

Research on the Factors Influencing the Transformation of Scientific and Technological Achievements in Small and Medium-sized Enterprises

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Abstract

The purpose of this study is to study the impact of government support and regulation on the transformation of SEMs' scientific and technological achievements. This paper focuses on the SEMs of Shenzhen Stock Exchange from 2014 to 2020. Most existing research does not consider the endogenous nature of R & D support. In this paper, Logistic regression analysis, negative binomial regression analysis and Two-stage least squares (2SLS) method are used to investigate the impact of government support and regulation on the transformation of SEMs' scientific and technological achievements. The results show that, firstly, considering the endogeneity of government support, it is found that government regulation can promote the transformation of scientific and technological achievements of SEMs. The study concludes that government support plays an important role in promoting the transformation of S & T achievements of small and Medium-sized enterprises (SEMs) due to the fragility of the environment. The government should improve the relevant laws and regulations and support the policy of small and Medium-sized enterprises to promote the transformation of scientific and technological achievements of small and Medium-sized enterprises, with a view to achieving sustainable development of regional economy.

Keywords

Government Support; Government Regulation; Transformation of Scientific and Technological Achievements; Small and Medium-sized Enterprises.

1. Introduction

In the fierce global competition environment, enterprises are using various methods to ensure the sustainable survival and core competitiveness. Among them, the transformation of scientific and technological achievements of enterprise ability aims to find a new growth engine to extend the new industries, the global trade competition is the market expand the differentiated products and services has become enterprise innovation inevitable pressure, this makes enterprises realize the transformation of scientific and technological achievements to ensure that the necessary conditions of competitive advantage, the transformation of scientific and technological achievements have proved to be heavy enterprise core competitiveness[1]. In

particular, the transformation activities of scientific and technological achievements centering on small and Medium-sized enterprises are faced with limitations[2]. However, for small and Medium-sized enterprises, due to their lack of R&D personnel and financial support, the transformation fails and eventually falls into the valley of death. However, small and Medium-sized enterprises are not only the transformation of scientific and technological achievements of safeguard their own market competition play a role, and in countries such as national technical development and create jobs and social aspects is also very important. In this context, the government mainly in two major in the research and development support and lax supervision has played a significant role in the transformation of scientific and technological achievements. The government regulated Existing research has not been able to related empirical studies have shown that the influence of the transformation of scientific and technological achievements of the enterprise. New classical school of thought, lax supervision is necessary, because the government through the regulatory governance intervention of the market will be negative impact on the economy. However, potter discussion assert that regulation will not necessarily have a negative impact on economic performance[3]. At the same time, some scholars rules conducive to the transformation of scientific and technological achievements for revising and improving the process of optimization, speed up the transformation of scientific and technological achievements related activities about regulatory effect on promoting the transformation of scientific and technological achievements into real productive forces is the result of the positive or negative is yet to be determined, therefore, need to analyze the influence of lax supervision. Research and development of government support. The government encourages small and Medium-sized enterprises to carry out the transformation of scientific and technological achievements through various forms of supporting policies and measures to promote the transformation of enterprises' scientific and technological achievements, such as the coordination of R&D investment, tax reduction and exemption of stakeholders, etc. Existing studies have shown that government support has a positive impact on the performance of small and Medium-sized enterprises. However, a common problem with these studies on government support is that they do not take into account that government support is inherently endogenous. Therefore, it is necessary to understand the effects of government support through studies that minimize the endogeneity of government support[4].

Through empirical research, this study explores the influence degree of SEMs' S&T achievement transformation activities under the influence of government support and supervision, in order to provide reference for the decision-making of SEMs' innovation chain integration in the formulation of policies supporting S&T achievement transformation activities by government departments.

2. Theory Analysis

2.1. Commercialization of Scientific and Technological Achievements in Small and Medium-sized Enterprises

Compared with large enterprises, small and Medium-sized enterprises (SEMs) are in an obviously weaker position in obtaining resources in the whole innovation chain (transfer of scientific achievements, technological achievements, engineering and industrialization), so it is difficult to ensure competitiveness[5]. In September 2014, Premier Li Keqiang proposed mass entrepreneurship and innovation at the Summer Davos Forum. For small and Medium-sized enterprises play an important role in the transformation of scientific and technological achievements. Since the government's policy of good unceasingly, the innovation chain is plural subject development, the innovation chain scale expands unceasingly, the market environment has changed, therefore, regulations and policies for small and Medium-sized enterprises to

participate in the transformation of scientific and technological achievements and the development of the core competitiveness is to enhance national competitiveness essential factors Small and Medium-sized enterprises and large enterprises in the transformation of scientific and technological achievements of scientific and technological achievements transformation between a significant difference between the two Achievements transformation of small and Medium-sized enterprises emphasis on using new inventions and achievements to replace existing products in the market, to adopt new technology and meet customer expectations, at the same time in a niche market (that is, the relatively small compared to the large enterprise market) in monopoly With the development of technology, a high proportion of innovation, and has a tendency to increase gradually At the same time, the small and Medium-sized enterprises achievements transformation is the basis of increase profits and profits, and corporate profit growth engine, is to achieve sustainable growth, development and competition in the survival of the absolutely key, so obviously in the transformation of small and Medium-sized enterprises of science and technology is more flexible and frequent [6].

However, in the transformation of scientific and technological achievements of small and Medium-sized enterprises, if the secondary development and transformation of achievements fail due to lack of capital or technical manpower, such failure may immediately lead to the bankruptcy of an enterprise. Therefore, the transformation ability of scientific and technological achievements of small and Medium-sized enterprises is limited. Based on this, the government needs to establish various types of support and systems as part of the policy measures to support SEMs' scientific and technological achievements transformation activities.

2.2. Government's Influence Measures in the Transformation of Scientific and Technological Achievements

2.2.1. Government Regulation

Generally called government regulation or control, regulation, academia is under the condition of market economy the government in order to achieve certain public policy goals, norms and constraints of the micro economic subject mainly through specific industries and microeconomic activity main body qualification to enter exit price and life safety relates to the national health behavior such as supervision and management to realize sustainable development While regulation is seen as essential to the achievement of the public good, it is also actively discussed by those who believe it may violate important principles of a free market economy Since the 1980s, neoclassicists have claimed that government intervention in markets through regulation has negative economic effects[7]. For example, they believe that the institutional environment surrounding economic activity (including regulation) has a significant negative impact on economic performance Dysfunction in the argument against the rules, the laws of inevitably leads to the increase of production cost, which hindered the optimal combination of factors of production, hinders the investment and employment, thus resulting in a decline in productivity and competitiveness, however, at the same time, there are conflicting views, namely regulation will not necessarily have a negative impact on economic performance Porter's hypothesis assumes that market failure can be corrected by making appropriate regulations authorized by the government so that industrial entities such as enterprises will not ignore profit opportunities [8]. It explains the positive economic impact of regulations, that is, enterprises' response will trigger the transformation of scientific and technological achievements, thus improving productivity.

Porter's hypothesis proposed the possibility that regulation and economic growth coexist, and was supported by scholars after the mid-1990s, and refuted by econometrics again, but this is consistent with the positive and negative effects of economic performance brought by regulation, and cannot ensure the result.

2.2.2. Government Support

Enterprises to carry out the transformation of scientific and technological achievements, are influenced by the enterprise all around the external environment, internal management is not only their own financial resources such as technology, also includes the influence between multiple subject of enterprise in the transformation of scientific and technological achievements, social economic and political environment In the external environment, the government support will affect in the transformation of scientific and technological achievements Due to the limited R&D activities caused by the lack of their own capabilities (such as lack of management resources), SEMs are usually unable to ensure core technological capabilities and competitive advantages. The government can influence the technological and capital expansion of SEMs by supporting them, thus driving the transformation of scientific and technological achievements in some cases In addition to the influence of the external environment, the enterprise of R&D investment usually show a lukewarm attitude, because they think to return on investment in the transformation of scientific and technological achievements is very small [9]. Therefore, the government needs to provide all kinds of support in the transformation of scientific and technological achievements, such as providing financial and technical trend information, to help enterprises enhance the capacity of conversion, combating climate change and ensure the competitive advantage Relevant studies include Zhou Bo et al., which show that there are significant differences in the correlation between institutions and the growth rate of private investment. Moreover, due to institutional constraints and economic factors, the mechanism of the effect of productive government expenditure on private investment also presents significant structural differences [10]. Xiao Bing et al. analyzed the Patent box policy in the UK, which achieved good results in reducing the tax burden of enterprises and promoting the application of intellectual property rights.

3. Research Methods

3.1. Determinants of Technological Innovation

This study attempts to explain how government support and regulation affect the transformation of scientific achievements by constructing a comprehensive research model based on the theoretical background and previous research related to transformation of achievements, where government support and regulatory barriers are used as explanatory variables and transformation as dependent variables Measure method of the transformation of scientific and technological achievements into real productive forces by different researchers have different, but many researchers use patents as the achievements on behalf of the enterprise performance indicators, this ensures that the patent for a certain period of technology and trademark has a monopoly position, this is because has the advantages of objective transformation technology, but as a result of the patent [11]. Due to this limitation, many previous studies have taken advantage of this concept for achievement transformation, engineering and marketization (such as realizing new products), in which enterprises bring new products to market In this study, the results of the transformation of scientific and technological achievements are utilized and measured by subdividing the process into achievement transformation opportunities, achievement secondary development, transformation products and innovation chain [12]. In addition, in order to minimize the error in the verification process between explanatory variables and dependent variables, the source of information of each enterprise R&D; Detailed models and research assumptions related to the D characteristics and enterprise characteristics used as control variables are as follows:

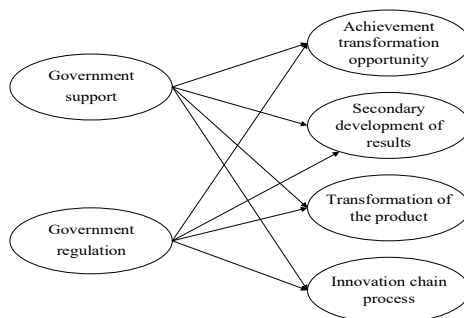


Figure 1. Research Model

H1: Government support will have a positive impact on the transformation of SEMs' scientific and technological achievements.

H1a: Government support will have a positive impact on the transformation opportunities of SEMs.

H1b: Government support will have a positive impact on the secondary development of SEMs' achievements.

H1c: Government support will have a positive impact on SEMs transforming products.

H1d: Government support will have a positive impact on the innovation chain process of SEMs.

H2: Government supervision will have a positive impact on the transformation of SEMs' scientific and technological achievements.

H2a: Government supervision will have a positive impact on the transformation opportunities of SEMs.

H2b: Government supervision will have a positive impact on the secondary development of SEMs.

H2c: Government supervision will have a positive impact on the transformation products of SEMs.

H2d: Government supervision will have a positive impact on the innovation chain process of SEMs.

3.2. Data Analysis

In this study, 994 companies listed on the Small and Medium-sized Board of Shenzhen Stock Exchange from 2014 to 2020 were used as valid data for research purposes. Among them, there are 916 independent enterprises, 50 mixed enterprises and 28 foreign-funded enterprises. By size, there are 516 Medium-sized enterprises, 428 small enterprises, and 50 micro enterprises.

3.3. Positivism Model

3.3.1. Logistic Regression Analysis and Negative Binomial Regression Analysis

In this study, achievement transformation opportunity, achievement secondary development, transformed products and innovation chain Innovation is used as dependent variables, where the value of 0 or 1 is used as a binary qualitative variable of achievement transformation opportunity, transformed products and innovation chain process, and the relationship between independent variables and dependent variables is used in logistic regression model.

In the case of secondary development of results, because it cannot have negative value as additional data and has discrete and asymmetric distribution, the estimation using the least square method will produce distorted results in this case. Since the variance is the same as the mean, it does not apply to most patent documents where the variance is greater than the mean (excessive dispersion). In order to solve this over-dispersion problem, the negative binomial model is used in this study.

3.3.2. Two-stage Least Squares (2SLS) Analysis

In this study, a factor model affecting the transformation performance of scientific and technological achievements is established and analyzed. Among the explanatory variables, various factors affecting government support should be considered. In general, it is estimated that enterprises receiving government support will show firm characteristics, R&D characteristics and innovation performance, but if the government support variables are used as is, the overestimation effect will be generated. Explanation variable on the dependent variable has the effect of unilateral, but in the case of government support, it is not a unilateral relationship, but in fact, each variable in the internal interaction. This interaction is known as endogenous, when using general regression equation, due to interaction of explain limitations, the results of the model error problems. For these reasons, the 2SLS model was used in this study, which can clearly estimate government-supported explanatory variables by examining the interrelationships between variables, thus minimizing endogeneity.

4. Conclusion Analysis

The analysis results of logistic regression analysis and negative binomial regression analysis of each dependent variable were reviewed. Firstly, it was found that the positive influence of government support on all dependent variables was supported, which could be interpreted as the positive influence of government support on the transformation activities of scientific and technological achievements of SEMs. Secondly, government regulation is supported because it has a positive effect on all dependent variables in the case of regulation. It supports Porter's innovation theory and finds that if there is government regulation, it will have a positive effect on the transformation activities of SEMs' scientific and technological achievements. From the analysis results, it can be seen that the government should cultivate SEMs by appropriately modifying and improving regulations' support policies for SEMs. Table 1 and Table 2 show the application of 2SLS model to exclude the endogenous influence of government support. Since the results of the analysis are identical to those of logistic regression and negative binomial regression, it is certain that government support has a positive effect on all dependent variables. This result indicates that the null hypothesis is supported even after the endogenous effects are removed.

Table 1. Results of Logistic regression and negative binomial regression

variable		Achievement transformation opportunity	Secondary development of results	Product transformation	Innovation chain innovation
explaining variable	government support	0.196***	0.146***	0.097***	0.072**
	government regulation	0.091*	0.074*	0.163**	0.237***
control variable	product cycle	0.000	0.000	-0.001	0.000
	Into place	0.853***	0.345***	0.528**	0.271
	Proportion of R&D personnel	0.735	1.737**	0.972	-3.316***
	Value of R&D investment	0.031	0.08**	0.081**	0.162***
	Marketing value	-0.004	0.009***	-0.004	-0.002
continuity		-1.633***	-1.88***	-0.079	-1.649***
Pseudo R2		0.1289	0.0603	0.0773	0.0727

Note: *, ** and *** mean significant at the significance level of 10%, 5% and 1%.

Table 2. 2SLS analysis results

variable		Achievement transformation opportunity	Secondary development of results	Product transformation	Innovation chain innovation
explaining variable	government support	0.613***	0.399***	0.489***	0.399***
	government regulation	-0.037	0.027	0.05	0.145**
control variable	product cycle	0.000	0.001	-0.002*	-0.001
	Into place	0.587**	0.141	0.245	0.065
	Proportion of R&D personnel	-1.62*	0.205	-1.317	-5.298***
	Value of R&D investment	-0.045	0.054	-0.006	0.105**
	Marketing value	-0.007**	0.007**	-0.007**	-0.003
continuity		-0.712**	-1.388***	0.533*	-1.366***
Pseudo R2		0.1023	0.0503	0.0769	0.0739

Note: *, ** and *** mean significant at the significance level of 10%, 5% and 1%.

5. Research Conclusion

The main purpose of this study is to analyze the influence of government support and government supervision on the transformation activities of SEMs' scientific and technological achievements. Based on the above results, the main differences of this study are as follows. First, it clearly measures the transformation effect of scientific and technological achievements supported by the government. Previous researches all believe that government support will have an impact on the performance of S&T achievement transformation activities, so the government continues to invest in R&D. Therefore, in this study, the 2SLS model was used to minimize the endogeneity of government support, to confirm the effect of government support on the transformation of scientific and technological achievements. Secondly, it measures and introduces the impact of government regulation on the transformation activities of small enterprises' scientific and technological achievements, and draws a fair analysis result. As discussed in previous studies, the neoclassicism-centered deregulation argument has been maintained since the 1980s to the present, and governments have been trying to deregulate through the way regulatory reform works. In other words, increased costs due to regulations lead to a decline in competitiveness, especially for small and Medium-sized enterprises with weak capital structures. However, because proper regulation can prevent market failure of firms and provide fair opportunities for firms, this study promotes research based on Porter's innovation theory and supports it by presenting empirical results. In addition, it can support the claim that not only technological progress but also product or process innovation enhances fundamental competitiveness. Finally, in this study, in addition to the commonly used transformation products and innovation chain innovation, the view of technological progress is also divided into achievement transformation opportunity and achievement secondary development, to make the view of the transformation of scientific and technological achievements more diversified.

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