Banks and Credit Cooperatives, Informal Financing Channels, Individuals, and Foreign Banks.

The *Financing Gap Ratio* could provide a more accurate measure than the *Constrained* variable. Banerjee and Duflo (2012) employ a similar definition to measure credit constraints, i.e., the amount of all lines of credit over the demand for credit (which is estimated by loan officers based on firm sales revenues). While *Constrained* captures the possibility of whether a firm is credit constrained or not, *Financing Gap Ratio* characterizes the extent, or rather, the tightness of the credit constraint.

4.2 Measurement for Competition: Herfindahl–Hirschman Index and Concentration Ratio

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 at the city level, the 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 the concentration ratio (CR3) using the banks' market shares in terms of number of bank branches.

When calculating the HHI and CR3, we assume implicitly that all bank branches are homogeneous in their 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 the loan interest rate,[17] 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,[18] and they can still benefit from business diversification nationwide compared

[17] 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.

[18] 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.

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, we define the *Market Share of Joint Stock Banks* and *of City Commercial Banks* as:

$$\text{Market Share of Joint Stock Banks} = \sum_{j=1}^{J_i}\left(\#branch_j \Big/ \sum_{k=1}^{K_i} \#branch_k \right)^2 \Big/ HHI \tag{4}$$

$$\text{Market Share of City Commercial Banks} = \sum_{c=1}^{C_i}\left(\#branch_c \Big/ \sum_{k=1}^{K_j} \#branch_k \right)^2 \Big/ HHI \tag{5}$$

where $HHI=\sum_{k=1}^{K_i}\left(\#branch_k \Big/ \sum_{k=1}^{K_i} \#branch_k \right)^2$, the standard Herfindahl–Hirschman Index.

K, J and C are the number of banks for all three types of banks, joint stock banks, and city commercial banks respectively in a city. The market share measures the proportion of HHI contributed by joint-stock, and city commercial banks. Hereby we aim to keep a consistent scaling between the HHI and the market shares. We also use the proportion of the number of bank branches as a measure for the market shares for which the results are qualitatively similar and not included for brevity. Intuitively, joint-stock banks and city commercial banks may change the marginal effect of HHI, which could be captured by an interaction term of HHI and their respective market shares.

All the variable definitions are listed in Table 1. The first column is the variable category, including our credit constraint measures, firm-specific variables and concentration measures, and the second column lists the variable name and the third column lists the variable definitions.

[Table 1 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.

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. Informal payments for loans are widespread in China, and more banking competition may reduce lending corruption (Barth, Lin, Lin and Song, 2009), which reduce the interest rate and enhance credit availability. In addition, Shen, Shen, Xu and Bai (2009) show that more competition leads to more SME lending in China. Consequently, we conjecture that more competition will lead to more credit availability, or fewer credit constraints.

We will test the *market power hypothesis* (as the null 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 however be stated as follows:

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

Competition is measured by the HHI or CR3, and the credit constraints are measured by the *Constrained* or *Financing Gap Ratio* variables. Consequently, the predicted signs of HHI and CR3 are positive if the *market power hypothesis* holds, while negative otherwise.

Small banks may have a comparative advantage in lending to SMEs (Jayaratne and Wolken, 1999) due to a flatter organization structure. Berger and Black (2011) show that small banks indeed have a comparative advantage in relationship lending. In contrast, Berger and Udell (2006) argue that a greater presence of foreign-owned financial institutions (that may be large and hence focused on transactional-lending) and a lesser presence of state-owned financial institutions are even associated with higher SME credit availability in developing countries, which show that large financial institutions can successfully lend even to opaque SMEs with certain proper transactional lending technologies.

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. Although Firth, Lin,

Liu and Wong (2009) show that Chinese state-owned banks make loan decisions based on commercial judgments, political connections still matter in obtaining bank finance, which may result in their relative inefficiency compared with non-state-owned banks (Bailey, Huang and Yang, 2011). Besides, Berger, Rosen and Udell (2007) show that market size structure may affect the conventional relationship between bank size and SME lending. The proportion of each type of banks in a local credit market, i.e., an indicator for the market size structure, may be associated with heterogeneous effect of competition on the credit availability for SMEs.

Our second hypothesis can therefore be stated as follows:

Hypothesis 2: Competition by joint-stock banks and city commercial banks has a larger effect on credit constraints than competition by state-owned banks.

The competition from joint-stock banks and city commercial banks are measured by HHI interacted with the market share of each type of banks defined in equations (4) and (5).[19] As a result, the predicted signs for coefficients of the interaction terms should both be positive if they are more efficient in reducing credit constraints for SMEs than state-owned banks are, and if their presence pushes the state-owned banks to invest more in relationship lending. Furthermore, joint-stock banks may also dominate city commercial banks due to their exposure to diversification benefits in the national market. Consequently, the coefficient of the interaction

[19] The competition of joint stock banks and city commercial banks affect the SME financing through two channels. As these two types of banks have flatter organization structures than state-owned banks, the presence of them may enhance the SME financing through providing more credit directly to SMEs. In addition, the presence of these two types of banks can push the state-owned banks to invest more in relationship lending to SMEs, which may also increase the credit availability to SMEs. However, we cannot identify the exact channel in this paper. By including an interaction term of HHI and the market shares of these two types of banks, we capture an aggregated effect of the presence of joint stock banks and city commercial banks on the SME financing.

term with the market share of joint stock banks should be larger than the one for city commercial banks if the former are more efficient than the latter 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 the variables *Constrained* and the *Financing Gap Ratio*; *Concentration* indices, i.e., HHI and CR3, which measure banking competition. *Control* are firm specific control variables such as *Size*, *Age*, *ROE* (return on equity), and *Partnership*, *Limited Liability*, and *Corporation* dummy variables; *Industry* and *Region* stand for the set of industry and regional dummy variables.

Small firms often have less access to formal sources of external finance thus higher credit constraints (Beck and Demirgüç-Kunt, 2006; Kumar and Francisco, 2005). Winker (1999) also shows that younger firms are more likely to be rationed in the credit market. Thus we control for firm size and age in our analysis. The internal source of finance may also alleviate the credit constraints (Guariglia, Liu and Song, 2011). We include ROE as a measure of the availability of internal finance, i.e., a higher ROE is associated with lower credit constraints. However, a higher ROE may also indicate higher growth opportunities, which may lead to more severe credit constraints. The predicted sign of ROE is therefore ambiguous. We also include firm registration

types as limited liability firms and corporations often have more access to formal sources of external finance than partnership and single proprietorship (the suppressed category). Finally, we include a full set of industry and regional dummies to account for potential observed and unobserved industry and regional heterogeneity.

In order to gain insight in whether a firm is credit constrained, we apply Probit estimations in equation (6). For the financing gap ratio, as it is censored at both zero and one, we use a Tobit model that accounts for left censoring at zero and for right censoring at one.

5. Summary Statistics

Table 2 presents summary statistics for the credit constraints measures, and the explanatory and control variables.

[Table 2 here]

The mean value of *Constrained* and *Financing Gap Ratio* are 82 and 64 percent, respectively.[20] Put differently, 82 percent of the firms face credit constraints while 64 percent of

[20] The proportion of credit constrained firms and financing gap ratio are much higher than the numbers documented in the literature on industrial countries. Most papers in the literature examine loan application and rejection data to define credit constraints. For example, Cheng and Degryse (2010b) show that the financing gap is 34 percent for a sample of Chinese credit card applicants. However, the questionnaire underlying our sample data asks for the amounts of credit needed for working capital and investment, while the respondents may not apply for banks loans as they expect that their loan applications will be rejected anyway, i.e., these respondents may be discouraged (Cole, 2010). Thus our measures of credit constraints indicate more severe credit rationing due to the inclusion of these discouraged borrowers. Banerjee and Duflo (2012) show that 77 percent of the borrowers reach or exceed their lines of credit for a sample of India firms in 1999, and that 60 percent of the amount of all lines of credit are below the maximal credit limits calculated by the bank based on firm sales (i.e., the maximal credit limits includes the credit demand of the discouraged borrowers). It seems that credit constraints are more widespread in emerging economies, and the results for our sample firms are consistent with the evidence from other emerging economies such as India.

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

6. Economic Importance of Banking Competition

Banking competition may stimulate or hamper SME 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 with the dependent variable *Constrained*. On the other hand, we investigate the tightness of these credit constraints with the dependent variable *Financing Gap Ratio*. Hence, *Constrained* provides a qualitative measure, while *Financing Gap Ratio* provides a quantitative measure for the presence and tightness of credit constraints. Both

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As discouraged borrowers are also very important in the policy debates on finance and growth, credit constraint measures accounting for discouraged borrowers have straightforward interpretational advantages over standard credit constraint measures.

[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 in the U.S., 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).

the HHI and the CR3 are used as concentration measures, while we further examine the HHI by bank types in order to capture the potential heterogeneous effects across bank type. In order to tackle possible endogeneity concerns, we will employ an instrumental variable estimation.

6.1 Constrained

We first focus on *Constrained* as the dependent variable, which equals 1 if the firm faces credit constraints, and equals 0 otherwise. In model (1) of Table 3 we employ Probit estimations to examine the effect of banking competition on the probability of the presence of credit constraints. A decrease in the HHI from its 75 to 25 percentile will result in a 5.65 percentage point reduction in the probability of having credit constraints. Similarly, model (2) yields a 5.49 percentage point reduction in this probability if CR3 decreases from 75 to 25 percentile. The model specification shows that more banking competition, or a lower HHI / CR3, is associated with a lower probability of having credit constraints for SMEs. The effect of banking competition on SME financing is not dependent on the choice of competition measure, which indicates the robustness of this correspondence.

[Table 3 here]

Firm size tends to have positive effect on the probability of falling credit constraints in model (1) of Table 3, 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 somewhat surprising finding is that smaller firms can alleviate credit constraints through informal financing channels. Another reason may be the discontinuity in the availability of investment opportunities. Smaller firms may have a discontinuous "inflow" of investment opportunities (i.e., a higher volatility), which may lead to a lower incidence of credit constraints.

The sign of ROE is significantly negative in model (1) of Table 3, which suggest that firms with higher profitability (i.e., with better access to internal finance) are less likely to be credit constrained. Corresponding our earlier discussion on the ROE as a measure for both internal finance and growth opportunities, it seems that the former dominates the latter in terms of its effect on the presence of credit constraints.

Firm age does not affect the probability of facing credit constraints. One reason may be that most of the sample firms are quite young, thus the variation is too limited (i.e., the age of the oldest firm is 21 years, and the medium is 7 years). Firm registration types are not significant individually in model (1), while the P-value of a joint F-test for the firm registration types is 0.1029, which suggests a weak effect on the probability of falling into credit constraints.

6.2 Financing Gap Ratio

The *Financing Gap Ratio* characterizes the severity of the credit constraints. While the existing literature typically focuses on whether firms are constrained, there is scant empirical work on the severity of the credit constraints that firms face. The unique dataset we employ allows us to examine the effect of banking competition on the severity of the credit constraints.

The financing gap ratio is somewhat clustered at zero and one. A Tobit model with left censoring at 0 and right censoring at 1 is estimated to tackle this problem. Models (3)-(4) of Table 3 present the Tobit estimation results for models with the *Financing Gap Ratio* as the dependent variable. HHI is significant at the 1 percent level in model (3), which is consistent with the results for the *Constrained* in model (1). If HHI decreases from its 75 to 25 percentile, the financing gap ratio will decrease by 7.68 percentage points in model (3) of Table 3. Alternatively, model (4) in Table 3 present the regression results when CR3 is used as a measure for competition, where CR3 is significant at the 5 percent level. 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 model (4). The choice of competition measure (again) does not change the effect of banking competition on the credit constraints. In summary, banking competition not only lowers the likelihood credit constraints are present, but also reduces its severity. These results are significant both in a statistical and economic sense.

For the estimated coefficients on the control variables, we can be brief. Size is negatively associated with the *Financing Gap Ratio*, which is consistent with stylized facts on firm size and credit constraints (Beck and Demirgüç-Kunt, 2006). This negative relationship hence only holds for the severity of the credit constraints not for their presence. Furthermore, firms registered as partnership have lower financing gap ratio in models (3)-(4) of Table 3. As single proprietary may have limited access to formal finance while limited liabilities firms and corporations have limited access to informal finance, firms registered as partnership may have adequate access to both informal and formal finance. This combination of informal and formal finance can be optimal for firms (Degryse, Lu and Ongena, 2012), also in alleviating credit constraints effectively. Firm age is insignificant, and so is ROE. As ROE is also associated with growth

opportunities, and thus credit demand, we find that higher ROE is associated with a higher financing gap ratio when restricting to the firms with credit constraints. Thus, the negative sign of ROE in models (1)-(2) of Table 3 may be caused by a group of firms with high profitability and consequently no credit constraints.

6.3 Heterogeneity of Banking Competition

The local presence of different types of banks may result in a heterogeneous effect on SME financing outcomes. Generally speaking, state-owned banks are less aggressive than joint-stock banks and city commercial banks in competing for SMEs, and their presence may lead to less efficiency in alleviating SMEs credit constraints. The heterogeneous effect can be captured by interacting HHI and the market shares of joint stock banks and city commercial banks.[23]

Model (1) in Table 4 shows that the presence of joint-stock banks is indeed somewhat more effective than the presence of city commercial banks in alleviating credit constraints, while the presence of state-owned banks is less effective.

[Table 4 here]

To examine the economic significance of the heterogeneous marginal effect of banking competition, note that the marginal effect of HHI in model (1) of Table 4 will increase by 23.65

[23] HHI is often more informative than the concentration ratio. Bikker (2004) shows that the concentration ratio ignores smaller banks, while HHI takes into account all banks in the market. The problem becomes more severe in more concentrated market as the dynamics of those smaller banks cannot be captured by the concentration ratio. The sample average of CR3 is 69 percent, which indicates a highly concentrated market in China. In particular, the largest three banks are often state-owned banks, which makes the CR3 less informative than HHI (i.e. it cannot capture the dynamics of the joint stock and city commercial banks). As a result, we will only use the HHI as a measure for the banking sector concentration from this point forward. Nevertheless, we have also done robustness checks for CR3 to all later model specifications, and the results are qualitatively similar. We do not include the results for brevity.

percent if joint-stock banks' market share increase from zero to its sample mean, and increase by 7.50 percent if city commercial banks' market share increase from zero to its sample mean. In short, joint-stock banks are more efficient and state-owned banks are less efficient (than city commercial banks) in reducing the probability that SMEs face credit constraints.

We also examine the heterogeneous effect for the financing gap ratio in model (2) of Table 4. The coefficient on the HHI is positive and significant at 1 percent level and the interaction terms are significantly positive, 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 of the interaction term between HHI and market share of joint-stock banks is larger than the one for city commercial banks.

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 29.78 and 7.25 percent, respectively.

We also use the proportion of joint stock and city commercial banks as a more intuitive measure for the market share. We find qualitatively similar results (we leave un-tabulated), although there is a small difference in the statistical significance probably due to a different scaling between the HHI index and the market share measure.

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 presence and magnitude of the SME financing gap.

6.4 Relationship Lending versus Price Effect

Banking competition can enhance credit availability through increasing relationship lending (Degryse and Ongena, 2007), and by lowering the interest rate. The positive effect of banking competition on SME financing could be caused by both channels. We will conduct a further analysis to distinguish between these two mechanisms 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. We show the estimates in Table 5.

[Table 5 here]

Model (1) of Table 5 shows that the interaction term is statistically positive, which is not consistent with the notion that smaller firms are more likely to be engaged in relationship lending. It seems that larger firms are more affected by the competition than smaller ones.[24] In addition, model (2) of Table 5 shows that young firms are also not more sensitive to banking competition, which again is inconsistent with commonly-made conjectures regarding relationship lending. We get similar results when looking at the heterogeneous effects across firm size and age for the financing gap ratio in models (3)-(4) of Table 5.

[24] The coefficient of HHI in model (1) of Table 5 is negative (-1.57), and the marginal effect is negative when the firm size is below 10.60. However, only 10 observations have a firm size below 10.60. In sum, there are very few observations that fall in the range of the negative marginal effect of the HHI. Thus larger firms do benefit more from market concentration than smaller ones.

In conclusion, there is no consistent evidence on the heterogeneous effect across firm size and age with respect to banking competition, which rules out relationship lending. The positive association between banking competition and credit availability must come through the price channel, or rather, through the lowering of the interest rate. Banking competition may lower the interest rate directly and thereby increase credit availability, or indirectly lower the informal payment that accrues to loan officers, a practice which may (unfortunately) be rather common in China.

7. Instrumental Variable Regression

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

We instrument the concentration indices with the average value of the concentration indices of the 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.[25]

[25] The distance between two (as such officially designated) "cities" in China is on average around 80 kilometers (the average population in a city is four million people). As a result, SMEs are not likely to borrow from formal or informal financing channels in other cities, which make the concentration in other cities irrelevant to local SME financing.

On the one hand, the four state-owned banks have branches in almost every city and internally a clear business segmentation among cities. Hence if firms are to apply for a loan from one of the state-owned banks, they have to visit a local branch in their (headquarter) city. On the other hand, city commercial banks do not have branches outside their own headquarter cities, so that they are constrained in servicing other local credit markets.

However, branches of joint-stock banks are allowed and capable to grant loans to firms outside the cities where they are domiciled. Their activities may therefore undermine any market segmentation across cities.[26] Petersen and Rajan (2002) document that the distance between banks and small firms is increasing in the US due to the improvement in lending technology. However, banks in China are relatively inefficient in their lending technology compared to banks in the US, which may force 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 often 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. Berger, Hasan and Zhou (2010) show that geographical diversification of banks is associated with higher cost in China, which may suggest that it is efficient for joint stock banks to focus on a specific region. Consequently, the business segmentation among cities may still hold even if joint-stock bank branches could lend across

[26] 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.

cities, which will lead to the irrelevance of concentration indices of neighboring cities for local SME 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 between competition indexes. Consequently, the average concentration indices of neighboring cities are correlated with local concentration indices but uncorrelated with SME credit constraints, which makes these indices valid instruments.

Table 6 presents the instrument variable regressions (i.e., a linear model) for HHI.[27] Model (2) of Table 6 shows that HHI is significant at the 1 percent level for *Constrained*. The magnitude of the coefficient is somewhat larger than the OLS model (1),[28] which shows that the IV captures a part of the HHI's variation. In addition, model (3) shows the first stage regression, in which the F-statistic is larger than ten. Furthermore, the Cragg-Donald F-Statistic is significant at the 1 percent level, which suggests that the average HHI of neighboring cities is a strong IV for the HHI in the (central) city.[29] The IV regression confirms the relationship between banking competition and probability of credit constraints while assuaging the endogeneity concerns.

[Table 6 here]

[27] We also try a similar strategy for CR3 and the results are qualitatively similar.

[28] Due to using a linear model for the IV regression, we replicate the results from OLS models for comparison in model (1) and (4) in Table 6.

[29] The correlation coefficient between the IV and the residuals from the first stage regression of *Constrained* is close to zero and insignificant. We also try to include the IV directly into the second stage regression as an additional explanatory variable, and the coefficient is close to zero and insignificant. The results are similar in the IV regression for the *Financing Gap Ratio*. This statistical evidence supports the exogeneity of the IV.

Similarly, we also conduct IV regressions for the financing gap ratio. Models (5)-(6) in Table 6 presents the IV estimations with the concentration indices instrumented with the average value for all neighboring cities. Model (5) yields positive coefficients for HHI significant at the 5 percent level and the magnitude of coefficient is a little larger than the OLS model (4), which confirms that more intense competition reduces the financing gap ratio. In addition, model (6) presents the first stage regression, in which the 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 order to further test the validity of the instrumental variable, we also instrument the HHI with the average value of both HHI and CR3 of neighboring cities, and then run an over-identification test. In an unreported table, the P-value of the Hansen J statistics is 0.19 for *Constrained* and 0.89 for *Financing Gap Ratio*, which fails to reject the null hypothesis of the over-identification restrictions, and proves the validity of the instrumental variables.

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

8. Robustness Checks

Degryse and Ongena (2007) show that there is a U-shaped effect of market concentration on relationship lending, and Presbitero and Zazzaro (2011) provide an explanation based on the organizational structure of the local credit markets. Elsas (2005) shows that the likelihood of

relationship lending is non-monotonically related to bank concentration in the local market, i.e., relationship lending decreases with market concentration in low and intermediate levels of bank concentration, and increases in highly concentrated markets. We will check the potential non-linear relationship between competition and credit availability by adding squared terms.

Estimates are shown in Table 7. The squared term of HHI in model (1) in Table 7 is not significant although it is jointly significant at 5 percent level with HHI, which shows that the concentration indexes may not have non-linear effects on the probability of the presence of credit constraints. However, model (2) in Table 7 shows that the squared term is statistically significant at the 5 percent level for HHI on the financing gap ratio. The turning point of HHI in model (2) is 0.0476, while no cities have a HHI value below the threshold. Put differently, there is no U-shaped relationship between financing gap ratio and the HHI for sample firms, i.e., the financing gap ratio increases monotonically with the HHI. In sum, banking competition seems to have no non-linear effects for the neither the probability of the presence of credit constraints nor the size of the credit constraints.

[Table 7 here]

Finally, the starting sample consists of 3,837 observations while in the end we employ only 1,519 observations in the final analysis. The main sample selection is caused by the missing value of accounting variables. We run a Heckman selection model to address any potential biases. The estimates (that are not tabulated) from a linear model that uses firm CEO age as the identifying factor in the sample selection process show that elder CEOs are more aware of firm characteristics than younger ones and are also more willing to report them. However, although the estimated coefficient on the inverse Mill's ratio is significant, the coefficient on the HHI is still statistically significant and its magnitude (0.52 for *Constrained* and 0.43 for *Financing Gap*

Ratio) is similar with the estimates in baseline regressions (0.53 for *Constrained* and 0.44 for *Financing Gap Ratio* in OLS models (1) and (4) of Table 6). It seems that the sample selection is not likely to change the results substantially.

9. Conclusion

Banking competition can enhance SME financing by reducing both the probability of the presence and the magnitude of the credit constraints. While there is substantial evidence in the literature on the probability of the presence of credit constraints, little evidence has been reported so far 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 they face.

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 joint-stock banks have a larger effect, while the state-owned banks have a smaller effect, than city commercial banks in reducing the probability SMEs that face credit constraints and on the magnitude of the credit constraints. 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 (Bergstresser, 2010; Fischer, 2000; Petersen and Rajan, 2002), 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 with similarly high economic growth and poor financial systems, 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 the 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.

References

Agarwal, Sumit, and Robert Hauswald, 2010, Distance and Private Information in Lending, The Review of Financial Studies 23(7), 2757-2788.

Allen, Franklin, Qian, Jun, and Meijun Qian, 2005, Law, Finance, and Economic Growth in China, Journal of Financial Economics 77(1), 57-116.

Ayyagari, Meghana, Demirgüç-Kunt, Asli, and Vojislav Maksimovic, 2010, Formal versus Informal Finance: Evidence from China, The Review of Financial Studies 23(8), 3048-3097.

Bailey, Warren, Huang, Wei, and Zhishu Yang, 2011, Bank Loans with Chinese Characteristics: Some Evidence on Inside Debt in a State-Controlled Banking System, Journal of Financial and Quantitative Analysis, 46(6), 1795-1830.

Banerjee, Abhijit, and Esther Duflo, 2012, Do Firms Want to Borrow More: Testing Credit Constraints Using a Targeted Lending Program, Working Paper

Barth, James, Lin, Chen, Lin, Ping, and Frank Song, 2009, Corruption in Bank Lending to Firms: Cross-Country Micro Evidence on the Beneficial Role of Competition and Information Sharing, Journal of Financial Economics 91(3), 361-388.

Beck, Thorsten, and Asli Demirgüç-Kunt, 2006, Small and Medium-Sized Enterprises: Access to Finance as a Growth Constraint, Journal of Banking and Finance 30(11), 2931-2943.

Beck, Thorsten, Demirgüç-Kunt, Asli, and Vojislav Maksimovic, 2008, Financing Patterns Around the World: Are Small Firms Different?, Journal of Financial Economics 89(3), 467-487.

Beck, Thorsten, Demirgüç-Kunt, Asli, and Maria Soledad Martinez Peria, 2007, Reaching Out: Access to and Use of Banking Services across Countries, Journal of Financial Economics 85(1), 234-266.

Beck, Thorsten, Demirgüç-Kunt, Asli, and Ross Levine, 2005, SMEs, Growth and Poverty: Cross Country Evidence. Journal of Economic Growth 10, 197-227.

Berger, Allen N., and Lamont K. Black, 2011, Bank Size, Lending Technologies, and Small Business Finance, Journal of Banking and Finance 35(3), 724-735.

Berger, Allen N., Hasan, Iftekhar, and Mingming Zhou, 2009, Bank Ownership and Efficiency in China: What Will Happen in the World's Largest Nation?, Journal of Banking and Finance 33(1), 113-130.

Berger, Allen N., Hasan, Iftekhar, and Mingming Zhou, 2010, The Effects of Focus versus Diversification on Bank Performance: Evidence from Chinese Banks, Journal of Banking and Finance 34(7), 1417-1435.

Berger, Allen N., Miller, Nathan H., Petersen, Mitchell A., Rajan, Raghuram G., and Jeremy C. Stein, 2005, Does Function Follow Organizational Form? Evidence from the Lending Practices of Large and Small Banks, Journal of Financial Economics 76(2), 237-269.

Berger, Allen N., Rosen, Richard J., and Gregory F. Udell, 2007, Does Market Size Structure Affect Competition? The Case of Small Business Lending, Journal of Banking and Finance 31(1), 11-33.

Berger, Allen N., and Gregory F. Udell, 2006, A More Complete Conceptual Framework for SME Finance, Journal of Banking and Finance 30(11), 2945-2966.

Bergstresser, Daniel, 2010, Banking Market Concentration and Consumer Credit Constraints: Evidence from the 1983 Survey of Consumer Finances, Mimeo Harvard Business School.

Bikker, Jacobs A., 2004, Competition and Efficiency in a Unified European Banking Market, Edward, Elgar Publishing Limited.

Bikker, Jacobs A., and Katharina Haaf, 2002, Competition, Concentration and Their Relationship: An empirical Analysis of the Banking Industry, Journal of Banking and Finance 26(11), 2191-2214.

Carbo-Valverde, Santiago, Rodriguez-Fernandez, Francisco, and Gregory F. Udell, 2009, Bank Market Power and SME Financing Constraints, Review of Finance 13(2), 309-340.

Cavalluzzo, Ken S., Cavalluzzo, Linda C., and John D. Wolken, 2002, Competition, Small Business Financing, and Discrimination: Evidence from a New Survey, The Journal of Business 75(4), 641-679.

Cheng, Xiaoqiang, and Hans Degryse, 2010a, The Impact of Bank and Non-Bank Financial Institutions on Local Economic Growth in China, Journal of Financial Services Research 37, 179-199.

Cheng, Xiaoqiang, and Hans Degryse, 2010b, Information Sharing and Credit Rationing: Evidence from the Introduction of A Public Credit Registry, CentER Discussion Paper 2010-34S.

Cole, Rebel A., 2010, Who Needs Credit and Who Gets Credit? Evidence from the Surveys of Small Business Finances, Working Paper.

Degryse, Hans, Laeven, Luc, and Steven Ongena, 2009, The Impact of Organizational Structure and Lending Technology on Banking Competition, Review of Finance 13(2), 225-259.

Degryse, Hans, Lu, Liping, and Steven Ongena, 2012, Informal or Formal Financing? Or Both? First Evidence on the Co-Funding of Chinese Firms, Working Paper

Degryse, Hans, and Steven Ongena, 2007, The Impact of Competition on Bank Orientation, Journal of Financial Intermediation 16(3), 399-424.

Easterly, William, 1999, The Ghost of Financing Gap: Testing the Growth Model Used in the International Financial Institutions, Journal of Development Economics 60(2), 423-438.

Elsas, Ralf, 2005, Empirical Determinants of Relationship Lending, Journal of Financial Intermediation 14(1), 32-57.

Fischer, Karl-Hermann, 2000, Acquisition of Information in Loan Markets and Bank Market Power - An Empirical Investigation, Mimeo Johann Wolfgang Goethe University Frankfurt.

Firth, Michael, Lin, Chen, Liu, Ping, and Sonia M.L. Wong, 2009, Inside the Black Box: Bank Credit Allocation in China's Private Sector, Journal of Banking and Finance 33(6), 1144-1155.

Guariglia, Alessandra, Liu, Xiaoxuan, and Lina Song, 2011, Internal Finance and Growth: Microeconometric Evidence on Chinese firms, Journal of Development Economics 96(1), 79-94.

Hu, Sandy, and Krista Yue, 2007, China's City Commercial Banks: Fishing in the Big Pond, Deutsche Bank Global Market Research Report.

Jayaratne, Jith, and John Wolken, 1999, How Important Are Small Banks to Small Business Lending? New Evidence from a Survey of Small Firms, Journal of Banking and Finance 23(2-4), 427-458.

Kirschenmann, Karolin, 2010, Credit Rationing in Small Business Bank Relationships, mimeo, University of Mannheim.

Kumar, Anjali, and Manuela Francisco, 2005, Enterprise Size, Financing Patterns, and Credit Constraints in Brazil: Analysis of Data from the Investment Climate Assessment Survey, World Bank Working Paper 49.

Li, Hongbin, Meng, Lingsheng, and Junsen Zhang, 2006, Why Do Entrepreneurs Enter Politics? Evidence from China, Economic Inquiry 44(3), 559-578.

Manova, Kalina, Wei, Shang-Jin, and Zhiwei Zhang, 2009, Firm Exports and Multinational Activity under Credit Constraints, NBER Working Paper 16905.

Petersen, Mitchell A., and Raghuram G. Rajan, 2002, Does Distance Still Matter? The Information Revolution in Small Business Lending, The Journal of Finance 57(6), 2533-2570.

Petersen, Mitchell A., and Raghuram G. Rajan, 1995, The Effect of Credit Market Competition on Lending Relationships, Quarterly Journal of Economics 110(2), 407-443.

Presbitero, Andrea F., and Alberto Zazzaro, 2011, Competition and Relationship Lending: Friends or Foes?, Journal of Financial Intermediation 20(3), 387-413.

Poncet, Sandra, Steingress, Walter, and Hylke Vandenbussche, 2010, Financial Constraints in China: Firm-Level Evidence, China Economic Review 21(3), 411-422.

Scott, Jonathan A., and William C. Dunkelberg, 2010, Competition for Small Firm Banking Business: Bank Actions versus Market Structure, Journal of Banking and Finance 34(11), 2788-2800.

Shen, Yan, Shen, Minggao, Xu, Zhong, and Ying Bai, 2009, Bank Size and Small- and Medium-Sized Enterprise (SME) Lending: Evidence from China, World Development 37(4), 800-811.

Winker, Peter, 1999, Causes and Effects of Financing Constraints at the Firm Level, Small Business Economics 12(2), 169-181.

Table 1: Variable Definitions.

Variable Category	Variable Name	Definition
Credit Constraints Measures	Constrained	=1 if credit demand > 0, = 0 otherwise. credit demand = credit demanded for expansion and credit demand for operation
	Financing Gap Ratio	= 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, rescaled by 100
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
	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
	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
	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

Table 2: Summary Statistics. The table provides the number of observations, mean, median, standard deviation, minimum, 25th and 75th percentiles, and maximum for all key variables. Constrained equals 1 if the firm's credit demand is positive, and equals 0 otherwise; Financing Gap Ratio is defined in Table 1; 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 a partnership, limited liability firm and corporation, respectively, and equals 0 otherwise; HHI is the Herfindahl–Hirschman Index for all banks; CR3 is the three-bank branch concentration ratio; Market Share of Joint-Stock Banks and Market Share of City Commercial Banks are defined in Table 1. All (other) variables are also defined in Table 1. ROE is winsorized at the 1 and 99 percentile.

	Variable	N	Mean	Median	Std. Dev.	Min	p25	p75	Max
Credit Constraints Measures	Constrained	1,519	0.8170	1	0.3868	0	1	1	1
	Financing Gap Ratio	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
	CR3	1,519	0.6919	0.6746	0.1157	0.4118	0.6174	0.7941	1
	Market Share of Joint Stock Banks	1,519	0.0300	0.0183	0.0324	0.0000	0.0003	0.0439	0.2525
	Market Share of City Commercial Banks	1,519	0.0635	0.0232	0.0895	0.0000	0.0044	0.1012	0.4214

Table 3: Effect of Concentration. The table provides Probit estimations for the model,

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

and Tobit estimates with lower limit 0 and upper limit 1 for the model,

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

Constrained equals 1 if the firm's credit demand is positive, and equals 0 otherwise; Financing Gap Ratio is defined in Table 1; 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 a partnership, limited liability firm, and corporation, respectively, and equals 0 otherwise. All (other) variables are also defined in Table 1. SIZE and ROE are winsorized at the 1 and 99 percentile. Marginal effects are reported, and robust standard errors clustered at the city level are in parentheses, significance * at 10%, ** at 5%, *** at 1%.

Dependent Variable	Constrained		Financing Gap Ratio	
	(1)	(2)	(3)	(4)
	Probit	Probit	Tobit	Tobit
HHI	0.6309***		0.8581***	
	[0.237]		[0.255]	
CR3		0.3109**		0.3676**
		[0.135]		[0.167]
Size	0.0099*	0.0092	-0.0203**	-0.0218**
	[0.006]	[0.006]	[0.009]	[0.009]
Age	0.0025	0.0024	0.0025	0.0022
	[0.003]	[0.003]	[0.006]	[0.006]
ROE	-0.0364*	-0.0358*	0.0027	0.0030
	[0.021]	[0.021]	[0.034]	[0.034]
Partner	-0.0536	-0.0559	-0.1909**	-0.1956**
	[0.062]	[0.062]	[0.076]	[0.076]
Limited Liability	0.0324	0.0308	0.0522	0.0463
	[0.042]	[0.043]	[0.065]	[0.066]
Corporation	-0.0218	-0.0240	-0.0441	-0.0494
	[0.060]	[0.061]	[0.087]	[0.087]
Constant	–	–	0.9297***	0.8972***
	–	–	[0.221]	[0.250]
Industry Dummies	Yes	Yes	Yes	Yes
Regional Dummies	Yes	Yes	Yes	Yes
Observations	1,519	1,519	1,519	1,519
Pseudo R2	0.047	0.045	0.018	0.016

Table 4: Heterogeneity of the Effect of Concentration. The table provides Probit estimations for the model,

$$Constrained_i = \kappa_0 + \kappa_1 HHI_i + \kappa_2 HHI \times Market\ Share\ of\ Joint\ Stock\ Banks_i + \kappa_3 HHI \times Market\ Share\ of\ City\ Commercial\ Banks_i + \sum_l \lambda_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \varepsilon_i$$

and Tobit for the following model,

$$Financing\ Gap\ Ratio_i = \beta_0 + \beta_1 HHI_i + \beta_2 HHI \times Market\ Share\ of\ Joint\ Stock\ Banks_i + \beta_3 HHI \times Market\ Share\ of\ City\ Commercial\ Banks_i + \sum_l \gamma_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \varepsilon_i$$

Constrained equals 1 if the firm's credit demand is positive, and equals 0 otherwise; Financing Gap Ratio is defined in Table 1; HHI is the Herfindahl–Hirschman Index for all banks; Market Share of Joint-Stock Banks and Market Share of City Commercial Banks are defined in Table 1; 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 a partnership, limited liability firm, and corporation, respectively, and equals 0 otherwise. All (other) variables are also defined in Table 1. Marginal effects are reported, and robust standard errors clustered at the city level are in parentheses, significance * at 10%, ** at 5%, *** at 1%.

Dependent Variable	Constrained	Financing Gap Ratio
	(1)	(2)
	Probit	Tobit
HHI	1.0673***	1.4591***
	[0.332]	[0.336]
HHI × Market Share of Joint Stock Banks	8.4138*	14.4924**
	[4.874]	[6.079]
HHI × Market Share of City Commercial Banks	1.2616**	1.6667**
	[0.590]	[0.739]
Size	0.0125**	-0.0155*
	[0.006]	[0.009]
Age	0.0020	0.0014
	[0.003]	[0.005]
ROE	-0.0366*	0.0034
	[0.021]	[0.034]
Partner	-0.0403	-0.1669**
	[0.061]	[0.077]
Limited Liability	0.0378	0.0634
	[0.040]	[0.062]
Corporation	-0.0199	-0.0376
	[0.060]	[0.087]
Constant	–	0.6561***
	–	[0.238]
Industry Dummies	Yes	Yes
Regional Dummies	Yes	Yes
Observations	1,519	1,519
Pseudo R2	0.057	0.023

Table 5: Relationship Lending versus Price Effect: Heterogeneity of Firm Size and Age. The table provides Probit estimation for Constrained,

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

And Tobit estimation for Financing Gap Ratio,

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

Constrained equals 1 if the firm's credit demand is positive, and equals 0 otherwise; Financing Gap Ratio is defined in Table 1; 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 a partnership, limited liability firm, and corporation, respectively, and equals 0 otherwise. All (other) variables are also defined in Table 1. Marginal effects are reported, and robust standard errors clustered at the city level are in parentheses, significance * at 10%, ** at 5%, *** at 1%.

Dependent Variable	Constrained		Financing Gap Ratio	
	(1)	(2)	(3)	(4)
	Probit	Probit	Tobit	Tobit
HHI	-1.5676	0.4245	-1.5918	0.4080
	[1.158]	[0.462]	[2.130]	[0.550]
HHI × Size	0.1478*		0.1637	
	[0.077]		[0.135]	
HHI × Age		0.0286		0.0640
		[0.049]		[0.069]
Size	-0.0196	0.0099*	-0.0545*	-0.0202**
	[0.016]	[0.006]	[0.029]	[0.009]
Age	0.0024	-0.0034	0.0024	-0.0114
	[0.003]	[0.011]	[0.006]	[0.018]
ROE	-0.0361*	-0.0368*	0.0030	0.0017
	[0.021]	[0.021]	[0.034]	[0.034]
Partner	-0.0584	-0.0539	-0.1947***	-0.1911**
	[0.061]	[0.062]	[0.075]	[0.077]
Limited Liability	0.0282	0.0320	0.0479	0.0514
	[0.043]	[0.042]	[0.065]	[0.065]
Corporation	-0.0262	-0.0210	-0.0471	-0.0420
	[0.062]	[0.061]	[0.087]	[0.087]
Constant	–	–	1.4489***	1.0194***
	–	–	[0.494]	[0.249]
Industry Dummies	Yes	Yes	Yes	Yes
Regional Dummies	Yes	Yes	Yes	Yes
Observations	1,519	1,519	1,519	1,519
Pseudo R2	0.050	0.048	0.019	0.019

Table 6: Instrumental Variable (IV) Regressions. The table provides IV estimates. The equations for Constrained are as follows,

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

$$HHI_i = \alpha_0 + \alpha_1 \text{Average HHI of Neighboring Cities}_i + \sum_l \mu_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \omega_i$$

And the equations for Financing Gap Ratio are as follows,

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

$$HHI_i = \alpha_0 + \alpha_1 \text{Average HHI of Neighboring Cities}_i + \sum_l \mu_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \omega_i$$

Constrained equals 1 if the firm's credit demand is positive, and equals 0 otherwise; Financing Gap Ratio is defined in Table 1; HHI is Herfindahl–Hirschman Index for all banks; Average HHI of Neighboring Cities 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 a partnership, limited liability firm, and corporation, respectively, and equals 0 otherwise. All (other) variables are also defined in Table 1. Coefficients are reported, with robust standard errors clustered at the city level in parentheses, significance * at 10%, ** at 5%, *** at 1%.

Dependent Variable	Constrained			Financing Gap Ratio		
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	IV		OLS	IV	
		2nd stage	1st stage		2nd stage	1st stage
HHI	0.5264***	0.7031***		0.4396***	0.5695**	
	[0.186]	[0.246]		[0.129]	[0.272]	
Average HHI of Neighboring Cities			0.0033***			0.0033***
			[0.0004]			[0.0004]
Size	0.0108	0.0113*	-0.0018**	-0.0101*	-0.0097*	-0.0018**
	[0.007]	[0.007]	[0.0009]	[0.005]	[0.005]	[0.0009]
Age	0.0022	0.0023	-0.0005	0.0023	0.0024	-0.0005
	[0.003]	[0.003]	[0.0004]	[0.003]	[0.003]	[0.0004]
ROE	-0.0392	-0.0387	-0.0018	-0.0026	-0.0022	-0.0018
	[0.026]	[0.026]	[0.0025]	[0.019]	[0.018]	[0.0025]
Partner	-0.0635	-0.0614	-0.0114*	-0.1188***	-0.1173***	-0.0114*
	[0.063]	[0.062]	[0.0062]	[0.045]	[0.044]	[0.0062]
Limited Liability	0.0283	0.0318	-0.0190***	0.0280	0.0306	-0.0190***
	[0.043]	[0.043]	[0.0043]	[0.038]	[0.039]	[0.0043]
Corporation	-0.0229	-0.0206	-0.0097	-0.0314	-0.0296	-0.0097
	[0.060]	[0.060]	[0.0078]	[0.053]	[0.053]	[0.0078]
Constant	0.6634***	0.6085***	0.2812***	0.7678***	0.7274***	0.2812***
	[0.127]	[0.142]	[0.0205]	[0.124]	[0.146]	[0.0205]
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Regional Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,519	1,519	1,519	1,519	1,519	1,519
R2	0.044	0.043	0.060	0.039	0.039	0.060
First Stage F-Statistic	–	–	15.47***	–	–	15.47***
Cragg-Donald F-Statistic	–	–	182.20***	–	–	182.20***

Table 7: Nonlinear Effects of Banking Competition. The table provides Probit estimation for Constrained,

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

And Tobit estimation for Financing Gap Ratio,

$$Financing\ Gap\ Ratio_i = \beta_0 + \beta_1 HHI_i + \beta_2 HHI - Squared_i + \sum_l \gamma_{il} Control_{il} + \sum_j \theta_j Industry_j + \sum_k \varphi_k Region_l + \varepsilon_i$$

Constrained equals 1 if the firm's credit demand is positive, and equals 0 otherwise; Financing Gap Ratio is defined in Table 1; HHI is Herfindahl–Hirschman Index for all banks; HHI-Squared is the squared term of HHI; 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 a partnership, limited liability firm, and corporation, respectively, and equals 0 otherwise. All (other) variables are also defined in Table 1. Marginal effects are reported, and robust standard errors clustered at the city level are in parentheses, significance * at 10%, ** at 5%, *** at 1%.

Dependent Variable	Constrained	Financing Gap Ratio
	(1)	(2)
	Probit	Tobit
HHI	0.1896	-0.1727
	[0.914]	[0.547]
HHI-Squared	0.9355	1.8148**
	[1.774]	[0.717]
Size	0.0101*	-0.0198**
	[0.006]	[0.009]
Age	0.0025	0.0026
	[0.003]	[0.006]
ROE	-0.0364*	0.0030
	[0.021]	[0.034]
Partner	-0.0542	-0.1899**
	[0.061]	[0.077]
Limited Liability	0.0307	0.0506
	[0.042]	[0.065]
Corporation	-0.0227	-0.0436
	[0.060]	[0.086]
Constant	–	1.0513***
	–	[0.227]
Industry Dummies	Yes	Yes
Regional Dummies	Yes	Yes
Observations	1,519	1,519
Pseudo R2	0.047	0.019

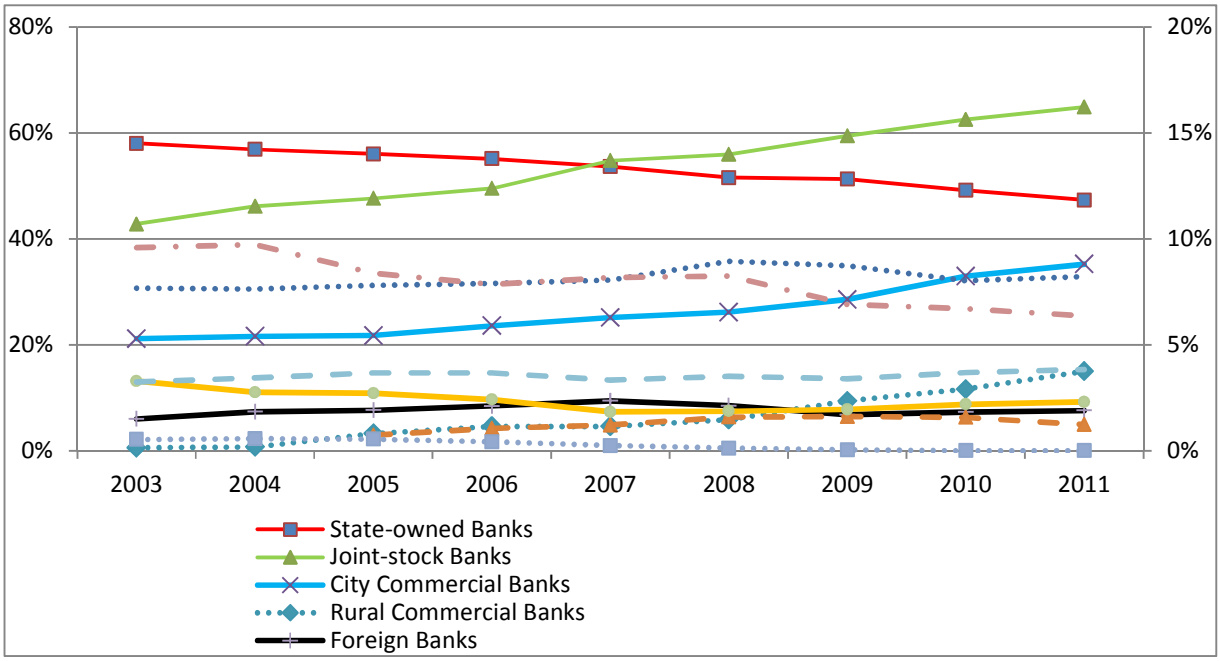

Figure 1: Market Share of Banks by Total Assets. State-owned banks' shares are displayed on the left Y-axis, and the shares for the other types of financial institutions are on the right Y-axis. Data Source: China Banking Regulatory Commission 2011 Annual Report.

Table A1: 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 from Bankscope.

Table A2: Survey Questionnaire.

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: Accounting Variables

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

Table A3: Number of Branches with Corporation Account 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