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Research Article

Analysis of the Relationship between Technology Capital and Equity Structure-Evidence of Shaanxi private tech enterprise of China

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Abstract: Science and technology are the primary productive forces, and technological innovation is particularly important for the development of technology companies. In order to better accumulate and apply technology capital, this paper descriptively analyzes the technology capital of private technology enterprises from the whole and various industries, and then explores the relationship between corporate equity structure and technology capital through modeling. The empirical analysis shows that there is a large difference in technical capital between different industries. There is no significant correlation between product competition and corporate technology capital. Equity concentration, equity checks and balances have a significant positive relationship with technology capital. Firm size has a significant negative impact on technology capital.

Key Words: Technical capital, private technology enterprise, equity structure, product competition.

1. Introduction

In the contemporary economy, technology has become an extremely important production factor of enterprises. Money, commodities and goods are put into production and management activities, and the process of value-added is realized, that is, the corresponding capital is formed. Technology is also the same, technology enters enterprises and combination with tangible capital, the realization of its use value, and the realization of value-added technology become technological capital.

At present, there are different studies on technology capital. Chen Xiaodan's research on technology capital allocation proposes that various production factors complement each other to create value for enterprises, and there are obvious irrational phenomena in the adjustment of the capital structure and dynamics of enterprises. The technological capital of the enterprise is replacing the human capital of the enterprise [1]. According to the issue of technical capital allocation, Wenrui proposes that only the strategic capital, physical capital, financial capital, human capital and other capitals can be allocated reasonably and effectively to maximize the marginal utility of each factor and optimize the profit of the enterprise [2]. Peng Liying's analysis of the value creation of technology capital shows that the process of value creation of technology capital is divided into the stage of factor resource input, the stage of technical capital formation, and the stage of technological capital creation. In this process, the effect of technological capital on the value creation of enterprises is also mainly reflected in the value creation stage of technology capital [3].

Tang Wenwen analyzed the investment of technology capital and proposed that technology capital investment can promote enterprises to improve the shareholding structure, improve the structure of the board of directors and the incentive and restraint mechanism [4]. Wang Xuqin proposed that a complete enterprise operation process should include four stages: the collection and accumulation of technology capital, the identification and confirmation of technology capital, the market operation of technology capital, and the release and use of technology capital. Based on this, the company's technology capital is derived. Operational management system [5]. Xu Xiumei found that technology capital has a significant positive correlation with short-term performance and long-term performance when researching technology capital and company performance [6].

After reviewing the literature, it can be seen that the current focus is on these three aspects: capital allocation research, technology capital investment analysis, and the relationship between technology capital and company performance. Few documents link technology capital to the company's shareholding structure. Therefore, this paper attempts to study the relationship between technology capital and the company's shareholding structure from the perspective of empirical analysis, as well as the factors affecting the company's technological capital changes, thus providing theoretical support and guidance for the practice of the enterprise.

The paper is organized as follows: The second part is the descriptive statistical analysis of technical capital, the third part is the empirical results and analysis, and the fourth part is the research conclusion.

2. Descriptive analysis of technical capital

Technology is a factor of production and refers to the relevant skills, skills and techniques used in the company's production process and its carriers. Specifically, it mainly includes proprietary technology, patents, software, and independent development expenditures of enterprises. Therefore, according to the meaning of technical capital, with reference to Roske's definition of technical capital, R&D projects and patent and development expenditures are considered as part of technical capital [7]. This paper adopts (total number of patents + positive research and development project + R&D expenditure) ÷ total assets as a substitute for technical capital, and takes the

data of private technology enterprises in Shaanxi Province of China as an example to descriptively analyze the technical capital of the enterprise as a whole and various industries.

2.1 Technical capital analysis of all companies

According to the report of the Science and Technology Department of Shaanxi Province of China in 2017, there are 300 private technology enterprises in Shaanxi Province, and the summary of the technical capital of all enterprises is summarized in Table 1.

Table 1: all corporate technology capital

Number	Minimum	Maximum	Average	SD	Coefficient
243	0.000	4.450	0.194	0.412	0.169

Technical capital reflects the company's level of technological innovation. As can be seen from the above table, the maximum technical capital of the sample enterprises is 4.45, the minimum value is 0, the average number is 0.194, the standard deviation is 0.412, and the coefficient of variation is 0.169. It can be seen that the level of technological innovation among enterprises is quite different.

2.2 Technical capital analysis of various industries

As of the end of 2017, there were 300 private technology enterprises in Shaanxi Province, and the sample data came from the Science and Technology Department of Shaanxi Province. According to the industry classification method formulated by the China Securities Regulatory Commission in 1998, the samples were classified, including 36 agriculture, forestry, animal husbandry and fishery, 2 mining industries and 145 manufacturing industries, 5 electricity, heat, gas and water production and supply industries, 6 construction companies, 3 wholesale and retail trades, 2 transportation, warehousing and postal services, 77 information transmission, software and information technology services, 1 financial industry, 12 scientific research and technical service industries, 5 water conservancy, environment and public facilities management industries, 3 residential service, repair and other service industries, 1 health and social work, and 2 cultural, sports and entertainment industries. After sorting out the technical capital of various industries and eliminating some unreasonable data, we will get Figure 1 and Table 2. For the convenience of expression, the following industries' names are replaced by letters.

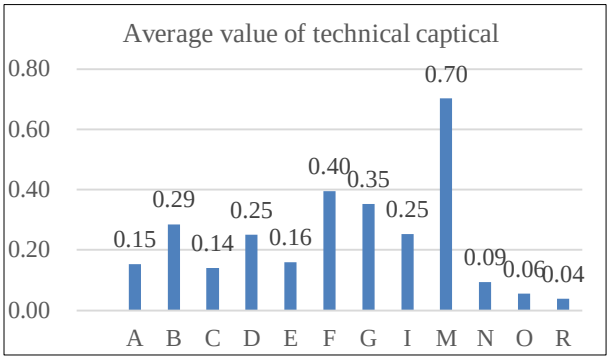

Figure 1: technical capital in various industries

Table 2: Technical capital of various industries

Industury	Number	Minimum	Maximum	Average	SD
A	25	0.00	1.59	0.15	0.40
B	2	0.15	0.42	0.29	0.20
C	127	0.00	1.94	0.14	0.25
D	5	0.03	0.79	0.25	0.32
E	5	0.00	0.60	0.16	0.25
F	1	0.40	0.40	0.40	-
G	2	0.15	0.55	0.35	0.28
I	59	0.00	2.70	0.25	0.39
M	9	0.00	4.45	0.70	1.43
N	4	0.02	0.26	0.09	0.11
O	3	0.01	0.12	0.06	0.06
R	1	0.04	0.04	0.04	-

It can be seen that the average value of technical capital of various industries in the sample is between 0.039 and 0.702, which is a big gap. From the perspective of the average value of technology capital in various industries, the scientific and technical services industry (M) has the highest average technical capital, reaching 0.702. The three major industries of private technology enterprises in Shaanxi Province: manufacturing(c), information transmission, software and information technology services (I), agriculture, forestry, animal husbandry and fishery (A), the average capital of technology capital is 0.14, 0.25, 0.15. The technical capital of the three categories of industries such as water conservancy, environment and public facilities management (N), residential services, repair and other services (O) and culture, sports and entertainment (R) are lower, both less than 0.1, respectively 0.09, 0.06, 0.04.

3. Empirical results and analysis

Competition will encourage companies to reduce the cost and improve the efficiency of resource utilization. As the main driving force for enterprise development, technology capital will inevitably receive the influence of product market competition. A good corporate governance model is conducive to promoting technological innovation. As a basis and an important part of corporate governance, the shareholding structure will inevitably affect the company's technology capital. In addition, enterprises are not isolated but are in a certain environment. The environment in which enterprises are located has an internal corporate governance environment and an industry competitive environment outside the enterprise. Therefore, the technical capital of the enterprise is related to the competition of the product market and the ownership structure. What kind of correlation is relevant, the following model can be used to verify.

3.1 Variable definitions

To study the impact of product market competition and shareholding structure on corporate technology capital, we use technology capital as a dependent variable. Referring to the research of relevant scholars[8], this paper uses TC = (total number of patents + positive research and development

projects + research and development funds) ÷ total assets as a substitute for technical capital.

To study the impact of product market competition and shareholding structure on corporate technology capital, we regard product market competition and shareholding structure as independent variables. There are many substitution variables used to measure the competition in the product market. This paper uses the market concentration index to measure the competition of the product market, that is, the Herfindal Index (HHI) HHI=$\sum_n(x_i - x)^2$, x_i is the sales revenue of i company, and x is the total sales revenue of the industry. This indicator is relatively reasonable and has been recognized by scholars [9]. The shareholding structure is reflected in the equity concentration and equity checks and balances. This paper uses the proportion TOP1 of the shares held by the company's largest shareholder to measure the concentration of equity. The second to fifth largest shareholder ÷ the largest shareholder OBH is used to measure the equity balance.

The size of the company will have an impact on the level of technology investment [10]. Therefore, this paper takes the company size SIZE as the control variable and measures the company size with the total assets at the end of the period. The variable definition table is as follows:

Table3：Variable definition table

Variable type	Variable name	definitions
Dependent	Technical capital（TC）	(Total number of patents + R&D project + R&D expenditure) ÷ Total assets
Independent	Product competition（HHI）	$\sum_n(x_i - x)^2$
Independent	Equity concentration（TOP1）	Number of shares held by the largest shareholder ÷ total number of shares
Independent	Equity checks and balances（OBH）	Number of shares held by the second to fifth largest shareholders ÷ number of shares held by the largest shareholder
Control	Business cale（SIZE）	Total assets at the end of the period

3.2 Model design

This paper studies the impact of product market competition and shareholding structure on technology capital. We build the following models to verify their relevance.

TC=a_0 +a_1HHI+a_2TOP1+a_3OBH+a_4SIZE

Where TC is the substitution variable of technical capital, a_0 is the constant term of the model, a_1 is the regression coefficient of the degree of competition in the product market, a_2 and a_3 are the regression coefficient of the equity structure, and a_4 is the regression coefficient of the control variable.

3.3 Empirical test results and analysis

3.3.1 Model regression result

The model regression analysis can know whether the model is effective and reasonable. The results are shown in Table 4 below.

Table4: Model regression result

R^2	Adjusted R^2	F value	Sig	Durbin-Watson
0.407	0.397	40.867	0.000	1.888

It can be seen from the above table that the goodness of fit R^2 and the adjusted R^2 values in the model are 0.407 and 0.397, respectively, and the F value is 40.867, indicating that the fit of the model is good, and the significance level of F value corresponds to 0.00, passed. A test of significance level indicates that the regression equation is meaningful and acceptable.

3.3.2 Variable regression result

For the variable test, you can know whether the independent variable has a significant effect on the dependent variable. The test results are shown in Table 5 below.

Table5：Variable regression result

variable	Non-standardized coefficient		Standardiza-tion coefficient	T	P value
	B	Standard error	Beta β		
constant	-0.015	0.063		-0.240	0.810
HHI	0.054	0.111	0.024	0.482	0.630
TOP1	0.247	0.087	0.151	2.827	0.005
OBH	0.040	0.003	0.664	12.392	0.000
SIZE	0.000	0.000	-0.106	-2.127	0.034

If the P value is <0.05, the variable is significant at the 5% significance level. If the P value is <0.01, the variable is significant at the 1% significance level. As can be seen from the above table, the P values corresponding to the constant and the four variables are 0.810, 0.630, 0.005, 0.000, and 0.034, respectively. The constants and the degree of product competition do not pass the significance test. The concentration of equity, equity checks and balances, and the scale of the company are all significantly correlated to technology capital. The technical capital and the concentration of ownership are significantly positively correlated at the level of 1%. The correlation coefficient is 0.151, indicating that the concentration of equity contributes to technological innovation. There is a significant positive correlation between technical capital and equity checks and balances at the 1% level, with a

correlation coefficient of 0.664, indicating that equity checks and balances contribute to technological innovation. The technical capital and the scale of the enterprise are significantly negatively correlated at the level of 5%, and the correlation coefficient is -0.106, indicating that the expansion of the scale of the enterprise is not conducive to technological innovation.

4. Conclusion

As the economic growth approach begins to shift to "intensive", more and more people recognize the importance of technological innovation for economic development. This paper takes the data of private technology enterprises in Shaanxi Province of China as a sample, and refers to the research methods of relevant scholars, first descriptive analysis of sample technology capital, and then explores the relationship between product competitiveness, shareholding structure and technology capital by constructing models. The conclusions are as follows.

(a) The technological innovation of private technology enterprises in Shaanxi Province of China has great differences in water products, and the technical capital among different industries is also different. Among them, the scientific and technical services industry has the highest technical capital, and the cultural, sports and entertainment industries have the lowest technical capital.

(b) There is no significant correlation between product competition degree and enterprise technology capital. Technology capital is significantly positively correlated with equity concentration. Equity concentration contributes to technological innovation. There is a significant positive correlation between technical capital and equity checks and balances, and equity checks and balances contribute to technological innovation. Technical capital is significantly negatively correlated with the scale of the company, and the expansion of the scale of the enterprise is not conducive to technological innovation.

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