Does the Cross Regional Operation of City Commercial Banks Reduce the Bank's Risk-Taking

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ABSTRACT

Based on the data of 67 commercial banks in China from 2010 to 2020, this paper studies the relationship between the geographical concentration of city commercial banks and their risk-taking level by establishing benchmark regression model and threshold regression model. The research finds that: first, there is a significant negative correlation between the geographical concentration of city commercial banks and their risk-taking level; Second, there is a significant threshold effect between the geographical concentration of city commercial banks and their risk-taking level; Third, as the degree of cross regional operation of city commercial banks increases, continuing to expand the geographical scope of operation will help them reduce the level of risk-taking, but this effect is not obvious.

Keywords: *City Commercial Bank; Cross Regional Operation; Bank Risk-Taking*

1. INTRODUCTION

No matter in what country, banks are the core component of its financial system. By the end of 2020, China's indirect financing accounted for 84.87% of the scale of social financing. China's financial market is still a bank leading market. As the core component of China's financial system, banking plays a decisive role in serving the real economy. In order to better play the role of the banking industry, as early as 2006, the CBRC issued the "measures for the administration of offsite branches of city commercial banks", encouraging and supporting city commercial banks to set up offsite branches on the basis of integrating resources and preventing risks. This has laid an institutional foundation for the geographical expansion of city commercial banks, making cross regional operation a key node in the development of small and medium-sized banks in China, especially city commercial banks [14].

Since then, qualified city commercial banks have quickly begun to layout, accelerating the pace of layout in various cities, and launching fierce competition for economic resources in economically developed regions. The geographical expansion of city commercial banks has alleviated the uneven distribution of financial resources in space to a certain extent, and this behavior has also become the main feature of the development of city commercial banks. At present, city commercial banks have set up more than 18000 branches across the country, covering the vast majority of provinces in the country. City commercial banks play a very important role in the process of China's economic development.

In order to better serve the real economy, city commercial banks should not only consider expansion, but also consider their risk-taking. The risks borne by the banking system are directly related to the safety of the entire financial system. Therefore, the improvement of the risk management ability of city commercial banks can not only reduce the capital cost of enterprises in the financing process, but also promote banks to improve their regulatory ability, thereby improving the stability of the banking industry and the entire financial system.

Taking the micro perspective of city commercial banks as the starting point, this paper attempts to verify the influence mechanism between the geographical concentration of city commercial banks and the level of bank risk-taking in different geographical business scopes by establishing a threshold regression model, expecting to make some reference for better prevention and management of financial risks of city commercial banks in China.

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2. LITERATURE REVIEW

The impact of cross regional operation of city commercial banks has always been a hot topic in academic circles.

As early as 1971, Lewellen (1971) [12] studied by establishing a theoretical model and found that if commercial banks implement cross regional operations, they can achieve the "co-insurance" effect and reduce the risks borne by reducing the income volatility of commercial banks. Demsetz & Strahan (1997) [16] found that the risk of the banking industry has been reduced to a certain extent after the United States liberalized the restrictions on cross state operations. Hughes et al (1999) [10] took Bank of America as a sample, and found that the profit level of banks with cross regional operation was higher, and compared with other banks, these banks' income volatility, bankruptcy risk and market risk were lower. Campello (2002) [15] believes that banks can obtain certain advantages in the internal capital market through cross regional operations, and allocate funds among branches in different regions, which is conducive to alleviating the capital constraints caused by financial market frictions to a certain extent. Akhigbe & Whyte (2003) [1] studied Bank of America and reached a similar conclusion. Tabak et al (2011) [19] found that the regional diversification of Brazilian banking industry improves the return of banks and reduces the risk of default. Sun and Liu (2009) [17] took the listed commercial banks in Shanghai and Shenzhen stock markets as samples and found that the cross regional operation of banks have a positively correlation with their profits. Fan et al. (2011) [7] studied five large commercial banks and nine joint-stock commercial banks in China and found that cross regional operation has a significant positive effect on improving the operating efficiency and reducing risks of large banks. Liu (2011) [13] found that for banks with strong operating capacity, sufficient capital and liquidity, cross regional operation can significantly reduce their risks. Wang et al (2012) [20] believed that the geographical expansion of banks can effectively disperse investment risks, thereby reducing the risk level of banks, and the greater the degree of geographical expansion, the lower the risk level. Chang (2014) [5] examined the relationship between the location choice of branches and bank performance by taking the location choice of branches as the starting point, and found that the establishment of branches in cities with higher economic development level can significantly improve bank performance and reduce bank risk, but there is no significant relationship between the number of branches and bank performance. Goetz et al (2016) [9] found that the geographical dispersion of operations can effectively reduce the financial risks of banks, while the diversification of business areas will not affect the quality of loans.

However, some scholars believe that the cross regional operation of city commercial banks will have a negative impact on banks. Chong (1991) [4] found that geographical expansion did not reduce the risk of commercial banks, but increased the motivation of banks to pursue risk, increased the leverage ratio of banks, and then increased the risk of banks. Berger & de Young (2001) [2] found that the farther the branches are from the headquarters, the weaker the head office's supervision and control over the branch managers, which is often combined with the performance pressure and incentive behavior of the branch bank's management, resulting in the branches' radical behavior when issuing loans and increasing the bank's operational risk. Brikley et al (2003) [3] also supports this view. Goetz et al (2013) [8] found that the greater the distance between the head office and branches, the easier it is for banks to lend to insiders, which reduces the quality of loans, increases the problem of bank agents, and increases the level of bank risk. The research of Delong (2001) [6] and Allen & gale (2004) also supports this view, and believes that cross regional operation makes commercial banks face greater competitive pressure, prompting them to lower the customer's credit standard in the process of lending, which in turn reduces the quality of bank loans, leads to the decline of Bank profits, and is not conducive to the decline of bank risk level. Klein & saidenberg (2010) [11] found that too many branches not only increased the competition between banks, but also reduced the efficiency of banks, which was not conducive to the reduction of risk level. Xue and Li (2013) believe that it is difficult for city commercial banks to improve their business performance in the short term by expanding in different places, blind expansion in different places will lead to an increase in bank risk. Through empirical data analysis, Sun (2014) [18] pointed out that cross regional expansion has generally improved the operating efficiency of city commercial banks, but it also shows the problems of poor capital replenishment, severe challenges to risk control, loss of comparative advantage, and uneven financial allocation. Li (2014) [14] took 214 small and medium-sized banks as research samples, and found that cross regional operations have damaged the profitability and asset quality of small and medium sized banks, increasing the risks of small and medium sized banks. Wang and Li (2021) [21] creatively used the HHI index to measure the geographical expansion of city commercial banks in their research, and found that the geographical concentration of city commercial banks is conducive to reducing bank risks, and the geographical concentration has a U-shaped effect on bank risks.

To sum up, the academic circles have no final conclusion on the impact of cross regional operation of city commercial banks, and there is no appropriate measurement method on the geographical concentration of city commercial banks. In view of this, this paper uses HHI index to measure the geographical concentration of

city commercial banks, and further uses a threshold model to verify the impact relationship between the geographical concentration of city commercial banks and their risk-taking level.

3. RESEARCH DESIGN

3.1 Variable Selection and Data

This paper selects the micro financial data and the distribution data of bank branches of 67 city commercial banks in China from 2010 to 2020. The micro financial data of banks are from China Stock Market & Accounting Research Database (CSMAR), the information of bank branches is from the official website of the China Banking and Insurance Regulatory Commission, and the macro data is from the China Statistical Yearbook.

3.1.1 Core Variables

(1) HHI index

When carrying out the cross regional operation degree of city commercial banks, referring to the practices of Wang and Li (2020), this paper takes the Herfindahl-Hirschman Index (HHI) as the proxy variable of the cross regional operation degree of city commercial banks. The main reasons are as follows, HHI index reflects the dispersion of various competitors in an industry. When it is applied to enterprises, it can reflect the geographical dispersion of an enterprise in operation, so it is more suitable to be used as a proxy variable to reflect the cross regional operation degree of city commercial banks.

The calculation process of HHI index is as follows:

$$\mathrm{HHI}_j = \Sigma_{i=1}^{n_j} S_i^2, i = 1,2,\ldots,n_j; j = 1,2,\ldots,m \quad (1)$$

Among them, the subscript j represents the jth bank, n_j represents the total number of cities in which the jth bank has established branches, and S_i represents the proportion of the number of branches owned by the bank in the ith city.

(2) Bank risk-taking

In terms of measuring bank risk-taking, this paper selects the bank's risk- weighted asset ratio as the proxy variable. The main reasons are as follows: the bank's risk-weighted asset ratio is an ex-ante risk measurement index, which can be calculated by banks before the occurrence of a real default event, it can accurately reflect the risks that banks subjectively or willingly take, so this indicator is more suitable as a proxy variable for bank risk-taking. Meanwhile, in order to test the robustness of the results, this paper also uses the annual non-performing loan ratio of the bank as a proxy index to test the robustness.

3.1.2 Control Variables

In order to eliminate the influence of other micro factors on the robustness of the results, this paper also introduces control variables such as $Loan-to-Deposit\ ratio$ and $Total\ assets$ to make the empirical test results more robust.

The definition and source of other bank's micro financial data are shown in Table 1.

Table 1 Description of main variables

Variable name	Symbol	Definition	Unit
HHI Index	HHI	The geographical concentration of city commercial banks	%
Risk-Weighted assets ratio	Rwar	(Risk-Weighted assets/ Total assets) *100%	%
Loan-to-Deposit ratio	Ltdr	(Total loans / total deposits) *100%	%
Total assets	Lnta	Logarithm of total assets of city commercial banks	ten thousand
Return on net assets	Roe	(Net profit / owner's equity)*100%	%
Non-performing loan ratio	Nplr	(Non-performing loans / various loans)*100%	%
GDP growth rate	Gdp	(GDP of this year - GDP of the last year) / GDP of the last year * 100%	%

Year on year growth rate of money supply	M2	(M2 of this year - m2 of the last year) / M2 of the last year * 100%	%

3.2 Statistical Description

The average value of HHI index is 0.493, indicating that most banks have carried out a considerable degree of geographical expansion; The maximum HHI index is 1, indicating that some banks have not or have not conducted geographical expansion during the sample period. The average value of total assets is 16.616, and the standard deviation is 1.002, indicating that there is little difference in scale among banks. In addition, the difference between the maximum and minimum of the deposit loan ratio and the non-performing loan ratio is large, and the standard deviations of the two are 0.405 and 0.009 respectively, indicating that there are great differences in asset allocation and risk levels among banks. The discreteness of other control variables is relatively small.

Table 2 Descriptive statistical results of main variables

Variables	Sample size	Mean	Standard error	Minimum	Maximum
HHI	664	0.493	0.248	0.078	1
Rwar	664	0.636	0.099	0.001	0.912
Lnta	664	16.616	1.002	14.119	19.485
Roe	664	0.009	0.004	0.001	0.025
Ltdr	664	1.626	0.405	0.043	4.755
Nplr	664	0.013	0.009	0	0.140
Gdp	664	0.077	0.013	0.059	0.106
M2	664	0.123	0.032	0.081	0.197

3.3 Model

Referring to the existing literature and combining the characteristics of the data selected in this paper, the two-way fixed effect model of time fixed effect and individual fixed effect is finally selected as the benchmark model. The model is set as follows:

$$RWAR_{i,t} = \alpha + \beta HHI_{i,t} + \gamma Controls_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (2)$$

$RWAR_{i,t}$ represents the level of risk-taking of banks; $HHI_{i,t}$ represents the geographic concentration of the ith bank in year t, which is calculated from the above; $Controls$ represents other control variables of city commercial banks; α Is intercept item, β is the coefficient of the core explanatory variable, γ is the coefficient of each control variable, μ_i is the individual fixed effect, λ_t is the time fixed effect, $\varepsilon_{i,t}$ is a random distcityce term.

4. RESULTS AND DISCUSSION

4.1 Benchmark Regression Results

Referring to the method of Goetz et al (2016), time fixed effect and individual fixed effect are further used in the panel regression of the benchmark model to prevent the adverse effects of heteroscedasticity and time on the model results. Table 3 reports a set of regression results of model (2), that is, the test results of the impact of city commercial banks' geographical concentration (HHI) on banks' risk-taking (risk-weighted asset ratio), in which columns 1 to 6 reflect the regression results after gradually adding control variables. All results are obtained by stata16 software.

The Table 3 shows that the regression coefficient of HHI index is significantly negative at the level of 1%, and after adding a series of control variables, the regression coefficient of HHI index is still significantly negative at the statistical level of 10%, indicates the result is robust. This shows that the geographical centralized operation of city commercial banks helps to reduce the level of risk-taking of banks, which may be due to the fact that the centralized operation facilitates the senior management of banks to make effective management, avoids the management inconvenience caused by distance, and the radical business behavior of branch managers for their own interests. While the cross regional expansion operation helps banks to seize more market share in the market and consolidate their industry position, the radical strategy of branch managers is difficult to be controlled in a timely and effective manner, which will directly or indirectly promote the increase of bank risk-taking, which

is not conducive to the long-term stable operation of banks.

Among the control variables, the regression coefficient of the logarithm of the total assets of the bank(lnta) is always significantly negative, which shows that the larger the city commercial bank, the lower the risk it bears in the process of operation, which is logical. Compared with some smaller city commercial banks, large city commercial banks have a more mature system in operation and management, have more experience in risk handling, and will be more strictly in loan review, it makes them more cautious and stable in geographical expansion, which helps them reduce the risks in the process of expansion.

It is worth noting that after the two macro-control variables are introduced at the same time, they are significantly negative at the statistical level of 1%, which shows that good economic conditions and loose monetary policy help city commercial banks reduce their risk-taking. On the one hand, good economic conditions may reduce the number of enterprises that need to borrow, on the other hand, loose monetary policy will increase the funds available for banks to lend, both will help to reduce the level of risk-taking of banks.

Table 3 Regression results of the impact of geographical concentration of city commercial banks on bank risk-taking

variables	(1)	(2)	(3)	(4)	(5)	(6)
HHI	-0.278***	-0.071**	-0.072**	-0.049	-0.049	-0.051*
	(-16.80)	(-2.30)	(-2.36)	(-1.60)	(-1.61)	(-1.76)
Lnta		-0.087***	-0.086***	-0.071***	-0.071***	-0.068***
		(-5.98)	(-5.97)	(-4.82)	(-4.81)	(-5.00)
Roe			2.001*	1.462	1.492	1.653*
			(1.95)	(1.44)	(1.46)	(1.74)
Ltdr				-0.038***	-0.038***	-0.037***
				(-4.59)	(-4.58)	(-4.82)
Gdp					-0.063	-0.669***
					(-0.37)	(-3.97)
M2						-0431***
						(-9.49)
Constant	0.771***	1.95***	1.929***	1.741***	2.41	17.319***
	(91.88)	(8.36)	(8.26)	(7.46)	(1.34)	(7.53)
Bank-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Time-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Sample size	664	664	664	664	664	664

Note: *, **, ***indicates significant at the level of 1%, 5% and 10%, respectively.

4.2 Threshold Regression Results

With the continuous changes of the geographical concentration of city commercial banks and the level of bank risk-taking, the influence of the geographical concentration of city commercial banks on bank risk-taking will also change. In order to verify this mechanism, we continue to use panel threshold regression model to test.

First, taking the geographic concentration of city commercial banks (HHI as the threshold variable, the following four assumptions are tested: (1 H^{I}:there is no threshold; (2 H^{II}:there is only one threshold; (3 H^{III}:there is only two threshold; (4 H^{III}:there is only there threshold.

Table 4 reports the test results of the above hypotheses, of which (I is the threshold test result based on the model (2 but without control variables, and (II is the threshold test result after introducing control variables on the basis of (I . The results in Table 3 show that (I and (II both passed the single threshold test at the significance level of 5%, that is, there is only one single threshold.

Therefore, on the basis of model (2 , the following threshold regression model (3 is further established to explore the nonlinear relationship between the geographical concentration of city commercial banks and

bank risk-taking. among θ Is the critical value of the threshold variable. The model setting is as follows:

$$RWAR_{i,t} = \alpha + \beta_1 HHI_{i,t}(HHI < \theta) + \beta_2 HHI_{i,t}(HHI > \theta) + \gamma Controls_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \quad (3$$

According to the above model, threshold panel regression is carried out on the samples of all selected city commercial banks, and the regression results are shown in Table 5. According to the results in Table 5, the symbols and significance of all explanatory variables are basically consistent with the regression results of the benchmark model, showing the robustness of the results. All results are obtained by stata16 software.

When HHI index is greater than the threshold ($HHI > \theta$, the he regression coefficient is negative and significant at the level of 1%. This shows that when the degree of cross regional expansion of banks is low, adopting the strategy of geographically centralized operation can effectively reduce the risk of banks and prevent the occurrence of financial risks. However, it is worth noting that when the HHI index is lower than the threshold value, the regression coefficient of the HHI index is positive, which indicates that when the degree of cross regional operation of city commercial banks is high, continuing to adopt expanding operation will help banks reduce financial risks. However, at this time, the regression coefficient is not significant, so this risk reduction effect may not be obvious.

Table 4 Threshold effect test results

	Threshold	F Value	P Value	Crit10	Crit5	Crit1
(I)	Single	17.18	0.013	10.954	13.457	17.512
	Two	4.23	0.633	10.368	13.372	25.185
	Three	4.46	0.757	14.008	16.606	28.775
(II)	Single	13.91	0.037	10.575	12.682	18.629
	Two	7.40	0.217	9.582	10.967	17.148
	Three	6.72	0.373	12.182	16.602	26.813

Note: P Value and F Value et al were obtained by bootstrap method for 300 times.

Table 5 Threshold regression results of geographical concentration of city commercial banks on bank risk-taking

Variables		(1)	(2)
	$HHI < \theta$	0.098	-0.130
		(0.57)	(-0.82)
	$HHI > \theta$	-0.275***	-0.118***
		(-16.63)	(-3.77)
Lnta			-0.012
			(-0.94)
Roe			-0.345
			(-0.35)
Ltdr			-0.049***
			(-5.67)
Gdp			-0.006***
			(-2.63)
M2			-0.006***
			(-4.09)
Constant		0.768***	1.093***
		(89.81)	(4.59)
Bank-fixed effect		Yes	Yes

Time-fixed effect	Yes	Yes
Sample size	664	664

4.3 Robustness Check

In order to prevent the negative impact of selecting a single core explanatory variable on the results, this paper also selects the annual non-performing loan ratio of banks as the proxy variable of bank risk-taking level for robustness test. The non-performing loan ratio of the bank directly reflects the loss of the bank in the current year. As an ex-post indicator, it can accurately reflect the risk that the bank has undertaken and suffered losses in the current year.

Table 6 reports the results of taking the non-performing loan ratio as the proxy variable of the bank's risk-taking level. The first and second columns are the results before and after the introduction of control variables based on the model (2), the third and fourth columns are the threshold regression results with HHI index as the threshold variable (the test results of threshold effect are omitted here). All results are obtained by stata16 software.

Table 6 shows that the regression coefficient of HHI index is always negative and has a high level of significance. The results in columns 3 and 4 show that as the threshold value decreases, the coefficient of HHI index also increases, and the sign is always negative. This shows that with the continuous expansion of city commercial banks, the sensitivity of bank risk-taking level to geographical concentration is increasing, that is, banks will be easier to bear higher risks. This result is also consistent with the previous test results, which proves the robustness of the results.

Table 6 Robustness test results

Variables	(1)	(2)	(3)	(4)
HHI	-1.033***	-0.721**		
	(-2.82)	(-2.01)		
$HHI < \theta_1$			-2.978*** (- 12.39)	-1.138***
				(-3.04)
$\theta_1 < HHI < \theta_2$			-2.775***	-0.357
			(-4.11)	(-0.95)
$HHI > \theta_2$			-2.305***	-0.956***
			(-12.24)	(-2.80)
Lnta		0.095		0.185
		(0.55)		(1.36)
Roe		-110.107***		-116.123***
		(-9.22)		(-10.92)
Ltdr		-.409***		-0.429***
		(-4.18)		(-4.62)
Gdp		0.991		0.072***
		(0.47)		(2.76)
M2		0.349		0.009
		(0.61)		(0.57)
Contant	1.800***	-15.441	2.718***	-0.135
	(6.36)	(-0.53)	(24.27)	(-0.05)
Bank-fixed effect	Yes	Yes	Yes	Yes
Time-fixed effect	Yes	Yes	Yes	Yes
Sample Size	664	664	664	664

5. CONCLUSIONS

Based on the relevant data of 67 city commercial banks from 2010 to 2020, this paper discusses the relationship between the risk-taking level of city commercial banks and the concentration and expansion of their geographical scope of operation by establishing a threshold regression model, and further makes a robustness test. The research finds the following conclusions:

(1) There is a negative correlation between the geographical concentration of city commercial banks and their risk-taking level. Whether in the benchmark model or in the robustness test, the regression coefficient of the geographical concentration of city commercial banks is always negative, and has a high level of significance, indicating that city commercial banks will gradually take higher and higher risks in their expansion.

(2) There is an obvious threshold effect between the geographical concentration of city commercial banks and their risk level. Both the benchmark model and the robustness test passed the threshold effect test. It shows that there is a dynamic relationship between the geographical concentration of city commercial banks and their risk-taking level.

(3) With the continuous reduction of the geographical concentration of city commercial banks, the sensitivity of the bank's risk-taking level to its geographical concentration is increasing; When the geographical expansion of banks reaches a certain level, there is even a positive correlation between the two. According to the above test results, when the bank's geographical expansion is high, continuing to expand may reduce the bank's risk-taking level, but this effect is not obvious.

Based on the above conclusions, the following policy recommendations are put forward:

(1) City commercial banks should try their best to adopt appropriate and gradual expansion strategies to avoid blind and wanton expansion in order to seize market share. When the bank's expansion operation does not reach a certain scale, the expansion operation will make the bank bear more risks, which is not conducive to the benign development of the bank. Therefore, we should adopt a moderate expansion mode to avoid the huge losses caused by blind expansion.

(2) Continuously improve the bank management system and strengthen the education and training of branch managers. According to the above assumptions, when banks conduct cross regional operations, due to distance, the decision-making information of the head office will inevitably be lost; And in the case that the branch is far away from the head office, the branch manager is more likely to adopt radical business strategies for his own interests, thus causing losses to the bank. Therefore, a perfect management system and good branch managers can effectively prevent such situations.

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