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Does the target market affect bank performance? Evidence from the geographic diversification of city commercial banks in China

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Abstract

After the opening up of the banking sector to domestic and foreign capitals which is approved by the Chinese government, the China Banking Regulatory Commission (CBRC) has permitted city commercial banks to diversify geographically. Since this deregulation in 2006, city commercial banks began to geographically diversify to occupy the market and acquire more financial resources. To examine the causal relationship between geographical diversification and bank performance, we construct an exogenous geographical diversification instrument using the gravity-deregulation model and a policy shock. We find that bank geographical diversification negatively affects bank performance. Moreover, we conduct some mechanism tests in the Chinese context. We find that the target market with several large- and medium-sized banks and a high level of local protectionism in the target market decreases the performance of city commercial banks. Finally, cross-sectional analyses show that the impact of geographical diversification on banks' performance is more notable among city commercial banks that are younger, and have a lower capital adequacy ratio and a higher non-performing loan ratio.

Keywords: Bank deregulation, Geographical diversification, Gravity-deregulation model, Commercial banks, China

Introduction

China has been experiencing a transition from a planned to a market economy since the 1979. Market-oriented economic reform has been proceeding gradually in each sector, but the financial sector, especially city commercial banks,[1] is still highly controlled and regulated by the government. Unlike the big five state-owned commercial banks and joint-equity banks which can establish branches in the whole country, the branches of city commercial banks are confined to their "home" city.[2] In February 2006 and April 2009, the China Banking Regulatory Commission (CBRC) deregulated the cross-regional operations of city commercial banks. City commercial banks were permitted to establish new branches in other cities within the province where the bank is headquartered. City commercial banks began geographically expanding by establishing branches outside their "home" city.

Does geographic diversification increase or decrease banks' performance? What drives performance? Existing studies include two perspectives: One perspective considers that geographic diversification could enhance banks' performance by boosting economies of scale (Berger et al. 1999; Chandler Jr. 1977; Gertner et al. 1994), improving internal capital markets (Houston et al. 1997; Kuppuswamy and Villalonga 2016), or reducing exposure to idiosyncratic local shocks (Diamond 1984). Another perspective based on corporate governance considers that the headquarters manager will find it challenging to monitor and govern such physically dispersed branches due to their distance from the headquarters. Moreover, branch managers prefer the high-risk credit business under performance pressure.

However, this research faced two main challenges. (1) It is difficult to empirically identify the causal impact of diversification on banks' performance. (2) Other mechanisms may explain the results of this study for the Chinese market. Although existing studies find that the geographic diversification of banks leads to better banks' performance in the American market (Berger et al. 1999; Chandler Jr. 1977; Diamond 1984; Gertner et al. 1994; Houston et al. 1997; Kuppuswamy and Villalonga 2016), the results and mechanisms of diversification cause these performance effects to be lacking in the Chinese context (Cai 2016; Li 2014; Wang et al. 2012; Zhang et al. 2017). To overcome these challenges, we improve this research as follows:

First, we develop and implement the gravity model to identify the causal impact of the geographic diversification of city commercial banks' branches on their performance. The deregulation of city commercial banks is a dynamic, time-varying, and city-specific process, providing us with an opportunity to construct an exogenous geographical diversification instrument based on the gravity-deregulation model following Goetz et al. (2013). We construct the instrument in two steps: (1) We use an exogenous index: the geographic distance between the "home" city and the other cities, (2) we also consider a policy shock. This instrumental variable might be more exogenous and suitable for the Chinese background.

Second, we find some possible explanations for the results based on the Chinese context. The particularity of Chinese banking deregulation is reflected in the following

[1] We call them "banks" hereafter in our paper.

[2] In 1995, the People's Bank of China (PBC) issued a document titled "The Regulation of City Cooperative Banks," which stipulated that city commercial banks can only do business and set up branches within the scope of the city (district) in which they are located.

ways. (1) The motivations for geographic expansion are different. According to the WTO rules, China needed to open up the banking market to foreign financial institutions in 2006. Accordingly, the CBRC deregulated the regional restrictions of city commercial banks. Although banks could eliminate the resource constraints of a single region and realize the optimal allocation of resources through geographic expansion (Fabrizio and Thomas 2012; Schotter et al. 2017; Wernerfelt 1995), a majority of city commercial banks were not eligible for cross-regional analysis in 2009. By the end of 2008, the historical problems and inefficiencies of city commercial banks had been addressed, but 70% of these banks had not grown beyond the size of small-sized banks.[3,4] Therefore, this deregulation policy was not suitable for all city commercial banks. Nevertheless, under deregulation, most city commercial banks have been expanding across regions. (2) Local protectionism has occurred. Since 1978, regionally decentralized authoritarian systems have allowed local governments to govern economic activities and have huge regulatory, and financial power (Poncet 2003; 2010; Xu 2011). Meanwhile, the assessment for among local officials to obtain financial resources has also caused local protectionism (Huang and Wang 2006; Wong 2003; Young 2000; Zhao and Zhang 1999). These two factors decrease the degree of integration in the domestic market (Bai et al. 2004; Poncet 2003; 2010) and increase local protectionism in China. However, as an important source of credit,[5] city commercial banks are influenced and protected by local governments. (3) The Chinese banking sector is an oligopolistic market (Liu and Huang 2002; Zhang 2006). In this market structure, small- and medium-sized banks are at a competitive disadvantage (Jiang et al. 2008). By the end of 2008, 70% of city commercial banks were small-sized banks. Additionally, because banking business homogenization is critical, and the Chinese banking industry implemented interest rate liberalization from 2012, city commercial banks rarely accessed high-quality resources from new markets. In this study, we find a new perspective by using these three factors in the mechanism test.

According to our empirical strategy, the results indicate that increases in geographic diversification reduced city commercial banks' performance. This finding holds after controlling for bank fixed effects, city fixed effects, time-varying bank characteristics, and the city commercial bank-specific factors, including the loan ratio, asset ratio, capital-asset ratio, asset quality, age, and size, which also exert an influence on bank performance. This result is different from the existing research in the American market (Berger et al. 1999; Chandler Jr. 1977; Diamond 1984; Gertner et al. 1994; Houston et al. 1997; Kuppuswamy and Villalonga 2016). Therefore, we examine potential explanations for these results in the Chinese market. This perspective is different from the existing explanations of scale effects or agency problems. The mechanistic evidence suggests that the decrease in city commercial banks' performance is associated with the degree of local protectionism, the market structure of the target market, and the

[3]The Research Group of Graduate Faculty of the PBC (2009) ranked 177 commercial banks (includes three stated-owned policy banks, five large commercial banks, 12 joint-stock banks, 136 city commercial banks, 22 rural commercial banks and one postal savings bank) in China and lists the top 70 commercial banks. There are 38 medium-sized and small-sized city commercial banks on the list.

[4]According to the 2008 CBRC Annual Report, by the end of 2008, all city commercial banks with grade 6 supervision and insolvent urban credit cooperatives were cleaned up. http://zhuanti.cbrc.gov.cn/subject/subject/nianbao2008/2.pdf (page 40, line 21)

[5]In 1998, the central government implemented vertical reform of state-owned banks and retrieved the credit approval authority of local branches of state-owned commercial banks.

ownership of city commercial banks. Specifically, (1) the higher the proportion of large- and medium-sized banks in the target market and (2) the higher the degree of local protectionism in the target market, the lower the performance of cross-regional city commercial banks. (3) Non-state-owned city commercial banks have worse performance than their state-owned counterparts.

We contribute to this research in the following aspects. Firstly, we add a different view to the existing literature on the effects of geographical diversification on banks' performance. In the existing literature, geographic diversification is implemented by banks themselves, as in the case of bank holding companies in the US. These studies consider that geographical diversification could enlarge scale economies, relieve political risk, and increase the market control of banks. Banks have more potential resources to enhance their performance by establishing new branches (Akhigbe and Whyte 2003; Berger et al. 1999; Calomiris and Mason 2003; Chandler Jr. 1977; Diamond 1984; Gertner et al. 1994; Goetz et al. 2016; Houston et al. 1997; Hughes et al. 1996; Meslier et al. 2016). However, the deregulation in China provided a policy-driven geographic diversification of banks. We find that in an oligopolistic market, following geographic expansion, local protectionism, and the ownership of city commercial banks could worsen their performance. This result echoes recent research on financial deregulation in transitional economies.

Secondly, we explain the reasons for the geographic diversification of banks from the theory of institution-based views. Institution-based views include two fields: a formal institution and an informal institution. The existing literature discusses the causes of geographic diversification and focuses on the perspective of informal institutions. However, this study researches the influence under the formal institution. According to the institution-based view, to legitimize corporate behaviors, enterprises need to make strategic behaviors that cater to institutional requirements, possibly leading to organizational convergence or organizational efficiency obstruction (DiMaggio and Powell 1983; Meyer and Rowan 1977). This study establishes a model of the influence of geographical diversification on the market share of banks. The results show that banks induce strategic behaviors that meet the regime's requirements to legitimize branches in different places. However, such behavior eventually leads to the obstruction of enterprise efficiency.

Thirdly, although our major contribution is to propose a new perspective based on the Chinese context, we also overcome endogeneity problems. Unlike Wang et al. (2012) and Li (2014), who use the Heckman model to eliminate the sample bias, we use a policy shock and gravity model to construct an instrumental variable to overcome endogenous simultaneity. This method is relatively exogenous and suitable for Chinese banking deregulation.

The remainder of this paper is organized as follows: Section 2 introduces the banking system and banking deregulation in China. Section 3 illustrates the data and summary statistics. Section 4 demonstrates the empirical strategy of the gravity-deregulation model. Section 5 shows the empirical results. Section 6 presents the results of mechanistic research and cross-sectional analyses. Section 7 provides the conclusion.

Banking deregulation in China

Since 1956, the Chinese government has established a centrally planned economy. In the financial sector, the People's Bank of China (PBC), the only bank before 1978, was responsible for all commercial banks (including deposits, loans, and foreign exchange) and central banks. After 1978, the big four banks were successively established and

began to take over the commercial bank business from the PBC.[6] In addition to the big four state-owned commercial banks, joint-equity banks and various types of regional banks were established in the same period. In September 1983, the PBC was formally reconstructed as the central bank, conducting national macroeconomic policymaking, monetary stabilization, and financial development functions. Furthermore, the CBRC was founded in 2003 to supervise and regulate the banking industry.

In addition to the big six state-owned commercial banks and 12 joint-equity banks, 133 city commercial banks were established from 1995 to 2015.[7]These city commercial banks are established by local companies and governments. Although most city commercial banks were established using state-owned capital, their size was much smaller than that of the big five commercial banks and 12 joint-equity banks, and they were only able to concentrate on local business[8] before 2006.

According to the WTO rules, China needed to open its banking market in 2006.[9] The market competition in banking intensified. Accordingly, in February 2006, the CBRC issued a document titled "The Regulation of City Commercial Bank Branches," which allowed eligible banks to establish branches outside their registered cities. The conditions for branch establishment included the bank's age, total capital, registered capital, capital adequacy, non-performing loans, return on assets (ROA), and return on equity (ROE). Furthermore, the bank's regulatory rating had to be above Grade 2 (including Grade 2).[10]

In April 2009, the CBRC issued a document titled "Adjustment Comment on the Market Access Policy of Setting Up Branches for Small- and Medium-Sized Commercial Banks," which allowed the establishment of new branches in the province in which the bank is headquartered. The approval procedure was simplified, and the approval authority for branch applications within the province was delegated to the local banking regulator. Moreover, the minimum capital requirement for new branches was canceled. Overall, this policy was a significant deregulation of China's banking system, which reduced the cost of new branch entry applications. This banking deregulation represents a transition of the banking sector from a plan-dominated system to a market-dominated system. City commercial banks were able to open branches freely in the province where their headquarters was located.

[6]The big four banks include the Construction Bank of China (CCB), Agricultural Bank of China (ABC), Bank of China (BOC), and Industrial and Commercial Bank of China (ICBC). They were established during 1978 – 1984. Specifically, the CCB specializes in construction and infrastructure projects, the ABC concentrates on the credit business for agriculture, the BOC focuses on the foreign exchange business, and the ICBC focuses on the credit business for industry and commerce. In 2004, the Bank of Communications (BCM) was classified as a large state-owned bank. In 2019, the Postal Savings Bank of China (PSBC) was listed as a large state-owned commercial bank. Thus, six banks are classified as large state-owned commercial banks.

[7]China's commercial banking system also includes over one thousand rural commercial banks. Each is usually limited to one rural area and serves the local economy and local firms.

[8]Please refer to the document of PBC [1997] No. 264, http://www.pbc.gov.cn/bangongting/135485/135495/135499/2833451/index.html

[9]According to the rules of the WTO, in 2006, China needed to deregulate the geographic restrictions of RMB business for foreign financial institutions. The vast majority of these restrictions, including customers, licensing conditions for operations, and cross-regional business, were deregulated in 2006. Assessed from http://www.cbrc.gov.cn/chinese/home/docView/2858.html

[10]The regulatory rating refers to the "Joint-equity bank risk rating system" issued and executed by the CBRC and is not disclosed to the public. It is different from the evaluation of commercial banks themselves and the rating of social intermediary institutions. Although this is important information, we cannot obtain the results now. The website for rating standards is as follows: http://www.cbrc.gov.cn/chinese/home/docDOC_ReadView/301.html

After the deregulation, city commercial banks expanded outside their home cities. In 2006, only 19 city commercial banks set up new branches outside their home cities. However, in 2016, 111 did so, accounting for 83% of the city commercial bank sector. In 2006, the total number of branches of city commercial banks was 5645, while in 2016, the total was 15,891. The number of branches in other cities was 35 in 2006, and this value increased to 4427 in 2016. Detailed information is shown in Figs. 1 and 2.

Banking deregulation drove the growth of the city commercial banks' size and promoted banking competition. From 2006 to 2016, the proportion of the assets of the city commercial banks to the total scale of the banking industry increased from 6.4% to 12.2%. Thus, the market share of city commercial banks increased. However, after the deregulation, the non-performing loan (NPL) balance of city commercial banks increased from 65.47 billion yuan to 149.8 billion yuan. The proportion of the non-NPL balance in the banking industry increased from 5.2% to 10% during the same period. Detailed information is shown in Fig. 3.

Sample selection and summary statistics

Data

The data in this research are of three types: information on city commercial bank branches, bank-level financial information, and regional macro data. We collect information on city commercial banks from the CBRC official website. The sample period is from 2006 to 2016 and the sample includes the full name, ID, location, date of approval, and opening date for each subordinate bank. Bank-level financial information is acquired from three sources, including the Chinese Research Data Services Platform (CNRDS), the Bankscope database, and city commercial banks' annual reports. The CNRDS and Bankscope database include a majority of the accounting information of city commercial banks. We supplemented and verified the information on the city commercial banks with annual bank reports. The regional macro data were acquired from the China Stock Market and Accounting Research Database (CSMAR), the CEIC, and the local statistical bureaus. Finally, our sample includes 91 banks and 933 bank-year

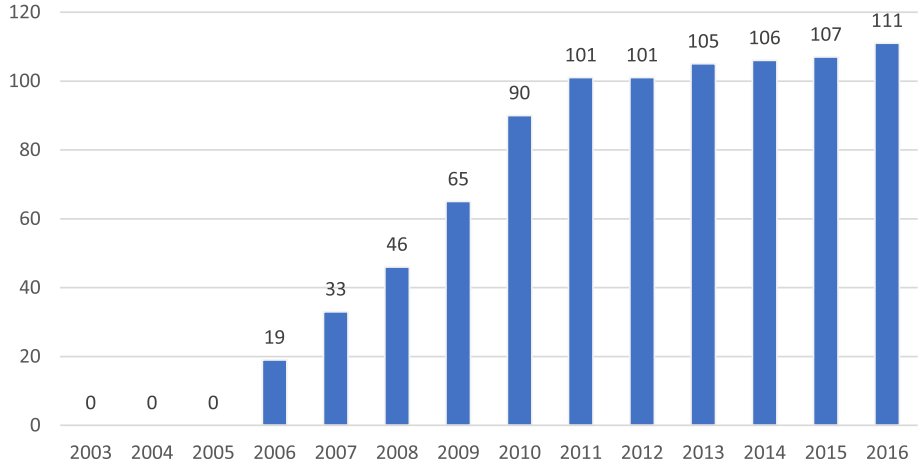

Fig. 1 The number of city commercial banks seting up new branches in other cities. *Notes*. The calculated data of this figure are from the CBRC

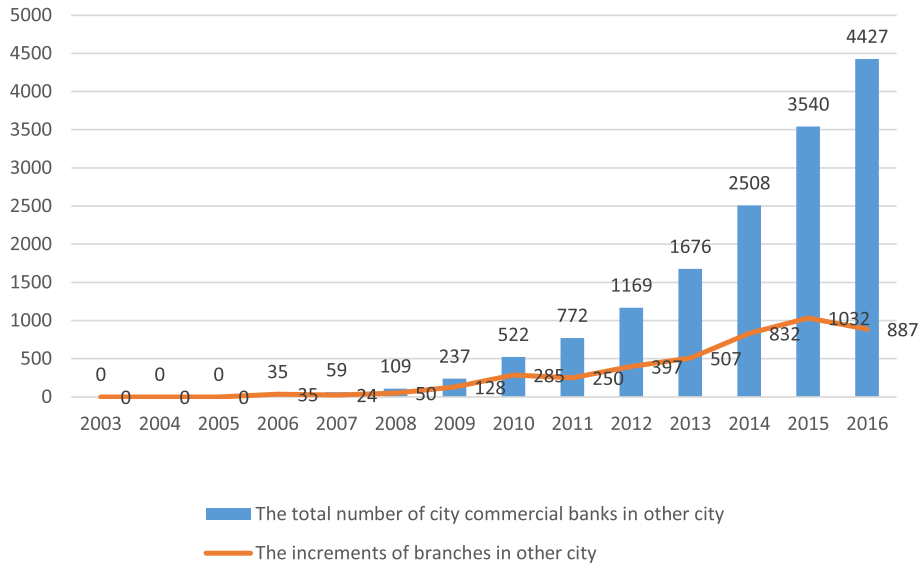

Fig. 2 The number of city commercial bank branches set up in other cities. *Notes*. The calculated data of this figure are from the CBRC

observations from 2006 to 2016. All variables are winsorized at the 1% and 99% levels to eliminate outliers.

Sample selection

We collated the restrictions on bank deregulation in Chinese banking to ensure that our samples were clean. In China, different banks are subject to different regulations when setting up new branches. There are almost no geographic restrictions for the big six state-owned banks. Joint-equity banks are restricted only quantitatively when the

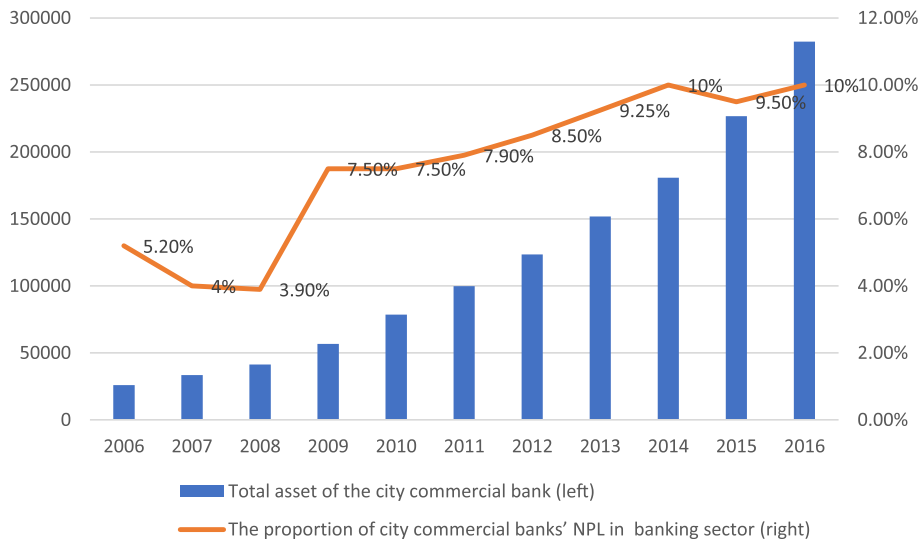

Fig. 3 The information of city commercial banks. *Notes*. The calculated data of this figure are from the CBRC

bank branches are cross-regional. There are two types of commercial banks with geographical operational restrictions: city commercial banks and rural commercial banks. Rural commercial banks continue to be regulated. Based on the deregulation of the geographic restrictions on city commercial banks since 2006, only eligible city commercial banks can be cross-regional and apply for the CBRC's approval. After April 2009, geographic restrictions were further deregulated, and the number of city commercial banks increased dramatically. Therefore, city commercial banks are different from other types of banks. However, in some studies, authors choose samples that include all types of banks in China. This study uses a sample of city commercial banks to study their geographical diversification to avoid these challenges. Specifically, our sample does not include banks subject to mergers and acquisitions (such as Huishang Bank) or reorganizations because there is no exact information on their expansion before these changes.

Variable

To measure geographical diversification of a city commercial bank, we use the branch dispersion index (1–*HHI*), similar to a Herfindahl-Hirschman index, described as 1 minus the sum of the squared ratios of the branches of subsidiaries in each city to the sum of the total branches in all the cities where a city commercial bank operates. This index ranges from 0 to 1. This index includes larger values for higher degrees of geographical diversification. We also use two proxy variables for geographical diversification in the preliminary results: a diversification dummy and the average distance between the home city and the target market as an alternative measure of 1–*HHI*.

Following Li (2014) and Cai (2016), we use city commercial banks' financial data. We construct four proxies to measure bank performance: ROA, ROE, NPL ratio, and operating cost. Furthermore, a proxy measures the market share, given as a city commercial bank's total proportion of the total loans of all city commercial banks each year. We also use some bank-level accounting variables as controllers or alternative measures in the following empirics: loan ratio, asset ratio, capital ratio, asset quality, GDP of bank headquarters, bank age, and bank size. The definitions of the variables are presented in the Appendix.

Sample descriptive statistics

Table 1 presents the sample descriptive statistics. We distribute the full sample into two subsamples: diversified and non-diversified banks. Although the deregulation of city commercial banks is in force simultaneously, the banks' geographic expansion occurs at different times. In our sample, one bank could be classified as a non-diversified bank in the year before the expansion and a diversified bank in the year following its diversification out of the city of the headquarter. On average, diversified banks have 21.65 branches in 3.26 other cities. Moreover, in comparison, diversified banks are larger-sized and older and have more NPLs, non-interest income, and fixed assets than non-diversified banks. However, these observations have lower NPL ratios, lower capital adequacy ratios, and lower ROE. Most of these differences are statistically significant at the 1% level.

Table 1 Summary statistics for diversified and non-diversified banks

Variable	Diversified banks				Non-diversified banks				Difference in mean	Difference in median
	N	Mean	Std.	Median	N	Mean	Std.	Median	*t*-stat	Wilcoxon *z*-value
ROA	650	0.010	0.010	0.010	256	0.010	0.030	0.010	0.010	1.764
ROE	651	0.160	0.090	0.150	257	0.260	1.200	0.140	0.107[b]	1.221
NPL ratio	654	1.220	1	1.030	261	2.310	2.640	1.670	1.086[c]	38.990[c]
Cost	649	0.020	0.010	0.020	229	0.020	0.010	0.020	0.004[c]	31.482[c]
1–HHI	655	0.350	0.230	0.320	276	0	0	0	−0.348[c]	391.457[c]
Equity	655	8.490	0.900	8.510	265	7.080	0.890	7.110	−1.401[c]	245.006[c]
Capital	639	13.620	3.570	12.990	255	71.660	942.50	11.570	58.040	39.640[c]
NPL	654	7.930	1.470	8.150	262	6.960	2.010	7.220	−0.968[c]	45.247[c]
Loan ratio	652	0.450	0.170	0.440	259	0.500	0.130	0.530	0.053[c]	43.005[c]
Asset quality	644	0.040	0.190	0.0300	252	0.050	0.220	0.030	0.010	3.732[a]
NII	647	2.540	1.250	2.560	224	1.48	1.09	1.32	−1.053[c]	101.166[c]
Fixed asset	646	6.211	1.150	6.260	224	4.580	1.670	5.00	−1.626[c]	142.587[c]
Size	654	10.730	12.090	6.840	265	7.130	55.35	1.850	− 3.607	205.188[c]
Age	657	12.230	4.690	13	276	8.390	4.370	9	− 3.842[c]	127.966[c]
No. of branches	657	76.450	52.420	65	276	40.68	25.460	35	− 35.762[c]	97.391[c]
No. of cities	657	3.260	2.840	3	276	0.01	0.12	0	−3.241[c]	327.907[c]
No. of branches in other cities	657	21.650	30.220	10	276	0.360	3.130	0	−21.291[c]	359.093[c]

Notes. The full sample range from 2006 to 2016. A bank is defined as diversified if it has subsidiaries in more than one city. The sample is divided according to the bank–year observations; a bank can be diversified in one year and non-diversified in another year. Thus, appearing in both groups. All variables defined in the Appendix. [a], [b], and [c] denote statistical significance at 10%, 5% and 1% levels, respectively. The original amount of equity, NPL, fixed asset, and non-interest income is reported instead of log form (in units of million *yuan*)

Identification strategy

An empirical challenge in this research is that geographical diversification may be endogenous, meaning there may be unobservable variables that affect both bank geographical diversification and performance. To address these challenges, we employ the gravity-deregulation model to construct a time-varying and bank-specific exogenous instrument, following Goetz et al. (2013). According to the gravity-deregulation model, we select an exogenous variable: distance. Distance is the straight-line distance between the city center where the new branch is located and the city center where the city commercial bank's headquarter is located. Moreover, this variable is relevant to 1–*HHI*; however, it is not directly relevant to bank performance. Additionally, we also consider the deregulation policy shock in the model. Due to the difference between the policies in 2006 and 2009, there are two ways to show the role of deregulation in constructing an instrument. In 2006, the CBRC allowed only qualified city commercial banks to establish cross-regional branches; however, this standard was not disclosed to the public. This evaluation system includes two parts: qualitative and quantitative. From 2006 to 2009, for observations in which city commercial banks did not meet the quantitative standard, we set the projected share equal to 0. In 2009, the regulation preventing city commercial banks from setting up branches in other cities was completely lifted.

We collect the cross-regional information for each city commercial bank from the CBRC website, which publicizes all license information on bank branches to construct

the instrument. Then, we calculate the probability of a city commercial bank entering the target market to establish subsidiaries based on the gravity-deregulation model following Goetz et al. (2013). The model specification is as follows:

$$bankbranch_{b,i,c,t} = \alpha + \beta \times Distance_{b,i,c} + +\delta_i + \tau_t + \varepsilon_{i,t}, \quad (1)$$

where, $bank\ branch_{b,\ i,\ c,\ t}$ is the number of branches that bank b in city c, headquartered in city i, establishes in year t; $Distance_{b,\ i,\ c}$ is the distance between bank b's "home" city and the other city c. We also add the home city and year fixed effects and cluster standard errors at a city-year level. Accordingly, we expect the coefficient on distance and relative market size to be negative, meaning that banks are more attracted to establish branches in neighboring cities and relatively larger markets. We employ a Logit model to estimate model (1). The results are presented in Table 2. Column (1) reports that the gravity model could explain city commercial banks' expansion. The results show a negative and significant relationship between banks' expansion and distance. The results indicate that banks prefer to establish branches in cities close to their headquarters, consistent with Goetz et al. (2013).

We use the estimates in Table 2 to construct the instrumental variable (1–*Predicted HHI*). To create the predicted value, we iterate the coefficient estimates in column (1) of Table 2 and obtain the projected value of city commercial banks' branches in other cities for each year. Next, we use the projected value to compute the 1–*HHI* of bank branches as the instrument for actual geographical diversification in the first-stage regression. This index ranges from 0 to 1, with larger values indicating a greater extent of geographical diversification and 0 values indicating that the city commercial bank has no geographic expansion. We construct the instrumental variables by the predicted value.

Empirical results

This section includes three sub-sections: (1) preliminary results; (2) additional control variable results; and (3) two-stage least squares regression (2SLS) using the instrument.

Preliminary results

In this part, we estimate the relationship between geographical diversification and city commercial banks' performance using ordinary least squares (OLS) regressions. The model specification is as follows:

$$Y_{i,t} = \alpha + \gamma \times Proxy + \delta_i + \tau_t + \varepsilon_{i,t}, \quad (2)$$

Table 2 Gravity-deregulation model

Dependent variable	Branch
Distance	−0.002[c] (0.000)
Constant	1.835[c] (0.161)
Year fixed effects	Yes
Home city fixed effect	Yes
N	9754
R^2	0.315

Notes. This table reports the average marginal effects of Logit regressions. Standard errors are robust and reported in parentheses. [a]***, [b]**, and [c]* indicate significance at 1%, 5%, and 10% levels, respectively

where $Y_{i,\ t}$ denotes the performance of city commercial bank i in year t, and bank performance includes four variables: ROA, ROE, NPL ratio, and cost. Additionally, we include a variable for market share. *Proxy* denotes alternative measures of city commercial banks' geographical diversification, including 1–*HHI*, average distance, and a diversification dummy.[11] δ_i is bank fixed effects; τ_t is year fixed effects; and $\varepsilon_{i,\ t}$ is the residual. In the preliminary tests, we control only for the year and city commercial bank fixed effects.

The preliminary results are shown in Table 3. The relationship between geographic diversification and bank performance is negative. Meanwhile, geographic diversification has a positive and significant relationship with market share. The resulting coefficient indicates that if a median-sized non-diversified city commercial bank begins to expand, its performance will decrease with depressed ROE, and increased NPL ratio, and increased costs. The results indicate that a bank's geographic expansion increases its market share but does not improve performance.

Test of additional control variables

In this part, we estimate the causal effects between bank geographic diversification and bank performance by controlling for city commercial bank-level and city-level factors. We use the *HHI* of city commercial banks' branches. The model specification is as follows:

$$Y_{i,t} = \alpha + \gamma_1 \times (1\text{–}HHI) + \gamma_2 X_{i,t} + \delta_i + \tau_t + \varepsilon_{i,t}, \tag{3}$$

where $Y_{i,\ t}$ denotes the performance of city commercial bank i in year t and includes four variables: ROA, ROE, NPL ratio, cost, and market share; (1 – *HHI*) denotes bank geographical diversification. $X_{i,\ t}$ is a set of bank characteristics; δ_i is banks' fixed effects; τ_t is year fixed effects; and $\varepsilon_{i,\ t}$ is the residual. In this specification, γ_1 indicates whether the banks' geographical diversification influences their performance.

The test results for additional control variables are shown in Table 4. In this test, we control for city commercial bank-specific factors, including the loan ratio, asset ratio, capital, asset quality, and banks' age and size. The city-level specific variable uses the GDP of the bank's "home" city. The results show that city commercial banks' geographic diversification has a negative relationship with performance but a positive and significant relationship to market share. Specifically, the ROA and ROE of the bank decline, and the NPL ratio, cost, and market share increase. All the results are significant at 5%. This result is consistent with the preliminary results.

Two-stage least squares regression (2SLS)

This section highlights (1 – *Predicted HHI*) as an exogenous instrument to estimate model (2). The first-stage model is as follows:

$$(1\text{–}HHI)_{i,t} = \alpha + \beta \times (1\text{–}PredictedHHI) + \delta_i + \tau_t + \varepsilon_{i,t}. \tag{4}$$

[11] These three measures of geographical diversification of city commercial banks are as follows: (i) 1 minus the *HHI* of the distribution of the bank's branches across cities; (ii) the average distance between a city commercial bank's "home" city and the city of its subsidiary; and (iii) a dummy variable that takes a value of 1 if the city commercial bank set up branches outside its "home" city, and 0 otherwise.

Table 3 Geographic diversification and bank performance: baseline result

Dependent variable	(1) *ROA*	(2) *ROE*	(3) *NPL ratio*	(4) *Cost*	(5) *Market share*
Panel A: 1–*HHI*					
1–HHI	− 0.004[c] (0.001)	− 0.064[a] (0.037)	1.913[b] (0.796)	0.005[a] (0.003)	0.528[c] (0.124)
Constant	0.005 (0.003)	0.099[c] (0.010)	8.077[c] (1.200)	0.021[c] (0.007)	0.884[c] (0.482)
N	933	933	933	933	933
R^2	0.421	0.399	0.381	0.301	0.914
Panel B: *Avg distance*					
Avg distance	−0.001[b] (0.002)	−0.005[b] (0.002)	0.011 (0.088)	0.001[b] (0.003)	0.022[b] (0.011)
Constant	0.004[c] (0.001)	0.101[b] (0.046)	7.847[c] (1.318)	0.020[c] (0.007)	−0.921[a] (0.515)
N	933	933	933	933	933
R^2	0.424	0.396	0.369	0.302	0.914
Panel C: *Diversification dummy*					
Diversification dummy	−0.001 (0.001)	− 0.019[b] (0.008)	0.675[b] (0.293)	0.003[b] (0.001)	0.055[c] (0.040)
Constant	0.005[c] (0.001)	0.104[b] (0.046)	7.682[c] (1.311)	0.020[c] (0.006)	0.964[c] (0.141)
N	933	933	933	933	933
R^2	0.415	0.396	0.380	0.306	0.908
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes

Notes. Standard errors are robust, clustered at the bank-year level, and reported in parentheses. [a], [b], and [c] indicate significance at 10%, 5%, and 1% levels, respectively

Table 4 Geographic diversification and bank performance: additional control variables test

Dependent variable	(1) *ROA*	(2) *ROE*	(3) *NPL ratio*	(4) *Cost*	(5) *Market share*
1–HHI	− 0.005[b] (0.002)	− 0.073[b] (0.031)	2.671[c] (0.758)	0.009[b] (0.004)	0.377[c] (0.082)
Loan ratio	0.015[c] (0.002)	0.038[a] (0.020)	0.471 (0.293)	0.032[c] (0.002)	0.146[b] (0.067)
Asset ratio	−0.014 (0.009)	−0.153 (0.149)	−6.556[b] (2.539)	− 0.028[b] (0.013)	−4.494[c] (0.956)
Capital	0.007[b] (0.003)	−0.300[c] (0.072)	− 0.648 (0.880)	0.010[a] (0.006)	− 0.272[a] (0.141)
Asset quality	0.064[b] (0.027)	−0.344 (0.857)	5.834 (6.855)	0.030 (0.034)	1.509[c] (0.470)
GDP	−0.190 (0.223)	1.630 (4.167)	− 252.737[b] (105.728)	− 0.281 (0.417)	−63.497[c] (19.166)
Age	0.004[c] (0.001)	0.003 (0.002)	−0.590[c] (0.048)	− 0.002[c] (0.002)	0.054[c] (0.006)
Size	0.004 (0.003)	0.057 (0.047)	1.493[a] (0.884)	0.014[c] (0.005)	1.201[c] (0.340)
Constant	−0.003[a] (0.002)	0.091[c] (0.028)	9.881[c] (0.367)	0.025[c] (0.002)	−0.411[c] (0.064)
N	808	808	808	808	808
R^2	0.704	0.580	0.461	0.633	0.971
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes

Notes. Standard errors are robust, clustered at the bank level, and reported in parentheses. [a], [b], and [c] indicate significance at the 10%, 5%, and 1% levels, respectively

Table 5 2SLS regression using 1–*Predicted HHI* as an instrument

Dependent variable	(1) *ROA*	(2) *ROE*	(3) *NPL ratio*	(4) *Cost*	(5) *Market share*
Panel A Second-stage					
1–HHI	−0.006[a] (0.003)	− 0.082[a] (0.048)	1.327[a] (0.775)	0.024[c] (0.004)	0.355[b] (0.137)
Loan ratio	0.015[c] (0.002)	0.036[a] (0.019)	0.444 (0.319)	0.032[c] (0.002)	0.136[b] (0.078)
Asset ratio	−0.006[a] (0.007)	− 0.002 (0.001)	− 0.086[c] (0.027)	0.000 (0.000)	−4.533[c] (0.897)
Capital	0.006[b] (0.003)	−0.301[c] (0.065)	− 0.782 (0.755)	0.010[c] (0.004)	− 0.313[b] (0.192)
Asset quality	0.001[b] (0.002)	−0.004 (0.008)	0.036 (0.215)	0.000 (0.001)	1.389[c] (0.511)
GDP	−1.984 (2.193)	13.998 (39.002)	− 2793.267[c] (643.740)	0.829 (3.154)	−62.621[c] (17.233)
Age	−0.001 (0.001)	0.011[c] (0.002)	− 0.011 (0.062)	0.000 (0.000)	− 0.023 (0.010)
Size	54.743 (33.593)	733.750[a] (434.495)	21,350.632[b] (8308.440)	50.455 (40.844)	1.258[c] (0.411)
Constant	0.001 (0.003)	−0.003 (0.044)	1.708[a] (0.999)	− 0.010[b] (0.005)	0.349[b] (0.177)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes
N	790	790	794	783	796
R^2	0.717	0.599	0.454	0.705	0.971
Panel B: First-stage					
1–*Predicted HHI*	0.655[c] (0.077)	0.655[c] (0.077)	0.652[c] (0.077)	0.659[c] (0.078)	0.658[c] (0.077)
Constant	0.541[c] (0.080)	0.541[c] (0.080)	0.542[c] (0.082)	0.535[c] (0.081)	0.533[c] (0.081)

Notes. Standard errors are robust and reported in parentheses. [a], [b], and [c] indicate significance at 10%, 5%, and 1% levels, respectively

Table 5 reports the results. In the results for the first stage presented in Panel B of Table 5, the index of (1–*Predicted HHI*) is positive and significantly associated with the actual degree of diversification at the 1% level. This means that a higher level of a bank's predicted geographical diversification is positively associated with actual bank geographical diversification at the 1% level. The result indicates that the instrument could explain diversification at the city commercial bank level. Panel A of Table 5 presents the second-stage results. The coefficient on the predicted diversification is significantly related to the bank's performance; the results consist of the baseline results. The coefficient has a positive and significant relationship with the NPL ratio, cost, and market share but a negative and significant relationship with ROA and ROE. In general, geographical diversification reduces the bank's performance.

In China, as the original intention of establishing city commercial banks is to serve the local economy, these banks can only operate in the registered city. Therefore, most city commercial banks are ill-informed about the areas outside their headquarters. After deregulation, to occupy the market, they blindly expand. Moreover, bank diversification does not result in lower risk because diversified banks may raise leverage and pursue riskier activities due to competitive pressures (Chong 1991; Demsetz and Strahan 1973). An increase in NPLs may account for this phenomenon. Banks' geographic diversification may increase organizational complexity and intensify agency problems. When a bank sets up affiliated branches far away from its "home" city, the headquarters may not be able to control these branches. Decreased ROA and ROE may account for agency problems. Existing studies consider that banks prefer investing in high-risk projects to protect their returns due to the increased distance and information asymmetry between branches and headquarters (Brickley et al. 2003; Degryse and Ongena 2005; Deng and Elyasiani 2008).

Mechanisms

Our results show a robust and negative effect of geographical diversification on bank performance. In this section, we explore the mechanisms of this research in the Chinese context. Specifically, the mechanisms include the number of large- and medium-sized banks in a target market, local protectionism, the ownership of city commercial banks, and heterogeneity characteristics between the city commercial banks.

Market structure of the target market

Although geographical diversification could expand city commercial banks' market, they also encounter competition and challenges. The banking industry in China is an oligopoly market, and state-owned banks and joint-equity commercial banks hold a major market share. In an oligopoly market, large-sized companies are likely to conspire together for higher profits (Bain 1956; Demsetz and Strahan 1973; Demirgüç-Kunt and Harry 1999). Compared with large banks, small banks prefer to offer high interest rates and over lend to enhance their competitiveness, possibly increasing risk (Franklin and Douglas 2000). Establishing a relationship with the local government could be difficult for a city commercial bank in a new market. As a new entrant, city commercial banks can acquire relatively few resources from the new market. Therefore, we predict that city

commercial banks expanding cross-regionally to new markets with large numbers of state-owned banks and joint-equity banks would worsen performance.

To examine this hypothesis, we estimate it using Eq. (3) and divide our sample into two subsamples.[12] The results are reports in Table 6. Columns (1) to (5) report the results for a subsample with a large number of state-owned banks and joint-equity banks, and columns (6) to (10) report the results for a subsample with a small number of these banks. We find that the coefficient estimates of ROA and ROE are negative in both specifications and significant at the 1% level for the former subsample but not significant for the latter subsample. The coefficient estimates for the NPL ratio and cost are positive in both specifications and significant at the 5% and 10% levels for both subsamples. However, the market share of city commercial banks in the subsample with a small number of state-owned banks and joint-equity banks is more significant than that for the subsample with several of these banks both economically and statistically. The results imply that city commercial banks that establish branches in cities with several large-sized banks have worse performance. However, although expanding to the market with a small number of large-sized banks did not increase the city commercial bank's return, it increased its market share.

Ownership

Government holding banks are a universal phenomenon worldwide (Porta 2012). According to the World Bank (2001), in the 1990s, governments held 40% of bank assets globally. There are also different views on the consequences of government intervention in finance. Compared to private banks, government banks have lower efficiency, lower revenue, poor loan quality, and a higher risk of bankruptcy (Baum et al. 2010; Cornett et al. 2008; Iannotta et al. 2007; Mian 2003; Shen and Lin 2012). However, government holding banks could remedy the market failure of private banks and address the interest of society and the public (Gerashchenko 1962; Greenwald and Stiglitz 1986; Hainz and Hakenes 2007; Lewis 1950; Stiglitz 1993; Stiglitz and Weiss 1981). These different views stem from the different levels of the political system and economic development in different countries (Körner and Schnabel 2011; Levy-Yeyati et al. 2004; Micco et al. 2007). The existing research considers that local governments acquire financial resources by intervening in city commercial banks, leading them to have high NPLs and low performance (Tian 2012). However, compared with the non-state-owned city commercial banks, the state-owned city commercial banks can access local resources from local governments (Hu and Guo 2013). They cannot achieve the optimal allocation of resources because of the oligopoly banking market in China. In this circumstance, the local government support is instrumental. We predict that non-state-owned banks show worse performance than state-owned banks.

To examine this hypothesis, we estimate it using Eq. (3) and divide our sample into two subsamples by city commercial banks' ownership. The results are seen in Table 7. Columns (1) to (5) report the results for state-owned banks, and columns (6) to (10) report those for non-state-owned banks. We find that the coefficient estimates of ROA

[12]We calculate the number of state-owned banks and joint-equity banks in each target market, and then cumulate the number of state-owned banks and joint-equity banks of all the target market. Finally, divide the number of target markets. The average number of state-owned banks and joint-equity banks in target markets is the index.

Table 6 Number of large size banks in subsidiary city

Dependent variable	Large subsample					Small subsample				
	(1) *ROA*	(2) *ROE*	(3) *NPL ratio*	(4) *Cost*	(5) *Market share*	(6) *ROA*	(7) *ROE*	(8) *NPL ratio*	(9) *Cost*	(10) *Market share*
1–HHI	−0.008[c] (0.003)	− 0.145[c] (0.049)	1.382[b] (0.578)	0.005[a] (0.003)	0.2875[c] (0.102)	−0.004 (0.003)	− 0.049 (0.046)	3.150[b] (1.209)	0.010[a] (0.006)	0.254[b] (0.114)
Loan ratio	0.016[c] (0.001)	0.053 (0.032)	0.226 (0.303)	0.030[c] (0.002)	0.1615[b] (0.062)	0.004 (0.004)	0.016 (0.092)	0.173 (1.438)	0.027[c] (0.006)	0.581[c] (0.174)
Asset ratio	−0.017 (0.011)	−0.265 (0.201)	−4.241 (2.786)	−0.013 (0.015)	−3.829[c] (0.754)	− 0.074 (0.057)	−1.228 (0.968)	−1.249 (17.960)	− 0.151 (0.110)	0.451 (2.600)
Capital	0.009[c] (0.002)	−0.331[b] (0.137)	− 0.262 (0.942)	0.020[c] (0.005)	− 0.4935[b] (0.219)	0.004 (0.003)	− 0.309[c] (0.114)	0.508 (0.515)	0.001 (0.003)	− 0.002 (0.054)
Asset quality	0.006 (0.040)	−2.352[b] (0.887)	−3.284 (35.896)	−0.003 (0.196)	2.311[c] (0.726)	−1.522 (2.073)	− 11.394 (34.576)	2686.574 (2239.584)	8.534 (6.386)	23.227 (35.106)
GDP	−0.219 (0.429)	1.520 (8.048)	− 128.827 (104.574)	0.230 (0.572)	−39.224 (38.386)	− 0.117 (0.216)	2.478 (5.024)	− 175.864 (150.104)	0.045 (0.447)	− 101.269[c] (21.856)
Age	0.001[c] (0.000)	0.006[b] (0.002)	−0.519[c] (0.078)	− 0.002[c] (0.000)	0.057[c] 0.008	0.001[b] (0.000)	0.006 (0.005)	− 0.507[b] (0.211)	− 0.003[c] (0.001)	− 0.291[b] (0.013)
Size	0.006 (0.004)	0.095 (0.062)	0.745 (0.885)	0.009[a] (0.005)	0.943[c] (0.274)	0.008 (0.007)	0.054 (0.159)	−0.486 (2.572)	0.007 (0.010)	1.963[c] (0.412)
Constant	−0.005[c] (0.001)	0.080[c] (0.025)	9.031[c] (1.139)	0.022[c] (0.006)	−0.433[c] (0.053)	− 0.001 (0.004)	0.049 (0.083)	7.330[b] (2.972)	0.038[c] (0.013)	0.775[c] (0.018)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	433	433	433	433	433	375	375	375	375	365
R^2	0.809	0.672	0.520	0.799	0.97	0.705	0.633	0.572	0.615	0.983

Notes. We distribute the full sample into two subsamples by the median. The large subsample is the sample larger than the median; others are small subsample. Year and Bank fixed effects are controlled. Standard errors are robust and reported in parentheses. [a], [b], and [c] indicate significance at 10%, 5%, 1% levels, respectively

Table 7 Ownership of city commercial bank

Dependent variable	State-owned				Non-state-owned					
	(1) *ROA*	(2) *ROE*	(3) *NPL ratio*	(4) *Cost*	(5) *Market share*	(6) *ROA*	(7) *ROE*	(8) *NPL ratio*	(9) *Cost*	(10) *Market share*
1–*HHI*	− 0.003 (0.003)	− 0.059 (0.045)	2.635[b] (1.087)	0.007 (0.005)	0.383[c] (0.110)	− 0.006[b] (0.002)	− 0.060[a] (0.034)	2.831[c] (0.955)	0.012[b] (0.004)	0.428[c] (0.115)
Loan ratio	0.015[c] (0.001)	0.027[b] (0.013)	0.208 (0.315)	0.031[c] (0.002)	0.130[a] (0.068)	0.006 (0.006)	−0.024 (0.076)	2.581 (1.609)	0.031[c] (0.009)	0.567[a] (0.281)
Asset ratio	−0.093 (0.060)	−1.434 (0.876)	− 19.731 (18.082)	− 0.127 (0.085)	−1.130 (2.053)	− 0.144[c] (0.028)	−3.313[c] (0.326)	− 14.832[a] (8.733)	− 0.036 (0.047)	− 2.632[b] (1.186)
Capital	0.008[b] (0.004)	− 0.220[c] (0.036)	− 0.131 (0.821)	0.013[a] (0.007)	− 0.156 (0.116)	− 0.001 (0.009)	− 0.910[c] (0.150)	−5.499[a] (2.792)	− 0.005 (0.015)	− 1.198[c] (0.300)
Asset quality	0.024 (0.038)	−2.114[b] (0.978)	−3.382 (10.118)	− 0.006 (0.064)	1.527[a] (0.904)	0.083[c] (0.022)	0.241 (0.321)	3.451 (12.013)	0.051 (0.041)	1.014 (0.848)
GDP	−0.469 (0.426)	−9.132 (6.666)	− 153.524 (242.428)	− 0.793 (1.055)	−91.503[b] (35.007)	0.080 (0.209)	7.948[c] (2.783)	− 299.673[c] (97.029)	− 0.133 (0.328)	−54.625[a] (28.066)
Age	0.001[c] (0.001)	0.003 (0.002)	−0.602[c] (0.064)	− 0.002[c] (0.000)	0.054[c] (0.005)	− 0.015[c] (0.003)	− 0.366[c] (0.035)	−1.673[a] (0.979)	− 0.005 (0.005)	0.252 (0.248)
Size	0.006 (0.006)	0.139[a] (0.072)	1.982 (1.476)	0.022[b] (0.008)	1.358[c] (0.295)	−0.001 (0.002)	−0.065[a] (0.033)	0.880 (0.749)	0.007[a] (0.003)	1.248[b] (0.580)
Constant	−0.004[c] (0.001)	0.088[c] (0.014)	10.271[c] (0.468)	0.027[c] (0.003)	−0.500[c] (0.054)	0.225[c] (0.045)	5.613[c] (0.532)	24.983[a] (14.302)	0.069 (0.075)	−3.357 (3.744)
Year fixed effects	489	489	489	489	489	319	319	319	319	319
Bank fixed effects	0.738	0.568	0.504	0.633	0.975	0.694	0.714	0.453	0.691	0.968
N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Standard errors are robust and reported in parentheses. [a], [b], and [c] indicate significance at 10%, 5%, and 1% levels, respectively. Robust standard errors in parentheses

and ROE are negative in both specifications and significant for the non-state-owned sample but not significant for the state-owned sample. The coefficient estimates of the NPL ratio and market share are positive and significant for both subsamples. The cost coefficient estimates are positive and significant for the non-state-owned sample but not significant for the state-owned sample. The reason for these results may be due to the support of local governments.

Local protectionism

To protect the interests of the local economy, the local government has taken a series of actions (Bai et al. 2004; Lin and Liu 2004; Poncet, 2002). The development of city commercial banks has been deemed important by local governments as they are only financial resources that local governments can directly control (Guo 2014; Guo and Xiong 2018; Zhou 2004a; 2004b; 2007). Local governments transfer the financial resources of city commercial banks to local enterprises by controlling city commercial banks (Guo and Xiong 2018). The local city commercial banks collect the utility expenses of a city. Therefore, city commercial banks cross-regionally expanding to other cities with high levels of local protectionism would lead to poor performance. Additionally, the target market may reject the application of other city commercial banks to set up a branch, as the new branches of other city commercial banks will increase the competitiveness of the local banking industry. We hypothesize that a higher level of local protectionism in the target market will decrease the performance and market share of city commercial banks. To examine this hypothesis, we estimate the following model:

$$Y_{i,t} = \alpha + \gamma(1\text{–}HHI) + \gamma_1 Protect + \gamma_2(1\text{–}HHI) \times Protect + X_{i,t} + \delta_i + \tau_t + \varepsilon_{i,t}, \quad (5)$$

where, $Y_{i,\ t}$ and $(1 - HHI)$ are the same as the previous model before. We add a new variable *Protect* and the interaction term $(1 - HHI) \times Protect$. *Protect* denotes the level of local protectionism in the target market. We calculate this value following Hu and Zhang (2005) and use the proportion of enterprise income tax as local fiscal revenue.[13]

The results of estimating Eq. (5) are seen in Table 8. Columns (1) and (2) present the regression for banks' ROA and ROE. The coefficient estimates of the interaction terms are negative and significant at the 1% level. In columns (3) and (4), we present the regression for banks' NPL ratio and cost: The coefficient estimates of the interaction terms are positive and significant at the 10% and 1% levels, respectively. Column (5) presents the results for market share; the coefficient of the interaction terms is negative but not significant. These results show that the higher the level of local protectionism in the target market, the worse the performance of city commercial banks. Local protectionism affects market share, consistent with local protectionism leading to market segmentation.

Cross-sectional analyses

Geographical diversification has different effects on large and small banks (Berger et al. 2006; Berger and DeYoung 2001; Brickley et al. 2003; Deng and Elyasiani

[13]We calculate the level of regional protectionism in each target market and then the regional protectionism index of the target market as a whole. Finally, we divide the number of target markets. The average of local protectionism in target markets is the regional protectionism index.

Table 8 Local protectionism

Dependent variable	(1) *ROA*	(2) *ROE*	(3) *NPL ratio*	(4) *Cost*	(5) *Market share*
Protect×(1−*HHI*)	− 0.097[c] (0.025)	−1.510[c] (0.401)	12.453[a] (6.603)	0.113[c] (0.031)	−0.065 (0.644)
Protect	0.013 (0.011)	0.242 (0.177)	−2.859 (2.911)	0.002 (0.014)	−0.649[b] (0.284)
1−*HHI*	−0.010[c] (0.002)	− 0.165[c] (0.030)	2.751[c] (0.495)	0.013[c] (0.002)	0.362[c] (0.048)
Loan ratio	0.004 (0.003)	−0.047 (0.045)	0.523 (0.749)	0.025[c] (0.004)	0.406[c] (0.073)
Asset ratio	−0.001[c] (0.004)	− 0.024[c] (0.007)	− 0.173 (0.120)	− 0.001 (0.001)	− 0.010 (0.012)
Capital	0.003 (0.017)	−0.447[c] (0.067)	−1.198 (1.118)	0.010[a] (0.005)	− 0.248[b] (0.109)
Asset quality	0.003 (0.002)	− 0.016 (0.029)	0.132 (0.479)	0.000 (0.002)	0.012 (0.047)
GDP	0.018 (0.027)	0.083[a] (0.045)	−0.025[c] (0.007)	−0.027 (0.034)	− 0.064[c] (0.007)
Age	−0.002 (0.002)	− 0.010[c] (0.003)	− 0.320[c] (0.048)	− 0.003[c] (0.007)	− 0.028[c] (0.005)
Size	0.007[b] (0.003)	0.001[a] (0.001)	0.011 (0.010)	0.001 (0.004)	0.012[c] (0.001)
Constant	0.011[c] (0.003)	0.322[c] (0.051)	6.404[c] (0.822)	0.048[c] (0.004)	0.860[c] (0.080)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes
N	736	736	741	729	741
R^2	0.504	0.505	0.450	0.621	0.973

Notes. Standard errors are robust and reported in parentheses. [a], [b], and [c] indicate significance at 10%, 5%, 1% levels, respectively

2008; Goetz et al. 2013; Wang et al. 2012). Banks with a capital of USD25 million to USD500 million could experience improved performance due to the expansion. Berger et al. (1995), Marcus (1983), and Rime and Stiroh (2003) suggest that the capital adequacy ratio has a positive and significant relationship with ROA. Bank characteristics will influence bank performance. We conduct several cross-sectional analyses and classify the sample into two subsamples based on bank characteristics.

We select bank characteristics, including size, age, capital adequacy, NPLs, and non-interest income. We separate our sample into two subsamples by the median of each bank characteristic. The observations greater than the median are classified as the higher subsample; other observations are classified as the lower subsample. We run the estimation of Eq. (3) for each subsample and present the results in Table 9.

Panel A of Table 9 indicates that the size of banks has no significant effect on the impact of geographical diversification on bank performance. Panel B of Table 9 shows that geographic expansion by younger banks contributes additionally to worse performance, while the impact on performance in larger city commercial banks becomes insignificant. Panel C of Table 9 indicates that geographic expansion by a bank with a lower capital adequacy ratio contributes to worse performance, while the impact on the performance of a bank with a higher capital adequacy ratio is insignificant. Panel D of Table 9 suggests that geographic expansion by higher NPLs contributes to worse bank performance, while the impact on the performance of banks with lower NPLs is insignificant. Panel E of Table 9 suggests that geographic expansion by higher non-interest income contributes to worse returns, while the impact on lower non-interest income contributes to operating costs. The results for market share are positive and significant for both subsamples.

Table 9 Cross-sectional analysis: heterogeneity of city commercial banks

Dependent variable	Above median					Below median				
	(1) *ROA*	(2) *ROE*	(3) *NPL ratio*	(4) *Cost*	(5) *Market share*	(6) *ROA*	(7) *ROE*	(8) *NPL ratio*	(9) *Cost*	(10) *Market share*
Panel A:Bank size										
1–*HHI*	− 0.003 (0.016)	0.007 (0.039)	1.598[b] (1.043)	0.002 (0.004)	0.348[c] (0.091)	− 0.002 (0.026)	− 0.007 (0.071)	1.241 (0.825)	0.008 (0.007)	0.254[c] (0.045)
N	447	447	447	447	447	361	361	361	361	361
R^2	0.777	0.780	0.578	0.783	0.979	0.846	0.725	0.702	0.704	0.982
Panel B:Bank age										
1–*HHI*	−0.002 (0.003)	−0.049 (0.048)	1.425 (1.103)	0.007 (0.005)	0.332[c] (0.074)	− 0.007[b] (0.003)	− 0.116[b] (0.048)	1.377[a] (0.801)	0.009 (0.005)	0.310[c] (0.056)
N	456	456	456	456	456	352	352	352	352	352
R^2	0.648	0.651	0.406	0.625	0.986	0.840	0.741	0.874	0.721	0.981
Panel C:Capital adequacy ratio										
1–*HHI*	−0.001 (0.003)	−0.018 (0.038)	0.814 (0.670)	0.002 (0.004)	0.187[c] (0.054)	− 0.007[b] (0.003)	− 0.121[b] (0.054)	4.410[c] (1.226)	0.015[b] (0.007)	0.519[c] (0.086)
N	427	427	427	427	427	381	381	381	381	381
R^2	0.810	0.719	0.532	0.817	0.987	0.652	0.670	0.562	0.595	0.969
Panel D:NPL										
1–*HHI*	−0.005[c] (0.002)	−0.087[c] (0.031)	3.642[b] (1.502)	0.013[b] (0.006)	0.411[c] (0.093)	− 0.004 (0.003)	− 0.069 (0.046)	0.699 (0.507)	0.007 (0.005)	0.161[c] (0.033)
N	419	419	419	419	419	389	389	389	389	387
R^2	0.589	0.615	0.611	0.593	0.974	0.832	0.680	0.676	0.797	0.980
Panel E:Non-interest income										
1–*HHI*	−0.010[c] (0.003)	−0.115[c] (0.044)	3.094[a] (1.613)	0.001 (0.006)	0.262[c] (0.075)	− 0.003 (0.003)	− 0.036 (0.046)	1.806[b] (0.823)	0.011[b] (0.005)	0.373[c] (0.065)
N	432	432	432	432	432	376	376	376	376	376
R^2	0.702	0.707	0.510	0.497	0.976	0.832	0.729	0.620	0.865	0.981

This table shows the results of cross-sectional analyses. The sample was divided into two subsamples, Large and Small, based on the sample medians of bank size, bank age, capital adequacy ratio, non-performing loan, and non-interest income. Year and Bank fixed effects are controlled. Standard errors are robust and reported in parentheses. [a], [b], and [c] indicate significance at 10%, 5%, and 1%levels, respectively

Conclusion

We extend our work by examining the impact of geographic diversification changes that resulted from deregulation on bank performance. Our baseline results suggest that geographic diversification of banks decreases their performance but increases their market share. Moreover, the result of the 2SLS regression using the instrument calculated from the gravity model is consistent with the baseline result. We also add a different explanation in this study. While some existing studies argue that geographic expansion leads to better performance due to cost reduction and scale effects, other studies highlight that geographic expansion increases the distance between headquarters and branches, leading to complexity in monitoring activities and risk management and decreasing bank performance. We find that the external environment and market structure in the target market reduce city commercial banks' performance. More specifically, different from the existing research, we perform some mechanism tests based on the Chinese market context. First, our findings are driven by the level of local protectionism in the target market and the number of large- and medium-sized banks. Higher levels of local protectionism and a higher number of large- and medium-sized banks dominate the target market and worsen the performance after deregulation. Second, compared with state-owned city commercial banks, non-state-owned city commercial banks are more likely to perform worse. According to our empirical results, in addition to the reasons for the scale effect and internal controls, the external environment, market structure, and ownership structure of banks also impact bank performance after geographic expansion.

The main differences between this study and other existing research are the following: (1) Our sample is different from those in other studies. Wang et al. (2012) use financial data on 104 city commercial banks from 2004 to 2009. They focus on the policy implemented in 2006. At this stage, only eligible city commercial banks were permitted to expand. Therefore, the sample might have a selection bias. However, our research includes the two phases of Chinese deregulation. Li (2014) uses bank financial data from 2008 to 2012, including 106 city commercial banks, 69 rural commercial banks, and 39 rural cooperative banks. However, rural commercial banks and rural cooperative banks have not been allowed to operate cross-regionally. Cai (2016) uses a sample of joint-equity commercial banks and city commercial banks. However, joint-equity commercial banks are not limited across regions, as they hold a nationwide license. This paper addresses these challenges. (2) Wang et al. (2012) and Li (2014) use the Heckman selection model (without IV) to overcome sample selection bias. Cai (2016) uses the interaction term between policy and the initial capital adequacy ratio of the bank. We use a policy shock and gravity model to construct an instrumental variable to overcome endogenous unobservable variables. This method is relatively exogenous. (3) The research mechanisms are different. Wang et al. (2012) and Li (2014) use the mechanism of the distance between the "home" city and other cities. However, following the geographic expansion of city commercial banks, the worse performance is due to market circumstances in China. Therefore, we pay more attention to market structure, local protectionism, and the ownership of city commercial banks.

Our results also have practical significance. First, the supervision department should build prudent regulations permiting well-performing city commercial banks to establish cross-regional branches. Meanwhile, city commercial banks should focus on local businesses, avoiding blind expansion to achieve a larger market share. Second, the government should pay more attention to local protectionism, as it leads to market segmentation and harms resource allocation. Third, city commercial banks should consider the market structure and administrative factors of the target market. Sufficient market surveys and accurate market positioning in the new market are necessary for a bank's cross-regional development. Finally, a good way to thrive in the target market is to implement different competitive strategies and elude conflict with state-owned banks and joint-equity banks. Thus, city commercial banks should pay particular attention to their local markets and concentrate on serving the local economy.

Appendix

Table 10 List of variables

Variable	Definition	Source
1–HHI	Branches dispersion index as a measure of geographic diversification, 1 – Herfindahl index of branches across cities is one minus the sum of squared branches held in other cities	CBRC
Age	The number of years since the bank has existed	CSMAR
Asset ratio	The growth rate of total assets	CSMAR
Asset quality	Loan loss reserves divided by gross loans	CSMAR
Avg distance	The average distance between a city bank's headquarter's county and the county of its affiliated subsidiary banks	CBRC
Capital	Book value of equity capital divided by total assets	CSMAR
Cost	The ratio of operating cost, measured by (Operating cost)/ (Total Cost)	CSMAR
Distance	the distance between bank's "home" city and other cities	CBRC
Diversification dummy	A dummy variable that takes on the value of one if a city bank has subsidiaries in other cities and zero otherwise.	CBRC
GDP	Gross domestic product of the bank's headquarter city	CSMAR
Loan ratio	Total loan ratio, measured by the bank's annual loan divided by the total asset	CSMAR
Market share	The market share of the loan, measured by the total loan of one city commercial bank divided by the total loan of the city commercial banks' sector	CSMAR
NPL ratio	Non-performing loan is given as (Non-performing Loan) / (Total loan), measured by the sum of loans past their 90-day due or more and still accruing, and the non-accrual loans, divided by total loans	CNRDS
ROA	ROA is given as (Net income) / (Total asset)	CSMAR
ROE	ROE is given as (Net income) / (Total equity)	CSMAR
Size	The book value of the bank's total assets	CSMAR

Abbreviations
CBRC: China Banking Regulatory Commission; HHI: Herfindahl index; NPL: Non-performing loan; PBC: People's Bank of China; ROA: Return on asset; ROE: Return on equity

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Authors' contributions
XL and CS designed the study. XL performed the research, collected and analyzed the data, and wrote the paper. The author(s) read and approved the final manuscript.

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Availability of data and materials
1. The bank branch data that support the findings of this study are available in: http://xukezheng.cbrc.gov.cn/ilicence/licence/licenceQuery.jsp
2. The bank financial data that support the findings of this study are available in: http://www-cnrds-com-s.vpn.ruc.edu.cn/Home/Index#/AllDatabase
3. The city information data that support the findings of this study are available in: http://www-gtarsc-com.vpn.ruc.edu.cn/SingleTable/DataBaseInfo?nodeid=23
4. All the details of information above that support the findings of this study are available from the corresponding author upon reasonable request, if needed. lixiaonan19901008@163.com

Declarations

Competing interests
The authors declare that they have no competing interests.

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