

The Influence of Banking Industry and Industrial Cluster on Innovation

Huanling Lin

School of Economics, Jinan University, Guangzhou, 510632, China

Abstract

Innovation is the key element of national competitiveness, and the innovation activities of enterprises are always facing greater financing constraints. In China, the financial development is dominated by banks, and the credit supply is influenced by the government intervention and other historical factors. The phenomenon of financial suppression is still prominent. To make up for this, scholars have found other ways: industrial clusters can help companies improve their credit availability. This paper further finds that the externality of industrial group can positively regulate the financial support function and provide assistance for the innovation activities of enterprises, which will seek the way out for the weak innovation ability caused by the insufficient investment of enterprises. At the same time, the knowledge spillover effect is also an important mechanism for the development mode of industrial group to promote enterprise innovation.

Keywords

Innovation Activities; Industrial Cluster; Financial Intermediaries.

1. INTRODUCTION

In the theory of economic growth, innovation is considered to be an important driving factor (Aghion & Howitt, 1992): it not only helps enterprises to obtain additional profits, but also improves the production efficiency and provides more new products for the economic society, meets the diversified consumer demand and improves human well-being. There are many factors influencing innovation, Schumpeter (1912) has long proposed that capital is a necessary condition. In fact, science and technology industries will always face greater financing constraints, and insufficient investment is an important reason to hinder the development of innovation activities. Therefore, it is necessary to further investigate the sources of funds of enterprises. There have been many studies on institutional factors, including the financial environment. However, in China and other developing countries, their economic foundation and national conditions determine the widespread phenomenon of financial repression, so we must further find other ways out.

The relevant theories of industrial clusters have always believed that enterprises can improve their innovation ability by enjoying the benefits of knowledge spillover (Marshall, 1890). In addition to the perspective of technological progress, in recent years, scholars have begun to realize that industrial clusters can also help enterprises tide over the financial difficulties and improve the financing difficulties of enterprises (Sheng Dan and Wang Yongjin, 2013; Mao Rui, 2015). The main mechanism is to improve the relationship between banks and enterprises, reduce the information asymmetry, and improve the credit availability of enterprises in banks and other financial institutions. At present, there are still serious financial repression problems in China, the credit support of banks and other financial institutions is inclined to state-owned enterprises and stable enterprises, the development of financial market starts late, and

innovative small enterprises can not get enough financing support, which leads to the industry at the low end of the innovation chain. Therefore, if the development of industrial clusters can not only provide technical help, but also indirectly alleviate the financial constraints for enterprises from the perspective of finance, it will provide great help to the industrial innovation activities of financial underdeveloped countries.

For a country's innovation activities, the innovation of small enterprises is the most active, but they also face great financing constraints. This double contradiction is an important reason for restricting developing countries to break through the bottleneck of economic growth. Among these innovative enterprises, the innovation of manufacturing enterprises is particularly important, because the manufacturing industry is the supporting industry of a country and an important part of the real economy. In the manufacturing industry, the leading technological innovation is the high-tech industry, and the industrial structure is dominated by small enterprises. As the leading industry of innovation, China's high-tech industry is lack of innovation investment, independent core technology and poor profitability, which is closely related to the financing constraints of enterprises.

Based on the current situation of financial and industrial development, this paper believes that the lack of finance has a negative impact on industrial innovation, and whether the externality of industrial clusters can help the innovation activities of high-tech industries from two aspects of technology and financial support remains to be further tested. Through empirical analysis, this paper finds that the current bank credit supply is still insufficient to support the innovation of enterprises. Industrial clusters can support innovation by exerting knowledge spillover effect and alleviating financing constraints, which is an effective supplement to the current financial repression.

2. LITERATURE REVIEW AND THEORETICAL ANALYSIS

2.1. The Relationship Between Banks and Technological Enterprises

Functionally, banks can provide financial support for corporate innovation activities (King & Levine, 1993) and risk management (Blackburn & hung, 1998). On the one hand, the essence of banks is to collect social idle funds and concentrate them on productive departments, which improves the efficiency of social funds utilization, and professional operation is conducive to reducing the applicable cost of funds and providing more sufficient and stable capital flow for enterprise innovation activities; on the other hand, banks are conservative, which can accommodate a lower risk than financial markets (Brown Et al., 2010; Gu et al., 2017; Yang Wei middle, 2020), which is in some degree contradictory to the uncertainty of innovation activities. In this way, generally stable or mature enterprises are their primary loan targets, especially in countries with serious financial suppression, state-owned enterprises are more cared for. Therefore, for the technology-based enterprises, the financing constraints facing innovation activities are larger, and the intervention of banks to lending enterprises will be more strict, which may limit the independent innovation of enterprises. However, if the enterprise is in the stage of imitating or introducing technology, the overall risk is lower and the possibility of getting credit support will be greater.

From the perspective of banking structure, many studies have thought that banks should match the scale of service objects in scale to maximize the effect of resource allocation (Zhang Yilin et al., 2019). In the underdeveloped areas, small and medium-sized financial institutions have more regional advantages than large institutions. Because through closer contact, they can understand the development status and trend of local enterprises, and master more detailed information on innovation projects, and more likely to go deep into small and medium-sized enterprises to search for information; while large enterprises generally prefer to obtain credit from large institutions, because of their own assets and other different kinds of assets. In terms

of the conditions, it is easier to meet the requirements of application. At the same time, the large institutions can lend to large enterprises to give full play to their own scale advantages and reduce costs and risks.

Combined with the development of high-tech industry, more than 75% of the enterprises are still small-scale enterprises. Can Chinese banking provide enough financial support for enterprise innovation? Or is risk management a limiting role in innovation? Combined with the reality, because the innovation level of China's industry is low and the risk is small, the restrictions on technology-based enterprises in the banking industry are likely to remain outstanding. Therefore, this paper proposes the hypothesis H1: the banking industry supports the innovation activities of high-tech industries.

2.2. The Influence of Externality of Industrial Cluster on Innovation

2.2.1 Knowledge spillovers

Enterprises in industrial clusters can promote the progress of production technology by means of information dissemination and technology exchange. There are three specific cases (Duranton)& Puga, 2004): firstly, enterprises in the same industry group share the local labor market and improve the professionalism of local factors; secondly, in order to keep the market share or improve the competitiveness, enterprises in the competitive relationship will constantly update their products and technologies; thirdly, there is a cooperative relationship between enterprises in the industrial chain, which is a link of cooperation. Progress will lead to changes in other sectors, and industrial clusters provide the possibility of rapid integration of resources and innovation.

The above effect is a classic study, especially for technology-based enterprises, agglomeration has an important impact on production technology. Therefore, combined with the previous empirical study (Ciccone)& Hall, 1995; Xie Ziyuan and Wu Lijuan, 2017; Yang haochang et al., 2020) and theoretical mechanism, this paper puts forward the hypothesis H2: industrial clusters can play a knowledge spillover effect and directly promote the innovation of high-tech industrial enterprises.

2.2.2 Financial supplement effect

In recent years, more and more scholars pay attention to the fact that enterprise agglomeration can promote the development of enterprises from the perspective of finance. The specific mechanism is (Long& Zhang, 2011; Sheng Dan and Wang Yongjin, 2013; Mao Rui, 2017): the asset liquidity of the enterprises in the industrial cluster is relatively large, because the industries are similar, it is easy to find the buyers of the assets, which provides great convenience for the asset disposal in the case of bankruptcy or default, thus reducing the negative impact of moral hazard on the banks; the information dissemination in the industrial cluster is fast, and the cooperation or competition between enterprises is difficult. Enterprises attach great importance to the impact of reputation, enterprise default may cause the termination of cooperation with the upstream and downstream enterprises in the industrial chain or lose to competitors, therefore, this kind of invisible pressure makes the moral hazard lower; enterprises in the industrial cluster have related business or similar business situation, the bank information search is less difficult, the cost is lower, can focus on providing loans, and require more attention. Appropriate commercial credit as a guarantee.

All of the above mechanisms can help enterprises gain trust from banks more easily, especially for small technology-based enterprises. This regulatory role is likely to play an important role. At the same time, it is an effective supplementary mechanism in countries with financial repression. Therefore, this paper puts forward the hypothesis H3: under the same financial level, the enterprises in the industrial cluster can get more support for innovation activities.

3. RESEARCH DESIGN

3.1. Variable

3.1.1 Explained variable: innovation output

There are many indicators to measure innovation, such as R & D investment, technical personnel investment, patent applications, etc. since innovation involves the R & D process from 0 to 1 and the process from R & D achievements to commercialization, only the final achievement transformation is effective innovation. Therefore, this paper uses the relevant research of Wei et al. (2019) for reference, and measures the innovation of high-tech industry by new product sales revenue (inno) Output level. Since the statistical data of sales revenue of new products are calculated by the price of the current year, the ex factory price index of industrial products is also used to deflate them.

3.1.2 Core explanatory variable 1: financial development

To measure the development level of financial institutions such as banks, we can consider the scale of the financial institutions. One is to consider both deposit and loan, such as GE type index, and the other is to consider loans, such as financial deepening index. Considering the availability and effectiveness of data, this paper, drawing on the research of Hsu et al. (2014), measures the development level of banking industry from the perspective of depth, that is, the proportion of loan balance of financial institutions in nominal GDP at the end of each province.

3.1.3 Core explanatory variable 2: industrial cluster

Referring to Yang Shouyun (2019) and other literatures, this paper uses location entropy to calculate the index of industrial agglomeration. Location entropy is a relative index. By comparing the regional industry with the national average level, it can not only reflect the degree of industrial agglomeration, but also measure the relative specialization degree of the industry in the region. Generally, the location entropy can be calculated by gross output value, business income, employment number and other indicators. Considering that the gross output value will not be counted after 2012, and the high-tech industry is not a typical labor-intensive industry, referring to the practice of LV Chengchao and Shang Yuanyue (2017), this paper uses the main business income to calculate the industrial agglomeration index (AGG): $AGG_{it} = (e_{it}/E_{it}) / (e_{t}/E_{t})$.

Where e_{It} is the main business income of high-tech industry in the T year of I Province, e_{t} is the main business income of national high-tech industry in year t; E_{It} is the main business income of all industrial enterprises in the T year of I Province, E_{T} is the main business income of all industrial enterprises in the country in the T year. In general, $agg_{It} > 1$ means that the industrial agglomeration of the region is higher than the national average level, $agg_{It} < 1$ is lower than the national average.

3.1.4 Other control variables

This paper also controls some indicators of industry and provincial level: (1) R & D personnel input (L): since R & D personnel are also important input factors of innovation output, this paper adds R & D personnel input (L), which is measured by R & D personnel full-time equivalent, as the control variable. (2) Government's capital investment (GF): the government's capital investment supports the development of high-tech industry R & D activities, this paper uses the government's capital investment in high-tech industries in various regions to measure; (3) the actual per capita GDP growth rate (PGDP): the level of regional economic development has a certain impact on the development of local enterprises. In order to eliminate the influence of population quantity and price level, we use the real per capita GDP growth rate of each province to measure the regional economic growth; (4) regional foreign direct investment (FDI): according to the theory of FDI spillover effect, foreign enterprises establish cooperative relationship with local enterprises through investment, and local enterprises may absorb and

imitate the advanced technology of the former It is measured by the amount of direct investment and converted by the exchange rate of US dollar and RMB in the current year.

3.2. Data Description

Considering the availability of the data, this paper takes the high-tech industry of 30 provinces, autonomous regions and municipalities in China from 2004 to 2016 as the research sample, constructs the balanced panel data with 390 regional annual sample points, winnows all variables at 1% level to eliminate the impact of outliers, and conducts logarithmic processing to alleviate the impact of heteroscedasticity. Table 1 is the name, definition and source of each variable.

Table 1. Name, Definition and Source of Variable

Variable	Meaning	Definition	Sources
<i>Inno</i>	Innovation output	Sales revenue of new products after adjustment	Statistical yearbook of China's high tech industry
<i>FIR</i>	Financial development	Sum of loan balances of financial institutions / nominal GDP	Wind
<i>Agg</i>	Industrial Agglomeration	location entropy Full time equivalent of R & D	Statistical yearbook of China's high tech industry , Wind
<i>L</i>	R&D personnel	personnel	Statistical yearbook of China's high tech industry
<i>Gf</i>	Government funds	Government investment in R&D of high tech industry	Statistical yearbook of China's high tech industry
<i>Pgdp</i>	GDP	Real per capita GDP of each province	Wind
<i>Fdi</i>	FDI	Actual utilization of foreign direct investment by provinces	Wind

3.3. Model

$$\text{LnInno}_{it} = \alpha_0 + \alpha_1 \text{LnFIR}_{it} + \alpha_2 \text{LnAgg}_{it} + \alpha_3 \text{LnFIR}_{it} \times \text{LnAgg}_{it} + \sum_{k=4}^7 \alpha_k \text{LnZ}_{kit} + \varepsilon_{it} \quad (1)$$

The model (1) is derived from Jaffe's knowledge production function $y = \lambda AK^\alpha L^\beta$ constructed in the form of Cobb Douglas, where y is the innovation index, a represents the production efficiency, K is the input index of human resources and capital, and l represents other possible influencing factors. In this study, l is the index of industrial agglomeration and K is the index of financial development. Taking logarithm on both sides of the knowledge production function, we get the model (1). As it takes a period of time from input to innovation output, this paper uses Hsu et al. (2014) and other typical literature for reference, and lags the financial development, industrial agglomeration and other input indicators in model (1) for one period.

Specific test steps: if α_1 is significantly positive, indicating that hypothesis H1 holds, indicating that the current banking industry is still helpful to enterprise innovation, and the problem of financing constraints is still prominent; α_2 is significantly positive, indicating that H2 is established, and knowledge spillover effect is an important mechanism for industrial clusters to promote enterprise innovation; α_3 significantly indicates that H3 is established. Under the background of financial repression, industrial clusters can help enterprises ease financing constraints and promote innovation output.

4. RESULTS AND DISCUSSION

4.1. Regression Results

Before regression, the model was tested by Hausman test, and the P values were all 0.0000, that is, the original hypothesis that the random effect model was more effective was rejected at the 1% significance level, so the fixed effect estimation was used. At the same time, considering the interactive relationship between the level of financial development and the innovation and agglomeration of industry, in order to overcome the possible endogeneity, 2SLS method is used. The financial development variable in model (1) lags two periods as the instrumental variable, because the innovation and agglomeration of industry can not affect the past financial development.

Table 2. Experimental data of sensor measurement accuracy

Variables	OLS	2SLS
LnFIR	1.110 ^{***}	1.538 ^{***}
LnFIR×LnAgg	1.419 [*]	3.378 ^{**}
LnAgg	0.847 ^{***}	0.866 ^{***}
LnL	0.154 ^{***}	0.133 ^{**}
LnGf	0.347 ^{***}	0.313 ^{***}
LnPGDP	2.394 ^{***}	2.122 ^{***}
LnFdi	0.163 ^{**}	0.129 ^{**}
Constant	2.760 ^{***}	3.074 ^{***}
Obs.	390	390
R ²	0.6937	0.6755
Anderson-		115.180
Rubin Wald		[0.0000]
Cragg-Donald		86.591
Wald F		{7.03}

Note: () is the standard error of regression coefficient, [] is the adjoint probability value of test statistic, and {} is the critical value at 10% level of stock Yogo test; *, **, ***, and *** are significant at 10%, 5%, and 1% level respectively. The same below.

From the data in the table, we can see that the coefficient of financial development index fir is significantly positive, which indicates that the current bank led financial development is still helpful to innovation, and industrial innovation needs more credit support. The two effects of industrial clusters play a role, especially the coefficient of interaction term in endogenous test is more significant, which indicates that industrial clusters can alleviate the problem to a certain extent Under the financing constraints of innovation activities, knowledge spillover effect is still significant, indicating that the current degree of industrial agglomeration can be further increased. The impact of other control variables on innovation output is positive, which is also more in line with expectations.

4.2. Robust Test

In order to ensure the robustness of the regression results, this paper adds R&D internal expenditure (R&D) as the control variable, and the slopes of financial development, industrial

agglomeration and interaction items are basically the same as those of the benchmark regression, which shows that the above results are more reliable.

Table 3. Experimental data of sensor measurement accuracy

Variables	OLS	2SLS
<i>LnFIR</i>	0.763***	1.166***
<i>LnFIR</i> × <i>LnAgg</i>	1.383*	3.081**
<i>LnAgg</i>	0.581***	0.606***
<i>LnL</i>	-0.010	-0.026
<i>LnGf</i>	0.108	0.110
<i>LnPGDP</i>	1.703***	1.551***
<i>LnFdi</i>	0.085	0.040
<i>LnR&D</i>	0.453***	0.431***
<i>Constant</i>	3.402***	3.704***
<i>Obs.</i>	390	390
<i>R</i> ²	0.7265	0.7097
Anderson-		115.769
Rubin Wald		[0.000]
Cragg-Donald		87.003
Wald F		{7.03}

5. CONCLUSION

Through the analysis of the impact of financial development and industrial agglomeration on innovation, this paper finds that the current banking industry supports the innovation activities of science and technology-based enterprises, mainly because the current enterprise innovation is still based on imitation and introduction, the uncertainty is small, and the risk is within the acceptable range of banks. At the same time, the current financial support is still insufficient, and the enterprises in the industrial cluster can relatively more easily obtain bank credit loans for innovation activities, which provides a new idea for the national implementation of industrial development strategy under the background of financial repression: appropriately promoting the construction of industrial parks is conducive to promoting the technological exchange and financing of enterprises, and directly or indirectly improving the technological competitiveness of enterprises. Of course, this is only a supplementary method. It is the financial sector that really plays the role of financing. We should further improve the structure of the banking industry, promote the matching of the scale of institutions and enterprises, and realize the real service of the real economy.

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