THE IMPACT OF GOVERNMENT INNOVATION POLICIES ON CORPORATE INNOVATION BEHAVIOR

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Abstract: Under the innovation-driven development strategy, innovation is an inevitable requirement for China's sustainable development, and enterprises are the main drivers of innovation. This paper studies the impact of government innovation policies on enterprise innovation behavior. It manually collected the cumulative effective number of innovation policies from 31 provinces across China from 2008 to 2017 as the research object. Simultaneously, it uses the number of patent applications by enterprises to measure their innovation behavior, establishing a panel data regression model to empirically test the impact of government innovation policies on enterprise innovation behavior. Furthermore, this paper analyzes the different effects of government innovation policies in the eastern, central, and western regions. The empirical results show a significant positive correlation between China's government innovation policies and the number of patent applications by enterprises, indicating that China's government innovation policies are effective and play a positive role in increasing the number of patent applications by enterprises. This demonstrates the significant importance of innovation policies in China's implementation of the innovation-driven development strategy.
Keywords: Innovation policy; Innovation behavior; Patents

1 INTRODUCTION

In the early stages of reform and opening up, China's rapid economic development benefited from abundant labor, vast land, and mineral resources. However, after 40 years of reform, China faces challenges such as an aging population and environmental degradation, leading to a gradual slowdown in economic growth and the entry into a "new normal" of economic development. Against this backdrop, innovation has become crucial for establishing new development advantages. Schumpeter's innovation theory emphasizes that enterprises are the main drivers of technological innovation, while the National Innovation System (NIS) theory points out that national policies provide enterprises with the resources needed for innovation. At the same time, the imperfect market environment and intellectual property protection inhibit enterprises' enthusiasm for innovation. Therefore, studying the relationship between government innovation policies and enterprise innovation behavior is of great significance. This paper manually collects government innovation policy documents from 31 provinces across China from 2008 to 2017, and uses the number of patent applications by enterprises as a measure of innovation behavior. A panel data regression model is used to analyze the impact of government innovation policies on the number of patent applications by enterprises, paying particular attention to the differences in the effectiveness of policies in different regions. The results show that government innovation policies have a positive promoting effect on enterprise innovation. The innovation of this study lies in its systematic classification and analysis of different types of innovation policy tools.

2 LITERATURE REVIEW

Innovation policy currently lacks a clear definition, with limited domestic research but more extensive European research. Schumpeter proposed in 1912 that innovation is the creation of new production functions by entrepreneurs through the recombination of production factors, pointing out its economic and technological attributes. During the sluggish economic growth of the 1970s, innovation policy began to be widely used [1]. Market failure is one of the theoretical foundations of innovation policy. Edler and Fagerberg argue that the most important source of innovation is the creation of new knowledge, but knowledge, as a public good, has low returns on investment, leading to insufficient investment [2]. The National Innovation System (NIS) theory posits that the national innovation system is a resource repository upon which enterprises rely for innovation activities. Domestic scholar Lian Yanhua emphasizes that innovation policy is a policy system involving multiple policy measures. Fan Bainai et al. summarize that innovation policy has both technological and economic attributes, constituting a policy system involving multiple policy areas [14]. Liu Fengchao et al. conducted an empirical analysis of the evolution of my country's innovation policy from 1980 to 2005, and divided the innovation policy into science and technology policy, industrial policy, fiscal policy, tax policy and financial policy [3].
Data such as corporate R&D investment, number of patent applications, and sales revenue or output value of new products [4]. Zeng qianqian et al. used corporate R&D investment to examine the effectiveness of China's innovation subsidy policy [5]. Li Chenguang et al. used the number of patent applications by enterprises to evaluate the effectiveness of government science and technology funding policies [6]. Huang Man et al. used new product sales

revenue to measure corporate innovation behavior and examine the effectiveness of government R&D subsidy policies [7]. Liu Xiuling et al. used the number of invention patent applications and the output value of new products by enterprises to study the implementation effect of innovation policies [8].

While the immediate effects of innovation policy tools generally meet expectations, their broader effects remain uncertain. Domestic scholars Huang Man et al. categorized innovation policy tools into hybrid [7], voluntary, and mandatory policies based on the intensity of government intervention. Liu Xiuling divided innovation policy tools into supply-side, demand-side, environmental, strategic, and evaluation-side policies [8]. European scholars categorized innovation policy tools into task-oriented, invention-oriented, and system-strategy-oriented policies based on different motivations [9]. The United States formulates different innovation policies according to its national conditions. He Yue summarized the main innovation policy tools in the United States as R&D fiscal incentive policies, SME policies, government procurement policies, and venture capital investment policies [10]. In summary, the content of innovation policies in various countries reflects the protection and support for all aspects of the innovation process, emphasizing the enhancement of innovation capabilities and the demonstrative and driving role of innovation achievements.

3 MEASUREMENT OF INNOVATION POLICY

3.1 Construction Approach for Innovative Policy Variables

This paper, referencing the construction approach of Xu Fuzhi, Lin Jinglu, and Qiu Danyi et al., manually collected provincial panel data on innovation policies from 31 provinces across China from 2008 to 2017, and assessed the impact of government innovation policies on the number of patent applications filed by enterprises [11-13]. Innovation policies are measured by the number of local regulations and rules issued by provincial governments. Since China's innovation policies are mostly in the form of regulations, rules, decisions, plans, opinions, measures, and programs, this paper uses CNKI and policy documents from local science and technology departments to filter the number of innovation policy documents from 31 provinces across China from 2008 to 2017. Data processing includes removing international treaties, judicial interpretations, administrative regulations, and departmental rules [14-15]; classifying currently valid, revised, and expired documents; and deleting documents issued by prefecture-level cities and below. Finally, the effective cumulative number of innovation policy documents for each province is obtained [16-17].

3.2 Characteristic Analysis of Innovation Policy Variables

According to statistical analysis, from 2008 to 2017, the total number of effective innovation policy documents issued by the governments of 31 provinces across the country showed an increasing trend, from 788 to 14,761 , with an average growth rate of 38.48% . After the concept of innovation-driven development was proposed in 2015 , the growth rate of innovation policies in most provinces increased compared with the previous year, which also reflects the Chinese government's recognition and emphasis on the concept of innovation-driven development.
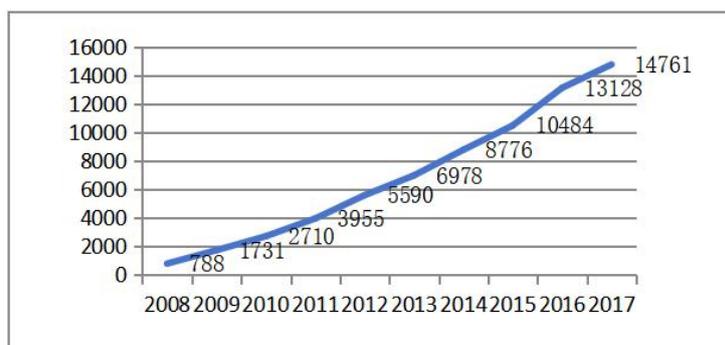

Figure 1 Summary of National Innovation Policies

Figures 2 and 3 summarize the number of innovation policies implemented by each province in 2008 and 2017, respectively. As shown in Figure 1, in 2008, the number of innovation policies implemented by most provinces was in the double digits, but this number grew rapidly by 2017. Whether in 2008 or 2017, Shanghai had the most innovation policies, while Tibet Autonomous Region had the fewest. This suggests that the Shanghai municipal government places greater emphasis on enterprise innovation, while the Tibet Autonomous Region government needs to increase its focus on innovation-driven development strategies, see Figure 4.
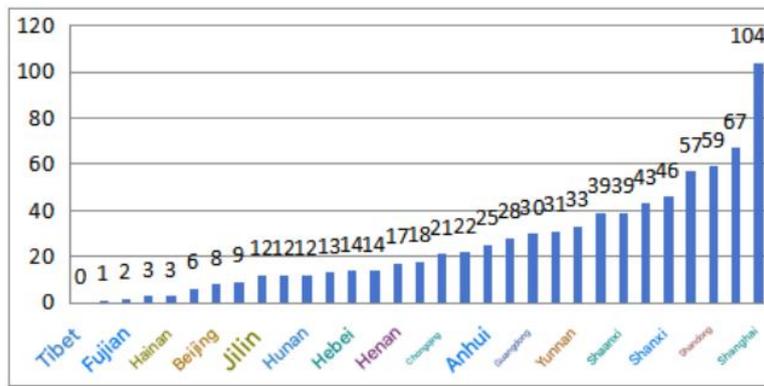
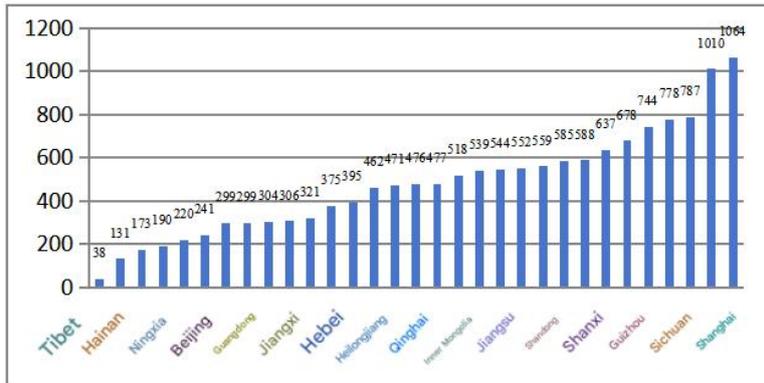**Figure 2** Summary of the Number of Innovation Policies in Each Province in 2008

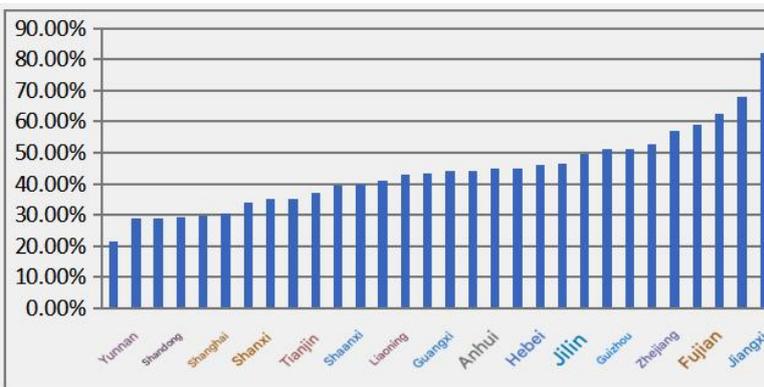**Figure 3** Summary of the Number of Innovation Policies in Each Province in 2017

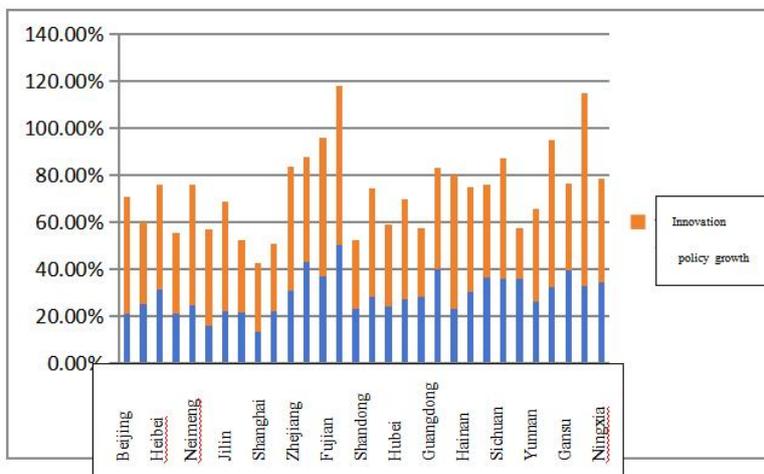**Figure 4** Average Annual Growth Rate of innovation policies in Each Province

Figure 5 Comparison of the Average Annual Growth Rate of Innovation Policies and Enterprise Patent Applications in Various Provinces

Figure 5 compares the average annual growth rate of innovation policies and the number of patent applications by enterprises in various provinces . As can be seen from the figure, most provinces have a high average annual growth rate of innovation policies, and the number of patent applications by enterprises in those provinces is also high, which to some extent indicates that there may be a correlation between the two.

4 CONCLUSION

This paper reviews domestic and international research on innovation policies, defines innovation policies, and categorizes innovation policy tools according to supply, demand, and environmental factors. Innovation policy documents from 31 provinces across China from 2008 to 2017 were manually collected. Using the cumulative effective number of innovation policies in each province as the core research object, and measuring corporate innovation behavior by the number of patent applications, a fixed-effects model was established to analyze the impact of government innovation policies on corporate innovation behavior. Regression results show that the coefficient of government innovation policies is 0.26, meaning that for every 1% increase in the number of innovation policies, the number of patent applications by enterprises increases by approximately 0.26 percentage points. Regional analysis indicates that innovation policies have the best effect in the central region, followed by the western region, and the worst effect in the eastern region. In conclusion, government innovation policies have played a positive role in increasing corporate innovation output. It is recommended to introduce more innovation policies, improve the policy system, enhance corporate innovation capabilities, increase patent applications, and promote an innovation-driven strategy.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

REFERENCES

[1]   Joseph Schumpeter. Economic Development Theory. Beijing: The Commercial Press, 2000.
[2]   Edler J, Fagerberg J. Innovation policy: what, why, and how. Oxford Review of Economic Policy, 2017, 33(1): 2-23.
[3]   Liu Fengchao, Sun Yutao. The process, trend and suggestions for the evolution of my country's science and technology policy into innovation policy: an empirical analysis based on 289 innovation policies in my country. China Soft Science, 2007(5): 34-42.
[4]   Han Yonghui, Huang Liangxiong, Wang Xianbin. Has industrial policy promoted the upgrading of local industrial structure? — A theoretical explanation and empirical test based on development-oriented local governments. Economic Research, 2017, 52(08): 33-48.
[5]   Zeng Jingjing, Wang Qiao. Evaluation of the effect of provincial innovation policies on driving innovation capacity: a case study of provincial panel data from China during the 11th to 12th Five-Year Plan periods. Soft Science, 2017, 31(08).
[6]   Li Chenguang, Zhang Yong'an. An Empirical Study on the Impact of Regional Innovation Policies on Enterprise Innovation Efficiency. Scientific Research Management, 2014, 35(9): 25-35.
[7]   Huang Man, Zhu Guilong, Hu Junyan. Classification, Selection, and Effect Evaluation of Innovation Policy Tools. China Science and Technology Forum, 2016(01): 26-30.
[8]   Liu Xiuling, Zhang Yixiu. A Study on the Duration and Determinants of Foreign Direct Investment in Listed Companies. Journal of North China Electric Power University (Social Sciences Edition), 2017(02): 82-91.
[9]   Zhu Guilong, Yang Xiaowan, Jiang Zhipeng. Research on the Evolution of my country's Collaborative Innovation Policies under a Three-Dimensional Framework of Levels, Objectives, and Tools. Science and Technology Progress and Policy, 2018, 35(13): 110-117.
[10] He Yue. A Comparative Study of Technology Innovation Policies in China, the United States, and Japan. Anhui University of Finance and Economics, 2012.
[11] Xu Fuzhi. A Study on the Supply, Demand, and Optimization of Independent Innovation Policies in Zhejiang Province. Zhejiang University, 2013.
[12] Qiu Danying, Yuan Yong. Analysis of Japan's Science and Technology Innovation Strategy and Policies and their Implications for my country. Science and Technology Management Research, 2018, 38(12): 59-66.
[13] Lin Jinglu. An Empirical Study on the Impact of Government R&D Subsidies on R&D Investment of SMEs. Management World, 2018, 34(03).
[14] Fan Bainai, Duan Zhongxian, Jiang Lei. A Review and Prospect of Innovation Policy Research. Soft Science, 2012, 26(11).
[15] Pan Yuzhang, Kou Zonglai. The impact of innovation policies on the patent behavior of listed companies in China—based on patent production function estimation. Industrial Economics Research, 2015(03): 54-63.
[16] Hu Kai, Wu Qing. R&D tax incentives, intellectual property protection and enterprise patent output. Financial Research, 2018, 44(04).
[17] Zhang Yunjun. Policy Analysis of Technological Innovation in SMEs from the Perspective of Policy Tools. Chinese Public Administration, 2012(04): 43-47.