Do State-owned Banks Follow State-owned Enterprises? Evidence from Bank Branching Behavior in China

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Abstract:

Using a unique dataset on all branch offices of state-owned commercial banks in China over the period 2013-2017, this paper investigates the branching behavior of state-owned banks. After controlling for other factors that may affect branching decisions of commercial banks, we robustly find that Chinese state-owned banks follow state-owned enterprises (SOEs) in choosing branching locations. On the extensive margin, state-owned banks are more likely to expand and less likely to reduce the size of their branch networks in cities with higher shares of SOEs. On the intensive margin, if a state-owned bank chooses to increase (reduce) the number of its branches in a city, it tends to open more (close fewer) branches if the share of SOEs in the city is higher. We further prove that ownership bias should be the driving force behind this branching behavior of Chinese state-owned banks.

JEL classification: G210 G280 L220

Key words: State-owned bank; State-owned enterprise; Bank branching

Abbreviations used in this manuscript:

SOEs：state-owned enterprises

nonSOEs: non-state-owned enterprises

1. Introduction

State ownership of banks is large and pervasive around the world (La Porta et al.,2002). There is a large literature discussing the behavior of state-owned banks. It is documented that state-owned banks, rather than following commercial principles, tend to make biased lending decisions favoring SOEs and charge SOEs lower interest rates because of government interventions. Consequently, higher shares of state ownership in the banking sector can lead to slower subsequent financial development, lower economic growth, and lower growth of productivity.

This paper examines the behavior of state-owned banks in making branching decisions. Branching is one of the most important non-price aspects of conduct among commercial banks. The size and geographic distribution of branch network is crucial for a bank to provide financial services. In light of the ownership bias in lending of state-owned banks, do state-owned banks follow SOEs in choosing branch locations? Using a unique dataset on all branch offices of commercial banks in China over the period 2013-2017, this paper investigates the branching behavior of Chinese state-owned commercial banks. After controlling for other factors that may affect bank branching decisions, we find that Chinese state-owned banks are more likely to expand and less likely to reduce their branch networks in cities with higher share of SOEs. Furthermore, if a state-owned bank chooses to expand in a city, it tends to open more branch offices in the city if the share of SOEs in the city is larger. If a state-owned bank chooses to reduce the number of its branches in a city, it tends to close fewer branch offices if the city has a larger share of SOEs. These results suggest that state-owned banks do follow SOEs in making branching decisions. We further prove that ownership bias should be the driving force behind this branching behavior of state-owned banks.

This paper contributes to the literature on state-owned banks. The existing literature in this area has discussed the lending and pricing behavior of state-owned banks. But to our best knowledge, there is no research discussing the branching behavior of state-owned banks despite the crucial role of branch networks in the operation of commercial banks. Our paper is the first one to investigate this issue. The findings in this paper complement this line of literature and can improve our understanding of state-owned banks' behavior.

This paper also contributes to the literature on bank branching, which is surprisingly sparse. Some research discusses the real effect on economic growth of deregulation over bank branching in the U.S. during the 1980s and 1990s. However, rather than investigating how banks make branching decisions, this line of research takes the branching behavior of banks after deregulation as an explanatory variable or just describes the evolution patterns of bank branch networks. Very few papers discuss how commercial banks make branching decisions. This paper tries to fill this gap and focuses on the branching behavior of state-owned commercial banks.

This paper also contributes to the literature on Chinese banking sector. It's well documented that the Chinese banking sector is large but inefficient. There have been many studies discussing the lending behavior and performance of Chinese banks with a general result that state-owned banks lend more to SOEs and are less efficient than other types of banks. This paper, for the first time, investigates the branching behavior of state-owned Chinese commercial banks and finds that the state-owned banks do follow SOEs in making branching decisions, which have important policy implications.

The following of this paper includes eight sections. Section 2 provides a brief review of related literature while Section 3 describes the institutional background. Section 4 develops the empirical models and Section 5 describes the data and methodology used in the paper. Section 6 presents the main empirical results and discusses the interpretation. Section 7 implements some robustness tests. Section 8 further investigates the dynamics of bank branching at different hierarchical levels and in different subperiods. The last section concludes.

2. Literature review

This paper is related to the following three lines of literature.

2.1. The literature on state-owned banks

There is a very large literature on the behavior and consequences of state-owned banks. La Porta et al. (2002) finds that state ownership of banks is large and pervasive around the world and that higher state ownership of banks in 1970 is associated with slower subsequent financial development, lower economic growth, and lower growth of productivity. They argue that these results support the political theories of government ownership of firms, which argue that politicians use government-owned banks to pursue their own political objectives.

Later research provides some direct evidence on the politically motivated behavior of state-owned banks. With a across-country bank-level data, Dinc (2005) finds that state-owned banks increase their lending in election years relative to private banks. Khwaja and Mian (2005) show that politically connected firms receive more and risker loans from state-owned banks in Pakistan. Cole (2009) shows that the volume of agricultural lending by state-owned banks tracks the electoral cycle in India. Using data on Austrian municipal banks in the period 1990-1999, Halling et al. (2016) provide evidence that government-owned banks' lending to the government was used to transfer revenues from the banks to the government and such effects are particularly strong in localities where the incumbent politicians face significant competition for reelection. Sapienza (2004) finds that the interest rates charged by state-owned banks in Italy reflect the local power of the party that controls the banks. Dinc and Gupta (2011) find that politicians who face more political competition are less likely to privatize government-owned banks.

2.2. State-owned banks in the Chinese banking sector

The Chinese financial sector has been dominated by a very large banking sector, in which the five state-owned commercial banks[1] have been playing a dominant role. In contrast to the general finance-growth literature, many studies have documented a non-positive association between banking development and economic growth in China and attributed the low efficiency of the banking sector to the dominance of state-owned banks (Allen et al., 2005; Chang et al., 2010).

Some earlier studies provide evidence on the biased lending behavior of China's state-owned banks. For instance, Brandt and Li (2003) show that China's state-owned banks discriminate against private firms in their lending decisions. China's state-owned banks have experienced extensive corporatization reform since 2003. While the corporatization reform has improved the efficiency in allocating loans by state-owned banks (Ayyagari et al., 2010), there is still ownership bias and political intervention in these banks' lending process. With a survey data on Chinese firms in the year 2003, Firth et al. (2009) find that while Chinese state-owned banks extend loans to financially healthier firms and better governed firms, having the state as a minority owner also helps firms to obtain loans. Jiang and Zeng (2014) examine the leverage-investment link of publicly listed firms and find that state-owned banks in China impose fewer constraints on capital spending by firms with greater state ownership. Focusing on the risk-taking behavior of state-owned banks in China, Jia (2009) and Dong et al. (2014) find evidence that state-owned banks tend to take more risks than other banks, which is attributed to the severe political intervention and weak incentives to follow prudent procedure for state-owned banks.

Some papers provide direct evidence of government intervention in bank lending in

[1] The five state-owned banks are Industrial and Commercial Bank of China (ICBC), Agricultural Bank of China (ABC), China Construction Bank (CBC), Bank of China (BOC), and Bank of Communication (BCOM).

China. Using a provincial level data, Tan and Zhou (2015) demonstrate that bank credit displays an inverse U-shape with respect to the tenure of top provincial officials. These results suggest that local government officials indeed intervene in the credit allocation by banks to increase the likelihood of promotion for themselves.

Some articles investigate the consequences of these banks' biased lending and less prudent behaviors. It's generally found that state-owned banks are less profitable, are less efficient, and have worse asset quality than other types of commercial banks in China (Berger et al., 2009; Lin and Zhang, 2009).

2.3. Literature on bank branching behavior

2.3.1. The importance of bank branch networks

Bank branches represent the main interface between banks and customers. The size and geographic distribution of branch network are crucial for a bank to provide financial services. Despite the emergence of electronic delivery tools such as phone centers, ATMs and Internet banking, brick-and-mortar bank branches are still a key delivery channel for banks. As some operational activities such as fund transfers and account balance maintenance are now primarily provided through electronic channels, brick-and-mortar branches are becoming more focused on deposit collection and lending which require more human input. Therefore, Internet banking and other electronic devices complements brick-and-mortar branches (Onay and Ozsoz, 2013).

Bank branch networks play a decisive role for the provision of loans. Information collection and processing lie at the heart of banks' operation. By introducing branches in a certain geographical area, banks can better obtain and process borrower-specific information and thus maintain the quality of their loan portfolio (Kim and Vale, 2001; Bofondi and Gobbi, 2006). Jayaratne and Strahan (1996) document that the US deregulation on bank branching in the 1990s has led to improved loan monitoring and screening resulted from branch network proliferation. With data on Italian banks for the years 1995-2009, Coccorese (2012) find that a larger size of the branch network and hence a more widespread presence in the geographic area guarantees a larger demand for the bank's loans.

The scope and scale of branch network is a key determinant of the demand for a bank's deposit services (Hirtle, 2007). Large branch networks offer customers the convenience of many possible points of contact with the institution and potentially, the ability to avoid various usage fees by staying within the bank's own network. Therefore, depositors value geographic reach and local branch density when selecting a depository institution (Dick, 2008). The distance between bank branches and customers has a significantly negative impact on customers' decision to open a deposit account (Ho and Ishii, 2011). In fact, some studies use branch density in a market and the geographic diversification of branch networks as proxies to measure the quality of bank services (Dick, 2007).

Some studies find that geographic expansion allows for better risk diversification and thus reduce volatility of bank revenues (Goetz et al., 2016).

Of course, brick-and-mortar branches entail significant costs, such as staff compensation, and the cost of the building, that banks must cover through the revenues generated by these branch networks. Hirtle (2007) examines the data on U.S. bank networks during 1995-2003 and finds that there is a U-shaped relationship between the size of branch networks and retail businesses, but there is no systematic relationship between branch network size and overall institutional profitability.

2.3.2. How banks make branching decisions

Despite the strategic importance of branch networks for banks, there is surprisingly little literature identifying the fundamental factors that drive banks' branching decisions.

Two studies (Okeahalam,2009; Huysentruyt et al.,2013) focus on socio-economic factors affecting a bank's decision on the size of its branch network in a market. Both papers find that income level is one key factor with banks more likely entering wealthier neighborhood and exiting from poor counterparts.

A few studies discuss how competition among banks affects a bank's branching decision. Using panel data of banks from Norway in the period 1988-1995, Kim and Vale (2001) provides evidence that banks act strategically in their branching decisions, taking into consideration the future response from rival banks. By analyzing a dataset of 1882 concentrated rural markets in the U.S. in 2004, Cohen and Mazzeo (2010) focus on relationship between the competitive environment faced by depository institutions and their decisions regarding the size of their branch networks.

Two papers discuss the phenomenon of spatial clustering of bank branches. Chang et al. (1997) find that branch openings follow other existing branches even this hurts the profitability of new branches and conclude that herd behavior may be a factor in the branch location decision of banks. Qi et al. (2018) develop a theoretical framework in which banks rationally trade off the market-size and price-cutting effects of geographical bank clustering.

2.3.3. Literature on the branching behavior of Chinese banks

There are a few papers examining the impact of branch networks using data on Chinese banks. Wang et al. (2012) and Cai (2016) look at the impact of geographical expansion on the performance of non-state-owned Chinese banks. They find that geographic expansion has some positive impact on bank performance by reducing the risk of bank assets, enlarging interest margin, improving income composition, and increasing market share, but does not influence the profitability of these banks. To our best knowledge, there is no research discussing how Chinese banks make branching decisions.

3. Institutional background

3.1. The five state-owned banks in the Chinese banking sector

The Chinese banking sector consists of six categories of banking institutions, the five state-owned commercial banks, 12 joint-equity commercial banks, 130 city commercial banks, foreign banks, rural banking institutions, and other banking institutions. The five state-owned banks have been dominating the Chinese banking sector. In late 1980s and early 1990s, the five state-owned banks accounted for more than 90% of total deposits and total loans of the whole banking system. At the end of 2013 when our sample period began, the market share of these five banks was still 50.4% in terms of deposits, 55.6% in terms of loans, and 47.3% in terms of total assets[2].

The four largest banks (ICBC, ABC, CBC, BOC) were created as fully state-owned in the 1980s. The fifth largest banks (BCOM), which was set up in 1987, was initially designed as a joint-equity bank but the central government directly owned more than 50% shares of BCOM and thus had a full control over BCOM's operation. After China's entry into WTO in 2001, the central government implemented a corporatization reform upon the five state-owned banks so as to transform them into real commercial banks. The government divested NPLs from and injected new capital into these banks, and then converted them into corporations and introduced strategic foreign investors, and publicly listed them on stock exchanges. However, these banks are still tightly controlled by the central government. Table 1 shows the ownership structure of 17 major commercial banks as of the end of year 2015. Completely different from the 12 joint-equity commercial banks, 82.3%, 71.7%, 66.6%, 57.3%. and 40.4% of shares of ABC, ICBC, BOC, CBC, and BCOM are directly controlled by the central government.

The direct control by the central government can have essential impacts on banks' behavior. China's central government probably continue to exert a strong influence over the operation of the five state-owned banks via various means. First, the board of directors of these banks and the senior bank officers are generally directly appointed by the Communist

[2] Calculated by authors with data from Almanac of China's Finance and Banking (2014).

Party Organization Department, and usually come from the central government or Party agencies. Second, the career opportunities for senior bank officers largely depend on the assessments of the government agencies responsible for their appointment, which make them more responsive to the wishes of the central government than to the interests of the shareholders of the bank. Third, the central government agencies such as the central bank (PBOC) and China Banking Regulatory Commission (CBRC) will exert direct pressure on the bank officials to provide loans and services to specific projects. Therefore, the strategies and operations of central government-controlled banks are more likely to be subject to political intervention.

Table 1 inserted here

3.2. Government regulations on bank branching

Branching activities of commercial banks in China were tightly regulated by the government till the year 2013. Here we focus on the regulations on banks with national operation licenses, i.e. the five state-owned banks and 12 joint-equity banks. Other types of domestic commercial banks were designed as local banks and have been rarely allowed to set up branches in places other than their home provinces. The branching regulations can be classified into four categories: first, locations where a bank can set up new branches; second, the number of branches a bank can set up each year; third, requirements on operating funds for each branch; fourth, prudential conditions such as capital adequacy ratio, NPL ratio, etc..

Before 2009, a domestic commercial bank could set up a new subbranch (Zhihang)[3] in a city only if the bank had already had a tier-one branch or a higher-level office with good performance in the same prefecture-level (or above) city for at least one year. Each

[3] For the large commercial banks in China, there are usually five organizational layers: the headquarter, tier-one-branches, tier-two-branches, subbranches (Zhihang), and local outlets. Smaller banks usually have fewer layers, usually without local outlets below the subbranch level.

commercial bank was permitted to set up at maximum 3 tier-one branches each year; each bank could set up only one subbranch in a city each year. The requirements for operating funds were 10 million Yuan for a subbranch and 100 million Yuan for a tier-one branch; total amount of operating funds of all branches of a bank should not exceed 60% of the bank's own capital.

In 2009, branching by medium-sized and small commercial banks was partially deregulated by CBRC. In 2013, regulations over branching are further relaxed for all domestic commercial banks. A commercial bank can set up subbranches in any place in a province as long as the bank has already had a tier-one branch within the province; there is no restriction on the total number of new subbranches the bank can set up in a city each year; there are no specific requirements for operating funds of each branch.

The deregulation on bank branching in 2013 provides us a nice window to observe domestic banks' branching behavior. Instead of being based on commercial principles, since their very beginning, the five state-owned commercial banks had established branches at various levels throughout mainland China according to the administrative structure of the government. Each of the five banks had one tier-one branch in each province and more tier-two branches and subbranches, and some banks had local outlets at lower administrative levels. They closed some of their lower level branches at the end of 1990s and during their corporatization reform in 2000s. But setting up new branches had been tightly regulated by the government. After deregulation, these banks are able to restructure their branch networks by adjusting their geographic spread among different cities and changing the branch densities in each local market. It would be interesting to observe how these banks make their branching decisions.

4. The empirical model

4.1. The baseline model

How would a commercial bank make decisions about the geographic distribution of its branch network? For a bank fully following commercial principles, in making such decisions it should balance the benefits against the costs of setting up and operating a branch in the target local market. Therefore, factors that affect the bank's costs and benefits of operating a branch should be included as explaining variables in our empirical model.

Since branch network is the key distribution channel of bank retail businesses, factors affecting the demand for bank retail businesses should influence the potential revenues of the entering bank branch. Demographic factors such as the size, density, and composition of population should be important variables. Therefore, we use the size of population (*population*) and the density of population (*density*) as independent variables in our model. Economic factors, such as income level, economic structure, activity of small businesses, should have significant impact on the demand for bank retail services. So we include GDP per capita (*gdppc*) and a variable measuring economic structure (*econstruc*). Unfortunately, we do not have data to measure the activity of small businesses in the local market.

Opening and operating a bank branch is costly. In addition to some fixed setup costs, direct operating expenses include staff compensation, the cost of building, expenses on electricity and supplies, etc. Therefore, such factors as labor cost and housing rents in the local area may also affect the branching decisions of the bank.

The revenues received by a bank branch are affected by the development and competition of the banking sector in the local market. As reviewed in Section 2, previous research documents some spatial clustering phenomenon with banks tending to enter local markets where there are already other bank branches. We include in our model a variable proxying banking development (*findev*) and another variable, *HHI,* which describes the competition environment of the local banking market.

Furthermore, a bank may optimize its branching network as part of its overall business strategy involving both branch-based and non-branch-based activities. Different banks may adopt different branching strategies. To capture the heterogeneity of individual banks, we include a dummy variable for each individual bank in the model.

In addition to the above factors that could affect the branching decision of all commercial banks, we also include some variables that are of Chinese characteristics. One such variable is associated with the level of the city in the administrative hierarchy system. We include a dummy variable, *bigcity*, which takes the value of 1 if the city is a provincial capital or one of the four municipalities[4]. Banks may want to open branches in such cities so as to be close to policy makers.

Last but not the least, how may state-owned banks behave differently from other commercial banks in making branching decisions? The large literature reviewed in the previous section suggest that the government tend to intervene in the operation of state-owned banks and consequentially state-owned banks behave biasedly in both pricing and lending decisions. It should be conceivable that the Chinese state-owned banks may also behave differently from other commercial banks by being more willing to operate branches in cities with more state-owned enterprises. This is the main hypothesis of this paper. To test this conjecture, we include in our model a variable (*SOE)* to reflect the importance and activity of state-owned enterprises.

Based on the above discussions, we set up our baseline empirical model as follows:

$$\begin{aligned} Y_{ij} = f\,(&SOE_j, population_j, density_j, gdppc_j, econstruc_j, findev_j, \\ &HHI_j, bigcity_j, branch0_{ij}, bank_i) \end{aligned} \qquad ①$$

In the model, Y_{ij} is one of the four dependent variables, which will be explained in detail later. Among the independent variables, $population_j$ is defined as the logarithm of total population in city j. And $density_j$ is the population density of city j, measured by the population per square kilometers. $gdppc_j$ is defined as the logarithm of GDP per capita in city

[4] The four municipalities include Beijing, Shanghai, Tianjin, and Chongqing.

j. The variable to describe the economic structure, $econstruc_j$, is measured by the share of secondary industry in GDP in city j. It is predicted that banks should be more willing to open new branches or less willing to close branches in cities with larger population, higher population density, and larger share of secondary industry. A larger value of GDP per capita may increase the possibility of bank presence or entry by providing a large demand for banking services; but larger GDP per capita may also reflect higher labor cost for banks.

The level of financial development, $findev_j$, is measured by the ratio of total loans outstanding of the whole banking sector in city j to GDP of the same city. We use Herfindahl-Hirschman index (HHI) as a proxy for banking competition in the local market. The HHI index is constructed as $HHI_j = \sum_{n=1}^{17} \left(L_{nj} / (\sum_{n=1}^{17} L_{nj}) \right)^2$. Here L_{nj} is the number of branches of bank n in city j. The five state-owned banks and 12 joint-equity commercial banks are included in calculating HHI index. The banking sector in a city with higher value of HHI index is less competitive.

$bank_i$ is a dummy variable for each bank in the sample. And $branch0_{ij}$, defined as the logarithm of 1 plus total number of branches of bank i in city j in the initial year, is used to control the initial size of the branch network of bank i in city j.

The variable in which we are most interested is the activity of state-owned enterprises in city j. This variable is measured in two ways. One is SOE_j, the assets owned by state-owned and state-controlled industrial enterprises as a share of total assets of all industrial enterprises above designed size in city j. Another is $nonSOE_j$, an index reflecting the development of the non-state-owned sector in city j, which is calculated by Wang and his coauthors (Wang et al., 2016). A higher value of $nonSOE_j$ represents a lower level of activity of state-owned enterprises in city j.

4.2. Presence of bank branches

As the first step, we will look at the presence of bank branches as of the end of year

2017. The dependent variable is $branch_{ij}$, the total number of branches of bank i in city j at the end of year 2017. Therefore, the first model that we will estimate is

$$Branch_{ij} = f_{presence}(SOE_j, population_j, density_j, gdppc_j, econstruc_j, findev_j, HHI_j, bigcity_j, bank_i) \quad ②$$

4.3. Dynamics of bank branching behavior

While the model ② can help us to get a snapshot of bank branch networks, it suffers endogeneity problems. Because the current branch network of a bank has been built over all the years since its creation in the early 1980s, almost all the explaining variables in the right-hand side of model ② can be endogenous. For instance, income level of each city is certainly affected by the development of bank branch networks as the finance-growth literature generally concludes that financial development can exert positive impact on economic growth (Levine, 2004). In order to get a clearer understanding of how a bank make branching decisions, we focus on the dynamics of bank branching behavior. In doing so, we further decompose our analysis into three steps.

4.3.1. The expansion decision of banks

We first look at patterns whether a bank chose to increase, make no change to, or reduce the size of its branch network in a city over the sample period from 2013 to 2017. In this case, the dependent variable is a limited variable E_{ij}. Here E_{ij} takes the value of 1 if bank i chose the "exit" option, reducing the number of its branches in city j over the sample period; it takes the value of 2 if there was no change in the number of branches of bank i in city j over the sample period; and it takes the value of 3 if bank i choses the "entry" option, increasing the size of its branch network in city j over the sample period. So, the empirical model is as follows.

$$E_{ij} = f_e(SOE_j, population_j, density_j, gdppc_j, econstruc_j, findev_j, HHI_j, bigcity_j, branch0_{ij}, bank_i) \quad ③$$

4.3.2. How many branches are opened?

Then, we use model ④ to investigate how many new branches the bank opened if the bank chose to increase the total number of its branches in a city. Here the dependent variable is the increase in the number of branches of bank i in city j, calculated by subtracting the number of branches of bank i in city j in 2013 from the number of branches of bank i in the same city at the end of 2017.

$$\begin{aligned} Enter_{ij} = f_{enter}(&SOE_j, population_j, density_j, gdppc_j, econstruc_j, findev_j, \\ &HHI_j, bigcity_j, branch0_{ij}, bank_i) \end{aligned} \qquad ④$$

4.3.3. How many branches are closed?

As the last step, we examine how many branches the bank closed if the bank chose to reduce the number of its branches in a city. In model ⑤, the dependent variable is minus one times the change in the number of branches of bank i in city j over the sample period.

$$\begin{aligned} Exit_{ij} = f_{exit}(&SOE_j, population_j, density_j, gdppc_j, econstruc_j, findev_j, \\ &HHI_j, bigcity_j, branch0_{ij}, bank_i) \end{aligned} \qquad ⑤$$

5. Data and methodology

5.1. Data

The data on bank branches comes from China Banking Regulatory Commission. We have collected detailed information, such as full name, address, and opening date, etc., for all branch offices of all banking institutions for the years 2012, 2013, 2015, 2016, 2017. With this data, we are able to obtain the total number of branches of each bank in each of the 287 cities at the prefectural level and above in China. We also doublecheck the branching information in the annual reports of banks. The data on cities are collected from China City Statistics Yearbooks. The data on *SOE* comes from National Bureau of Statistics of China. And we got the data on *nonSOE*, the index of development of the non-state-owned sector, from the publicly published report titled as “Marketization Index of China’s provinces: NERI report 2016" (Wang et al., 2016). Notice that there is no data on the share of state-owned sector at the prefectural city level, so we have to use the data on the share of state-owned sector at the provincial level as a proxy[5]. The same is also true for *nonSOE* because Wang et al. (2016) only report data on the development level of the non-SOE-sector at the provincial level.

Table 2 report the summary statistics of our main variables. On average, each state-owned commercial bank operates 45 branches in each prefectural city. But there is huge variation in the total number of branches, with a minimum of zero and a maximum of 566, and the standard deviation is 56. For those cases in which the bank chose to increase the number of branches in a city, the average number of new branches is 3 per city with a standard deviation of 4.5. And for those cases in which the bank chose to close branches, the average number of closed branches per city is 3.4 while the standard deviation is 4.0. For all the three dependent variables, variances are larger than their means, which has very important implications for our estimation methods as discussed later.

Table 3 presents the number of cities, in which each state-owned bank expanded its branch network, reduced the number of its branches, or kept the total number of branches unchanged over the sample period. Banks exhibited very different branching behavior. Industrial and Commercial Bank of China (ICBC) chose to reduce the size of its branch network in 225 cities, keep it unchanged in 52 cities, and increase it in 10 cities. Bank of China (BOC) reduced the number of its branches in 72 cities, kept it unchanged in 159 cities, and increased it in 56 cities. The number of branches of Agriculture Bank of China (ABC)

[5] We have managed to collect some firm level data and aggregated them at the prefectural city level and then calculated the asset share of state-owned and state-controlled industrial enterprises in each city. Using this new proxy for *SOE,* the regression results are similar. But because there are missing observations in the firm level data, this new proxy for *SOE* probably suffer measurement errors, the seriousness of which is uncertain. Therefore, we choose to use the share of state-owned sector at the provincial level as a proxy for the variable *SOE* in our regressions.

fell in 34 cities, did not change in 162 cities, and increased in 91 cities. China Construction Bank (CCB) and Bank of Communications (BOCM) were more aggressive in expanding their branch networks. CCB increased the number of its branches in 123 cities and closed branches in 39 cities while BOCM opened new branches in 179 cities and reduced the size of its branch network in only 17 cities.

Table 2 and Table 3 inserted here

5.2. Methodology

Model ② is designed to identify determinants of the presence of state-owned banks' branches among all the cities at the prefecture level and above. Because the dependent variable, $Branch_{ij}$, the total number of branches of bank i in city j, is a non-negative integral, we first apply Poisson Regression to estimate this model. However, the equidispersion condition that Poisson model requires is violated in our data, as Table 2 shows, we thus apply Negative Binomial-2 (NB2) model to accommodate the overdispersion issue.

Model ③ is used to analyze determinants of banks' entry/exit decisions. In this model, the dependent variable is a limited variable E_{ij}. It takes the value of 1 if bank i chose the "Exit" option, reducing the number of its branches in city j over the sample period; it takes the value of 2 if there was no change in the total number of branches of bank i in city j; and it takes the value 3 if the bank i chose the "Entry" option, increasing the total number of its branches in city j. Considering the ordering nature of dependent variable, we apply Ordered Logit Regression to estimate model ③.

The model ④ and model ⑤ further investigate how many branches the bank opened if it chose $E_{ij} = 3$ and how many branches the bank closed if it chose $E_{ij} = 1$. $Enter_{ij}$ is left truncated at zero in our sample because $Enter_{ij}$ can be observed and take positive values only when E_{ij} is equal to 3. Similarly, $Exit_{ij}$ is also left truncated at zero because $Exit_{ij}$ can be observed and take positive values only when E_{ij} is equal to 1. For truncated samples of count data, Truncated Poisson model or Truncated Negative Binomial model are often proposed (Grogger and Carson,1991). But one vital property of Truncated Poisson model is the conditional variance equal to the conditional mean in the full sample, which does not hold in our data. Instead, the Truncated Negative Binomial model relaxes the restriction allowing the conditional variance exceeds conditional mean. So we apply Zero-truncated Negative Binomial Regression model to estimate model ④ and model ⑤.

6. Empirical results

6.1. SOEs and presence of state-owned-bank branches

Table 4 shows the estimated coefficients of model ②. The dependent variable is $branch_{ij}$, the total number of branches of bank i in city j at the end of the year 2017.

As expected, the coefficients of most economic and demographic variables are significant. These banks tend to operate more branches in cities with a larger population and higher GDP per capita. But a surprising result is significantly negative coefficient for the economic structure variable, *econstruc*, which is measured as the share of secondary industry in the GDP. Both *findev* and *HHI*, the two variables measuring the development and competition of the banking sector in city j, are significant. Positive coefficient of *findev* suggests that these state-owned banks tend to have more branches in cities with more developed banking sector. And the negative coefficient of *HHI* suggests that clustering phenomenon indeed exists.

The variables of most interest in this paper, *SOE* and *nonSOE*, are two measures of the activity of state-owned enterprises in city j as of the year 2013. A higher value of *SOE* and a lower value of *nonSOE* mean a large share of state-owned enterprises in city j. In column (3), the coefficient of *SOE* is significantly positive, suggesting that state-owned banks tend to have more branches in cities with a larger share of SOEs in the economy. Consistently, in column (4), the coefficient of *nonSOE* is significantly negative, suggesting that these five state-owned banks tend to have fewer branches in cities with a more active private sector. These results suggest that, after controlling for all the economic, demographic factors and the development of banking sector, the state-owned banks operate more branches where there are more active SOEs.

The key problem with Table 4 is that most of the explanatory variables can be endogenous because the branches existing at the end of the year 2017 had been set up over all the years since early 1980s. To deal with this potential endogeneity problem, we now turn to the next three models in which the dependent variables are constructed based on the change in the number of branches over the period 2013-2017 and the explanatory variables are for the year 2013.

Table 4 inserted here

6.2. SOEs and state-owned banks' expansion dynamics

Table 5 presents the estimated coefficients of model ③. The dependent variable, E_{ij}, takes the value of 1 if bank i chooses the "exit" option by reducing the number of its branches in city j; it takes the value of 2 if there is no change in the number of branches of bank i in city j ; and it takes the value 3 if the bank i chooses the "entry" option, increasing the number of its branches in city j. The coefficients for *population* and *gdppc* are significantly positive, showing that banks do expand their branch networks in cities with a larger population and higher income level. The coefficient of *bigcity* is also significantly positive while that of *HHI* is significantly negative. The coefficient of the initial number of branches of bank i in city j, *branch0,* is significantly negative. But the coefficients for *density*, *econstruc, findev* are not significant anymore. In column (3), controlling for all those economic and demographic factors and banking development, the coefficients of *SOE* is significantly positive; consistently, the coefficients of *nonSOE* in column (4) is significantly negative.

Table 6 reports the marginal effects of variables based on the regression results in column (3) and column (4) of Table 5, which include the full set of explanatory variables.

The columns (1)-(3) of Table 6 show the marginal effects of *SOE* and other explanatory variables. The marginal effect of *SOE* in the third column is significantly positive at 0.418, meaning that the predicted probability for a state-owned bank to choose the “entry” option ($E_{ij} = 3$) significantly increases by 6.98 percentage points as *SOE* increases by one standard deviation (0.17) at the means of explanatory variables. The marginal effect of *SOE* in the first column is -0.37, meaning that the predicted probability for a state-owned bank to choose the “exit” option ($E_{ij} = 1$) significantly decreases by 6.18 percentage points as *SOE* increases by one standard deviation (0.17) at the means of explainable variables. Notice that the frequency of “$E_{ij} = 1$” is 26.97% and that of “$E_{ij} = 3$” is 31.99% in the whole sample.

The column (4)-(6) of Table 6 show the marginal effects of *nonSOE* and other explanatory variables. The marginal effect of *nonSOE* in the last column is significantly negative. The marginal effect of -0.026 means that the predicted probability for a state-owned bank to increase the total number of its branches in a city significantly decreases by 4.99% as *nonSOE* increases by one standard deviation ((1.92) at the means of explainable variables. The column (4) of Table 6 shows the marginal effect of *nonSOE* at 0.023, meaning that the predicted probability for a state-owned bank to reduce the number of its branches significantly increases by 4.42% as *nonSOE* increases by one standard deviation (1.92) at the means of explainable variables.

We also calculate marginal effects of other control variables as shown in Table 6. The initial size of branch network of bank i in city j has the largest impact on the entry dynamics of the bank. If the initial number of branches of a bank in a city increases by one standard deviation (1.31), the probability for the bank to open new branches in the city is reduced by 20.47% and the probability for the bank to close branches in the city will increase by 18.11%. The size of population and GDP per capita also have large marginal effects. One standard deviation increase in population will increase the probability of choosing “entry” option by 12.52% while reducing the probability of choosing “exit” option by 11.08%. If GDP per capita in a city increases by one standard deviation, the probability of bank “entry” will increase by 3.66% and the probability of bank “exit’ would decrease by 3.22%. Furthermore, banks are more likely to open new branches and less likely to close branches in provincial capitals or municipality cities. Banks tend to increase the size of their branch networks in cities with a more competitive banking sector and reduce the size of their branch networks in a city with a monopolized banking sector.

Table 5 and Table 6 inserted here

6.3. SOEs and state-owned banks' branch growth

Table 7 reports coefficients and associated marginal effects of model ④ estimated with truncated NB2 regression. The dependent variable, $Enter_{ij}$, is the increase in the number of branches of bank i in city j if bank i chooses “entry” option in the first stage. Columns (1)-(4) report the estimated coefficients of Model ④ and columns (5)-(6) report the corresponding marginal effects.

In columns (1)-(4) of Table 7, the demographic economic factors are significantly positive, which shows that the five state-owned banks set up more branches in cities with favorable economic fundamentals, especially those with larger population, higher population density, higher GDP per capita. Also, banks tend to open more new branches in cities with better financial development. The coefficients of *branch0* and *HHI* are not significant. In column (3), *SOE* is included in the regression and the coefficient of *SOE* is significantly positive, suggesting that state-owned banks tend to open more branches in cities with more active SOEs. In column (4), *nonSOE* is included with a significantly negative coefficient, which are consistent with results in column (3).

To fully understand the estimation results, we also present the marginal effects of key explanatory variables in columns (5)-(6). Note that the marginal effects are calculated at the means of explanatory variables and based on the estimates in column (3) and column (4). Other things equal, the number of branches will increase by 0.7 if the size of population increases by one standard deviation. The marginal effect of GDP per capita on the increase in the number of bank branches is about 0.5. If financial development level increases by one standard deviation, the number of bank branches increases by about 0.25. The marginal effect of *SOE* is about 0.44, meaning that the number of bank branches will increase by 0.44 if the share of state-owned enterprises increases by one standard deviation. As a reference, the sample mean of the increase in the number of bank branches, $Enter_{ij}$, is 3.

Table 7 inserted here

6.4. SOEs and state-owned banks' branch closure

Table 8 presents the regression results of model ⑤ with Truncated NB2 method. The dependent variable, $Exit_{ij}$, is the decrease in the number of branches of bank i in city j if bank i chooses to reduce the size of its branch network in city j at the first stage. Columns (1)-(4) report the estimated coefficients of Model ④ and columns (5)-(6) report the corresponding marginal effects.

In Table 8, the coefficients of *branch0* are significantly positive and economically large, which shows that the state-owned banks close more branches in cities where their initial branch networks are larger. The marginal effect of *branch0* is also very large, one standard deviation increase in *branch0* is associated with a marginal effect of 2.88. The size of *population* is significantly negative, suggesting that banks tend to close fewer branches in cities with larger populations. On average, if *population* increases by one standard deviation, the number of closed branches will be reduced by 1.4. While the coefficients of *HHI* are not significant, the coefficients of *findev* are significantly negative, which shows that state-owned banks close more branches in cities with low level of financial development. After controlling for those economic, demographic, and financial factors, the coefficients of *SOE* are significantly negative. This result suggests that the state-owned banks close fewer branches in cities with a larger share of SOEs. And the marginal effect is about -0.32. Notice that the sample mean of "Exit" is 3.39.

Comparing results in Table 8 and those in Table 7, we can see that the driving forces of the bank's expansion and closure decisions are not symmetric. GDP per capita and population density have significant impact on state-owned banks' decision to open new branches but little impact on their decision to close existing branches. On the other hand, the initial size of a bank's branch network in a city has very large impact on a bank's decision to close existing branches but no noticeable impact on the bank's expansion. The size of population and financial development level have significant impact on both types of decisions. Interestingly, the magnitude of the impact of *SOE* on the bank's decision to close existing branches is similar to that on its decision to open new branches.

Table 8 inserted here

6.5. Interpretation of the main results

The above empirical results have established that the share of SOEs is one driving force affecting the branching decision of the five state-owned banks. On the extensive margin, these state-owned banks are more likely to expand and less likely to reduce their branch networks in a city with a larger share of SOEs, all else equal. On the intensive margin, given that the bank chooses to expand in a city, the bank tends to open more branches in the city if the city has a larger share of SOEs; given that the bank chooses to reduce the branch network in a city, the bank tends to close fewer branches in the city if the share of SOEs in the city is larger.

Then how to interpret these results? Our interpretation is that state-owned banks follow SOEs in order to better serve these customers because of ownership bias or government interventions. But a possible alternative interpretation is that state-owned banks follow SOEs because SOEs are better customers, being less risky or more profitable, or having more collateral than private enterprises in the Chinese economic environment.

To investigate whether the alternative interpretation is plausible, we collect aggregated data on industrial firms above designed size[6] over the period 2012-2016. Fig.1 compares the performance of state-owned enterprises and that of non-state-owned enterprises. Panel A shows the profitability (measured by ROA, defined as total profits / total assets) of SOEs and non-state-owned enterprises. Both groups of firms experienced a decline in profitability, but SOEs were always much less profitable than non-state-owned enterprises over this period, with ROA of SOEs being 5 percentage points lower. Panel B shows the percentage of loss-making firms in each group of enterprises. About 25% of SOEs were making losses while only about 10% of non-state-owned enterprises were loss-making firms. Panel C presents the debt ratios, defined as total liabilities divided by total assets, of these two groups of firms. While the debt ratio of non-state-owned enterprises declined from 55.7% in 2012 to 52.3% in 2016, the debt ratio of SOEs stayed above 61% over this period. The gap between the debt ratios of these two groups of firms were enlarging. With SOEs being less profitable and more likely to make losses and bearing higher debt burdens, it is unlikely that state-owned banks follow SOEs because of profitability reasons.

Fig.1 inserted here

A very recent paper by Zhong, et.al (2016) provides similar results with firm level data on all the manufacturing enterprises above designed size in China over the period 1998-2013, most of which are not publicly listed enterprises. Their paper analyzes the leverage patterns of different types of firms in China and find that leverage ratios of SOEs have been much higher although SOEs have been less profitable than other types of firms over those years.

6 All industrial firms with annual sales greater than 20 million Yuan.

Indeed, SOEs tend to operate in more capital-intensive industries and thus have more collateral. However, with more rigorous econometric analysis, they find that after controlling for collateral level, riskiness, profitability, tax shields, firm size, leverage ratio of SOEs are still significantly higher than that of private enterprises, suggesting that SOEs have received a disproportionately large share of credit from the banking system compared to other types of firms, implying ownership bias in banks' lending decisions. In addition, studies on zombie firms in China have found that SOEs are more likely to become zombie firms than private firms and foreign firms in China (Shen and Chen, 2017; Tan, et. al, 2017).

Next, we do an indirect test by comparing the branching behavior of the five state-owned banks with that of other commercial banks. The idea is that, if SOEs were better customers than private enterprises, then other commercial banks should also follow the footprints of SOEs. We rerun the regressions of model ② and model ③ for a larger group of banks, including both state-owned banks and twelve shareholding commercial banks which have been permitted to branch nationwide. We include in the regressions a new dummy variable, *SOB*, and its interaction term with the variable *SOE*. Here *SOB* takes a value of 0 for the twelve shareholding commercial banks and 1 for the five state-owned banks. Table 9 presents the regression results. Columns (1) and (2) are results for model ② and columns (3) and (4) list results for model ③. The coefficients of the share of state-owned enterprise~~s~~, *SOE*, are significantly negative while its interaction with *SOB* is significantly positive with a much larger magnitude. The coefficients of the development level of non-state-owned sector, *nonSOE*, are significantly positive while the interaction term of *nonSOE* and *SOB* is significantly negative. Therefore, it is the state-owned banks that follow SOEs when making branching decisions; other shareholding banks tend to reduce the number of branches in cities with more SOEs.

Table 9 inserted here

Another possible interpretation is the size specialization hypothesis. After the restructuring process of the state-owned sector initiated at the end of 1990s, in which smaller SOEs were sold to private owners while large SOEs are retained in the hands of the government, SOEs that survived this restructuring process are mostly of large size. The pattern of SOBs following SOEs in branching might be evidence that large banks serve large firms. Unfortunately, due to lack of data, we are unable to empirically test the ownership bias hypothesis against the size specialization hypothesis in the framework of this paper. But in light of the findings in the literature on Chinese banking sector, we believe that the ownership bias should be at work, even the size preference of banks exists, as discussed in Lin et al. (2015). Furthermore, studies like Zhong et al. (2016) find that, state ownership is still a significant determinant of firm's leverage ratio even controlling for other factors including firm size. We will leave this task for future research.

7. Robustness tests

In this section, some robustness tests are presented. First, we recheck the results if Bank of Communications (BCOM) is not treated as a state-owned bank. Second, we will check whether the key results hold when different measures of banking competition are included. Third, we rerun all the regressions with different measures of population. Fourth, the regressions are rerun with four municipalities excluded from the sample. Last, we recheck whether the results are driven by some outliers.

7.1. Four state-owned banks

In the previous discussions, we include ICBC, ABC, BOC, CBC, and BCOM as state-owned banks in our sample, based on the ownership structure of commercial banks as listed in Table 1. The Bank of Communications (BCOM) is a special case compared to the other four banks. More than 50% of shares in each of ICBC, ABC, BOC, and CBC are in the hand of the central government of China. The share structure of Bank of Communications

(BCOM) is relatively more dispersed, although still 40.4% of its shares are directly held by the central government, contrasting itself to other sharing holding commercial banks. In this subsection, we exclude BCOM from the sample of state-owned bank and rerun the regression of models. As reported in Panel 1 of Table 10, the key regression results are very similar to those in Table 5, Table 7, and Table 8.

7.2. Different measures of banking competition

In the previous section, we use the Herfindahl-Hirschman index as a proxy for banking competition in the local market. In this subsection, we deploy another proxy for banking competition, *competition*, which is the average number of branches of banking institutions per 10000 people in each city. The idea to construct this variable is that when there are more bank branches in the local market, there should be more competition among bank branches. Panel 2 of Table 10 reports the coefficients of model ③, ④, and ⑤ with the new measurement of banking competition, *competition*. The main results are very similar to those in Table 5, Table 7, and Table 8.

7.3. Different measures of population

In China, there are two types of data on population, registration population (Huji population) and permanent resident population (Changzhu population). Registration population of each city is counted based on Hukou Registration, including all people whose Hukou are registered in the city; permanent resident population of each city include people who live in the city for more than half year but whose Hukou may or may not be registered in the city. In the previous analysis, the demographic variables are measured with permanent resident population. In this subsection, we rerun all the regressions with population variable measured by registration population. The major regression results are listed in Panel 3 of Table 10. The results in the first four columns are similar to those in Table 5 and Table 7 while the coefficients of *SOE* and *nonSOE* in the last two columns are less significant than that in Table 8.

7.4. Regressions with four municipality cities excluded

We also rerun the regressions with the four municipalities (Beijing, Tianjin, Shanghai, Chongqing) excluded from the sample cities. The four municipalities are at provincial level and attract much more bank branches than prefecture-level cities. SOEs are also rather active in these four municipalities, with SOEs accounting for about 73% of total assets of industrial enterprises in Beijing and profitability of state-owned industrial firms being higher than that of non-state-owned firms in Shanghai. To exclude the possibility that the main results are driven by these four municipalities, we rerun all the regressions with the four municipalities excluded from the sample. Panel 4 of Table 10 summarizes these results, which are very similar to the main results in the previous section.

7.5. Regressions with outliers excluded

In the full sample, there are two outliers. The total number of branches of Construction Bank of China (CBC) in Shenzhen city increased by 67 over the period 2013-2017. Agricultural Bank of China closed 42 branches in Foshan city during the sample period. To check whether the main results in the previous section are driven by these two outliers, we rerun regressions of model ③, ④, and ⑤ with a subsample excluding the two outliers. As presented in Panel 5 of Table 10, the main results still hold.

Table 10 inserted here

8. Bank branching at different hierarchical levels and over time

8.1. Dynamics of bank branching at different hierarchical levels

The previous analyses treat all bank branches equally. However, except for BCOM, there are usually more than five organizational layers in each of the other four state-owned banks (ICBC、CCB、ABC、BOC)[7], i.e. the headquarter, tier-one-branches, tier-two-branches, subbranchs (Zhihang), and local outlets below subbranches. Generally, branches at or above the subbranch level provide corporate banking services while local outlets below the subbranch level focus on retail banking services. If state-owned banks follow SOEs in branching, then this behavior pattern should be more pronounced with subbranches or above. Therefore, we look closely at the dynamics of branches at different organizational levels. We recollect two datasets, one including data on bank offices at and above the subbranch level while the other dataset on local outlets below the subbranch level for the four state-owned banks over the sample period. Then we rerun the regressions with these two new samples. Table 11 reports the results.

Columns (1)-(6) are results with data on bank offices at higher levels. While the results are qualitatively similar to those in Table 5, Table 7, and Table 8, the coefficients of *SOE* and *nonSOE* are indeed significant and of larger magnitude in Table 11, suggesting that the impact of SOEs upon bank branching behavior is indeed stronger for branches at or above the subbranch level, which focus on corporate banking services.

Columns (7)-(10) are regression results with data on local outlets below the subbranch level. Since banks are not allowed to set up new local outlets below the subbranch level since 2002, they have only two choices, either reducing the number of local outlets below the subbranch level or keep it unchanged. Results in columns (9)-(10) show that state-owned banks **close more** local outlets in cities with **more** SOEs and less active nonSOEs.

The reason behind these seemingly confusing results for local outlets is that, some local outlets are upgraded and transformed into subbranches. For instance, ICBC upgraded 916 local outlets into subbranches while the overall number of local outlets decreased by 1103 during the sample period. The total number of CBC local outlets was reduced by 1911,

[7] BOCM's organizational structure is a little different, consisting of four layers, without outlets below the subbranch level.

among which 1820 were transformed into subbranches. ABC upgraded 2510 local outlets into subbranches that accounted for 97.6% of total decrease in the number of local outlets. Actually, most of the increase in the number of higher-level branches were caused by upgrading of lower level branches. Some regressions further show that these banks are more likely to upgrade local outlets into subbranches in cities with more SOEs.

Table 11 inserted here

8.2. Branching behavior in different subperiods

This subsection investigates whether the branching behavior of state-owned banks has changed over the sample period. To do so, we divide the sample period into two subperiods, 2013-2015 and 2015-2017 and rerun the three regressions for each subperiod. Table 12 summarizes the results. The coefficients of key variables for the first subperiod 2013-2015 are similar to those for the second subperiod as displayed in columns (7)-(12). If anything, the coefficients of *SOE* and *nonSOE* are of much larger magnitude in columns (7)-(8) than that in columns (1)-(2). It seems that the share of SOEs had a stronger impact on the branching behavior on the extensive margin in the second subperiod as compared to the first subperiod.

Table 12 inserted here

9. Conclusion

Using a unique dataset on all branch offices of state-owned commercial banks in China over the period 2013-2017, this paper investigates the branching behavior of state-owned commercial banks. More specifically, we focus on whether state-owned banks follow SOEs in choosing branch locations. After controlling for the development level and competition of the banking sector and factors affecting the demand for banking services such as population size, population density, GDP per capita, and economic structure, etc., we find that state-owned banks are more likely to increase and less likely to reduce the number of their branches in cities with higher shares of SOEs. Furthermore, if a bank chooses to expand its branch network in a city, the bank tends to open more branch offices if the city has a larger share of SOEs; if it chooses to reduce its branch network in a city, the bank tends to close fewer branch offices where there are more active state-owned enterprises. These empirical results suggest that state-owned banks do follow SOEs in making branching decisions.

Our results on the branching behavior of state-owned banks are consistent with the literature on the lending behavior of state-owned banks, which has generally found that state-owned banks have ownership bias toward SOEs in making lending decisions.

While the existing research on state-owned banks has focused on their lending and pricing behavior, the results in this paper suggest that we may need to pay more attention to their branching behavior which has been a black box so far. Branching is one of the crucial strategic non-price actions for banks. The size of a bank's branch network in a market constitutes its capacity in providing financial services. While prices can be changed easily in the short run, a bank's branch network can only be adjusted in a much longer run and usually with very high adjustment costs. Therefore, the branching decision of a bank should have profound implications for the operation of banks. The pattern that state-owned banks tend to follow SOEs in making branching decisions should have serious impact on the efficiency of banking system.

Our results have important policy implications in the China case. The five state-owned banks, which have dominated Chinese banking sector for many years, underwent a costly corporatization reform process during 2003-2010, the purpose of which was to transform the state-owned banks into real commercial banks. However, our results with the latest data on the branching behavior of these state-owned banks present a mixing picture: while these banks do consider commercial factors such as population, economic development, and banking competition in making branching decisions, they still tend to locate close to SOEs which are generally less profitable than other types of firms. And this biased branching behavior seems to be stronger more recently. There is still a long way to go for the commercialization reform of the Chinese banking sector.

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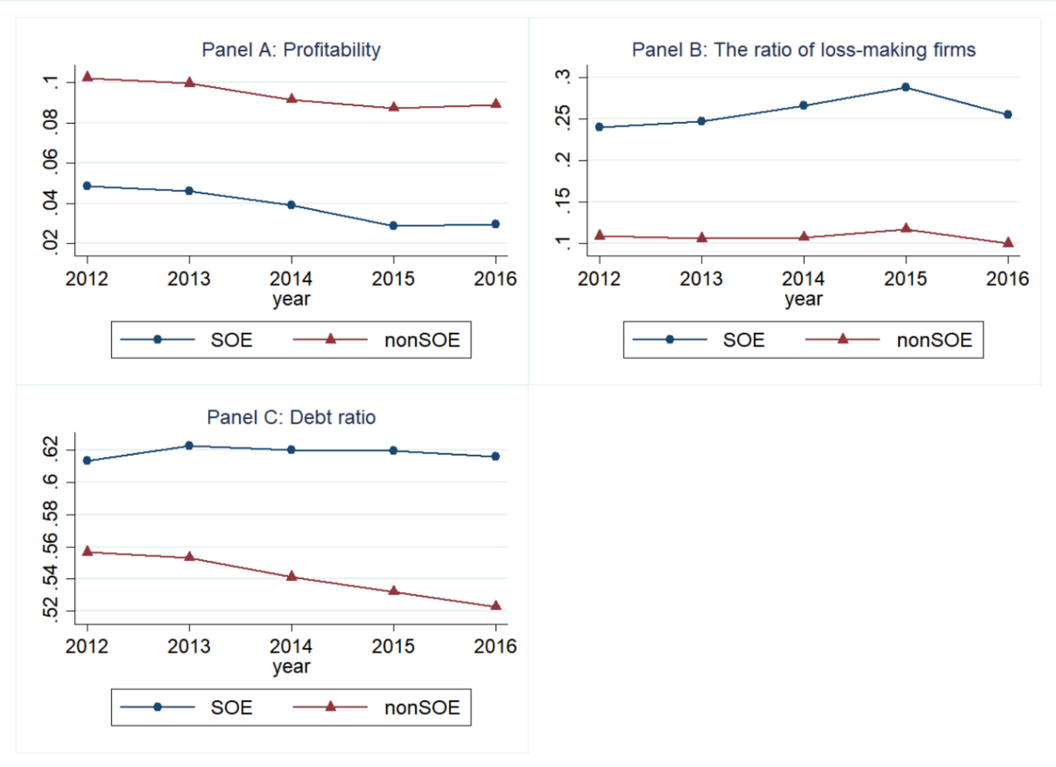

Fig.1 Performance of state-owned enterprises and non-state-owned enterprises. These three figures compare the performance of state-owned enterprises and non-state-owned enterprises with aggregated data on industrial firms above designed size (above 20 million Yuan in sales) over the period 2012-2016. Panel A shows the profitability (measured by ROA, defined as total profits divided by total assets) of SOEs and nonSOEs. Panel B shows the percentage of loss-making firms in each group of enterprises. Panel C presents the debt ratios, defined as total liabilities divided by total assets, of SOEs and nonSOEs.   Data source: China National Bureau of Statistics.

Table 1 Ownership structure of major Chinese commercial banks as of 2015 (%)

Bank Name	Central government	Local government	SOEs	Other	Ten largest shareholders
Agricultural Bank of China (ABC)	82.3	0	2.3	10	94.6
Industrial and Commercial Bank of China (ICBC)	71.7	0	1.9	23.3	96.9
Bank of China (BOC)	66.6	0	3.6	25.9	96.1
Construction Bank of China (CBC)	57.3	0	2.9	37.8	98
Bank of Communications (BCOM)	40.4	0	6.7	30.3	77.4
China Everbright Bank	22	0	36	15.6	73.6
Ping An Bank	0.4	0	5.4	60.3	66.1
China CITIC Bank	0.1	0	70.1	25.9	96.1
China Guangfa Bank	0	0	42.9	47.6	90.5
Hengfeng bank	0	0	19.4	54.9	74.3
Hua Xia Bank	0	0	47.2	23.4	70.6
China Bohai Bank	0	0	62	38	100
Minsheng Bank	0	0	2.7	50.6	53.2
Shanghai Pudong Development Bank	0	0	51.3	19.4	70.7
Industrial Bank	0	17.9	13.5	13.4	44.7
China Merchants Bank	0	0	38.6	28.7	67.3
China Zheshang Bank	0	0	20	47.5	67.5

Notes: This table shows the ownership structure of major Chinese commercial banks as of the end of 2015. Central Government shares include those shares directly held by the Finance Ministry of China, Central Huijin Investment Ltd, and the Social Security Fund of China. Among the 17 commercial banks, 4 banks (Guangfa Bank, Hengfeng Bank, Bohai Bank,and Zheshang Bank) are not publicly listed on stock exchanges; 5 banks (Everbright Banks, PingAn Bank, HuaXia Bank, Pudong Development Bank, and Industrial Bank) are publicly listed on domestic stock exchanges(Shanghai or Shenzhen Stock Exchanges); the other 8 banks are listed both on domestic and HongKong Stock Exchanges. Data Source: Annual reports of banks and calculation by authors.

Table 2 Summary statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
			Panel A		
branch	1435	45.45	55.89	0	566
E	1435	2.05	0.77	1	3
Enter	459	3.00	4.46	1	67
Exit	387	3.39	4.02	1	42
			Panel B		
SOE	1435	0.44	0.17	0.15	0.77
nonSOE	1435	7.62	1.92	2.80	10.38
density	1435	0.05	0.05	0.00	0.53
population	1435	5.87	0.69	3.16	8.00
gdppc	1435	10.60	0.55	9.12	12.19
econstruc	1435	0.51	0.10	0.18	0.79
findev	1435	0.84	0.46	0.18	2.95
HHI	1435	0.26	0.06	0.10	0.54
branch0	1435	3.21	1.31	0.00	6.34
bigcity	1435	0.11	0.31	0.00	1.00

Table 3 The five state -owned banks' branching dynamics

	E=1	E=2	E=3	Total
ICBC	225	52	10	287
BOC	72	159	56	287
ABC	34	162	91	287
CCB	39	125	123	287
BCOM	17	91	179	287
Total	387	589	459	1,435
Frequency	26.97%	41.05%	31.99%	100%

Notes: This table presents the number of cities, in which each state-owned bank increased the number of its branches (E=3), reduced the number of its branches (E=1), or kept the total number of its branches unchanged(E=2) over the sample period.

Table 4 SOEs and presence of state-owned-bank branches

VARIABLES	(1) Branch	(2) Branch	(3) Branch	(4) Branch
density	0.476*	-0.195	-0.033	-0.045
	(0.080)	(0.455)	(0.907)	(0.873)
population	0.757***	0.756***	0.781***	0.782***
	(0.000)	(0.000)	(0.000)	(0.000)
gdppc	0.721***	0.574***	0.594***	0.593***
	(0.000)	(0.000)	(0.000)	(0.000)
econstruc	-0.624***	-0.379***	-0.433***	-0.449***
	(0.000)	(0.004)	(0.001)	(0.001)
bigcity	0.438***	0.092**	-0.005	0.018
	(0.000)	(0.044)	(0.913)	(0.716)
findev		0.285***	0.291***	0.265***
		(0.000)	(0.000)	(0.000)
HHI		-1.726***	-2.061***	-2.119***
		(0.000)	(0.000)	(0.000)
SOE			**0.389*** **	
			(0.000)	
nonSOE				**-0.033*** **
				(0.000)
Constant	-8.162***	-6.455***	-6.870***	-6.402***
	(0.000)	(0.000)	(0.000)	(0.000)
Bank dummy	Y	Y	Y	Y
AIC	10832	10672	10639	10645
BIC	10890	10740	10713	10718
ll	-5405	-5323	-5306	-5308
r2_p	0.219	0.231	0.234	0.233
N	1435	1435	1435	1435

Notes: This table reports regression results of model ②. Here the dependent variable is $Branch_{ij}$, the total number of branches of bank i in city j at the end of 2017. $density_j$ stands for population density, measured as the population per square kilometer in city j at the end of 2013, with the unit being 10,000 people per square kilometer. $population_j$ is the logarithm of total population (measured as 10,000 people) in city j. $gdppc_j$ is the logarithm of GDP per capita in city j at the end of 2013 and the unit of GDP per capita is Yuan. $econstruc_j$ is defined as economic structure, measured as the share of secondary industry in GDP of city j at the end of 2013. And financial development variable, $findev_j$, is measured by the ratio of total loans outstanding of the whole banking sector in city j to GDP of the same city at the year end of 2013. Banking competition variable, HHI_j, is measured as Herfindahl-Hirschman index calculated with branches of commercial banks in the city j at the year end of 2013. Here $bigcity_j$ is a dummy, taking the value of 1 when the city is a provincial capital or a municipality directly under the central government and 0 otherwise. SOE_j is defined as the assets owned by state-owned and state-controlled industrial enterprises as a share of total assets owned by all industrial enterprises above designed size in city j at the end of 2013. $nonSOE_j$ is an index of development of non-state-owned sector in city j at the end of 2013. Robust p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Coefficients of dispersion parameter α of NB2 regression are not reported in this table. The tests of overdispersion after NB2 reject the null hypothesis that "α=0", suggesting that the NB2 regression is more reasonable than Poisson regression.

Table 5 SOEs and state-owned banks' entry dynamics

VARIABLES	(1) E	(2) E	(3) E	(4) E
density	0.561	-0.140	1.210	0.766
	(0.746)	(0.937)	(0.497)	(0.662)
population	0.736***	0.779***	1.015***	0.948***
	(0.000)	(0.000)	(0.000)	(0.000)
gdppc	0.263	0.165	0.372*	0.298
	(0.130)	(0.419)	(0.072)	(0.150)
econstruc	-0.083	0.020	-0.496	-0.404
	(0.896)	(0.975)	(0.451)	(0.536)
branch0	-0.689***	-0.770***	-0.867***	-0.835***
	(0.000)	(0.000)	(0.000)	(0.000)
bigcity	1.610***	1.323***	0.774**	1.008***
	(0.000)	(0.001)	(0.047)	(0.010)
findev		0.238	0.293	0.171
		(0.301)	(0.196)	(0.457)
HHI		-2.113	-4.073**	-3.888**
		(0.182)	(0.013)	(0.019)
SOE			**2.329*** **	
			(0.000)	
nonSOE				**-0.145*** **
				(0.000)
Constant cut1	6.006***	4.558	8.091***	4.898*
	(0.002)	(0.101)	(0.005)	(0.076)
Constant cut2	8.540***	7.097**	10.676***	7.461***
	(0.000)	(0.011)	(0.000)	(0.007)
Bank dummy	Y	Y	Y	Y
AIC	2447	2448	2418	2434
BIC	2511	2521	2497	2513
ll	-1212	-1210	-1194	-1202
r2_p	0.221	0.222	0.232	0.227
N	1435	1435	1435	1435

Notes: This table presents the regression results of model ③. The dependent variable is the entry decision, E_{ij}, from 2013 to 2017, which takes the value of 1 if bank i reduced the number of its branches in city j in this period, takes the value of 2 if the number of bank i's branches did not change, and takes value of 3 if bank i increased the number of its branches in city j during this period. $density_j$ stands for population density, measured as the population per square kilometer in city j at the end of 2013, with the unit being 10,000 people per square kilometer. $population_j$ is the logarithm of total population (measured as 10,000 people) in city j. $gdppc_j$ is the logarithm of GDP per capita in city j at the end of 2013 and the unit of GDP per capita is Yuan. $econstruc_j$ is defined as economic structure, measured as the share of secondary industry in GDP of city j at the end of 2013. And financial development variable, $findev_j$, is measured by the ratio of total loans outstanding of the whole banking sector in city j to GDP of the same city at the year end of 2013. Then banking competition variable, HHI_j, is measured as Herfindahl-Hirschman index calculated with branches of commercial banks in the city j at the year end of 2013. Here $bigcity_j$ is a dummy, taking the value of 1 when the city is a provincial capital or a municipality directly under the central government and 0 otherwise. $branch0_{ij}$ is the logarithm of 1 plus the total number of branches of bank i in city j at the end of 2013. SOE_j *is* defined as the assets owned by state-owned and state-controlled industrial enterprises as a share of total assets owned by all industrial enterprises above designed size in city j at the end of 2013. $nonSOE_j$ is an index of development of non-state-owned sector in city j at the end of 2013. Robust p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6 Marginal effects: SOEs and state-owned banks' entry dynamics

	Model with *SOE*			Model with *nonSOE*		
VARIABLES	E=1	E=2	E=3	E=1	E=2	E=3
density	-0.192	-0.025	0.217	-0.123	-0.016	0.138
	(0.496)	(0.535)	(0.498)	(0.661)	(0.675)	(0.662)
	[-1.02%]		[1.15%]	[-0.65%]		[0.73%]
population	-0.161***	-0.021*	0.182***	-0.152***	-0.019*	0.171***
	(0.000)	(0.079)	(0.000)	(0.000)	(0.083)	(0.000)
	[-11.08%]		[12.52%]	[-10.46%]		[11.76%]
gdppc	-0.059*	-0.008	0.067*	-0.048	-0.006	0.054
	(0.070)	(0.227)	(0.075)	(0.147)	(0.287)	(0.152)
	[-3.22%]		[3.66%]	[-2.62%]		[2.95%]
econstruc	0.079	0.010	-0.089	0.065	0.008	-0.073
	(0.451)	(0.486)	(0.451)	(0.535)	(0.556)	(0.535)
	[0.79%]		[-0.89%]	[0.65%]		[-0.73%]
branch0	0.138***	0.018*	-0.156***	0.134***	0.017*	-0.150***
	(0.000)	(0.073)	(0.000)	(0.000)	(0.076)	(0.000)
	[18.11%]		[-20.47%]	[17.58%]		[-19.68%]
bigcity	-0.123**	-0.016	0.139**	-0.161**	-0.020	0.182***
	(0.047)	(0.167)	(0.046)	(0.011)	(0.124)	(0.010)
	[-12.3%]		[13.9%]	[-16.1%]		[18.2%]
findev	-0.046	-0.006	0.053	-0.027	-0.003	0.031
	(0.194)	(0.308)	(0.197)	(0.456)	(0.505)	(0.458)
	[-2.11%]		[2.43%]	[-1.24%]		[1.42%]
HHI	0.646**	0.084	-0.730**	0.622**	0.079	-0.701**
	(0.014)	(0.115)	(0.013)	(0.021)	(0.126)	(0.018)
	[4.07%]		[-4.60%]	[3.92%]		[-4.42%]
SOE	**-0.370*** **	**-0.048***	**0.418*** **			
	(0.000)	**(0.076)**	**(0.000)**			
	[-6.18%]		**[6.98%]**			
nonSOE				**0.023*** **	**0.003***	**-0.026*** **
				(0.000)	**(0.090)**	**(0.000)**
				[4.42%]		**[-4.99%]**
N	1435	1435	1435	1435	1435	1435

Notes: This table reports the marginal effects calculated with regression coefficients in Table 5. Numbers in [ ] report the response of the predicted probability for a state-owned bank to choose the "entry" option (E_{ij}=3) or the "exit" option (E_{ij}=1) as an independent variable (except for *bigcity*) increases by one standard deviation. Because *bigcity is a dummy variable*, the numbers in [ ] report the response of predicted probability for a state-owned bank to choose the "entry" option (E_{ij}=3) or the "exit" option (E_{ij}=1) as *bigcity* changes from 0 to 1. And p-values are in ( ). *** p<0.01, ** p<0.05, * p<0.1.

Table 7 SOEs and state-owned banks' branch growth

	Coefficient estimation				Marginal effect	
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Enter	Enter	Enter	Enter	Enter	Enter
density	3.497***	2.525**	3.041***	2.707***	4.234***	3.734***
	(0.000)	(0.011)	(0.001)	(0.005)	[0.292]	[0.258]
population	0.619***	0.786***	0.801***	0.877***	1.115***	1.210***
	(0.000)	(0.000)	(0.000)	(0.000)	[0.747]	[0.811]
gdppc	0.591***	0.628***	0.606***	0.663***	0.844***	0.915***
	(0.000)	(0.001)	(0.001)	(0.001)	[0.475]	[0.515]
econstruc	0.474	1.020	0.840	0.666	1.169	0.919
	(0.424)	(0.104)	(0.156)	(0.262)	[0.116]	[0.091]
branch0	-0.012	-0.109	-0.146	-0.149	-0.204	-0.206
	(0.900)	(0.310)	(0.146)	(0.163)	[-0.319]	[-0.322]
bigcity	0.815***	0.367	0.167	0.185	0.233	0.256
	(0.000)	(0.154)	(0.513)	(0.478)	[0.233]	[0.256]
findev		0.458**	0.321*	0.265	0.447*	0.366
		(0.012)	(0.074)	(0.143)	[0.249]	[0.204]
HHI		-0.756	-3.400	-3.358	-4.733	-4.633
		(0.745)	(0.183)	(0.174)	[-0.293]	[-0.287]
SOE			**1.969*** **		**2.741*** **	
			(0.000)		**[0.436]**	
nonSOE				**-0.164*** **		**-0.226*** **
				(0.000)		**[-0.415]**
Constant	-10.911***	-12.260***	-12.029***	-10.769***		
	(0.000)	(0.000)	(0.000)	(0.000)		
Bank dummy	Y	Y	Y	Y		
AIC	1467	1464	1441	1446		
BIC	1517	1522	1503	1508		
ll	-721.6	-717.9	-705.4	-708.2		
r2_p	0.141	0.145	0.160	0.157		
N	459	459	459	459	459	459

Notes: This table reports the regression results of model ④. Estimated coefficients are listed in columns (1)-(4) and marginal effects are presented in columns (5)-(6). The dependent variable $Enter_{ij}$ is the increase in the number of branches of bank i in city j from 2013 to 2017. $density_j$ stands for population density, measured as the population per square kilometer in city j at the end of 2013, with the unit being 10,000 people per square kilometer. $population_j$ is the logarithm of total population (measured as 10,000 people) in city j. $gdppc_j$ is the logarithm of GDP per capita in city j at the end of 2013 and the unit of GDP per capita is Yuan. $econstruc_j$ is defined as economic structure, measured as the share of secondary industry in GDP of city j at the end of 2013. And financial development variable, $findev_j$, is measured by the ratio of total loans outstanding of the whole banking sector in city j to GDP of the same city at the year end of 2013. Banking competition variable, HHI_j, is measured as Herfindahl-Hirschman index calculated with branches of commercial banks in the city j at the end of 2013. $bigcity_j$ is a dummy, taking the value of 1 when the city is a provincial capital or a municipality and 0 otherwise. $branch0_{ij}$ is the logarithm of 1 plus the total number of branches of bank i in city j at the end of 2013. SOE_j *is* defined as the assets owned by state-owned and state-controlled industrial enterprises as a share of total assets owned by all industrial enterprises above designed size in city j at the end of 2013. $nonSOE_j$ is an index of development of non-state-owned sector in city j at the end of 2013. The number in [ ] reports the response of the predicted increase in the number of branches of a state-owned bank i in city j as an independent variable (except for *bigcity*) increases by one standard deviation. Because *bigcity* is a dummy variable, the number in [ ] reports the response of the predicted increase in the number of branches of a state-owned bank i in city j as *bigcity* changes from 0 to 1. Robust p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Notice that estimates of dispersion parameter α of ZTNB2 are not reported in this table. The tests of overdispersion reject the null hypothesis that "α=0", suggesting that the truncated NB2 regression is reasonable.

Table 8 SOEs and the reduction in the number of bank branches

	Coefficient estimation				Marginal effect	
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Exit	Exit	Exit	Exit	Exit	Exit
density	-0.789	-0.413	-0.924	-0.760	-1.684	-1.387
	(0.384)	(0.667)	(0.339)	(0.430)	[-0.086]	[-0.071]
population	-0.720***	-0.856***	-1.051***	-0.973***	-1.916***	-1.776***
	(0.000)	(0.000)	(0.000)	(0.000)	[-1.404]	[-1.302]
gdppc	-0.050	-0.055	-0.188	-0.125	-0.342	-0.228
	(0.786)	(0.786)	(0.374)	(0.558)	[-0.183]	[-0.122]
econstruc	-0.002	-0.320	-0.026	-0.140	-0.047	-0.256
	(0.998)	(0.633)	(0.969)	(0.836)	[-0.005]	[-0.025]
branch0	1.724***	1.924***	2.104***	2.023***	3.834***	3.692***
	(0.000)	(0.000)	(0.000)	(0.000)	[2.879]	[2.773]
bigcity	-0.474**	-0.163	0.126	-0.017	0.230	-0.032
	(0.018)	(0.470)	(0.635)	(0.944)	[0.230]	[-0.032]
findev		-0.412**	-0.493***	-0.405**	-0.899***	-0.738**
		(0.027)	(0.009)	(0.030)	[-0.410]	[-0.337]
HHI		1.043	2.461	2.070	4.484	3.777
		(0.537)	(0.174)	(0.265)	[0.251]	[0.212]
SOE			**-1.020****		**-1.858****	
			(0.030)		**[-0.316]**	
nonSOE				**0.057**		**0.104**
				(0.181)		**[0.197]**
Constant	-0.818	-0.543	1.325	-0.281		
	(0.679)	(0.834)	(0.623)	(0.914)		
Bank dummy	Y	Y	Y	Y		
AIC	1383	1381	1378	1381		
BIC	1430	1436	1438	1441		
ll	-679.4	-676.5	-674.2	-675.6		
r2_p	0.127	0.131	0.134	0.132		
N	387	387	387	387	387	381

Notes: This table reports the regression results of model ⑤. Estimated coefficients are listed in columns (1)-(4) and marginal effects are presented in columns (5)-(6). The dependent variable $Exit_{ij}$ is the decrease in the number of branches of bank i in city j from 2013 to 2017. $density_j$ stands for population density, measured as the population per square kilometer in city j at the end of 2013, with the unit being 10,000 people per square kilometer. $population_j$ is the logarithm of total population (measured as 10,000 people) in city j. $gdppc_j$ is the logarithm of GDP per capita in city j at the end of 2013 and the unit of GDP per capita is Yuan. $econstruc_j$ is defined as economic structure, measured as the share of secondary industry in GDP of city j at the end of 2013. And financial development variable, $findev_j$, is measured by the ratio of total loans outstanding of the whole banking sector in city j to GDP of the same city at the year end of 2013. Banking competition variable, HHI_j, is measured as Herfindahl-Hirschman index calculated with branches of commercial banks in the city j at the end of 2013. $bigcity_j$ is a dummy, taking the value of 1 when the city is a provincial capital or a municipality and 0 otherwise. $branch0_{ij}$ is the logarithm of 1 plus the total number of branches of bank i in city j at the end of 2013. SOE_j *is* defined as the assets owned by state-owned and state-controlled industrial enterprises as a share of total assets owned by all industrial enterprises above designed size in city j at the end of 2013. $nonSOE_j$ is an index of development of non-state-owned sector in city j at the end of 2013. The number in [ ] reports the response of the predicted change in the number of closed branches of a state-owned bank i in city j as an independent variable (except for *bigcity*) increases by one standard deviation. Because *bigcity* is a dummy variable, the number in [ ] reports the response of the predicted change in the number of closed branches of a state-owned bank i in city j as *bigcity* changes from 0 to 1. Robust p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Notice that estimates of dispersion parameter α of ZTNB2 are not reported in this table. The tests of overdispersion reject the null hypothesis that "α=0", suggesting that the truncated NB2 regression is reasonable.

Table 9 Comparing state-owned banks with other commercial banks

VARIABLES	(1) Branch	(2) Branch	(3) E	(4) E
density	0.084	0.028	-1.057	-1.297
	(0.853)	(0.952)	(0.390)	(0.267)
population	1.058***	1.051***	1.005***	0.980***
	(0.000)	(0.000)	(0.000)	(0.000)
gdppc	0.919***	0.901***	0.921***	0.893***
	(0.000)	(0.000)	(0.000)	(0.000)
econstruc	-0.447**	-0.442**	-0.081	-0.050
	(0.029)	(0.034)	(0.838)	(0.899)
branch0			0.558***	0.559***
			(0.000)	(0.000)
bigcity	0.087	0.075	-0.200	-0.121
	(0.311)	(0.375)	(0.400)	(0.607)
findev	0.658***	0.656***	0.805***	0.759***
	(0.000)	(0.000)	(0.000)	(0.000)
HHI	-5.754***	-6.050***	-0.657	-0.650
	(0.000)	(0.000)	(0.492)	(0.499)
SOE	**-0.807*** **		**-0.790*** **	
	(0.000)		**(0.002)**	
SOE*SOB	**2.480*** **		**6.013*** **	
	(0.000)		**(0.000)**	
nonSOE		**0.070*** **		**0.068*** **
		(0.000)		**(0.002)**
nonSOE*SOB		**-0.214*** **		**-0.444*** **
		(0.000)		**(0.000)**
Bank dummy	Y	Y	Y	Y
AIC	22743	22752	5824	5868
BIC	22918	22928	6006	6050
ll	-11344	-11349	-2884	-2906
r2_p	0.225	0.225	0.328	0.323
N	4879	4879	4879	4879

Notes: This table presents the regression results of model ② and model③ with a larger sample including both the five state-owned banks and twelve shareholding commercial banks which are allowed to operate nationwide. The dependent variable in columns (1)-(2) is $Branch_{ij}$, the total number of branches of bank i in city j at the end of 2017. The coefficients are estimated by NB2 regression. And the dependent variable in columns (3)-(4) is the entry decision, E_{ij}, which takes the value of 1 if bank i reduced the number of its branches in city j in this period, takes the value of 2 if the number of bank i's branches did not change, and takes value of 3 if bank i increased the number of its branches in city j during this period. SOE_j *is* defined as the assets owned by state-owned and state-controlled industrial enterprises as a share of total assets owned by all industrial enterprises above designed size in city j at the end of 2013. $nonSOE_j$ is an index of development of non-state-owned sector in city j at the end of 2013. $density_j$ stands for population density, measured as the population per square kilometer in city j at the end of 2013, with the unit being 10,000 people per square kilometer. $population_j$ is the logarithm of total population (measured as 10,000 people) in city j. $gdppc_j$ is the logarithm of GDP per capita in city j at the end of 2013 and the unit of GDP per capita is Yuan. $econstruc_j$ is defined as economic structure, measured as the share of secondary industry in GDP of city j at the end of 2013. And financial development variable, $findev_j$, is measured by the ratio of total loans outstanding of the whole banking sector in city j to GDP of the same city at the year end of 2013. Banking competition variable, HHI_j, is measured as Herfindahl-Hirschman index calculated with branches of commercial banks in the city j at the year end of 2013. $bigcity_j$ is a dummy, taking the value of 1 when the city is a provincial capital or municipality directly under the central government and 0 otherwise. $branch0_{ij}$ is the logarithm of 1 plus the total number of branches of bank i in city j at the end of 2013. SOB_i is a dummy variable, taking value of 1 if bank i is one of the five state-controlled banks and 0 if bank i is a joint-equity commercial bank. $nonSOE_j$* SOB_i is the interaction term of $nonSOE_j$ and SOB_i. while SOE_j* SOB_i is the interaction term of SOE_j and SOB_i. Robust p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 10 Robustness tests

	Mode l③		Model ④		Model ⑤	
	E	E	Enter	Enter	Exit	Exit
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Panel 1. Results with four state-owned banks						
SOE	2.734***		1.123**		-1.056**	
	(0.000)		(0.042)		(0.028)	
nonSOE		-0.175***		-0.088		0.060
		(0.000)		(0.108)		(0.171)
Panel 2. Results with different measures of banking competition						
SOE	2.251***		1.679***		-0.934**	
	(0.000)		(0.000)		(0.044)	
nonSOE		-0.130***		-0.133***		0.049
		(0.001)		(0.000)		(0.230)
Panel 3. Results with different measures of population						
SOE	2.577***		2.258***		-0.750	
	(0.000)		(0.000)		(0.133)	
nonSOE		-0.155***		-0.198***		0.032
		(0.000)		(0.000)		(0.470)
Panel 4. Results with four municipalities excluded						
SOE	2.414***		2.179***		-0.841*	
	(0.000)		(0.000)		(0.057)	
nonSOE		-0.147***		-0.165***		0.050
		(0.000)		(0.000)		(0.222)
Panel 5. Results with outliers excluded						
SOE	2.307***		1.878***		-0.937**	
	(0.000)		(0.000)		(0.045)	
nonSOE		-0.143***		-0.155***		0.049
		(0.000)		(0.000)		(0.242)

Notes: This table reports the key results for five robustness tests. The dependent variable for model ③ is the entry decision from 2013 to 2017, E_{ij}, which takes the value of 1 if bank i reduced the number of its branches in city j in this period, takes the value of 2 if the number of bank i's branches did not change, and takes value of 3 if bank i increased the number of its branches in city j during this period. The dependent variable ($Enter_{ij}$) of model ④ is the increase in the number of branches if the bank chose to grow its branch network at the first stage. The dependent variable ($Exit_{ij}$) of model ⑤ is the decrease in the number of branches of bank i in city j if bank i chose to reduce the size of its branch network in city j. SOE_j *is* defined as the assets owned by state-owned and state-controlled industrial enterprises as a share of total assets owned by all industrial enterprises above designed size in city j at the end of 2013. $nonSOE_j$ is an index of development of non-state-owned sector in city j at the end of 2013. Bank dummy and all other control variables are included in the regression. Robust p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 11 Dynamics of bank branches at different hierarchical levels

VARIABLES	Bank branches at and above the subbranch level						Outlets below the subbranch level			
	Model ③		Model ④		Model ⑤		Model ③		Model ⑤	
	E	E	Enter	Enter	Exit	Exit	E	E	Exit	Exit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
density	0.012	-0.424	-0.181	-0.293	-1.177	-0.820	-0.529	-0.670	-0.032	0.005
	(0.994)	(0.788)	(0.801)	(0.684)	(0.455)	(0.618)	(0.774)	(0.715)	(0.963)	(0.995)
population	1.268***	1.217***	0.865***	0.876***	-1.369***	-1.251***	0.081	0.047	-0.151**	-0.155**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.695)	(0.820)	(0.029)	(0.024)
gdppc	0.992***	0.921***	0.856***	0.844***	-0.148	-0.074	-0.495	-0.513	0.032	0.021
	(0.000)	(0.000)	(0.000)	(0.000)	(0.537)	(0.760)	(0.124)	(0.111)	(0.742)	(0.825)
econstruc	-1.629**	-1.539**	-2.199***	-2.222***	-1.270	-1.588*	1.176	1.302	-1.347***	-1.349***
	(0.021)	(0.029)	(0.000)	(0.000)	(0.143)	(0.069)	(0.305)	(0.263)	(0.000)	(0.000)
branch0-above	-0.988***	-0.973***	-0.239***	-0.233***	2.427***	2.330***				
	(0.000)	(0.000)	(0.004)	(0.007)	(0.000)	(0.000)				
branch0-lower							-2.030***	-2.030***	1.024***	1.031***
							(0.000)	(0.000)	(0.000)	(0.000)
bigcity	0.439	0.660	0.184	0.276	0.483	0.204	0.756	0.802	0.165	0.228*
	(0.278)	(0.104)	(0.330)	(0.151)	(0.149)	(0.522)	(0.161)	(0.125)	(0.225)	(0.085)
findev	0.382	0.245	0.054	-0.071	-0.658***	-0.561**	-0.327	-0.271	-0.168*	-0.228**
	(0.115)	(0.319)	(0.675)	(0.594)	(0.006)	(0.020)	(0.304)	(0.393)	(0.068)	(0.013)
HHI	-2.903*	-2.959*	-3.560***	-3.891***	6.619***	5.593**	-1.000	-0.446	-3.649***	-3.729***
	(0.075)	(0.072)	(0.006)	(0.002)	(0.008)	(0.027)	(0.725)	(0.881)	(0.000)	(0.000)
SOE	**2.448*** **		**2.158*** **		**-1.490** **		**-0.630**		**0.819*** **	
	(0.000)		**(0.000)**		**(0.016)**		**(0.404)**		**(0.000)**	
nonSOE		**-0.165*** **		**-0.182*** **		**0.066**		**0.090**		**-0.067*** **
		(0.000)		**(0.000)**		**(0.204)**		**(0.204)**		**(0.001)**
bank dummy	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
r2_p	0.204	0.200	0.112	0.110	0.177	0.172	0.553	0.554	0.173	0.172
N	1435	1435	801	801	249	249	1148	1148	583	583

Notes: This table reports the regression results for bank branches at different organizational levels. The dynamics of bank branch at and above the subbranch level are shown in the first six columns and the dynamics of outlets below the subbranch level are shown in the last four columns. *branch0-above*$_{ij}$, is the logarithm of 1 plus the total number of branches at and above the subbranch level of bank i in city j at the end of 2013. *branch0-lower*$_{ij}$ is the logarithm of 1 plus the total number of outlets below the subbranch level of bank i in city j at the end of 2013. p-values in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 12 Branching behavior of state-owned banks over time

	Subperiod 2013-2015						Subperiod 2015-2017					
	Model ③		Model ④		Model ⑤		Model ③		Model ④		Model ⑤	
	E	E	Enter	Enter	Exit	Exit	E	E	Enter	Enter	Exit	Exit
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(10)	(12)
SOE	**1.561***** **(0.001)**		**1.702***** **(0.000)**		**-0.859** **(0.397)**		**2.884***** **(0.000)**		**0.969** **(0.109)**		**-0.631*** **(0.100)**	
nonSOE		**-0.100**** **(0.012)**		**-0.122***** **(0.001)**		**0.008** **(0.922)**		**-0.184***** **(0.000)**		**-0.118**** **(0.047)**		**0.044** **(0.261)**
r2_p	0.194	0.191	0.154	0.149	0.126	0.124	0.210	0.202	0.161	0.163	0.159	0.159
N	1435	1435	389	389	140	140	1435	1435	269	269	380	380

Notes: This table presents regression results for two subperiods. The columns (1)-(6) are results for the subperiod 2013-2015 with the independent variables taking values for the year 2013. The columns (7)-(12) are results for the subperiod 2015-2017 and the independent variables take values for the year 2015. p-values in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.