RESEARCH ON THE IMPACT OF INBOUND OPEN INNOVATION ON FINANCIAL PERFORMANCE-- FROM THE PERSPECTIVE OF TECHNOLOGY INTRODUCTION

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ABSTRACT

Affected by the economic globalization, the various countries' political and economic pattern has significant changes. It is gradually from the past closed innovation to open innovation. Today, the inbound open innovation has become a hot issue in research of innovation management. This paper puts forward the relationship model between open innovation and firm performance, discusses the parameter of technology innovation, performance and control variables. With the data of high-tech companies as sample, using the empirical analysis to discuss the best strength of technology introduction and provide the management suggestion for the enterprises. The research results show that strength of technology introduction has an inversed U relationship on firm performance. When the strength of technology introduction reaches 0.00359, enterprises get the maximum return on equity. So companies should get the sweet spot in the technology introduction and self-innovation to enhance business performance.

Keywords: inbound open innovation; firm performance; strength of technology introduction

1. INTRODUCTION

The transformation of the national competitiveness base has enabled enterprises to replace the traditional methods of natural resource intensive consumption with knowledge creation. The resource sharing approach has also shifted from regional sharing in closed environments to global resource sharing.

In the context of this technological innovation, the company's innovation model has also

undergone a series of changes, and the investment in innovation activities is increasing. Originality and breakthrough innovation are becoming the pursuit of more and more companies. Open innovation has gradually become the key of the successful enterprise.

Chesbrough and Crowther (2006) argue that inbound open innovation, as a model of open innovation, refers to the process of introducing innovative external talents, skills, and ideas into the enterprise for innovation and commercialization[1].

The survey found that the impact of the inward-oriented open innovation model on innovation performance and financial performance is the focus of current research.

Based on the importance of inward-oriented open innovation, researchers have made many research results in this regard, but there are also two major problems: First, the lack of synergy between technology introduction and independent innovation has an impact on performance. Related research on relationships. Second, the current research on the relationship between technology introduction and independent innovation on performance is mostly qualitative research, and the quantitative research between the two needs to be further explored.

In view of the research flaws of the two points, and referring to the research results of the predecessors, this question will coordinate the best matching relationship between technology development and technology introduction, technology development and technology output activities, using dynamic system perspectives and quantitative methods to describe and optimize. Further I will combine and improve the dynamic optimization model and strategy of technology introduction and financial performance. This is not only of theoretical value, but also has a great reference value and reference for the choice of future innovation strategies of Chinese enterprises.

2. THEORETICAL ANALYSIS AND MODEL ASSUMPTIONS

There are many ways to measure the inward-oriented open innovation model and performance. This chapter collects and analyzes the measurement parameters commonly used in previous research. Combined with the specific research needs of this paper, it proposes the use of technology introduction and financial performance as the measure of inward-oriented open innovation and performance. The parameters, with industry attributes, firm size and year as the control variables, thus comprehensively reflect and evaluate the inward-style open innovation model and performance relationship research, and put forward hypotheses.

2.1 Indicator Selection

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(1) Measurement of technological innovation in the inward-looking open innovation model

Under the inward-oriented open innovation model, enterprises have two ways to improve their technological innovation capabilities, namely independent research and development and introduction of foreign technology.

However, not every company can conduct independent research and development. It requires sufficient R&D funds and a strong R&D team to undertake the R&D risks that may arise during a long development cycle. In addition, due to increasing market competition and large and complex market demand, relying solely on high-cost internal R&D activities can not keep up with the needs of social development. Therefore, most companies believe that the introduction of foreign technology is a strong complement to independent research and development, relying more on external research and development results.

It is understood that many scholars have used different models to explore the impact of foreign technology introduction on technological innovation. Wu Guangmou, Sheng Zhaohan (1998) used the innovative benefit model from the market perspective to draw the market to encourage enterprises to introduce technology, and believe that to a certain extent, enterprises abandon independent innovation is the Nash equilibrium of market competition[2]. Zhou Hao (2003) used the patent competition model to study the relationship between the cost of technology introduction and the cost of independent research and development. The results of the study suggest that the two are not necessarily substitutes or complement each other. The relative size is judged[3]. Zhou Bin, Li Huizhen (2000) used quantitative analysis to study the impact of technology introduction on macroeconomics in Shanghai since the 1980s. The research results show that a large number of advanced technologies introduced by Shanghai have greatly improved the overall level of the Shanghai area and brought great contributions to the development of Shanghai's industrial economy[4].

Another view is that inward-looking open innovation is not an innovation model that simply relies entirely on external technology, nor does it mean giving up or weakening internal R&D and innovation. Enterprises should continually dig deeper into the advantages of using their own technology. While increasing the degree of innovation and openness of enterprises, they also pay attention to the cultivation and promotion of their own research and development capabilities [5]. Hu Angang (2003) pointed out that the state should not only encourage enterprises to purchase external advanced production technology, but also strengthen their own technological innovation level [6]. Wang Zijun (2003) proposed that Indonesia and Thailand should be introduced to foreign countries due to excessive dependence on technology introduction, and that Chinese enterprises should appropriately introduce foreign technology, avoid excessive investment, and

direct direct technology introduction to the track of promoting local technological innovation[7].

This paper combines the above viewpoints and believes that technology introduction and independent research and development are not absolute opposite relations, but complementary forms of enterprise technology independent innovation capabilities. Therefore, this paper will use the parameter of technology introduction intensity to measure the level of enterprise independent technological innovation under the inward-style open innovation. The higher the intensity of technology introduction, the lower the level of independent technological innovation of enterprises.

(2) Measurement of enterprise performance under the inward-oriented open innovation model

Whether it is the introduction of external technology or internal self-development, the ultimate goal is to achieve corporate performance. For a long time, technology innovation and related aspects of technology and management have faced the problem of how to measure enterprise performance. However, the current measurement of performance has not yet formed a unified indicator system.

Hopkins and Bailey (1981) proposed five indicators for measuring performance: new product sales ratio; target completion level; new product development success rate; financial evaluation; satisfaction with new product development leaders[8]. Cooper and Kleinsehmidt (1987) are different from their predecessors. They use factor analysis to organize three facets to measure performance: the market share of new products in domestic and international markets; new products will meet in the competition process. Barriers to the market; financial performance, mainly including profit, sales, overall business operations and static, dynamic investment payback period [9] .Brown and Svenson (1998) divide performance into two aspects: R&D performance and business performance, focusing on the additional benefits that companies bring to the company after the new product is launched [10]. In recent years, many experts and scholars have frequently used the proportion of patents and the proportion of new product sales in total sales to measure corporate performance. Wu Xiaobo and Chen Ying (2010) used the proportion of the company's new product sales as a metric [11].

Throughout the measurement of performance of predecessors, it can be seen that because different technological innovation activities have different applicability to enterprises, performance has multiple dimensions of measurement, which can be mainly divided into financial performance and non-financial performance.

This paper will use financial performance to measure firm performance, not only because financial performance is more intuitive than the indicators such as patents, but also the degree of

commercialization of enterprise technology research and development results, and companies must have a good competitive advantage. Financial Performance. In addition, external technology acquisition may also result in management costs and opportunity losses while obtaining relevant benefits. Therefore, the impact of technology introduction on performance is more appropriate and more practical.

(3) Measurement of control variables under the inward-looking open innovation model

In the research on the relationship between the enterprise's inward-oriented open innovation model and performance, the nature of the enterprise, the size of the enterprise, the industry to which the enterprise belongs, and the number of years the company is established are generally selected as control variables.

The nature of the enterprise determines the production relationship within the enterprise, which in turn determines the way in which information and knowledge are distributed. The differences in the system of state-owned, private, joint-stock, joint venture, and foreign-owned enterprises will affect the enthusiasm and distribution of employees, and thus affect the performance of enterprises.

Different industries have different levels of knowledge and technology, and the intensity of competition is different, so the pressure and level of innovation are different. Enkel and Gassmann (2008) found that enterprises in the fast-changing industry will increase the intensity of external technology introduction. For example, in the fast-changing high-tech industries such as IT, electronics and electrical, the proportion of joint development projects exceeds 50%. In non-technically intensive industries such as printing and manufacturing, the proportion of joint development projects is less than 20% [12].

Nadler and Tushman (1988) pointed out that firm size is an important factor in corporate decision-making. The larger the enterprise, the more obvious the scale effect and reputation advantage of the enterprise, but there is also the lack of flexibility to better absorb and absorb the external introduction technology [13]. Some scholars believe that large-scale enterprises are more inclined to independently research and develop because they have sufficient funds and research and development strength, in order to prevent technology leakage and reduce communication with the outside. Small and medium-sized enterprises are more willing to increase the intensity of external technology introduction due to lack of resources, and choose an inward-oriented open innovation model. However, Enkel and Gassmnn hold the opposite view, they believe that the larger the company, the greater the intensity of external technology introduction [12].

The time of establishment of the company also has a greater impact on innovation performance.

The first established companies have accumulated a large amount of knowledge and ability to adapt to market changes more quickly and change the innovation strategy in a timely manner[14]. Due to the volatility of the market environment, the proportion of products in different years in the market can bring different benefits to enterprises.

Therefore, based on the previous research, this paper will select the industry, enterprise size and year of the enterprise as the control variables.

2.2 Research hypothesis

At present, many literature studies focus on the impact of external technology on corporate performance, but the research conclusions are not the same.

Kiyota and Okaza (2005) explored the relationship between technology introduction and performance in their country and found that technology introduction can effectively improve business performance[15]. Zhang Leiyong, Feng Feng et al. (2012) used stochastic frontier analysis to analyze the impact of technology purchases in various provinces on corporate performance from 2000 to 2008. The results prove that the introduction of advanced technology is more efficient than the independent innovation and investment in new products, and the technology purchase can improve the efficiency of regional technological innovation[16].

However, Jones and Teegen (2000) reached the opposite conclusion by empirical analysis of 188 companies in the United States on technology introduction. And with the introduction of foreign technology, this negative impact will continue to expand [17]. Parente and Prescott (1994) believe that there are barriers to introduction in the process of technology introduction, and such barriers will make the cost of introducing technology far exceed the independent innovation of enterprises, which is not conducive to the improvement of innovation performance[18]. Lin Zhongping (2006) believes that foreign large multinational companies adopt more technical control strategies, and their core technologies are not sold to ensure their technological competitive advantages. If Chinese enterprises blindly increase the number of technology introductions, they will rely on foreign advanced technologies to reduce their independent innovation capabilities, and the industrial structure is difficult to upgrade [19]. Li Guojie (2005) refers to the situation that this technology is subject to outsiders as "path dependence" [20].

There are two main reasons for this contradiction. On the one hand, the introduction of external technology may not only improve the level of technical capabilities of enterprises, but also may result in corresponding management costs and loss of opportunities. On the other hand, previous studies have less considered control variables that affect the relationship between external technology introduction and performance, such as company size, data year and industry gap.

Stock, Greis, and Fischer (2001) measure the performance of new product development with process performance of new products. The results show that the relationship between technology introduction capability and new product development performance is not a simple linear correlation but an inverted "U" type relationship that rises first and then falls [21].

The Laursen and Salter studies found that there is an inverted "U" relationship between innovation breadth and depth and innovation performance[22], and Almirall and Casadesus-Masanell also confirmed this relationship[23].

Based on the above literature analysis, this paper proposes the hypothesis H1:

The external "enterprise technology" introduced the proportion of the total investment in technology research and development and the financial performance first rises and then falls. The research model diagram is as follows:
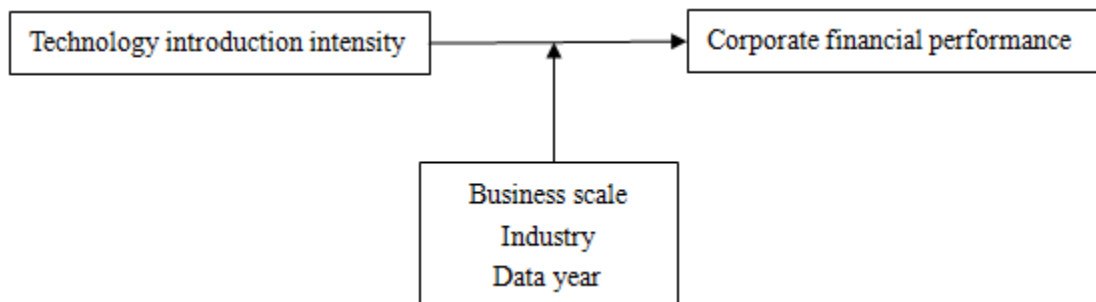

Figure 2.1: Research model diagram

The above-mentioned technology introduces the intensity as the explanatory variable, the financial performance of the enterprise is the explanatory variable, and the enterprise size, the industry in which it is located, and the data year are all control variables.

3. EMPIRICAL RESEARCH DESIGN

3.1 Sample selection and data source

In order to make the research results more instructive to high-tech enterprises, and true and credible. This paper selects the A-share high-tech listed company on the Shanghai Stock Exchange as a research sample. According to the CITIC industry classification, the sample mainly covers pharmaceuticals, electronic components, computers, defense and military industries, and the research time is from January 1, 2011 to December 31, 2015. This article considers the following points in the sample selection:

(1) Select companies that only issue A shares and are listed before 2011.

(2) Remove companies that have not introduced external technology.

(3) Remove companies with incomplete data.

The sample was originally 122 companies. A total of 48 listed companies were selected according to the above rules. A total of 240 sets of observations of the sample companies from 2011 to 2015 were selected for analysis. Among them: the data of enterprise technology introduction comes from the intangible assets in the annual report of the listed company, and the purchase amount is increased in the current period. The scale of the enterprise, the return on net assets, etc. are from the annual report data of Guotaian Database and Shanghai Stock Exchange website. The industry in which the enterprise is located is from CITIC Industry. classification.

3.2 Variable definition and description

(1) Interpreted variables

In order to better reflect the commercialization level of enterprise technology research results, this paper takes the single variable of return on equity (ROE) as the explanatory variable, and the calculation formula is:

Return on net assets = net profit / average balance of shareholders' equity

This indicator reflects the degree of return on shareholders' equity and is used to measure the efficiency of the company's use of its own capital. The larger the indicator value, the higher the return from investment.

(2) Explanatory variables

In this paper, the proportion of external technology investment in total investment in enterprise technology research and development is called the intensity of external technology introduction. In recent years, the intangible assets of listed companies in the annual report have divided the intangible assets into three categories, namely, acquisition, internal R&D and mergers. The paper directly selects the increase in the purchase of intangible assets in the current period. That is, the external technology introduction intensity is equal to the annual purchase increase amount of non-patent technology and patent technology in the listed company's annual report intangible assets, divided by the current business income.

(3) Control variables

Considering data matching, the size of the firm in this paper will be measured by the natural

logarithm of the total assets that are often used in the study.

The virtual data variable will be set in the enterprise data year, and the sample will be taken as 1 in the current year, otherwise it will be 0.

In order to make the research results more instructive to high-tech enterprises, and true and credible. According to the classification of CITIC industry, this paper selects four types of enterprises, namely: national defense industry, computer industry, electronic components industry, pharmaceutical industry and other four high-tech industries. When the enterprise belongs to the industry, the sample takes 1; otherwise, it takes 0.

The relevant variables and definitions are detailed in Table 3.1.

Table 3.1: Variable Symbol Definition and Measurement

Variable type	Variable name	Variable symbol	Variable description
Explained variable	Return on net assets	ROE	Net profit/average balance of shareholders' equity
Explanatory variables	Technology introduction intensity	SIT	Annual purchase technical amount / current operating income
Control variable	Business scale	SIZE	The natural logarithm of the current total assets
	Enterprise data year	YEAR	Take 1 for the sample in the current year, otherwise take 0
	Industry in which the company is located	INDUSTRY	Take 1 in the industry, otherwise take 0

3.3 Model Construction

Wang Wenhua, Zhang Zhuo, and Ji Xiaoli (2014) constructed a multivariate linear regression model and used SPSS19.0 to test hypotheses when studying the inverted "U" relationship between executive shareholding and corporate R&D investment intensity[24].

Wang Wenhua, Zhang Zhuo, Chen Yurong, and Huang Qi (2015) also used a multivariate linear model when studying the inverse "U" relationship between technology diversification and firm performance[25].

According to SPSS22.0 software:

$$ROE_{it} = \alpha + \beta_1 SIT_{it} + \beta_2 SIT_{it}^2 + \beta_3 Control\_Variable_{it} + \varepsilon_{it}$$

The meaning of each parameter is shown in Table 3.1.

4. EMPIRICAL ANALYSIS

4.1 Descriptive statistical analysis

As can be seen from Table 4.1, the average size of China's high-tech listed companies is not low, but the variance is 1.825. It can be seen that although they are high-tech enterprises, the industry is different, and obviously there is a certain gap in scale.

The intensity of technology introduction is generally low, which shows that China's high-tech enterprises are generally relatively open to the outside world. They lack certain attention to the introduction of external advanced technologies to improve their own technical level. Most of them are independent research and development or R&D centers. The difference in the intensity of technology introduction will also lead to fluctuations in the return on net assets.

Table 4.1: Main variable description statistics

	N	Minimum	maximum	average	variance
ROE	240	-0.299	0.319	0.098	0.084
SIT	240	0.000088	0.097	0.00231	0.00235
SIZE	240	0.21	26.06	22.48	1.825

4.2 Regression results and analysis

Table 4.2 shows the linear regression results when the return on equity is the explanatory variable and the technical introduction strength is the explanatory variable.

It can be seen from the F value that all three models have passed the 1% statistical significance test, indicating that the regression model has a good fit.

Model 1 is the base model. There are only constants and control variables in the model, and no explanatory variables are added.

Model 2 adds the explanatory variable technique introduction strength to Model 1 based on it. The adjusted model fitting effect is slightly enhanced, the regression coefficient is 0.911, and the 10% statistical significance test is passed, indicating that the technology introduction intensity has a correlation with the return on net assets.

Model 3 adds the square of the intensity of the explanatory variable technique to the model 2. It can be seen from the regression results that the model fitting strength is further significantly

enhanced. The correlation coefficient of the intensity of technology introduction is still positive and passed the 1% statistical significance test. The squared regression coefficient of the technical introduction intensity is -11190.733 and is shown by a statistical significance analysis of 1%. That is to say, when the intensity of technology introduction is low, as the proportion of foreign technology introduction increases the proportion of current operating income, the return on net assets will increase, and the intensity of technology introduction will increase the financial performance of enterprises; but the return on assets will not Unrestricted growth, when reaching an optimal value, due to the increasing management costs and opportunity losses introduced by foreign technology, the return on net assets begins to decline gradually, and the increase in the degree of inward-looking open innovation will reduce the financial performance of enterprises. Bring losses.

Therefore, only a modest increase in the intensity of enterprise technology introduction, a good balance between technology introduction and independent research and development can maximize the positive effect of the inward-oriented open innovation model on financial performance, this paper is verified.

From the regression coefficient of the control variables, the firm size and the return on net assets are negatively correlated, but the significant effect is not strong. It may be due to the different industries, and the intensity of technology introduction of enterprises of different scales is different. In some high-tech industries, small-scale enterprises are more inclined to purchase innovative resources such as technology from outside due to lack of independent development funds and resources. To a certain extent, the return on net assets first rises to a certain value and then begins to decline. With large financial resources and resources, large-scale enterprises have their own R&D centers and strong R&D teams. The technology purchases to the outside world are less, and the technology introduction intensity is gradually reduced over a period of time. The return on net assets will also change accordingly.

Therefore, the sample size of the industry and the enterprise in this sample may not be sufficient or representative, and the significance of the relevant results is not particularly obvious, and further analysis is needed.

Table 4.2: Multiple regression results

	Model 1	Model 2	Model 3
Constant	***	***	***
SIT		0.911*	80.275***
		(0.063)	(0.000)
SIT^2			-11190.733***
			(0.000)
SIZE	-0.004	-0.004	-0.001
	(0.389)	(0.415)	(0.838)
INDUSTRY	control	control	control
YEAR	control	control	control
R^2	0.127	0.128	0.417
Adjusted R^2	0.089	0.086	0.386
F	3.952***	3.519***	13.091***
N	240	240	240

Note: The non-normalized coefficients are listed in the table, and the significance level of the coefficient is shown in parentheses. * is a 10% significance level, ** is a 5% significance level, and *** is a 1% significance level.

4.3 Optimal technology introduction strength

Through SPSS22.0 software, this paper simulates the relationship between technology introduction strength and ROE in panel data, as shown in Figure 4.1.

From Figure 4.1 and the above regression analysis, we can see that the technology introduction strength and the return on net assets rise first and then fall, and the inverted "U" type relationship can be used to derive the optimal technology highest. Deriving the model $ROE_{it} = \alpha + \beta_1 SIT_{it} + \beta_2 SIT_{it}^2 + \beta_3 Control\_Variable_{it} + \varepsilon_{it}$ on both sides. we can get

$(ROE_{it})' = \beta_1 + 2\beta_2 SIT$.

The SIT and SIT^2 non-normalized coefficients in Model 3 in Table 3.2 Model Regression Analysis are taken into β_1 and β_2 respectively, and make $(ROE_{it})'$ equal to 0.we can get $SIT = (-\beta_1)/2\beta_2$.

The calculated value of SIT is 0.00359, that is, when the technology introduction strength of the enterprise is 0.00359, the return on net assets of the enterprise reaches the maximum.
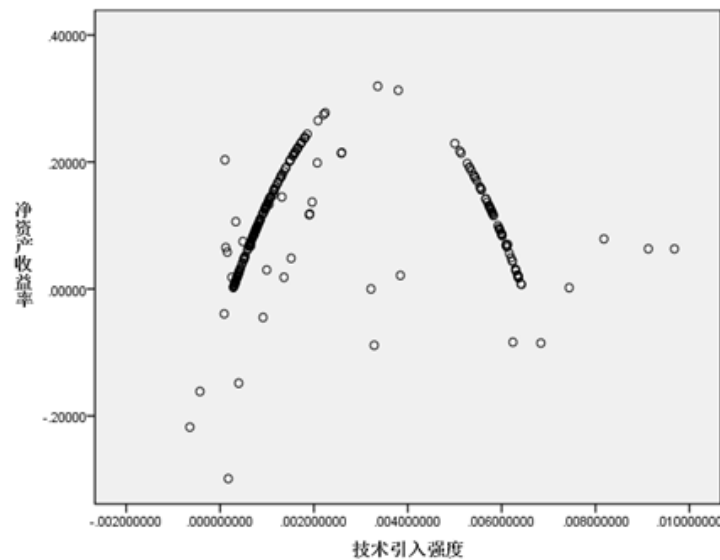
Figure 4.1: Relationship between technology introduction intensity and ROE

4.4 Countermeasures and Management Implications

The results of the above regression analysis provide a reference for the source of technological innovation of enterprises, and also bring inspiration for enterprises to choose different sources of technology to improve their financial performance.

First of all, enterprises should fully consider the combination of independent innovation and technology introduction when implementing the open innovation strategy, in order to seek the open innovation model with the largest net profit return.

Second, when introducing external technologies, companies should do a good job of research and analysis. After comparing the cost of independent research and development, the technology should be introduced reasonably according to the development needs of the enterprise itself, instead of introducing more technologies as possible. Previous studies have shown that when the introduction of technology and the core competence of the enterprise, that is, the ability to strengthen independent innovation or complement each other, the best effect.

Finally, it is necessary to improve the shortcomings in the production process in time after the introduction of the technology, rather than putting it down on either side. It is necessary to be able to understand the external resources absorbed by the purchase, do a good job of subsequent development and utilization, and continue to explore the value of the introduced technology, otherwise it may fall into the vicious circle of "introduction-utilization-elimination-re-introduction". This will not only waste a large number of human and material resources, but also

gradually rely on external introduction technology to hinder the improvement of their own innovation level and reduce their financial performance.

5. RESEARCH CONCLUSIONS AND PROSPECTS

5.1 Research conclusions

This paper focuses on the inward-oriented open innovation model, and uses the combination of theoretical analysis and empirical research to analyze the impact of enterprise technology introduction intensity on financial performance, and discusses the most suitable method for determining the technical introduction intensity of enterprises. Analysis conclusion:

With the increasing demand from customers and the market, the industry boundary is becoming increasingly blurred. Enterprises have purchased advanced technology knowledge to improve corporate performance. The new model of technological innovation and cooperation between enterprises has gradually replaced the traditional individual competition model.

Through the existing researches on the relationship between inward-oriented open innovation model and performance at home and abroad, it is found that there are two major problems: First, there is currently a lack of research on the relationship between the synergy of technology introduction and independent innovation on performance. Second, the current research on the relationship between technology introduction and independent innovation on performance is mostly qualitative research, and the quantitative research between the two needs to be further explored.

According to the research flaws of the two points, this paper uses the parameters of technology introduction intensity to measure the level of enterprise independent technological innovation under the inward-oriented open innovation. Use financial performance to measure business performance and demonstrate the commercialization level of enterprise technology research and development results. In terms of control variables, the industry, the size of the enterprise, and the year in which the company is located will be used as a measure. After studying the literature on the relationship between technology introduction and performance, this paper puts forward the assumption that the proportion of external technology in the total investment of technology research and the financial performance will rise and then fall.

Using the linear regression model to analyze the panel data of 48 high-tech listed companies, it is found that there is an inverted "U" relationship between the yields. And when the technology introduces the strength, that is, the ratio of the annual purchase technology amount to the current operating income is 0.00359, the enterprise's return on net assets reaches the maximum.

According to the above analysis results, it can be found that in the initial stage of technology introduction, due to its weak foundation, the purchase of external advanced technology innovation knowledge can improve product development efficiency and new product success rate. By integrating external resources and internal R&D, we will accelerate the process of specialized division of labor, enhance the efficiency of innovation, and achieve the goal of improving corporate performance.

However, when companies use various internal resources to search for external partners, due to the uncertainty of matching, high transaction costs may be incurred. Moreover, as the introduction of foreign technology continues to increase, management costs and opportunities are also increasing. After the technology introduction intensity exceeds a certain threshold, the "ceiling" effect gradually appears, and the financial performance of the enterprise shows a downward trend. If enterprises simply increase the intensity of technology introduction without improving their technological innovation capabilities, they will lose control of technical resources, and the company's decision-making flexibility will be greatly reduced. After a short-term market share growth, the gap with leading companies will widen again, and it may lose the hard-won market position.

This paper breaks through the macro data of the industry in the past research or the survey data method of industrial enterprises, and uses the micro-data of enterprises, especially the empirical analysis of listed companies, to reveal the inward-looking openness from the dynamic perspective through the careful division of the incremental methods of technology acquisition. The impact of the innovation model on corporate financial performance has enriched and improved the research on the relationship between technology introduction intensity and ROE.

5.2 Research Outlook

Due to the limitations of author level and research time, this paper inevitably has certain limitations.

First of all, in the regression results of this paper, the impact of firm size on corporate financial performance is not significant. It may be that the selected samples are not very representative due to different industries.

Second, this paper studies the impact of inward-style open innovation on performance, only considering financial performance and neglecting strategic performance. The impact of technology introduction intensity on strategic performance remains to be studied.

Third, the sample of this paper is the data of listed companies in high-tech enterprises. Whether

the research conclusions are applicable to other industries remains to be further studied, and the promotion value of research conclusions is limited.

Fourth, Von Hipple (1988) defines four external sources of useful knowledge: suppliers and customers; universities, government and private laboratories; competitors and other countries. This paper only roughly divides the technology incremental acquisition method, but does not make a detailed division of the technology acquisition channels. The influence of different external technology acquisition channels on enterprise performance remains to be further studied [26].

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