

Bank Competition and Enterprise Innovation¹

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Abstract. This paper makes use of the structural competition of the joint stock commercial banks and city commercial banks brought by the relaxation of China's banking regulation at the prefecture-level level and the expansion of the number of business outlets, and empirically examines the impact of bank competition on corporate innovation activities. The study found that, overall, bank structural competition has a significant U-shaped effect on corporate innovation activities, that is, when the structural competition of banks has not exceeded the critical value, competition has a restraining effect on corporate innovation, and when the bank's structural competition has exceeded the critical value, competition will have a positive effect on corporate innovation. The experience of this paper provides important evidence for revisiting and understanding the relationship between the Chinese banking system and corporate innovation.

1. Introduction

Market share of large state-owned banks and monopoly powers have gradually declined, and the level of market competition in the banking industry has continued to rise. Moreover, the decision of the party to accelerate the development of private financial institutions since the "18th National Congress" further pointed out the evolution of China's banking structure. Therefore, under these specific multiple reforms and development backgrounds, can China's current financial system dominated by state-owned banks promote micro-enterprise innovation activities? At the present stage, will the strengthening of structural competition in the banking sector brought about by the reform of the foreign banks in the non-state-owned banks be able to effectively promote the innovation activities of micro-enterprises in the region? In-depth research and objective answers to these questions are not only providing direct empirical evidence from leading developing countries such as China for the frontier areas of research, but also providing an indispensable part important policy reference for China's future financial system and financial system reform.

The contribution of this paper is reflected in the following two aspects: First, it provides important supplementary evidence for the research in this field. Based on a series of empirical evidence from the largest developing countries like China, this paper provides valuable additional evidence for an in-depth understanding of the internal relations between the banking system in developing countries and the reform of banking systems and corporate innovation. Second, the uniqueness of the research perspective and the novelty of empirical discovery. On the one hand, different from the existing research perspective, this paper is based on the basic logic of the competition behavior among the three types of banking institutions at different levels, the state-owned five major banks, the joint-stock commercial banks, and the city commercial banks in the Chinese banking system. The core characteristics of bank competition in the Chinese context are abstracted into the "structural competition" of banks. On the other hand, unlike the empirical facts of existing research, the important finding of this paper is that the structural competition of banks in China has a significant and stable U-shaped effect on the enterprises and the innovation activities of local enterprises. These unique experiences have found important evidence for this frontier area from developing countries like China.

2. Theoretical analysis and hypothesis

From the perspective of the possible inhibitory effect of the monopolistic banking structure on corporate innovation activities in the Chinese context, on the one hand, China's existing pattern dominated by the absolute monopoly of the five state-owned banks has certain negative effects and hindering effects on economic growth (Wang Xun et al., 2011). The implementation of the deregulation policy of the Bank of China's off-site market has promoted the expansion of the number of joint-stock commercial banks and city commercial banks and the expansion of business outlets. However, this may not be able to fundamentally break the absolute monopoly situation of China's current state-owned five major banks. The pattern of the financial system dominated by monopoly status. Under this circumstance, the bank's structural competition caused by the relaxation of the regulatory policies of the Bank of China's off-site market may have a limited effect on the innovation of enterprises, which cannot alleviate or even reverse China's current absolute monopoly of the five major state-owned banks. In the financial system structure, the existing monopolistic banking structure still has a restraining effect on the micro-enterprise innovation activities in those regions where the banking system reform is not motivated and the banking system reform is relatively lagging behind. On the other hand, the increase and intensification of regional banking competition brought about by the deregulation policy of the Bank of China in different markets is likely to undermine the ability of small and medium-sized banking institutions in the region to use "soft" information mechanisms to meet the financing needs of regional enterprises and SMEs. Forcing small and medium-sized banking institutions in the region to target loans to state-owned enterprises as well as large-scale enterprises. Especially for small and medium-sized enterprises that are more innovative in some aspects, the structural pressure of banks and the financial risks brought by regional small and medium-sized banks may have a negative impact on corporate innovation activities (di Patti & Dell' Ariccia, 2004). From the perspective of the promotion effect of bank structural competition on corporate innovation under the Chinese scenario, it is clear that a reasonable logic that is relatively easy to obtain is that the Bank of China's foreign market entry control policy is relaxed → the entry of joint-stock commercial banks and city commercial banks With the expansion of the number of business outlets → the structural competition pattern of banks has been strengthened → the opportunities for enterprises to obtain bank loans have increased and the cost of loans has decreased → to promote regional enterprise innovation activities. Specifically, on the one hand, the relaxation of the regulatory policies of banks in different markets will inevitably lead to the expansion of the number of joint-stock commercial banks and city commercial banks and the expansion of business outlets, which will result in the mutual expansion of regional small and medium-sized financial institutions and local branches of the five major state-owned banks' competition, to form a structural competitive landscape of Chinese characteristics (Benfratello et al., 2008; Chava et al., 2013). On the other hand, the relaxation of the bank's remote market entry control policy may prompt regional small and medium-sized banks such as city commercial banks to better serve the regional small and medium-sized enterprises by leveraging their flexibility scale advantages and channel advantages of collecting "soft" information (Lin Yifu, Li Yongjun, 2001), and thus effectively promote the innovation activities of small and medium-sized enterprises in the region.

In summary, under the Chinese scenario, the structural characteristics of the banking industry and the structural competition of banks brought about by the relaxation of regulatory policies may not necessarily promote or inhibit the micro-innovation activities of the micro-enterprises, and are more likely to cause a more complex nonlinear effect. Objectively speaking, the relaxation of the Chinese bank's entry control policy is subject to various specific factors, such as differences in economic development levels and differences in government interventions, which may be heterogeneous and inconsistent, leading to the asynchronism of evolution of the monopolistic banking structure in different regions of China to the competitive banking structure, and thus the degree of structural competition of banks must have significant regional differences. Specifically, on the one hand, in the areas where the existing monopolistic bank structure dominated by the five major state-owned banks has not been greatly affected and broken by joint-stock commercial banks

and city commercial banks, the promotion of structural competition of banks may be relatively limited, the existing monopoly banking structure dominated by the five major state-owned banks still plays a leading role. For the monopolistic banking system dominated by the five major state-owned banks in these regions, it is not conducive to the solution of information asymmetry and innovation risk discrimination between banking institutions and micro-enterprise innovation activities, and is not conducive to the lending period of banking institutions and micro-enterprises. The solution to the mismatch effect between innovative R&D financing needs is not conducive to the specific financing constraints and financing difficulties and financing difficulties of SMEs and private enterprises. Therefore, under the specific circumstances of small and medium-sized enterprises and private enterprises as the main body of innovation activities, the monopolistic banking system will have an inevitable inhibitory impact on the innovation activities of small and medium-sized enterprises through the negative impact on the innovation activities of small and medium-sized enterprises and private enterprises. On the other hand, in the areas where the existing monopolistic bank structure dominated by the five major state-owned banks has been greatly affected and broken by joint-stock commercial banks and city commercial banks, the role of structural competition of banks in promoting regional enterprises' innovation activities played a leading role, and in general, it has promoted the innovation activities of regional enterprises. Based on this, this paper believes that during the sample observation period, the effect of structural competition on the innovation activities of regional enterprises should have a certain critical value. In other words, the structural competition level of those banks has not broken through certain thresholds or key points. At the time, the structural competition of banks showed a restraining effect on regional micro-enterprise innovation activities. When the structural competition degree of banks broke through certain critical values or key points, the structural competition of banks showed a promoting effect on regional micro-enterprise innovation activities. Therefore, the impact of structural competition of banks from the bank's entry into the regulatory relaxation policy on corporate innovation activities in the Chinese context can be attributed.

Based on the above analysis, this paper proposes the following hypothesis: Bank structural competition has a significant U-shaped effect on corporate innovation activities, that is, when the structural competition of banks has not exceeded the critical value, competition has a restraining effect on enterprise innovation, and when the bank structure When sexual competition exceeds a certain threshold, competition will have a positive effect on corporate innovation.

3. Research design

3.1 Sample selection and Data source

The enterprise data used in this paper is from the database of industrial enterprises above designated size in the National Bureau of Statistics from 2005 to 2007. Although the industrial enterprise database has the characteristics of rich indicators and large sample information, the year for the "R&D expenditure" indicators is only 2005- 2007, and this article has to limit the period of investigation to these three years. The data sources used in this paper mainly include four parts: First, the bank data comes from the financial license information of the national financial institutions issued by the China Banking Regulatory Commission. The data gives the name, approval date, residence and distribution of a single financial institution. Financial license elements such as the date of the certificate. According to this information, we have obtained branch information of financial institutions such as state-owned commercial banks, joint-stock commercial banks, city commercial banks, rural commercial banks, foreign banks, and postal savings banks. Second, the relevant data of information on enterprise innovation and R&D investment and corporate characteristics is from the China Industrial Enterprise Database; the third is the relevant data on the invention patent information of the enterprise, which is derived from the patent database of the State Intellectual Property Office of China; the fourth is the relevant data of the per-capita GDP information of the prefecture-level city level in China. The Yearbook of China's Urban Statistics. According to the research needs, the original data is also processed as follows: first,

exclude financial listed companies; second, exclude samples without R&D investment or disclosure of R&D investment; third, exclude samples with missing other observations; fourth, in order to eliminate the possible impact of outliers on the robustness of regression results, 1% of Winsorize truncation is applied to all continuous variables except dummy variables. Finally, 8674 company annual observations were obtained.

3.2 The definition and Description of the variables

3.2.1 Enterprise Innovation (Innov)

Enterprise innovation, this article uses two proxy indicators to represent: The first is enterprise R&D investment intensity (R&D). It is an input indicator of the enterprise's innovation activities, which is equal to the amount of R&D investment of the enterprise/the income of the main business of the enterprise; Second, the number of patents granted by the company in the same year (Patents) is the output aspect indicator of the company's innovation activities.

3.2.2 Bank competition (Bankcomp)

This article uses two methods to measure bank competition: The first method is to use the loan amount information of various types of banking institutions at various regional levels in China to construct a structural competitive index of banks; The second method is to construct a structural competitive index of the bank by using the number of business outlets of various types of banking institutions at various regional levels in China. The proxy indicators HHI_loan and HHI_branch, which are used to measure the degree of structural competition of banks at the prefecture-level level in China, are used to reflect the structural monopoly of banking institutions. The larger the value, the higher the degree of monopoly. It needs to be transformed into a proxy indicator that reflects the degree of structural competition of banks. Drawing on the approach of Akins et al. (2016), Multiply the above two proxy indicator variables that reflect the degree of structural competition of regional banks by -1 to convert them. The transformed proxy variables are HHI_bankloan and HHI_bankbranch, respectively. The larger the value, the higher the structural competitiveness of banks at the prefecture-level level in China.

3.2.3 Other control variables

This article also controls the following variables: Enterprise size (log(capital)), defined as the natural logarithmic value of the period of time for the establishment of the enterprise; Corporate finance costs (Finance cost), defined as the ratio of the net interest expense of the enterprise to the total liabilities of the enterprise; Subsidy obtained by the company, defined as the ratio of government subsidies and total assets acquired by the company in the current year; Enterprise export factor (Export), defined as the ratio of the export value of the enterprise in the current year to the total assets of the enterprise; Corporate profit factor (ROA), defined as the ratio of the company's net profit for the year to the total assets.

3.3 Model design

$$\begin{aligned}
 Innov_{i,t} = & \beta_0 + \beta_1 Bankcomp_{i,t-1} + \beta Control_{i,t-1} \\
 & + \sum Industry + \sum Year + \varepsilon \quad . \quad (1)
 \end{aligned}$$

Among them, β_0 is the intercept term, ε is the residual term, β_i is the regression coefficient.

4. Empirical test results and analysis

4.1 Empirical test results and analysis

Table 1. Impact of bank competition on corporate innovation activities

	(1)	(2)	(3)	(4)
variable	R&D	Patents	R&D	Patents
HHI_Bankloan	0.0143*** (205.99)	1.9482*** (55.17)		
HHI_Bankloan_sq	0.0106*** (131.72)	1.2034*** (46.76)		
HHI_Bankbranch			0.0059*** (83.01)	0.1392*** (10.00)
HHI_Bankbranch_sq			0.0051*** (68.77)	0.2054*** (19.43)
Control Variable	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Number of samples	8674	8674	8674	8674

Note: ***, **, and * indicate the statistical significance level of 1%, 5%, and 10% (two-tailed), respectively. The values in parentheses are t-values or z-values that have been adjusted for cluster clustering and heteroscedasticity in China's prefecture-level cities.

Table 1 reports the test results of the impact of bank competition on corporate innovation activities. Model (1) and Model (2) report the regression results of the bank's structural competitive agent variable HHI_bankloan designed using the loan amount of different types of banking institutions in prefecture-level cities in China. Where the dependent variable in model (1) is R&D, The regression results show that the one-item regression coefficient of the bank's structural competition agent variable HHI_bankloan is significantly positive at the 1% statistical level, and its quadratic regression coefficient is also significantly positive at the 1% statistical level. The dependent variable in model (2) is Innopatient, The regression results show that the one-item regression coefficient of the bank's structural competition agent variable HHI_bankloan is also significantly positive at the 1% statistical level. The quadratic regression coefficient is also significantly positive at the 1% statistical level. Similarly, Model (3) and Model (4) report the regression results of the bank's structural competition agent variable HHI_bankbranch designed using the number of outlets of different types of banking institutions in prefecture-level cities in China. Among them, the dependent variable in model (3) is R&D. The regression results show that the one-item regression coefficient of the bank's structural competition agent variable HHI_bankbranch is significantly positive at the 1% statistical level. The quadratic regression coefficient is also significantly positive at the 1% statistical level. The dependent variable in model (4) is Innopatient. The regression results also show that the one-item regression coefficient of the bank's structural competition agent variable HHI_bankbranch is significantly positive at the 1% statistical level. The quadratic regression coefficient is also significantly positive at the 1% statistical level. From the consistency regression results obtained above, it can be seen that the structural competition of banks in China and the

innovation activities of micro-manufacturing enterprises have formed a significant U-shaped relationship. The test results of this paper show that under the Chinese scenario, the structural competition of banks brought about by the policy of loosening access control policies of small and medium-sized commercial banks has obvious complex nonlinear effects on the effects of innovation activities. That is to say, when the degree of structural competition of banks has not reached a certain critical value, the improvement of structural competition of banks will bring about the suppression effect on the innovation activities of manufacturing enterprises. Only when the structural competition degree of banks reaches a certain critical value, the continuous improvement of the bank's structural competition will only promote the innovation activities of manufacturing enterprises.

4.2 Robustness test

4.2.1 State-owned enterprises vs private enterprises.

U-shaped effects of structural competition of banks on corporate innovation activities in Chinese local enterprises, will there be different performances in the sample groups of state-owned and private enterprises with different ownership characteristics? In the sample group of state-owned enterprises (including state-owned enterprises and collective enterprises), Whether it is to measure the intrinsic value of enterprise innovation activities, the intensity of enterprise R&D investment or the different forms of invention patents, and whether it is to measure the core explanatory variables of regional banking structural competition, the amount of bank loans or the number of banking outlets, The structural competition of banks has caused significant U-shaped effects on corporate innovation activities. In the sample group of private enterprises (including independent legal entities and privately owned enterprises), there is also a U-shaped influence effect. This shows that the significant U-shaped effects of structural competition on the innovation of Chinese local enterprises will not change due to differences in the nature of different ownership systems.

4.2.2 Large-scale private enterprises vs small-scale private enterprises.

Will the U-shaped effects of structural competition of Chinese banks on local enterprise innovation activities be different in different sample groups of large-scale and small-scale private enterprises? In response to this question, from the regression results of the large-scale and small-scale private enterprise sample group (using the average value of the net value of private enterprises' fixed assets), whether in the sample group of large-scale private enterprises or the sample group of small-scale private enterprises .The structural competition of banks has caused stable and significant U-shaped effects on corporate innovation activities. This shows that the significant U-shaped effect of bank structural competition on local enterprise innovation activities will not change due to differences in firm size.

5. Conclusion of the study

This article starts from the adjustment policy of the China Banking Regulatory Commission for the establishment of market access for small and medium-sized commercial banks in different places. Empirically studied the impact of the banking industry competition brought about by the deregulation policy on the micro-enterprise innovation activities, The study finds that the structural competition of banks in China has a significant U-shaped nonlinear effect on corporate innovation activities. When bank competition has not exceeded a certain threshold, the structural competition of banks has a restraining effect on enterprise innovation. When bank competition exceeds a certain threshold, the structural competition of banks will have a promoting effect on enterprise innovation.

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