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A Text Analysis on Technology Innovation Policy of Small and Medium-Sized Enterprises in China

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Abstract: ***This paper, on the basis of the double perspectives of the policy tools and life cycle, makes a text analysis by using content analysis method for 51 policies for small and medium-sized enterprises technology innovation promulgated by the central government in our country. Through designing policy analysis frameworks, selecting samples, and analysing the texts, we will find out some policies problems existing in the process of designation, collocation and analysis, and put forward corresponding policy recommendations on this basis.***

Keywords: Small and medium-sized enterprises; Technology innovation policies; Policy tools; The life cycle One

1. Introduction

As a source of technological innovation, small and medium-sized enterprises create a large number of employment opportunities, which plays an important role in voltage regulator to the social development. However, the technological innovation activities have some characteristics such as the high cost, the high risk, the long cycle and the positive externalities and so on, as well as the risk aversion of private investors and the stability and development of preference, which often leads to a phenomenon of pontaneous supply of ″market failure"for small and medium-sized enterprises technology innovation activities. According to the theory of new classical economics, it is necessary for the government to intervene in the economy and make up for the phenomenon of ″market failure"when there are market failure phenomenona. on the basis of it, our government has issued a series of corresponding policies support, to guide and promote the development of small and medium-sized enterprises technology innovation in the process of small and medium-sized enterprise technology innovation.

Based on it, this paper, with the method of content analysis,tries to establish the analysis of policy framework based on the policy tools, make a quantitative analysis of policy text, and to grasp essencially the technology innovation policy, and to analyze its characteristics and some problems existing in each stage of the small and medium-sized enterprise technology innovation, and finally to work out corresponding policy suggestions.

2. Literature Review

In recent years, small and medium-sized enterprises innovation policy has been attracting the attention of many scholars and researchers. In terms of the small and medium-sized enterprises innovation policy, Zhao Wenfeng etc[1] have a quantitative study by using the method for text analysis on the dimensions such as policy text type, the distribution units, policy themes and the evolution stage, which makes her find support measures for the small and medium-sized enterprise policy to change from the simplification to the systematization and socialization;Zhang Wenguang etc[2] analyze and summarize phased features of policy change by using Ucinet and Nvivo, and put forward policy suggestions; As for small and medium-sized enterprise technology innovation policy, Zhang Yunjun[3], to *A Number of Policres Support for Small and Medium-sized Enterprise Technology Innovation* as the content analysis sample, try to analyze the policy tool selection characteristics of the small and medium-sized enterprises technology innovation, and finally put forward reasonable suggestions.

With combing the literature, we find that most scholars research focus on the problems existing in the policy itself. and for the text analysis of small and medium-sized enterprise technology innovation policy, the research is relatively insufficient. Based on this, this paper establishes two dimensional frameworks of policy text analysis of small and medium-sized enterprise technology innovation, and makes an analysis of it from the double perspectives on the policy tools and the life cycle of technology innovation. As for the classification of the life cycle of technology innovation, this paper refers to Ji Linglong et[4] study, and it divide the life cycle of small and medium-sized enterprise technology innovation into four parts: seed, early stage, growth period, and mature period, and decline phase. At the same time, considering that the technology innovation of the small and medium-sized enterprise in mature stage and decline stage will be carried out in a new round of innovation activities, and cycling, this paper only discuss the first three stages of technology innovation.

3. Policy Analysis Framework and the Choice of Sample

(a) Policy Analysis Framework of Small and Medium-sized Enterprise Technology Innovation

1, Policy Tools Dimension. This paper refers to Rothwell et.[6] the division of the innovation policy tools, find that small and medium-sized enterprise technology innovation policy tools can be divided into three parts:Supply, Environment and Demand (as shown in figure 1).

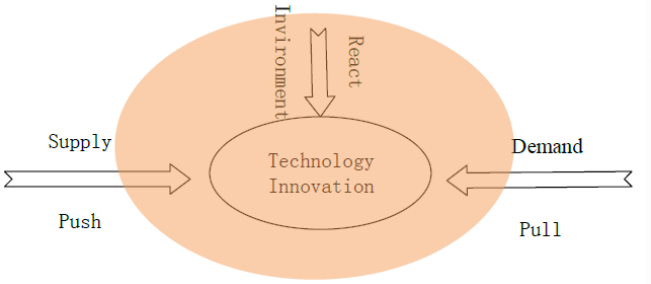

Figure 1: Policy tools applied to small and medium-sized enterprise technology innovation activities

Supply policy tool promotes to the development of small and medium-sized enterprise technology innovation activities. It mainly includes four aspects: the talent team construction, science and technology information dissemination, capital investment, intellectual property rights protection; Environmental policy tool affects the whole process of the small and medium-sized enterprise technology innovation activities. It mainly includes four aspects: infrastructure, regulatory, tax incentives, financial support; Demand policy tool pulls the small and medium-sized enterprises technology innovation activities. It mainly includes four aspects: the financial subsidies, government procurement, outsourcing services, trade control.

2, Policy Tool Applied to Field Dimension. The choice of policy tools must consider the life cycle of small and medium-sized enterprise technology innovation. In the different stages of life cycle, small and medium-sized enterprise technology innovation have their characteristics.

Small and medium-sized enterprise technology innovation process has experienced three stages: unstabilizatione, transition, and stabilizatione. In seed, technology itself is in a state of development and change, potential market of technology is to be confirmed, this phase of R&D spending is higher, the economic benefit is much lower. therefore, it is particularly important for enterprises to accurately graspe the direction of technology and market opportunities. In the early stage, it appears a dominant design combined with technology and market, which provides a standard for enterprise development. At the same time, technology innovation rates slowly drop, small-scale investments keep steadily, and enterprises keep constantly feedback adjustment, in preparation for the comprehensive technical innovation diffusion. In the growth period, with the specialized production equipment instead of the general production equipment, campaign in full swing and scale formation, enterprise sales have a rapid growth, and profit has increased dramatically, and therefore it gains a huge commercial interests. Above the comprehensive analysis, we can see that the demand for policy tool is different of small and medium-sized enterprises in different stages of technological innovation, making a segmentation of the policy tool for the life cycle of small and medium-sized enterprise technology innovation, contributes to have a more comprehensive and in-depth understanding of the use of policy tools for the small and medium-sized enterprises in the process of technological innovation. Therefore, to the life cycle of small and medium-sized enterprise technology innovation as another dimension of small and medium-sized enterprise technology innovation policy analysis framework.

Based on the theoretical analysis of fundamentals policy tools for small and medium-sized enterprise technology innovation policy and policy role in the field, we construct an analysis framework of small and medium-sized enterprise technology innovation policy (as shown in figure 2).

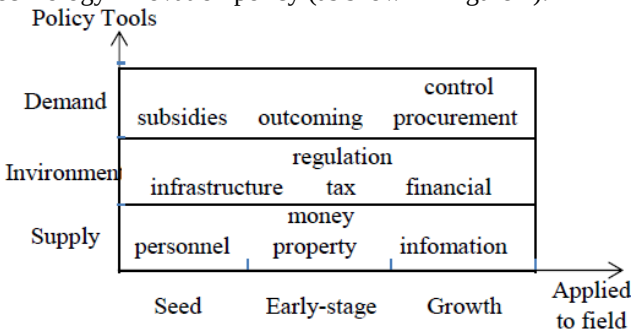

Figure 2: The text analysis framework of small and medium-sized enterprise technology innovation policy

In this paper, it looks for small and medium-sized enterprise technology innovation policy as samples by the government websites of the central people's government, the People's Republic of China ministry of science and technology and others, and the network of Peking University legal information, conducts a comprehensive search for 1994-2017 small and medium-sized enterprise technology innovation policy to small and medium-sized enterprise technology innovation "small micro enterprise technology innovation" "small and mid-sized enterprise technology innovation" "small and medium-sized high-tech enterprises" as the keyword, and finally we finds 81 policy samples. In order to ensure the integrity and the representation of the sample, we make the selection according to the following principles: 1) keep the national policy text, excluding provinces, cities and areas of policy text; (2) the retention policy types such as laws, regulations, planning, announcements, reflect the government's policy of documents, eliminate reply, about the speech and judicial interpretation text; (3) remove the duplicated text under the conditions of different retrieval. Based on the above conditions, we finally compiled 51 files as the research samples and its number.

4. The Quantitative Analysis of Policy Text

Policy terms and conditions is the basic unit of content analysis carried out on the policy text [5]. First of all, this study makes its number according to the policy document published on the time sequence; Secondly, it encodes content analysis unit on the basis of "policy number - the terms/sections"; Finally, according to the text analysis framework of small and medium-sized enterprise technology innovation policy, we make the content analysis for a total of 51 policy text policy provisions of article 473, and get the content analysis results of the small and medium-sized enterprise technology innovation policy (see table 1).

Table 1: The content analysis results of small and medium-sized enterprise technology innovation policy

Tools category	name	seed	early-stage	growth	subtotal	In total
Supply	personnel	25	19	21	65	146 (30.9%)
	information	15	6	11	32	
	money	10	8	3	21	
	property	11	9	8	28	
Environmental	infrastructure	35	19	24	78	261 (55.2%)
	financial	18	22	29	69	
	tax	28	17	23	68	
	regulations	15	14	17	46	
Demand	subsidies	21	10	14	45	66 (13.9%)
	procurement	3	1	5	9	
	outsourcing	1	0	1	2	
	control	2	0	8	10	
In total		184 (38.9%)	125 (26.4%)	164 (34.7%)	473 (100%)	

Seen from table1, we can find that policy tools go through the three stages of the life cycle of small and medium-sized enterprise technology innovation, and each have emphasize particularly on policy tools category, only in different stages.

(a) An analysis of policy tools dimension
Seen from table1, we can find that the supply side, the policy environment, demand tools accounted respectively for 30.9%, 55.2% and 13.9%. Among them, Supply side policies are in the middle position, with the highest and lowest proportion of the environmental policy tools and the demand side policy tools.

Further analysis shows that: At the supply level, personnel accounts for 45.5%, is the highest, and investment accountes for more than the minimum being 14.4%, and science and technology information is in the middle position, with the intellectual property rights. and it shows that the government attaches great importance to the talent team construction and intellectual property protection in the process of small and medium-sized enterprise technology innovation, and to provide the inexhaustible power flow and motive force of sustainable development for technology innovation of small and medium enterprises; At the environment level, the proportion is more balanced. And the financial and the tax support, can alleviate the pressure of the financing in the process of small and medium-sized enterprise technology innovation, which can lead to accelerated depreciation of equipment in the process of technological innovation, and promote the further development of technology innovation; On the demand level, each accountes for more than six to one. Among them, subsidies account for more than two-thirds, the proportion of government procurement was only 1/10, and outsourcing services accountes for only 3.0%. on the one hand, we can find that the government directly supports more efforts of small and medium-sized enterprise technology innovation, on the other hand, it also reflects that the development momentum is relatively weak of small and medium-sized enterprise in our country, which mainly depends on the discount directly and also will not be able to fully transition to rely on their own relatively independent development of technological innovation.

(2) An analysis of the policy tools applied to field dimension
Seen from table 1, three stages of technological innovation in small and medium-sized enterprises accountes for 38.9%, 26.4% and 34.7%. Seen from one of the three stages of the small and medium-sized enterprise technology innovation, the use of policy tools more focus on the seed and growth period, and it has provided the safeguard for small businesses in the capital, information, talents, and infrastructure, which makes the small and medium-sized enterprise has more focus on R&D, and promote technical test and development; For the growth of enterprises, the implementation of the policy instruments can effectively alleviate the plight of small and medium-sized enterprises in financing. capital chain is related to sustainable development and grandness of the growth of small and medium-sized enterprises, and the financial support and preferential fiscal and taxation in this period injectes a strong force for the small and medium-sized enterprise focusing on the technical excellence.

5. The Conclusion and Counter Measures

5.1 Conclusion

1) Environmental policy instruments are used too much.
Statistics show that environmental policy tools are used frequently. Among them, Policy tools is used most frequently, the total using proportion of policy tools in the infrastructure, financial support and preferential taxation has reached to 82.4%. It is obvious that the government attaches great importance to the external environment of small and medium-sized enterprise technology innovation, and also introduces a series of corresponding supporting policies at the same time, to provide the level precision support for small and medium-sized enterprise technology innovation from the micro level and macro. However, regulatory policy tools is used overflow, which also raised enjoying the threshold of the technological innovation policy tools of the small and medium-sized enterprises. And it makes that a large number of supporting policies introduced by the government are in idle wait-and-see status, makes the separation of policy and target groups.

2) Supply side policy tools are used balanced.
Seen from the policy tool categories accounted for, the policy tool using in supply side is relatively balanced. From the use proportion of the policy tools in supply side, all aspects in proportion are imbalanced: talent team construction has the highest proportion, which is about 1/2, the proportion of funds is the lowest, which is about 1/7. the talent is the first capital of the enterprise, and the

competition of market economy eventually embodies in the talent contest, therefore it is very necessary for the government to support for the construction of talent team in the macroscopic direction. However, it is recommended to increase money to policy tools in supply side because of the ratio of talents and funds to maintain a certain relationship,.

3) Demand side policy tools are used insufficient.
The using of demand side policy tool is mainly to reduce the instability in marketing. Seen from table 4, the demand side is only about 1/7 in the policy tools category, and about 7/10 in the policy tools category is concentrated in the fiscal subsidies, and the using in the policy tools of government procurement and service outsourcing policy tools are at least. On the one hand, the technology innovation and development of the small and medium-sized enterprise in our country is not yet mature. on the other hand, it also reflectes that the government's support in this regard is too small.

4) The collocation of policy tools is not reasonable.
Seen from the policy tools category, the collocation of policy tools is not reasonable in supply side, environment, and demand side. And the whole collacation of policy tools focus on the environment and supply side, and the use of policy tools in demand side is poor; In addition, at the point of internal structure, the collocation of policy tools in all aspects is not reasonable. And it makes that good policies can not play a much important role in the development of enterprises, which makes enterprise eventually can't benefit.

5.2 The Policy Suggestions

Based on the analysis of the conclusion above, we have the following Suggestions:
1) At the macro level, it is feasible to reasonable use of policy tools category, to moderately reduce the use of policy instruments in environment, and to attache great importance to the role of policy tool in supply side and the pull function of side policy tools in demand. The policy tools in environment creates a positive and healthy atmosphere for the development of small and medium-sized enterprises. however, if supply level do not provide the basic protection, the small and medium-sized enterprise technology innovation will not reach the point of fully using the policy tools in the environment. in the long run, the use of policy tools in demand side will be thwarted and interlocking, so the development of society and economic will be hindered. Therefore, it is necessary to attach great importance to the capital investment in supply. And it can promote the development of small and medium-sized enterprises technology innovation.

2) At the micro level, policy tools need to have a balanced internal structure in the supply side, environment, and demand side. On the supply side, it is very important to strengthen the construction of talent team and increase capital investment, which encourages small and medium-sized enterprise technology innovation to get sustainable development; In the environment, it should increase financial and tax support, at the same time, reduce regulatory controls and fully release the market dynamics, and give the small and medium-sized enterprises, with a better development prospect, the relaxed requirements in financing moderately; On the demand side, it is recommended that they should begin to look for opportunities to small and medium enterprises timely from small scale project, further excavate the potential of small and medium-sized enterprises, to have a better guide the development of small and medium-sized enterprises.

3) The collocation of the policy tools and policy dimensions needs to be reasonable.
When using policy tools, we should give full consideration to the stages of the small and medium-sized enterprise technology innovation. In the seed, the government should intensify the policy tilt; In early stage, the research of the technology innovation has been completed, and the new technology should be given patent protection, and the expenses of the research and development should enjoy preferential tax. With facing the demand of funds, the government should moderately ease the lending conditions of small and medium-sized enterprises and give financing support; In growth period, the configuration of new production equipment is complete, and large-scale preparation of technology promotion has been completed, and the activities such as PPP cooperation and government procurement in this period are gradually expanding. with the further development of small and medium-sized enterprises, the listed and the exported activities of them need government regulations.

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