

Research on the Impact of Financial Subsidies on Enterprise R&D Innovation——Based on the Mediation Effect Model

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Abstract: This paper selects the data of high-tech enterprises on the ChiNext from 2014 to 2016, and comprehensively analyzes the relationship between financial subsidies, tax incentives, R&D investment and innovation performance. The results show that financial subsidies have a positive incentive effect on R&D investment and innovation performance; tax incentives are a negative hindrance to R&D investment and innovation performance; R&D investment has a significant positive effect on enterprise innovation performance. The use of the stepwise test method and the Bootstrap method to test the intermediary effect of R&D investment shows that research investment has a complete intermediary effect between tax incentives and innovation performance. There is an intermediary effect between financial subsidies and corporate innovation performance, but complete intermediation or partial intermediation has not been reached.

Keywords: Financial Subsidies; Innovation Performance; R&D Investment; Intermediary Effect

1. Introduction

The report of the 19th National Congress of the Communist Party of China mentioned science and technology more than 10 times and emphasized innovation more than 50 times, pointing out that innovation is the first driving force for development. The government's policies to encourage enterprise innovation mainly include direct subsidies and indirect reductions. Direct subsidies (financial subsidies) directly stimulate corporate innovation and reduce private costs in R&D investment; indirect deductions (tax incentives) indirectly stimulate corporate innovation and reduce the tax cost of corporate income. However, the initial investment made by companies to obtain policy support will also bring additional costs to R&D activities. Considering the company's initial investment, it is necessary to decide which policy, fiscal subsidy or tax incentives, can best promote enterprise innovation, analyze the extent to which these two policy tools can promote the enterprise's technological innovation and economic growth, and study whether one of the policies is better than the other. One policy is more conducive to enterprise innovation. Is there a "best combination" of two policy tools. At present, my country's fiscal and taxation support for high-tech enterprises is relatively large and the standards are relatively uniform. Therefore, this article selects high-tech enterprises as the research object. Through the analysis of the relationship between financial subsidies, tax incentives, R&D investment and enterprise innovation performance, these Questions provide empirical evidence^[1].

2. Research Design

2.1 Data source

The government's support for high-tech enterprises is relatively large and the standards are relatively uniform. At the same time, high-tech enterprises also pay more attention to innovative activities. Therefore, this article uses GEM high-tech enterprises as the research sample. Excluding ST companies and companies that did not continuously disclose data from 2014 to 2016, a total of 255 listed companies were obtained. Financial data comes from www.cninfo.com, and patent application data is collected from the State Patent Office.

2.2 Variable selection

2.2.1 Interpreted variable

The way to measure innovation performance: one is the number of patent applications, authorizations and effective numbers of enterprises; the other is the sales revenue of new products and the sales profit rate of new products. Since the sales revenue and profits of new products are not clearly disclosed, and relevant data cannot be obtained, this article selects the company's patent output in the current year as the explained variable, and uses the ratio of patent output to per million assets to measure the innovation ability of the enterprise^[2].

2.2.2 Explaining variables

(1) Financial subsidies

Financial subsidy is the government's financial support for enterprise innovation, and it is the most direct cash subsidy for enterprise innovation investment. This article uses the ratio of the government subsidy enjoyed by the enterprise that year to the total assets at the end of the period to measure.

(2) Tax incentives

The goal of the government's implementation of tax incentives is to stimulate the innovation performance of enterprises, but there is uncertainty in the compensation of tax incentives to innovation results, so specific verification of the implementation effects of tax incentives is needed. The current preferential tax policies mainly include: accelerated depreciation, additional deductions, and a preferential tax rate of 15%. These preferential policies will eventually be reflected in the calculation of income tax expenses. In order to enhance the comparability of preferential tax policies among various enterprises, this paper selects the ratio of income tax expense to profit before interest and tax as a measure of tax incentives.

2.2.3 Intermediary variables

The intensity of R&D investment reflects the relative degree of R&D investment of different companies in corporate expenditures, and is the performance of R&D investment after excluding the impact of corporate size and other factors. This article mainly measures the intensity of R&D investment, which is expressed by the ratio of R&D expenses/operating income.

2.2.4 Control variables

Due to the risk aversion of shareholders and the high investment and high risk of innovation activities, excessive concentration of equity may inhibit the innovation activities of enterprises; if capital investment in research and development is a necessary condition for enterprise innovation, then human capital is the key factor of innovation. It plays an important role in innovation activities; large-scale enterprises have strong financial resources, advanced technology and equipment, and relatively less investment in innovation activities; the longer the company is established, the more comprehensive the knowledge of innovation, and the shorter the establishment due to the lack of basic knowledge. Enterprises can only increase innovation output through a large amount of input; the asset-liability ratio reflects the capital structure of the enterprise. Too much debt is easy to fall into financial distress, resulting in the company's inability to innovate, and too little debt means that financial leverage is not fully utilized. It will reduce the profitability of the company and limit its development. Therefore, this paper selects equity concentration, human capital factors, firm size, firm age and capital structure as control variables. The definitions of variables are shown in Table 1.

Table 1. Variable description.

Variable Type	Variable Name	Variable Symbol
Explained variable	Innovation performance	IP
Explanatory variables	Financial subsidy	SUB
	Tax incentives	TR
Mediating variable	R&D investment intensity	RD
	Human capital factor	LABOR
	Equity concentration	CR
Control variable	Enterprise size	SIZE
	Business age	AGE
	Capital Structure	LEV

2.3 Model design

In order to test the hypothesis, this paper designs the following model:

$$IP = a_0 + a_1SUB + a_2TR + a_3LABOR + a_4CR + a_5SIZE + a_6AGE + a_7LEV + \varepsilon_2 \quad (1)$$

$$RD = b_0 + b_1SUB + b_2TR + b_3LABOR + b_4CR + b_5SIZE + b_6AGE + b_7LEV + \varepsilon_1 \quad (2)$$

$$IP = c_0 + c_1RD + c_2LABOR + c_3CR + c_4SIZE + c_5AGE + c_6LEV + \varepsilon_3 \quad (3)$$

$$IP = d_0 + d_1SUB + d_2TR + d_3RD + d_4LABOR + d_5CR + d_6SIZE + d_7AGE + d_8LEV + \varepsilon_1 \quad (4)$$

The independent variables of model (1) are financial subsidies and tax incentives, and the dependent variable is innovation performance, which is used to test hypothesis 1. The independent variables of model (2) are financial subsidies and tax incentives, and the dependent variable is R&D investment, which is used to test hypotheses. 2; The independent variable of model (3) is R&D investment, and the dependent variable is innovation performance, which is used to test hypothesis 3. The independent variable of model (4) is fiscal subsidies, tax incentives and R&D investment, and the dependent variable is innovation performance. Pass d3 Test the direct effect of R&D investment on innovation performance, and then test the mediation effect through a1, a2, b1, b2 and d1, d2 to determine whether R&D investment is a complete mediation effect or a partial mediation effect between financial subsidies, tax incentives and innovation performance^[3].

3. Empirical Research

3.1 Direct Effect Analysis

It can be seen from Table 2 that the D.W. value is between 1.863 and 2.064, indicating that there is no serious error autocorrelation phenomenon. The test result of model (1) shows that fiscal subsidies have a significant positive effect on innovation performance at the 1% level, while tax incentives have a significant negative impact on innovation performance at the 5% level. The regression coefficient a1 of fiscal subsidies in model (2) a1=0.187 (p<0.01), indicating that fiscal subsidies have a significant positive effect on R&D investment; the regression coefficient of tax incentives

$a_2 = -0.084$ ($p < 0.01$), that is, tax There is a significant negative relationship between preferences and R&D investment. The results of model (3) show that R&D investment at the 1% level has a positive incentive effect on innovation performance.

Table 2. Empirical analysis results.

	(1) IP	(2) RD	(3) IP	(4) IP
RD			0.125**	0.096*
SUB	0.152**	0.187**		0.134**
TR	-0.067*	-0.084**		-0.059
CR	0.119	-0.089**	0.125**	0.127**
LABOR	0.205**	0.359**	0.184**	0.171**
SIZE	0.133**	-0.433**	0.240**	0.174**
AGE	-0.073**	-0.048	-0.074*	-0.068*
LEV	-0.074	-0.233**	-0.045*	-0.052
D.W	1.863	2.064	1.880	1.871
R2	0.148	0.244	0.139	0.155
F	18.654	34.728	20.255	17.206

3.2 Analysis of intermediary effects

In model (4), R&D investment at the 5% level has a significant positive impact on innovation performance. According to the intermediary research model of Baron and Kenny, the regression coefficient ($c_3 = 0.125$, $p < 0.05$) of R&D investment in model (3) meets the basic conditions for exploring the intermediary effect. In model (2), the regression coefficients of the explanatory variables fiscal subsidies, tax incentives, and the intermediary variable R&D investment are significant at the 1% level, and in model (4), the regression coefficients of the intermediary variable R&D investment and the explained variable innovation performance are also significantly correlated ($d_3 = 0.096$, $p < 0.05$), so there is a mediating effect. At the same time, the regression coefficient between tax incentives and innovation performance in model (4) $d_2 = -0.059$ ($p > 0.05$), so R&D investment has a complete mediating effect between tax incentives and innovation performance; the regression coefficient between fiscal subsidies and innovation performance $d_1 = 0.134$ ($p < 0.01$). According to the stepwise test method of mediating effect, if the direct effect of the explanatory variable on the explained variable is still significant, then the mediating variable is a partial mediating effect between the explanatory variable and the explained variable. Between the two innovation performance is a partial mediating effect. The specific mediation effect is shown in Figure 1.

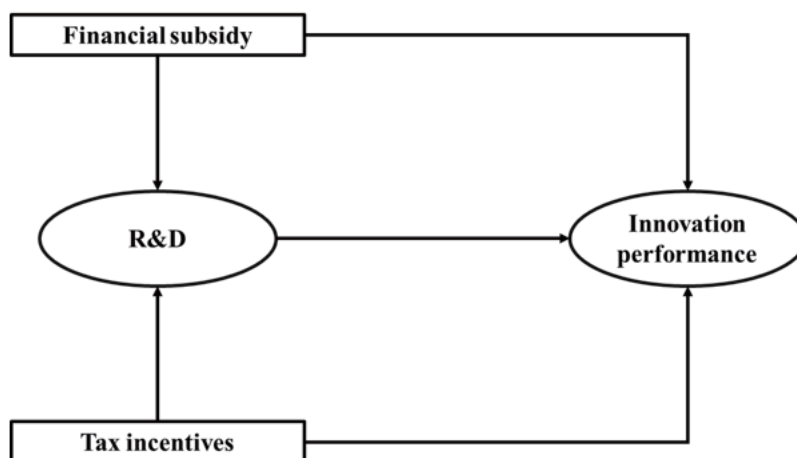


Figure 1. Mediating effect model.

In Figure 1, financial subsidies and tax incentives mainly affect innovation performance through R&D investment. Although there is a significant correlation between fiscal subsidies, tax incentives, and innovation performance, the coefficients of their influence on innovation performance are not very high, and the value of the coefficient of influence of R&D investment on innovation performance is also very small, so it is necessary to influence the variables Correlation analysis of effects. When analyzing the robustness test, this article will further analyze the conversion efficiency of the mediation effect^[4].

4. Robustness Test

Table 3. Robustness test results.

Explanatory variables	Mediating variable	Mediation effect			Total effect	Mediation effect	
		Explained variable	Standard regression coefficient	Test statistics			Bilateral P value
Financial subsidy	R & D investment	Innovation performance	0.009	1.865	0.062	0.232	0.039
Tax incentives	intensity		-0.009	-1.877	0.061	-0.073	0.123

In order to test the robustness of the conclusion, the Bootstrap method of Mplus software was introduced to verify the relationship between financial subsidies, tax incentives, R&D investment and innovation performance. The control variables were not tested. The results are shown in Table 3. After adding R&D investment, the direct effect of fiscal subsidies on innovation performance is 0.009, and the two-sided P value is greater than 0.05. The direct effect of tax incentives on innovation performance is -0.009, and the two-sided P value is also greater than 0.05, which shows that the two have an effect on innovation performance. The impact effects of R&D are not significant, so it is determined that R&D investment plays a completely mediating effect between financial subsidies, tax incentives and innovation performance. The mediation effect detected by the Bootstrap method is stronger than the stepwise test method, but the overall result is consistent with the previous results. This may be due to the fact that no control variables were added during the robustness test, thereby enhancing the mediating effect of R&D investment between financial subsidies and innovation performance^[5]. However, the total effect of financial subsidies on the innovation performance of enterprises is 0.232, of which the intermediary effect accounts for only 3.9%, indicating that the ability of the intermediary effect to transform the total effect is not very strong. Since fiscal subsidies have a positive effect on innovation performance as a whole, the government needs to pay attention to increasing the conversion efficiency between fiscal subsidies and innovation performance by R&D investment. The overall effect of tax incentives is -0.073, and the intermediary effect accounts for 12.3% of the total effect. The conversion efficiency is relatively high. However, given that tax incentives are a negative hindrance to corporate R&D investment, the government needs to consider appropriate tax incentives. Adjustment^[6].

5. Conclusions

By constructing an intermediary effect model, this paper specifically analyzes the relationship between financial subsidies, tax incentives, R&D investment, and innovation performance. The main research conclusions obtained are: (1) Financial subsidies have a significant positive effect on innovation performance, and have a significant positive impact on innovation performance^[7]. It has an inducing effect, and tax incentives have a significant negative effect on innovation performance, and have a crowding-out effect on innovation performance; (2) The relationship between fiscal subsidies, tax incentives and R&D investment is similar to the relationship between the two and innovation performance, but R&D investment has a significant positive impact on innovation performance; (3) When using the stepwise test method to test the mediation effect, R&D investment is a partial mediation between financial subsidies and innovation performance, and it is completely between tax incentives and innovation performance. Intermediary effect; (4) When

using the Bootstrap method to test the intermediary effect of R&D investment, it is found that R&D investment is a complete intermediary effect in fiscal subsidies and innovation performance, tax incentives and innovation performance, and it is still complete between tax incentives and innovation performance. Mediation effect.

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