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Industrial Policy, R&D Investment and Firm Innovation Performance

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Abstract

Based on the panel data of 1400 Shanghai and Shenzhen A-share listed companies from 2010 to 2020, this paper empirically tests the relationship between industrial policy and R&D input on firm innovation performance and the mechanism of industrial policy on R&D input and firm innovation performance. The empirical results show that: (1) industrial policy has a significant positive correlation with enterprise innovation performance; (2) R&D input has a significant positive correlation with enterprise innovation performance; (3) Industrial policy has a positive moderating effect on the relationship between R&D input and enterprise innovation performance. This moderating effect is more significant in private enterprises, but not in state-owned enterprises. The results of this empirical study are still valid after endogeneity test and robustness test.

Keywords

Enterprise; Innovation Performance; R&D Investment; Industrial Policy.

1. Introduction

Today, the world is in the midst of no great changes in a century, with the global economic market shrinking and the industrial chain of supply chain impacted. Faced with complex domestic and international situations, our country has adopted a domestic economic cycle as the main body and a double domestic and international cycle to enter a new development stage, requiring efforts to enhance its independent innovation capability and master core technologies. This is the formation of a large domestic economic cycle as the main key.In China's 14th Five-Year Plan and 2035 Vision Goal Proposal, the promotion of independent innovation capability is given top priority in 12 other important work areas. In recent years, our scientific and technological innovation has made remarkable achievements, but our enterprises still face many problems in scientific and technological innovation, such as insufficient investment in enterprise research and development, lack of innovative talent and imperfect related laws and regulations. Therefore, the promotion of enterprise innovation performance is of great significance for our country to enter the front of innovative countries and break the western countries' technological monopoly led by the United States.

Scholars at home and abroad have never stopped studying on the issue of enterprise innovation performance, and the academic circle has not reached a consensus on the idea of enterprise innovation performance, which is still in deep digging. Foreign scholar Sergio G.Lazzarini (2015) believes that national industrial policies can guide the effective allocation of resources and improve the competitiveness and innovation performance of enterprises. [1] Lin Yifu (2017), a famous Chinese economist, believes that a country's resource allocation is limited, and industrial policies can concentrate limited resources to promote technological innovation and industrial upgrading of enterprises. [2] On the other hand, some scholars believe that industrial policies have a "crowding out effect", and fiscal subsidies and tax breaks will lead to rent-seeking and corruption.Wallsten (2000) believes that government subsidies will lead to the

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reduction of capital investment, which is not conducive to the improvement of enterprise innovation performance. [3] Lin Zhouyu, Lin Hanchuan et al. (2015) found that government subsidies and patent output of enterprises are not simply linear, but an inverted U-shaped relationship. When government subsidies are lower than a certain critical value, they can promote patent output of enterprises; otherwise, they can inhibit it. [4] On the research of national industrial policy, Lin Yifu and Zhang Weiying had a heated debate on the importance of "industrial policy" in 2006, with different views. Professor Lin Yifu believed that the government should play the role of "visible hand", and the healthy development of national economy cannot be separated from the government's macro-control. Economic development needs corresponding supporting facilities and relevant laws and regulations to standardize the market;Zhang Weiying, on the other hand, strongly opposes state intervention in the economy. He believes that blind government intervention will lead to overcapacity and waste of resources, and industrial policy is doomed to failure. It can be seen that domestic and foreign scholars have different opinions on the impact of industrial policies on enterprise innovation performance, but no conclusion has been reached.

R&d investment also has an important impact on firm innovation performance.wang xi, zhang qiang (2022) etc Based on the regression research on the panel data of listed manufacturing companies in Shanghai and Shenzhen A-share markets, it is found that R&D investment can significantly improve the innovation performance of enterprises.[5]Beneito (2003) It is believed that R&D investment can guide the technological innovation of enterprises, expand the market share of new products and improve the innovation performance of enterprises. [6]Based on the data of Shanghai and Shenzhen A-share listed companies from 2010 to 2019, Du Wenqin and Guo Shujuan found that the increase of R&D expenditure can improve the innovation performance of enterprises, but when the R&D investment reaches the critical point, it will inhibit the innovation performance of enterprises, and after the critical point, it can improve the innovation performance of enterprises. [7]Based on the above researches on the effect of R&D input on enterprise innovation performance, no consistent conclusion has been reached. Most of the existing literature is limited to the study of the relationship between industrial policy and firm innovation performance and the influence of R&D input on firm innovation performance, but there are few studies on the moderating effect of industrial policy on R&D input and firm innovation performance. Based on this, this paper conducts an empirical study based on the panel data of 1,400 listed companies in Shanghai and Shenzhen A-share markets from 2010 to 2020, and further analyzes the relationship between industrial policy, R&D input and enterprise innovation. The contribution of this paper is: to enrich the literature related to enterprise innovation performance; It provides some reference for the government to formulate relevant industrial policies and laws and regulations.

2. Theoretical Analysis and Research Hypothesis

2.1. Industrial Policy and Enterprise Innovation Performance

Market economy can effectively allocate resources and promote economic development and scientific progress, but on the other hand, it may lead to oligopoly, resource waste and disorderly competition, so it is necessary to carry out macro-control, through administrative, legal and economic means to ensure the healthy development of national economy. Dechezlepretre A, Eini E (2017), based on a study on tax exemption policies, found that tax exemption can significantly increase enterprises' R&D expenditure and the number of patent applications. [8]The reduction of taxes and fees can reduce the burden of enterprises and increase their income, which will promote enterprises to increase investment in research and development. Shang Hongtao and Fang Dan (2021), based on the panel data of China's A-share listed private technology enterprises in Shanghai and Shenzhen, found that the government's

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subsidy policies can improve the level of risk taking of enterprises and thus improve their innovation performance. [9] On the contrary, relevant literature holds that government subsidies, additional deduction of R&D expenses and tax incentives are easy to lead to tax fraud and subsidy fraud, and government subsidies will crowd out R&D expenses of enterprises and inhibit enterprise innovation. Zhao Yulin and Gu Junjian (2018), based on the data analysis of listed manufacturing companies in China, argued that there were structural deviations between fiscal subsidies and incentive effectiveness in China, which could not improve the innovation performance of enterprises. [10]Based on the above literature, the following hypotheses H1 and H2 are proposed:

H1: There is a significant positive correlation between industrial policy and firm innovation performance.

H2: There is a significant negative correlation between industrial policy and firm innovation performance.

2.2. R&D Investment and Innovation Performance of Enterprises

The innovation of enterprises cannot be separated from the investment in R&D. The level of R&D expenditure and the time of R&D expenditure will have different impacts on the innovation performance of enterprises. Domestic and foreign literatures have different views on the relationship between R&D investment and innovation performance, which can be divided into promotion and inhibition. Chen Hongwei, Xu Qingru et al. (2021), based on the panel data of listed high-tech enterprises in China, believe that R&D investment in the stage of technology R&D can significantly improve the innovation performance of enterprises, but with the increase of government science and technology funds, the role of R&D investment in improving the innovation performance of enterprises will be continuously reduced. [11]LOS B, VERSPAGEN B. (2000) Based on the data of American manufacturing industry, it is concluded that with the increase of R&D investment, the number of patent applications of enterprises will also increase, indicating that R&D investment can promote the innovation performance of enterprises. [12] Li Jingyi, Wang Zhenyang et al. (2020) analyzed the data of high-tech listed companies in western China from 2014 to 2018 through empirical study, and the R&D input of private listed companies enjoying government tax incentives has a significant "crowding-out effect" on enterprise innovation performance.[13]Zhu Weiping and Lun Rui (2004), based on the research of Chinese high-tech enterprises, believe that high-tech enterprises fail to give full play to the effectiveness of scientific and technological talents, there is a waste of human resources, and the market risk and technological risk assessment are not carried out. The increase of R&D risk leads to the low utilization efficiency of R&D funds, and most high-tech enterprises have unclear property rights. Therefore, R&D investment cannot improve the innovation performance of enterprises. [14] Based on this analysis, hypothesis H3 and H4 are proposed in this paper:

H3: R&d investment promotes innovation performance of enterprises.

H4: R&d investment inhibits firm innovation performance.

2.3. The Influence of Industrial Policy on R&D Investment and Firm Innovation Performance

Enterprises' R&D activities are characterized by high investment, sustainability and uncertainty. In particular, private enterprises are subject to greater financing constraints and cannot continue to invest in their R&D activities. Increasing R&D funds and reducing R&D costs are important means to promote enterprise innovation. Dai X, Cheng L (2015), based on the data of listed manufacturing companies in China, found an inverted U-shaped relationship between the government's fiscal subsidies and enterprises' R&D expenditure, that is, fiscal subsidies will initially increase enterprises' R&D expenditure, but when they reach a certain

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critical value, they will squeeze enterprises' R&D investment. [15]Sun Hui and Wang Hui (2017) selected the data of high-tech enterprises in the Growth Enterprise Market of Shanghai and Shenzhen from 2010 to 2015 as the research object, and argued that both government R&D subsidies and enterprises' R&D input could promote enterprises' innovation performance, while government subsidies would improve enterprises' R&D input. [16] The government's R&D subsidies and preferential tax policies can, to some extent, ease the financing constraints of enterprises, reduce their R&D risks and increase their investment in R&D activities. Wang Yihui (2013), based on the data of Chinese high-tech enterprises, concluded that government subsidies can significantly improve the innovation performance of enterprises, and government subsidies have a negative regulating effect on R&D input and innovation performance of enterprises, that is, the increase of government subsidies will reduce the R&D expenditure of enterprises. [17]On the other hand, Wang Gang, Xie Fuji et al. (2017) believe that the government's R&D subsidies show the feasibility of enterprises' R&D technology, and can also strengthen the supervision of enterprises' R&D, so that enterprises can be trusted by market investors, so that they can obtain more external financing to increase their R&D investment and promote their innovation performance. Therefore, government subsidies have a significant positive moderating effect on R&D investment and innovation performance of enterprises. [18] Based on the above theoretical analysis, hypothesis H5 and H6 are proposed as follows:

H5: Industrial policy has a positive moderating effect on R&D investment and innovation performance.

H6: Industrial policy has a negative moderating effect on R&D input and firm innovation performance.

3. Research Design

3.1. Selection and Source of Sample Data

In this paper, panel data of China's Shanghai and Shenzhen A-share market manufacturing enterprises from 2010 to 2020 were selected as samples. In order to ensure the scientific rationality of the data, the sample data were processed as follows: (1) samples with missing data were excluded; (2) sample data of ST and ST* enterprises were excluded; and (3) sample data of financial companies were excluded. Finally, sample data of 1400 listed companies in Shanghai and Shenzhen A-share markets were obtained, and all continuous variables were reduced by 1% and 99% to eliminate the interference of extreme values. Data was downloaded from the National Tai 'an database and Wind financial database, and other missing data was collected manually. In this paper, Stata16.0 software was used for regression analysis of the data.

3.2. Variable Definition and Model Setting

3.2.1. Variable Definition

(1) Explained variables

The main indicators to measure enterprise innovation performance include the number of patent applications, sales revenue of new products and productivity of new products, etc. In this paper, the number of patent applications within an enterprise year is used to measure the innovation performance of the enterprise, and the number of patent applications of the enterprise is logarithm, and the innovation performance of the enterprise is represented by lnpat.

(2) Explanatory variables

R&d investment refers to the capital invested, resources consumed and salaries of R&D personnel in the process of technological innovation and new product development. R&d

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investment is an important index to measure the R&D intensity of enterprises. In this paper, the R&D input of enterprises is taken as explanatory variable, the influence of heteroscedasticity is eliminated by taking the logarithm of R&D input, and lnrd is used to represent R&D input.

(3) Adjusting variables

In this paper, industrial policy is set as a moderating variable and Ip is used to represent national industrial policy. By visiting the website of the Government of China and inquiring documents such as the Outline of the 13th Five-Year Plan, the Outline of the 14th Five-Year Plan and the Directory for Guidance of National Industrial Policy, the research methods of Li Tianshi and Zhu Jigao (2021) are used for reference. [19] Words such as encouragement, support and acceleration of development in the document indicate the existence of industrial policy support in the industry. The value of enterprise with existing industrial policy support is 1, while that without existing industrial policy support is 0. Ip is used to represent industrial policy.

(4) Control variable

liabilities in tBy referring to previous literature, other variables that may affect industrial policy, R&D investment and innovation performance of enterprises are selected as control variables: 1) Enterprise scale, which is measured by the total assets in the balance sheet; 2) Enterprise age, which is measured by the listed years of the enterprise; 3) Corporate financial leverage, expressed by dividing the total amount of ending he balance sheet by the total amount of assets; 4) Corporate profitability. This paper uses return on equity to measure corporate profitability, that is, net profit divided by net asset. 5) The growth rate of the enterprise, that is, the growth of the enterprise's operating income divided by the operating income of the previous year.

3.2.2. Model Setting

In order to study the relationship between industrial policy, R&D input and innovation performance, based on the results of Hausmann test, this paper adopts the fixed-effect model for regression test of panel data, and establishes the following models. Model (1) is used to test the relationship between industrial policy and innovation performance; Model (2) is used to test the relationship between R&D investment and innovation performance. Model (3) is used to test the moderating effect of industrial policies on R&D investment and firm innovation performance.

$$Inpat=\alpha+\beta IP+\sum_{i=1}^{5} bControl+\varepsilon \quad (1)$$

$$Inpat=\alpha+\varphi lnrd+\sum_{i=1}^{5} bControl+\varepsilon \quad (2)$$

$$Inpat=\alpha+\mu lnrd+\delta IP+\lambda lnrd*IP+\sum_{i=1}^{5} bControl+\varepsilon \quad (3)$$

4. Empirical Analysis

4.1. Descriptive Statistics

The number of patent applications represents the quality of an enterprise's innovation performance. The descriptive statistical results in Table 1 show that the median of the number of inventions is 1.792, the minimum value is 0, and the maximum value is 10.60, indicating that the innovation performance of the sample companies is not high on the whole, and there is a large gap between different companies. The median value of R&D investment is 4.977, the minimum value is 0, and the maximum value is 17.04, indicating that the overall R&D investment of the selected sample enterprises is not high, and the gap between companies is large. The mean value of industrial policies is 0.592, indicating that 59.2% of the selected

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samples have enjoyed the support of national industrial policies, and China has a strong support for relevant industries.The mean value, minimum value, maximum value and standard deviation of listing years of enterprises are 1.714, 0, 3.367 and 0.941, indicating a large difference in the number of listing years of enterprises and a wide range of selected samples. The mean value of asset-liability ratio of enterprises is 0.371, and the standard deviation is 0.194, indicating that the asset-liability ratio of most enterprises is within a reasonable range, and there is little difference among enterprises. The average return on equity is 0.078, the minimum value is -1.12, and the maximum value is 0.442, indicating that the selected sample enterprises have low return on equity and poor profitability. The average growth rate of enterprises is 0.175, and the standard deviation is 0.365, indicating that the sample companies are in the development stage, and the growth rate gap of enterprises is small.

Table 1. Descriptive statistics of variables

Variable name	Observed value	Average value	median	Minimum value	Maximum value	Standard deviation
lnpat	14000	1.934	1.792	0	10.60	1.705
lnrd	14000	4.003	4.977	0	17.04	2.695
Ip	14000	0.592	1	0	1	0.491
Size	14000	21.93	21.73	19.55	26.39	1.218
ListAge	14000	1.714	1.792	0	3.367	0.941
Lev	14000	0.371	0.357	0.0270	0.975	0.194
ROE	14000	0.0780	0.0810	-1.112	0.442	0.109
Growth	14000	0.175	0.119	-0.732	4.806	0.365

4.2. Correlation Analysis

Table 2. Correlation analysis of variables

Variable name	lnpat	lnrd	Ip	Size	ListAge	Lev	ROE	Growth
lnpat	1							
lnrd	0.261***	1						
Ip	0.134***	0.047***	1					
Size	0.147***	0.320***	-0.129***	1				
ListAge	0.064***	0.206***	-0.066***	0.509***	1			
Lev	0.058***	0.138***	-0.057***	0.579***	0.422***	1		
ROE	0.0100	-0.0070	-0.018**	0.028***	-0.199***	-0.176***	1	
Growth	0.00500	0.0140	0.0140	0.0120	-0.089***	0.022**	0.274***	1

Note: ***p<0.01,**p<0.05,*p<0.1; The same as.

In Table 2, the correlation coefficient between national industrial policy and enterprise innovation performance is 0.134, indicating a significant positive correlation between industrial policy and enterprise innovation performance at the 1% level, which preliminarily verifies hypothesis H1. The correlation coefficient between R&D input and firm innovation performance is 0.261, and there is a significant positive correlation between R&D input and firm innovation performance at 1%, which preliminarily verifies hypothesis H3. Among the control variables, firm size, listing age and asset-liability ratio have a significant positive correlation with innovation performance at 1%, while the return on equity and growth rate have no significant correlation with innovation performance. The correlation coefficient between all variables is lower than 0.6, indicating that there is no multicollinearity problem. Therefore, regression analysis can be conducted to discuss the influence of industrial policy and R&D input on enterprise innovation performance.

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4.3. Regression Analysis

Table 3. Regression results

Variable name	(1)	(2)	(3)
Ip	0.553***		0.246***
	(17.961)		(5.361)
lnrd		0.151***	0.110***
		(26.223)	(13.076)
lnrd*Ip			0.058***
			(5.066)
Size	0.278***	0.136***	0.168***
	(13.474)	(6.890)	(8.456)
ListAge	-0.027	-0.083***	-0.079***
	(-1.195)	(-3.719)	(-3.538)
Lev	-0.379***	-0.130	-0.181*
	(-3.974)	(-1.376)	(-1.931)
ROE	0.038	0.117	0.143
	(0.243)	(0.750)	(0.933)
Growth	-0.002	-0.022	-0.036
	(-0.055)	(-0.505)	(-0.822)
_cons	-4.292***	-1.444***	-2.269***
	(-10.257)	(-3.650)	(-5.628)
N	12506	12506	12506
F	77.954	135.277	130.683

The regression results of industrial policy, R&D input and innovation performance are shown in Table 3. Model (1) National industrial policy Ip has a significant positive correlation with enterprise innovation performance at the level of 1%, indicating that industrial policies can improve enterprise innovation performance. The implementation of industrial policies such as financial subsidies and tax cuts can make enterprises have more resources to invest in R&D expenditure, thus improving enterprise innovation performance. In Model (2), the coefficient of R&D investment is 0.151, and R&D investment has a significant positive correlation with enterprise innovation performance at the level of 1%. Every increase of R&D investment will improve the innovation performance of 0.151 units, indicating that China's R&D investment has no significant promoting effect on enterprise innovation performance, so it is necessary to improve the use efficiency of R&D funds.

In Model (3), the coefficient of industrial policy is 0.246 and that of R&D input is 0.110, indicating that when both industrial policy and R&D input exist in an enterprise, both industrial policy and R&D input can have a significant positive impact on the innovation performance of the enterprise, and the promoting effect of industrial policy is greater than that of R&D input. lnrd*Ip has a significant positive correlation at the 1% level, indicating that industrial policy has a positive moderating effect on R&D input and enterprise innovation performance. National industrial policy conveys the information that the industry has a promising development prospect to the society, and the incentive effect and information transmission effect of industrial policy can alleviate the difficult and expensive financing situation of enterprises to some extent. Enterprises with sufficient capital will increase their R&D investment and improve their innovation performance.Among the control variables, firm size has a significant positive

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correlation with firm innovation performance at the level of 1%, indicating that the expansion of firm size, technological level and improvement of firm system can also improve firm innovation performance. There is a negative correlation between the listed years of enterprises and their innovation performance, which indicates that mature enterprises may face the problem of rigid organization and lack of innovation consciousness. There is a significant negative correlation between the asset-liability ratio and the innovation performance of enterprises at the level of 10%. The increase of the asset-liability ratio is not conducive to the external financing of enterprises, and the insufficient research and development funds will reduce the innovation performance of enterprises. The return on equity and growth rate have no significant influence on innovation performance.

4.4. Robustness Test

In order to ensure the robustness of regression results, this paper adopts the following two methods to test regression results: (1) Replace explanatory variables. In order to measure the innovation performance of an enterprise, the absolute value of R&D input and patent applications is used for regression, and control variables are replaced. The symbols of regression result coefficients are consistent with those mentioned above. (2) lagged explanatory variables. Considering the lag effect of industrial policy and R&D input on enterprise innovation performance, multiple regression is carried out for the lag period of industrial policy and R&D input. Empirical regression shows that the main coefficient symbols are consistent with the above. The robustness test proves that industrial policy and R&D input have a significant positive correlation with firm innovation performance, and industrial policy has a positive moderating effect on R&D input and firm innovation performance.

5. Further Inspection

Table 4. Grouping regression results

variable name	(1)	(2)	(3)	(4)	(5)	(6)
	State-owned enterprise			Private enterprise		
IP		0.531***	0.281***		0.562***	0.206***
		(7.942)	(2.976)		(16.516)	(4.052)
lnrd	0.176***		0.150***	0.135***		0.082***
	(15.268)		(9.515)	(20.389)		(8.513)
Ip*lnrd			0.036			0.076***
			(1.600)			(5.896)
Size	0.122***	0.299***	0.157***	0.143***	0.280***	0.163***
	(4.167)	(9.553)	(5.188)	(5.189)	(10.046)	(5.917)
Lev	0.166	-0.273	0.183	-0.177	-0.315***	-0.262**
	(0.897)	(-1.469)	(0.992)	(-1.595)	(-2.821)	(-2.389)
ROE	1.030***	0.839**	1.149***	-0.140	-0.188	-0.137
	(3.155)	(2.563)	(3.567)	(-0.796)	(-1.071)	(-0.790)
Growth	-0.192**	-0.165**	-0.221***	0.032	0.039	0.029
	(-2.259)	(-1.987)	(-2.598)	(0.632)	(0.768)	(0.574)
ListAge	-0.235***	-0.136**	-0.258***	0.011	0.088***	0.031
	(-4.517)	(-2.559)	(-5.003)	(0.389)	(3.185)	(1.134)
_cons	-1.118*	-4.743***	-1.974***	-1.638***	-4.503***	-2.174***
	(-1.826)	(-7.170)	(-3.098)	(-2.942)	(-7.926)	(-3.905)
N	3271	3271	3271	9227	9227	9227
F	50.021	24.590	43.140	93.372	68.179	98.148

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In order to further test the relationship between industrial policies, R&D input and enterprise innovation performance under different ownership conditions, the samples are divided into state-owned enterprises and private enterprises for grouping regression. The regression results are shown in Table 4:

The regression results show that, whether state-owned enterprises or private enterprises, industrial policies and enterprise innovation performance are significantly positively correlated at 1% level, and R&D input and enterprise innovation performance are significantly positively correlated at 1% level, indicating that industrial policies and R&D input can promote the innovation performance of state-owned enterprises and private enterprises. Moreover, the promotion effect of industrial policy on enterprise innovation performance is greater than that of R&D investment. From the perspective of the interaction term coefficient, the interaction term coefficient of state-owned enterprises is not significant, indicating that industrial policy in state-owned enterprises on R&D input and enterprise innovation is not obvious. The interaction coefficient of private enterprises is 0.076, which passes the significance test at the 1% level, indicating that industrial policy has a significant regulating effect on R&D input and innovation performance of private enterprises. The reason is that state-owned enterprises are backed by strong state-owned assets and financial revenue. Compared with private enterprises, state-owned enterprises have less capital constraints, more human capital and a lot of resources to invest in research and development, while private enterprises, especially small and medium-sized enterprises, are weak and lack funds, equipment, technology and talents, so they need industrial policy support more.

6. Conclusion and Enlightenment

Through the regression analysis of the panel data of listed manufacturing companies in Shanghai and Shenzhen A-share markets, the relationship between industrial policy, R&D input and enterprise innovation performance is discussed. The empirical results show that: (1) National industrial policy has A significant promoting effect on enterprise innovation performance; (2) R&D investment can significantly improve the innovation performance of enterprises; (4) Industrial policies have a positive moderating effect on the relationship between R&D input and innovation performance. This moderating effect is more significant in private enterprises, but not in state-owned enterprises. Based on the above research conclusions, this paper puts forward the following suggestions:

Increase support for industrial policies, especially for private enterprises, and strengthen supervision of related industries. The government can significantly improve the innovation performance of enterprises through industrial policies such as research and development subsidies, tax and exemption. Private enterprises in our country have difficulties in financing and expensive financing, so it needs to be supported by relevant industrial policies. Carbon delivery by the government can improve the marginal benefit of enterprises, reduce the risk and cost of research and development of enterprises, and promote enterprises to increase research and development investment. While implementing relevant industrial policies, supervision should also be strengthened to avoid corruption such as "rent-seeking", tax fraud and subsidy fraud, so as to guide the positive and healthy development of relevant industries.

Increase investment in research and development, and improve the level of innovation performance of enterprises. On the whole, the R&D investment of Chinese enterprises is on the low side and does not reach the critical value of R&D investment. Therefore, increasing R&D investment will significantly improve the innovation performance of enterprises. To master key core technologies and improve the overall innovation performance level and production efficiency of the society, enterprises need to increase their R&D investment. Enterprises should establish innovation consciousness and accelerate the transformation of scientific and

technological achievements into economic benefits. Only with the increase of economic benefits can enterprises further increase their R&D investment.

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