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Analysis of Tax Incentives, Risk Taking and R&D Investment: Evidence Based on Manufacturing

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ABSTRACT

Although China is a big manufacturing country, its manufacturing industry is "big but not strong". In recent years, in order to encourage manufacturing enterprises to invest resources in innovation projects, preferential tax policies and government subsidies have become important regulatory means. However, due to the different risk bearing capacity of enterprises, enterprises also have different attitudes toward research and development (R&D) investment. In order to test the relationship between the four, this paper takes listed manufacturing companies in China from 2015 to 2020 as samples to empirically analyze the impact of tax incentives on R&D investment, as well as the mediating and moderating effects of risk bearing capacity and government subsidies between them. The results show that tax incentives can significantly promote R&D investment; The risk bearing capacity of enterprises plays a partial mediating role between tax incentives and R&D investment. Government subsidies play a positive regulating role between tax incentives and R&D investment.

KEYWORDS

Tax incentives; Research and development investment; Risk taking; Government subsidy

1. INTRODUCTION

Over the past 40 years of reform and opening up, China has become a major manufacturing country in the world. According to the Statistical Bulletin of National Science and Technology Funding Investment in 2020, by 2020, the total amount of R&D investment in China has reached 2.4 trillion yuan, and the intensity of R&D investment has steadily increased to 2.40%. In 2020, the R&D intensity of the United States, Japan and South Korea will be 2.86%, 3.40% and 4.70%, respectively, much higher than that of China (2.40%). China's manufacturing industry is "big but not strong", its independent innovation capacity is insufficient, and it is in a low position in the global manufacturing value chain.

Therefore, in order to improve the independent innovation ability of manufacturing enterprises, the state has implemented a series of tax incentives and government subsidies. As the government's macro-control policy tools, tax incentives and government subsidies allow enterprises to save funds and supplement funds respectively, which can effectively alleviate the financing constraints of enterprises, thus improving the risk bearing capacity of enterprises. Because of the wide range of capital investment areas, it is difficult to ensure the ultimate flow of enterprises to save funds. At present, many scholars at home and abroad have studied the relationship between tax incentives and R&D investment, but they rarely take risk bearing ability and government subsidies as influencing factors. Combined with the existing research literature of domestic and foreign scholars, this paper takes China's listed manufacturing enterprises from 2015 to 2020 as samples to test the relationship between tax incentives and R&D investment, and takes risk bearing as an intermediary variable and government subsidies as a moderating variable to conduct empirical research to explore the relationship between the four variables.

2. THEORETICAL ANALYSIS AND RESEARCH HYPOTHESIS

2.1. Tax Incentives and R&D Investment

Until 2021, China's preferential tax policies to encourage enterprises to increase investment in research and development involve a variety of taxes, including individual income tax, corporate income tax, value-added tax and so on. The impact of tax preferential policies on enterprise research and development activities is also reflected in different aspects, in order to better understand the current research and development tax preferential situation in our country, this paper is simply summarized as follows:

Table 1. China's current R & D tax preference policies

Categories of taxes	Preferential subject	Promotional content
Enterprise income tax	Most enterprises (excluding special industries)	Additional deduction (On the basis of the actual deduction, add 75% deduction)
	Special enterprise (such as biological drug manufacturing, etc.)	Accelerated depreciation (More than 1 million instruments allow accelerated depreciation)
	Resident enterprise	Transfer of technology (Tax relief for income from technology transfer)
	High-tech enterprise	Reduced tax rate (15%)
	Software industry, integrated circuit industry	Deduction of taxable income (Exemption for 1 and 2 years, halved for 3 and 4 years)
	Innovation investment enterprise	Deduction of taxable income (70% of the investment amount is deducted for 2 years)
Individual income tax	Scientific and technological personnel	Personal income tax relief (Cash reward or 50% tax reduction for scientific research)
Value-added tax	Software product	Tax rebate (More than 3% of the tax is refunded)

Data source: According to the Tax Law for the 2021 Unified National Examination for Certified Public Accountants and the website of the State Administration of Taxation

Through the above summary, it can be seen that the additional deduction of research and development expenses is the research and development tax preferential policy enjoyed by most enterprises. Taking most enterprises as an example, additional deduction preferential policies can reduce the tax payable, reduce the tax cost, and increase the after-tax profits of enterprises, which is more conducive to the decision of enterprises to make research and development investment. It can be inferred that tax incentives are positively correlated with R&D investment.

Deng (2021) [1] believes that when enterprises are supported by tax incentives, the average R&D innovation intensity of enterprises will be significantly increased. Ding et al. (2020) [2] Empirical evidence shows that tax incentives have an incentive effect on enterprises' innovation and R&D

investment. Rao (2016) et al. [3] found empirically that tax subsidy policies are conducive to enterprises increasing R&D investment.

Based on the above analysis, assumptions are made:

H1: Tax incentives have a positive impact on R&D investment.

2.2. Tax Incentives and Risk Bearing

Enterprise risk tolerance refers to the use of controllable resources to ensure that an enterprise will not deviate from the original normal state and operate normally when uncontrollable risk events occur under the influence of a specific environment. In the great changes of the new coronavirus epidemic and the intensification of anti-globalization in the world, enterprises have a certain risk bearing ability is undoubtedly a magic weapon for enterprises to win. Capital, then, is the key to increased risk taking. Tax incentives can save enterprises' cash expenditure to ease financing constraints, thus improving enterprises' risk bearing ability. Enterprises can use the saved funds to further promote product innovation and technology research and development.

The empirical results of Yang et al. (2021) [4] show that enterprises can save a lot of cash by reducing taxes, effectively alleviate financing constraints, and thus enhance their risk bearing capacity. Ljungqvist et al. (2017) [5] believe that the increase of corporate tax will reduce the ability to cope with risks. Zhang et al. (2019) [6] believe that industrial policy can promote the risk bearing capacity of enterprises by increasing the available resources of enterprises.

Based on the above analysis, assumptions are made:

H2: Tax incentives have a positive impact on enterprise risk bearing ability.

2.3. The Mediating Role of Risk Taking

First of all, the intermediary effect model needs to analyze the relationship between tax incentives and R&D investment. Secondly, the relationship between tax incentives and corporate risk-taking is analyzed. Finally, the influence of tax incentives and corporate risk-taking on R&D investment is analyzed. The risk bearing capacity of an enterprise is closely related to the amount of resources that can be consumed and utilized within the enterprise, and the available resources generally refer to the capital of the enterprise. The more capital of the enterprise, the stronger the risk bearing capacity of the enterprise. Generally speaking, research and development projects have the characteristics of high cost, high risk and uncertain income, which often require enterprises to inject a lot of funds, but the input and output are not necessarily proportional, which makes many enterprises reluctant to put limited resources into research and development projects. When enterprises enjoy preferential tax policies, they can save a lot of cash, that is, they can increase the funds that can be used within the enterprise, and their risk tolerance is improved, and they are often more willing to invest funds in research and development projects.

Li (2019) [7] points out that the level of enterprise risk taking plays a part of the intermediary effect between government subsidies and R&D investment of enterprises. The empirical results of Yan et al. (2020) [8] show that financing constraints and risk coping ability play a part of the intermediary effect between government subsidies and enterprises' R&D input.

Based on the above analysis, assumptions are made:

H3: Enterprise risk bearing capacity plays a part of the mediating effect between tax incentives and R&D investment.

2.4. The Regulating Role of Government Subsidies

Research and development projects are money-consuming activities. If companies receive government subsidies or tax incentives, they can reduce research and development costs and risks, thus incentivizing companies to increase research and development efforts. However, government subsidies and tax incentives cannot be confused, because government subsidies have the characteristics of direct and targeted, while tax incentives have the characteristics of indirect and universal. Specifically, government grants are designed to provide financial assistance to specific companies and specific projects, which can force companies to improve their independent innovation capabilities in the short term; There are no special requirements for tax incentives, and companies can choose to participate in relevant innovation activities in order to benefit from relevant tax incentives.

Companies that receive government subsidies have more special working capital, so they need to invest the cash in research and development projects. However, research and development projects require more funds, so it will also drive the increase in tax incentives for corporate funds to invest in research and development projects. Referring to the empirical research of Chen et al .(2020) [9] taking software and information technology service industries as samples, the increase of government subsidies can stimulate the growth of R&D investment. Yin et al. (2020) [10] conducted an empirical study based on the sample of equipment manufacturing industry in 30 provinces and cities across the country, and found that government R&D subsidies are positively promoting enterprises' R&D input. Chen et al. (2019) [11] Empirical analysis: With the increase of government subsidies, the range of tax incentives will also increase.

Based on the above analysis, assumptions are made:

H4: Government subsidies have a positive regulating effect between tax incentives and R&D investment.

In order to make the research structure of this paper more clear, Figure 1 is used to represent the research logical framework among the variables selected in this paper.

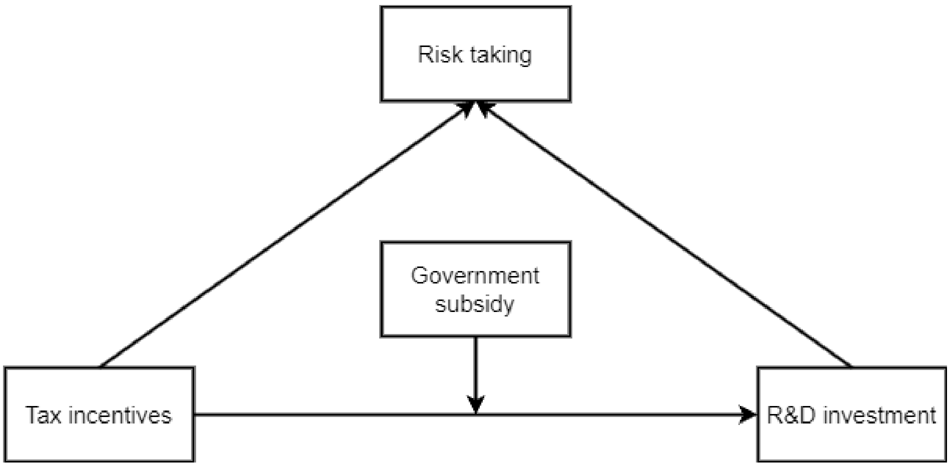

Figure 1. Logical framework of this document

3. RESEARCH DESIGN

3.1. Sample Selection and Data Sources

In this paper, listed manufacturing companies are selected as samples, and the time span is 2015-2020. Considering that abnormal samples may bring errors to the empirical results, the following treatments are carried out on the samples in this paper: (1) The samples that cannot obtain complete data are excluded. (2) Enterprises with missing indicators required in this paper are excluded. (3) Eliminate abnormal companies that have been ST. After the above processing, this paper finally confirmed the selection of manufacturing listed enterprises, a total of 9233 sets of data observation values as research samples. The relevant data are from CSMAR database. In the process of empirical analysis, STATA16.0 was used for empirical analysis of sample data. In order to avoid the impact of extreme values existing in the research process on the empirical results, this paper uses STATA16.0 software to perform WINSORIZE tail reduction on variables, eliminate extreme values, and supplement missing values with the mean value of the series.

3.2. Variable Selection and Definition

3.2.1. Independent variable (tax incentives)

In this paper, referring to the research of Hu et al. (2017) [12], the effective tax rate is measured by the ratio of income tax expense to EBIT, and the opposite digit of the ratio represents tax incentives, that is, the higher the ratio, the higher the degree of tax incentives.

3.2.2. Dependent variable (R&D investment)

The existing literature mainly measures R&D investment in two ways, the first is to take the total R&D investment or its logarithm, and the second is to take the value of "R&D investment/business income". Referring to the empirical studies of Zhuang (2020) [13] and Cheng and Yan (2018) [14], and considering the empirical results of the whole paper, this paper chooses the second measurement method and takes "R&D input/operating income" as the dependent variable.

3.2.3. Mediating variables (risk taking)

With reference to the study of Tang et al. (2021) [15], this paper uses the standard deviation of ROA of corporate return on assets to measure the company's risk bearing level, and ROA is measured by the ratio of EBIT to total assets at the end of the period. In order to eliminate the effects of business cycles and industries, this paper subtracts the average return on assets of the industry from the sample year of the firm, i.e.

$$\mathrm{ROASD} = \sqrt{\frac{1}{n-1}\sum_{t=1}^{n}(\mathrm{ROA}-\overline{\mathrm{ROA}})^2} \qquad (1)$$

3.2.4. Adjustment variables (Government subsidies)

In CSMAR database, government subsidies are classified into other income and non-operating income. For reference to Chen et al.(2020) [16], the data taken in this paper is the ratio between the total amount of the two and the total assets to measure government subsidies.

3.2.5. Control variables

In addition to the above explanatory variables, the change of R&D investment of enterprises is also affected by many factors. In order to enhance the rationality and completeness of the empirical model, this paper selects eight indicators, including asset-liability ratio, as control variables by referring to the practices of He et al. (2020) [17], Yang et al. (2021) [18] , Wu et al. (2019) [19] and Li et al. (2019) [20]. The specific definitions of each variable are listed in Table 2:

Table 2. Variable names, symbols and their definitions

Variable type	Variable name	Symbol	Variable definition
Independent variable	Tax incentives	ERP	- (Income tax expense/EBIT)
Dependent variable	R&D investment	RD	R&d investment/operating income
Intermediate variable	Risk taking	ROASD	Standard deviation of ROA
Regulating variable	Government subsidy	GOV	(Other income + government subsidies in non-operating income)/ Total assets
Control variable	Asset-liability ratio	LEV	Enterprise scale
	Revenue growth rate	GROW	Revenue growth/Total revenue in the previous year
	Proportion of fixed assets	PPE	Fixed assets/total assets
	Enterprise scale	SIZE	The natural logarithm of a firm's total assets
	The proportion of the largest shareholder	TOP1	Shares held by the largest shareholder/total shares of the company
	Equity nature	SOE	Virtual variable, if the enterprise is state-owned holding, the value is 1, otherwise it is 0
	Tobin’s Q	TOBINQ	Market capitalization/total assets
	Establishment time of enterprise	AGE	Ln (Current year - year of incorporation)

Data source: stata16.0 statistical software analysis results

4. EMPIRICAL MODEL SELECTION

In this paper, the software Stata16.0 was used to analyze 9233 panel data, including descriptive analysis, correlation analysis, benchmark regression analysis, stepwise regression analysis, moderating effect regression analysis and simple slope analysis. The following model is constructed based on the discussion of mediating effect and moderating effect models by Wen Zhong and Ye (2014) [21] and Liu (2022) [22], in which RDit, ERPit, GOVit and ROASDit respectively represent the R&D investment, tax incentives, government subsidies and risk taking of the i sample in the t period. Controls represents the sum of the control variables shown in Table 3.

4.1. Intermediary Effect Model

In order to test the impact of tax incentives on R&D investment and the mediating effect of risk taking between them, that is, to test whether H1, H2 and H3 are valid, the regression equation constructed can be expressed as follows:

$$\mathrm{RD}_{\mathrm{it}} = \alpha_0 + \alpha_1 \mathrm{ERP}_{\mathrm{it}} + \alpha_2 \mathrm{Controls}_{\mathrm{it}} + \varepsilon \quad (2)$$

$$\mathrm{ROASD}_{\mathrm{it}} = \beta_0 + \beta_1 \mathrm{ERP}_{\mathrm{it}} + \beta_2 \mathrm{Controls}_{\mathrm{it}} + \varepsilon \quad (3)$$

$$\mathrm{RD}_{\mathrm{it}} = \gamma_0 + \gamma_1 \mathrm{ERP}_{\mathrm{it}} + \gamma_2 \mathrm{ROASD}_{\mathrm{it}} + \gamma_3 \mathrm{Controls}_{\mathrm{it}} + \varepsilon \quad (4)$$

If the result is significant and positive, H1 is established, and tax incentives can promote R&D investment; If the result is significant and positive, H2 is established, and tax incentives promote risk taking. On the basis of the existing model (2), the intermediary variable of risk taking is added to form model (4). If H1 and H2 are true and the results are significant and positive, then H3 is true.

4.2. Modulating Effect Model

In order to verify whether government subsidies play a regulating role in tax incentives and R&D investment, that is, to test whether H4 is established, the regression equation constructed can be expressed as follows:

$$\mathrm{RD}_{\mathrm{it}} = \mu_0 + \mu_1 \mathrm{ERP}_{\mathrm{it}} + \mu_2 \mathrm{ERP}_{\mathrm{it}} \times \mathrm{GOV}_{\mathrm{it}} + \mu_3 \mathrm{Controls}_{\mathrm{it}} + \varepsilon \tag{5}$$

Model (5) is based on model (2) by adding the interaction terms of tax incentives and government subsidies. If the result is significant and positive, and the interaction term coefficient is significant and positive, then H4 is valid.

5. EMPIRICAL RESULTS AND ANALYSIS

5.1. Descriptive Statistics

As for the explanatory variable and the explained variable, the standard deviation of R&D investment (RD) is 0.0370, and the measurement value ranges from 0.00100 to 0.220, indicating that the investment of enterprises in R&D projects is different. The minimum value of the tax benefit (ERP) is -0.627, the maximum is 0.407, and the tax benefit measure is positive or negative, which may be affected by deferred income tax.

As for the adjustment variable, the absolute value of the mean value of tax incentives is 0.126, which is greater than the mean value of government financial subsidies (GOV) is 0.012. It can be seen that the intensity of tax incentives for sample enterprises is greater than that of government subsidies.

For the intermediary variable, the standard deviation, minimum and maximum values of risk taking (ROASD) are 0.041, 0.004 and 0.229, respectively, indicating that there are significant differences in risk taking levels among different firms.

As for the control variables, the standard deviation of each control variable is not zero, which indicates that the asset-liability ratio, the growth rate of operating income, the proportion of fixed assets, the size of the enterprise, the shareholding ratio of the largest shareholder, the nature of equity, Tobounq and the establishment time of the enterprise are different. Among them, the standard deviation of the shareholding ratio of the largest shareholder is 13.65, which is far greater than other control variable indicators, indicating that the shareholding ratio of the largest shareholder of each enterprise has a significant difference. The average value of equity nature is 0.265, indicating that the number of non-state-owned manufacturing enterprises is much larger than that of state-owned manufacturing enterprises. The specific descriptive statistical results of core variables in this paper are shown in Table 3.

Table 3. Descriptive statistical analysis

variable	N	Mean value	median	Standard deviation	Minimum value	Maximum value
RD	9233	0.0470	0.0390	0.0370	0.0010	0.220
ERP	9233	-0.126	-0.132	0.125	-0.627	0.407
GOV	9233	0.012	0.007	0.016	0	0.093
ROASD	9233	0.040	0.026	0.041	0.004	0.229
LEV	9233	0.391	0.382	0.185	0.0620	0.867
GROW	9233	0.169	0.109	0.360	-0.469	2.168
PPE	9233	0.224	0.201	0.130	0.0190	0.614
SIZE	9233	22.14	22.01	1.152	20.12	25.68
TOP1	9233	32.96	30.92	13.65	9.090	70.04
SOE	9233	0.265	0	0.441	0	1
TOBINQ	9233	2.186	1.750	1.340	0.876	8.353
AGE	9233	17.54	17	5.243	7	31

Data source: stata16.0 statistical software analysis results

5.2. Correlation Analysis

Through the Person correlation coefficient test of each variable (Table 4), it is found that the correlation coefficient between tax incentives and R&D investment is 0.122, and the correlation is positive and correlated, indicating that tax incentives have a positive and significant impact on enterprises' R&D investment, preliminarily verifying H1. The correlation coefficient between tax incentives and risk taking level is 0.079, and the correlation is also positive and correlated, indicating that tax incentives also have a positive and significant impact on enterprises' risk taking ability, which also preliminarily validates H2. The degree of coefficient correlation between the variables is basically significant, and is basically less than 0.5, which indicates that the variables are selected properly.

Table 4. Correlation analysis

	RD	ERP	LEV	GROW	PPE	SIZE	TOP1	SOE	TOBINQ	AGE	GOV	ROASD
RD	1											
ERP	0.122***	1										
LEV	-0.207***	0.178***	1									
GROW	-0.033***	-0.053***	0.028***	1								
PPE	-0.221***	0.061***	0.151***	-0.103***	1							
SIZE	-0.202***	0.006	0.508***	0.057***	0.109***	1						
TOP1	-0.099***	-0.069***	-0.004***	0.001	0.034***	0.094***	1					
SOE	-0.147***	-0.004	0.263***	-0.073***	0.14***	0.337***	0.136***	1				
TOBINQ	0.196***	-0.037***	-0.290***	0.016	-0.088***	-0.362***	-0.014	-0.086***	1			
AGE	-0.153***	-0.0150	0.217***	-0.078***	0.073***	0.201***	-0.048***	0.279***	-0.097***	1		
GOV	0.441***	0.061***	-0.091***	-0.043***	-0.080***	-0.141***	-0.058***	-0.071***	0.122***	-0.094***	1	
ROASD	0.077***	0.079***	0.06***	0.020*	-0.039***	-0.088***	-0.129***	-0.091***	0.072***	-0.001***	0.095***	1
*, **, and *** respectively indicate significance at the 10%, 5%, and 1% significance levels.												

Data source: stata16.0 statistical software analysis results

5.3. Intermediate Effect Test

5.3.1. Multicollinearity test

In order to further test whether there is a multicollinearity problem between the explained variables, this paper uses Stata16.0 software to carry out multicollinearity test for each variable. The results are shown in Table 5, VIF values of all variables are within 10, empirical results show that there is no multicollinearity problem in variables, and further regression analysis can be carried out.

Table 5. Multicollinearity diagnosis

Variable	VIF	1/VIF
ERP	1.05	0.949498
ROASD	1.18	0.846932
GOV	1.04	0.960592
LEV	1.47	0.680650
GROW	1.03	0.967809
PPE	1.05	0.952463
TOP1	1.04	0.960592
TOBINQ	1.18	0.846932
SIZE	1.59	0.629298
SOE	1.25	0.799717
AGE	1.12	0.894396
Mean VIF	1.20	

Data source: Stata16.0 statistical software analysis results

Table 6. Baseline regression analysis

VARIANCE	J_1	J_2
	RD	RD
ERP	0.0259***	0.0352***
	(8.81)	(12.69)
LEV		-0.0320***
		(-14.33)
GROW		-0.0054***
		(-5.63)
PPE		-0.0372***
		(-13.58)
SIZE		-0.0004
		(-1.18)
TOP1		-0.0002***
		(-7.38)
SOE		-0.0017*
		(-1.96)
TOBINQ		0.0049***
		(16.46)
AGE		-0.0008***
		(-11.41)
Constant	0.0196***	0.0575***
	(12.73)	(7.00)
N	9233	9233
r2_a	0.0933	0.2274
F	106.5181	160.8237
Year	Yes	Yes
Ind	Yes	Yes
*, **, *** means significant at the significance level of 10%, 5%, and 1%, respectively		

Data source: Stata16.0 statistical software analysis results

5.3.2. Baseline regression analysis

In order to test the relationship between tax incentives and R&D input, the results are shown in Table 6. J1 is the benchmark regression analysis of single explanatory variable of tax incentives (ERP) and R&D input (RD). The empirical results show that the coefficient of tax incentives is 0.0259, that is, > 0, and at the significance level of 1%, P < 0.01, that is, the result is significant and positive. It shows that tax incentives can promote R&D investment. Model J2 is the baseline regression analysis after adding control variables to model J1, and the empirical results show that the tax incentive coefficient is also significantly positive, the same as J1. Compared with models J2 and J1, the tax incentive coefficient of model J2 is larger, indicating a high degree of positive correlation, that is, H1 is established.

5.3.3. Stepwise regression analysis

In order to test the mediating effect of risk taking between tax incentives and R&D investment, this paper draws on the research methods of Wen and Ye (2014) [21], and conducts step-to-step analysis of samples. As shown in Table 7, D1 is the regression statistical result of the relationship between tax incentives and R&D input. The coefficient of tax incentives (ERP) is 0.0352155, that is, > 0, and is significant at the 1% level, P < 0.01, that is, the result is significant and positive, indicating that China's listed manufacturing enterprises can effectively promote their R&D input after enjoying tax incentives. H1 is verified.

Table 7. Stepwise regression analysis D1

RD	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
ERP	.0352155	.0027756	12.69	0	.0297747	.0406562	***
LEV	-.0319541	.0022303	-14.33	0	-.036326	-.0275823	***
GROW	-.0054178	.0009616	-5.63	0	-.0073027	-.0035328	***
PPE	-.0372374	.002742	-13.58	0	-.0426124	-.0318624	***
SIZE	-.0004375	.0003709	-1.18	0.238	-.0011645	-.0002894	
TOP1	-.0001854	.0000251	-7.38	0	-.0002346	-.0001362	***
SOE	-.001673	.0008544	-1.96	0.050	-.0033478	1.08e-06	*
TOBINQ	.0048557	.0002949	16.46	0	-.0042776	.0054339	***
AGE	-.0008015	.0000702	-11.41	0	-.0009392	-.0006638	***
Constant	0.0575	.0003215	7.00	0	0.0324	0.0592	***
R-squared		0.2288		Number of obs		9,233	
F-test		160.82		Prob > F		0.000	
Adj R-squared		0.2274		Root MSE		0.03224	
*** p<.01, ** p<.05, * p<.1							

Data source: Stata16.0 statistical software analysis results

As shown in Table 8, D2 represents the regression result of the relationship between tax incentives and risk taking of listed manufacturing enterprises in China. The coefficient of tax incentives (ERP) is 0.0175018, that is, > 0, and is significant at the 1% level, P < 0.01, that is, the result is significant and positive, indicating that tax incentives also have a significant positive impact on risk taking, and H2 is verified.

Table 8. Step regression analysis of D2

ROASD	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
ERP	.0175018	.0034572	5.06	0	.0107249	.0242786	***
LEV	-.0336515	.0027818	12.10	0	-.0281985	.0391045	***
GROW	-.0013186	.0011998	1.10	0.272	-.0010332	.0036704	
PPE	-.0091451	.0034209	-2.67	0.008	-.0158508	-.00024394	***
SIZE	-.0032128	.0004626	-6.95	0	-.0041195	-.002306	***
TOP1	-.0003048	.0000313	-9.72	0	-.0003663	-.0002434	***
SOE	-.0065282	.0010635	-6.14	0	-.008613	-.0044434	***
TOBINQ	.0032987	.0003707	8.90	0	.002572	.0040254	***
AGE	-.0001529	.0000879	1.74	0.002	-.0000194	.0003252	**
Constant	0.0952	.0003467	9.27	0	0.0561	0.0954	***
R-squared		0.0570		Number of obs		9,165	
F-test		32.54		Prob > F		0.000	
Adj R-squared		0.0553		Root MSE		0.04008	
*** p<.01, ** p<.05, * p<.1							

Data source: Stata16.0 statistical software analysis results

As shown in Table 9, model D3 is the regression result of model D1 after adding the explanatory variables of risk-taking level. Empirical results show that after adding the explanatory variables of risk-taking level (ROASD), the coefficient of tax incentive (ERP) changes from 0.0352155 to 0.0350223, that is, and >, and is significant at the 1% level, P < 0.01. Risk taking (ROASD) coefficient is 0.0319257, that is, P < 0.01, which is significant at 1% level. The results show that corporate risk tolerance and tax incentives can jointly promote R&D investment. Based on the empirical results in Table 7, Table 8 and Table 9, it can be verified that H3 is established, and enterprise risk bearing capacity plays a partial mediating role between tax incentives and R&D investment. Moreover, compared with models D1 and D2, the R^2 of model D3 is larger, indicating that the linear regression fit is better.

Table 9. Step regression analysis D3

Rd	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
ERP	.0350223	.0027604	12.69	0	.0296112	.0404334	***
ROASD	.0319257	.008337	3.83	0	.0155832	.0482681	***
LEV	-.0325073	.0022358	-14.54	0	-.03689	-.0281247	***
GROW	-.0054219	.0009567	-5.67	0	-.0072973	-.0035466	***
PPE	-.0358244	.0027287	-13.13	0	-.0411733	-.0304755	***
SIZE	-.0002759	.0003698	-0.75	0.456	-.0010008	.000449	
TOP1	-.0001744	.0000251	-6.94	0	-.0002237	-.0001252	***
SOE	-.0014065	.0008498	-1.66	0.098	-.0030722	.0002593	*
TOBINQ	.0046895	.0002969	15.80	0	.0041076	.0052715	***
AGE	-.0007982	.0000701	-11.39	0	-.00009356	.0006608	***
Constant	0.0529	.0006578	6.43	0	.00327	.00689	***
R-squared		0.3406		Number of obs		9,165	
F-test		248.64		Prob > F		0.000	
Adj R-squared		0.3392		Root MSE		0.02952	
*** p<.01, ** p<.05, * p<.1							

Data source: Stata16.0 statistical software analysis results

Based on the above analysis results, the total effect of tax incentives on R&D investment of enterprises is 0.0352155, and the direct effect is 0.0350223. The risk bearing capacity of enterprises plays an indirect effect between tax incentives and R&D investment of enterprises, that is, the intermediary effect is 0.00055876 (0.0175018×0.0319257), and the intermediary effect accounts for 1.59% of the total effect (0.00055876/0.0352155). However, the traditional step-up regression analysis proposed by Wen and Ye (2014) [21] has been questioned by some scholars. Therefore, after the existence of intermediary effect was confirmed by stepwise regression analysis, Bootstrap was used to test the robustness of intermediary effect.

5.3.4. Verify the Bootstrap

In order to further test the robustness of the mediation model, Stata16.0 analysis tool was used for Bootstrap test. This paper conducted 1,000 repeated sampling tests on 9,233 sample data, and the results obtained (Table 10) were consistent with the results of stepped-regression analysis (Table 8, 9, 10). The direct effect of tax incentives on enterprises' R&D investment was 0.0441362, the intermediary effect was 0.0006858, and the intermediary effect accounted for 1.55% of the total effect. Compared with stepwise regression analysis, the proportion of mediating effect in the total effect is basically the same.

Table 10. Bootstrap test - Mediation effect

	Observed Coef.	Bootstrap Std. Err.	z	P>z	Normal-based [95%Conf.Interval]	
_bs_1	0.0006858	0.0002505	2.74	0.006	0.0001948	0.0011768
_bs_2	0.0441362	0.0038869	11.36	0.000	0.0365179	0.0517544
-bs-1 (ind aff) -bs-2 (dir aff)						

Data source: Stata16.0 statistical software analysis results

Table 11. Test M1 on the regulatory effects of government subsidies

RD	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
ERP	.0303514	.0026434	11.48	0	.0251697	.0355331	***
interact	.3694864	.2132509	1.73	0.083	-.0485327	.7875054	*
GOV	.8554654	.020532	41.66	0	.8152181	.8957127	***
LEV	-.0286154	.0020436	-14.00	0	-.0326213	-.0246095	***
GROW	-.0037441	.0008813	-4.25	0	-.0054717	-.0020166	***
PPE	-.0339018	.0025122	-13.49	0	-.0388264	-.0289773	***
SIZE	-.0003291	.00034	0.97	0.333	-.0003375	.0009956	
TOP1	-.000144	.000023	-6.26	0	-.0001891	-.0000989	***
SOE	-.0014541	.0007823	-1.86	0.063	-.0029875	.0000794	*
TOBINQ	.0041472	.0002706	15.33	0	.0036167	.0046776	***
AGE	-.0006836	.0000644	-10.62	0	-.0008097	-.0005574	***
Constant	0.0281	0.002980	3.71	0	0.01680	0.04592	***
R-squared		0.3537		Number of obs		9,233	
F-test		265.33		Prob > F		0.000	
Adj R-squared		0.3523		Root MSE		0.02952	
*** p<.01, ** p<.05, * p<.1							

Data source: Stata statistical software analysis results

5.4. Adjustment Effect Test

In order to test the moderating effect of government subsidies on the relationship between tax incentives and R&D investment, this paper referred to the research methods of Liu (2022) [22] on the main effect and the moderating effect, and conducted a regression test of the moderating effect on the model. As can be seen from Table 11, M1 tests the regulating effect of government subsidies on tax incentives and R&D input. The coefficient of tax incentives (ERP) is 0.0303514, and $P < 0.01$, that is, it is significant at the level of 1%. Meanwhile, the coefficient of the interaction term of tax incentives (ERP) and government subsidies (GOV) is 0.3694864, and $P < 0.1$, the coefficient of government subsidies (gov) is 0.3694864. That is, it is significant at the level of 10%, indicating that enterprises can improve the promoting effect of tax incentives on enterprises' R&D investment after receiving government subsidies. H4 in this paper has been verified.

5.5. Simple Slope Analysis

According to the above test results, we know that the regulatory effect of government subsidies exists, but at different levels, its role is different. In order to more directly observe the adjustment effect of different values of government subsidies, this paper uses the point selection method for testing according to the theoretical analysis of Fang et al. (2015) [23]. Two specific values above and below the mean plus or minus standard deviation (M±SD) were selected as new variables according to government subsidies, and two specific values above and below the mean plus or minus standard deviation of tax incentives (Z±SD0) were selected as another new variable, and the product term of the two new variables was formed, and then regression analysis was performed on it. The coefficient of the regression equation obtained is the simple slope value, as shown in Figure 2.

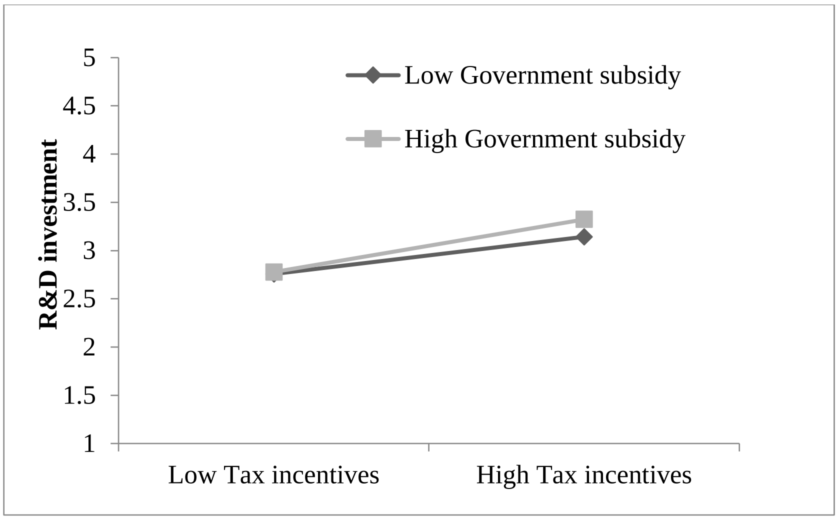

Figure 2. Simple slope analysis

The simple slope analysis results show that when the government subsidy level is high, the tax preference degree is low; When the government subsidy is high, the regression line slope of the interaction term between government subsidy and tax preference is larger than that when the government subsidy is low. That is, tax incentives have a positive impact on R&D investment, and government subsidies play a promoting role between tax incentives and R&D investment.

5.6. Robustness Test

Robustness test is mainly to test whether the model is still valid in different situations. If the conclusion is still valid, that is, the robustness of the model is better. In this paper, robustness tests are carried out in two situations: In the first case, the variables used in the empirical study of Bu and Song (2019) [24] are used for reference, the measurement indicators are replaced, and the regression analysis of the samples is performed again. The second method is to shorten the sample period by referring to Wang and Wu (2021) [25] and conduct regression analysis on the samples again.

5.6.1. Robustness test of baseline regression

The benchmark regression model in this paper focuses on the relationship between tax incentives and R&D investment, and its robustness test results are shown in Table 12.

(1) Replace the explained variable. The original R&D investment index "R&D investment/business income" was replaced by the value of "logarithm of total R & D investment", and the regression analysis was conducted on the benchmark regression model again. The robustness test results of the benchmark regression were shown in Table 12 (2). The regression coefficient of tax incentives was still positive and significant, and the control variables were basically significant.

(2) Adjust the sample period. After the sample was shortened to 2016-2019, the regression analysis was conducted on the benchmark regression model again. The results of the benchmark regression are shown in Table 12 (3). The symbols and significance of the regression coefficients of tax incentives are the same as those of the original benchmark regression model, and the symbols and significance of the coefficients of control variables are basically the same as those of the original model.

Table 12. Robustness test of baseline regression

VARIBALE	(1) Original model	(2) Substitution variable	(3) Adjustment period
	RD	RD_1	RD
ERP	0.0352***	0.0120***	0.0369***
	(12.69)	(9.07)	(11.86)
LEV	-0.0320***	-0.0044***	-0.0340***
	(-14.33)	(-4.16)	(-13.47)
GROW	-0.0054***	0.0010**	-0.0060***
	(-5.63)	(2.10)	(-5.35)
PPE	-0.0372***	-0.0113***	-0.0378***
	(-13.58)	(-8.67)	(-12.19)
SIZE	-0.0004	-0.0002	-0.000
	(-1.18)	(-1.12)	(-0.04)
TOP1	-0.0002***	0.0000*	-0.0002***
	(-7.38)	(1.91)	(-6.55)
SOE	-0.0017*	-0.0009**	-0.0020***
	(-1.96)	(-2.25)	(-2.20)
TOBINQ	0.0049***	0.0026***	0.0051***
	(16.46)	(18.37)	(13.16)
AGE	-0.0008***	-0.0002***	-0.0008***
	(-11.41)	(-5.98)	(-10.97)
Contant	0.0575***	0.0150***	0.0537***
	(7.00)	(3.82)	(5.74)
year	Yes	Yes	Yes
lnd	Yes	Yes	Yes
N	9233	9233	7293
Adj-R2	0.2274	0.1565	0.2256
F	160.8237	101.7336	142.6363
*, **, *** means significant at the significance level of 10%, 5%, and 1%, respectively			

Data source: Stata16.0 statistical software analysis results

5.6.2. Robustness test of mediating effect

The mediation effect model in this paper focuses on the partial mediation effect of risk taking between tax incentives and R&D input, and the robustness test results are shown in Table 13.

Table 13. Robustness test of the intermediate-effect model

VARIBALE	Substitution variable			Adjustment period		
	(1)	(2)	(3)	(4)	(5)	(6)
	RD1	ROASD	RD1	RD	ROASD	RD
ERP	0.0120***	0.0175***	0.0125***	0.0369***	0.0194***	0.0362***
	(9.10)	(5.06)	(9.48)	(11.86)	(5.01)	(11.64)
LEV	-0.0045***	0.0337***	-0.0035***	-0.0340***	0.0287***	-0.0350***
	(-4.22)	(12.10)	(-3.32)	(-13.47)	(9.12)	(-13.79)
GROW	0.0009**	0.0013	0.0010**	-0.0061***	-0.0013	-0.0060***
	(2.01)	(1.10)	(2.10)	(-5.35)	(-0.89)	(-5.31)
PPE	-0.0110***	-0.0091***	-0.0113***	-0.0378***	-0.0115***	-0.0374***
	(-8.43)	(-2.67)	(-8.64)	(-12.19)	(-2.98)	(-12.06)
SIZE	-0.0002	-0.0032***	-0.0003	-0.0000	-0.0021***	0.0001
	(-1.02)	(-6.95)	(-1.53)	(-0.04)	(-4.07)	(0.13)
TOP1	0.0000**	-0.0003***	0.0000	-0.0002***	-0.0003***	-0.0002***
	(2.03)	(-9.72)	(1.32)	(-6.55)	(-9.13)	(-6.13)
SOE	-0.0009**	-0.0065***	-0.0011***	-0.0020**	-0.0074***	-0.0017*
	(-2.20)	(-6.14)	(-2.64)	(-2.02)	(-6.05)	(-1.76)
TOBINQ	0.0026***	0.0033***	0.0027***	0.0052***	0.0041***	0.0050***
	(18.12)	(8.90)	(18.74)	(13.16)	(8.35)	(12.75)
AGE	-0.0002***	0.0002*	-0.0002***	-0.0009***	0.0001	-0.0009***
	(-5.97)	(1.74)	(-5.86)	(-10.97)	(1.04)	(-11.02)
ROASD			-0.0278***			0.0345***
			(-6.98)			(3.67)
Contant	0.0146***	0.0952***	0.0173***	0.0537***	0.0777***	0.0511***
	(3.72)	(9.27)	(4.39)	(5.74)	(6.67)	(5.44)
N	9165	9165	9165	7293	7293	7293
Adj-R^2	0.1543	0.0553	0.1587	0.2256	0.0516	0.2269
F	99.3349	32.5365	97.0163	142.6363	27.4602	134.7918
year	Yes	Yes	Yes	Yes	Yes	Yes
lnd	Yes	Yes	Yes	Yes	Yes	Yes
*, **, *** means significant at the significance level of 10%, 5%, and 1%, respectively						

Data source: Stata16.0 statistical software analysis results

(1) Replace measurement indicators. The logarithm of total R&D input value was used to replace the original R&D input index "R&D input/business income", and a step-to-step regression test was conducted on the samples. As can be seen from Table 13 (1), the coefficient of the regression equation between tax incentives and R&D input is 0.012, and the coefficient is positive and the result is significant. Table 13 (2) shows that the regression coefficient between preferential tax treatment and risk taking is 0.0175, and the coefficient is positive and the result is significant. In Table 13 (3), the total effect of tax incentives on R&D input is 0.0120, and the direct effect is 0.0125, while the risk bearing capacity of enterprises plays an indirect effect between tax incentives and R&D input, that is, the intermediary effect is -0.0004865 (0.0175×-0.0278). The ratio of the intermediate effect to the total effect was -4% (-0.0004865/0.0120). Based on the results of Liu and Ling (2009) [26], the phenomenon was a masking effect, and the absolute value of the ratio between the intermediary effect

and the total effect should be selected, i.e., 4%, with significant results. Based on the above analysis, risk bearing capacity still plays a part of mediating effect between tax incentives and R&D investment.

(2) Adjust the sample period. The sample period was shortened to 2016-2019, and the step-based regression test was conducted on the samples again. Table 13 (4) shows that the coefficient of the regression equation between tax incentives and R&D input is still positive and the result is significant. As can be seen from Table 13 (5), the regression coefficient between preferential tax treatment and risk taking is still positive and the result is significant. As can be seen from Table 13 (6), after adding the risk bearing variable, the total effect of tax incentives on R&D investment of enterprises is 0.0369, the direct effect is 0.0362, and the intermediary effect is 0.000669 (0.0194×0.0345). The ratio of the mediation effect to the total effect was 1.97 (0.000669/0.0369) and the result was significant. Based on the above analysis, the result was basically the same as that of the original mediation model.

Table 14. Robustness test of adjustment effect

VARIBALE	(1) Original model	(2) Substitution variable	(3) Adjustment period
	RD	RD	RD
ERP	0.0304***	0.0327***	0.0355***
	(11.48)	(11.99)	(11.64)
interact	0.3695*	1.0273*	0.0039**
	(1.73)	(1.84)	(2.01)
GOV	0.8555***	1.347***	0.0076***
	(41.66)	(25.60)	(19.62)
LEV	-0.0286***	-0.033***	-0.0353***
	(-14.00)	(-15.29)	(-14.23)
GROW	-0.0037***	0.0053***	-0.0045***
	(-4.25)	(-5.68)	(-4.06)
PPE	-0.0339***	-0.0358***	-0.0403***
	(-13.49)	(-13.53)	(-13.27)
SIZE	0.0003	0.0001	-0.0068***
	(0.97)	(0.30)	(-12.69)
TOP1	-0.0001***	0.0002***	-0.0002***
	(-6.26)	(-7.81)	(-6.68)
SOE	-0.0015*	-0.0015*	-0.0013
	(-1.86)	(-1.81)	(-1.38)
TOBINQ	0.0041***	0.0042***	0.0051***
	(15.33)	(15.04)	(13.02)
AGE	-0.0007***	-0.00075***	-0.0008***
	(-10.62)	(-11.01)	(-9.92)
Contant	0.0281***	0.0386***	0.0768***
	(3.71)	(4.84)	(8.30)
year	Yes	Yes	Yes
lnd	Yes	Yes	Yes
N	9233	9233	7254
Adj-R^2	0.3523	0.1657	0.2669
F	265.3298	97.4843	156.3550
*, **, *** means significant at the significance level of 10%, 5%, and 1%, respectively			

Data source: Stata16.0 statistical software analysis results

5.6.3. Robustness test of regulatory effect

The moderating effect model in this paper focuses on the positive moderating effect of government subsidies between tax incentives and R&D input, and the robustness test results are shown in Table 14.

(1) Replace measurement indicators. Replace the original government subsidy measure index "(other income + Government subsidy in non-operating income)/ business income" with the measure value of "(other income + Government subsidy in non-operating income)/ business income", and conduct the moderating effect regression test for the samples again. As can be seen from Table 14 (2), the regression coefficient of tax incentives is 0.0327, $P < 0.01$, which is significant at the 1% level. The interaction coefficient between tax incentives and government subsidies is 1.0273, $P < 0.1$, which is significant at the level of 10%. Based on the above analysis, government subsidies still play a positive role in promoting the relationship between tax incentives and R&D investment.

(2) Adjust the sample period. The sample period was shortened to 2016-2019, and the regression test of the adjustment effect was conducted on the samples again. As can be seen from Table 14 (3), the regression coefficient of tax incentives was positive and $P < 0.01$, which was significant at the 1% level. The interaction coefficient of tax incentives and government subsidies is also positive, and $P < 0.05$, which is significant at the 5% level. Based on the above analysis, the robustness test results of the regulation effect are basically the same as those of the original regulation effect model.

The methods of replacing variables and adjusting sample period were used for the regression analysis of the benchmark regression model, the intermediary effect model and the moderating effect model. The empirical results of the core variables were basically the same as those of the original model, and the control variables were basically significant. In general, the model constructed in this paper has good robustness.

6. CONCLUSION AND ENLIGHTENMENT

6.1. Conclusion

Based on the data of 9233 sets of listed manufacturing enterprises from 2015 to 2020, this paper adopts multicollinearity analysis, benchmark regression analysis, step regression analysis, moderating effect regression analysis and simple slope analysis to test the benchmark regression model, intermediary effect model and moderating effect model, and analyzes the impact of tax incentives on R&D investment. The mediating effect of risk taking level between tax incentives and R&D investment; The moderating effect of government subsidies on tax incentives and R&D investment. Through the empirical test, the following results are obtained: (1) Tax incentives can effectively promote enterprise R&D investment; (2) Risk bearing capacity plays a partial mediating role between tax incentives and R&D investment; (3) Government subsidies play a positive regulating role between tax incentives and R&D investment.

6.2. Enlightenment

The research results of this paper provide a new way for listed manufacturing enterprises in China to effectively improve the research and development ability: tax incentives can effectively promote the R&D investment of enterprises; Risk bearing ability can also affect the enterprise's R & D willingness, the stronger the enterprise's risk bearing ability, the stronger the enterprise's R & D willingness. Finally, for enterprises under government subsidies, the degree of tax incentives has a stronger effect on enterprises' R&D investment.

For the government, continue to increase the research and development support of the manufacturing industry, so that the manufacturing enterprises occupying half of the country from large to strong, gradually close to the developed countries; Improve R&D support policies, government subsidies and tax incentives should also be related to the degree of R&D demand of enterprises; R&d projects of enterprises have a long cycle, great risk and strong uncertainty. The government should evaluate enterprises when providing subsidies, but its lag should be taken into account when evaluating the effect of government subsidies and tax incentives, and the direction of funds should be tracked and supervised to ensure that certain funds flow to research and development.

For manufacturing enterprises, while ensuring their basic operation, they should strive for government subsidies and tax incentives. Government support can not only save funds for enterprises, alleviate financing constraints, but also expand more financing channels for enterprises. Enterprises should also improve the ability to cope with risks, enterprises are no longer limited by the disadvantage of R&D investment, and more actively enhance independent innovation R&D investment.

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REFERENCES

[1] Deng Weihong. The impact of tax incentives on enterprise innovation: An empirical analysis based on micro-survey data [J]. Systems Engineering, 2019, 39(03):37-47.

[2] Ding Jinjin, Zhang Zheng. The effects of government subsidies and R&D input on firm innovation performance: Based on the perspective of industry heterogeneity in manufacturing [J]. Journal of Economic Research, 2020(32):9-11.

[3] Nirupama Rao. Do tax credits stimulate R&D spending? The effect of the R&D tax credit in its first decade[J]. Journal of Public Economics, 2016, 140.

[4] Yang Xudong, ZHENG Huiqiong, Yuan Meng. The impact of Tax reduction on corporate risk bearing capacity [J]. Tax Research, 2021(02):115-121.

[5] LJUNGQVISTA. HANGL, ZUOL. Sharing Roasd5 with the Government: How Taxes Affect Corporate Roasd5 Taking [J]. Journal of Accounting Research, 2017, 55(3):669-707.

[6] Zhang Raore, Lu Jiye, Ji Donghua. Can industrial policy promote corporate risk taking? [J]. Accounting Research, 2019(7):3-11.

[7] Li Tian. Research on Government Subsidies, Innovation Efficiency and Enterprise Risk Taking [D]. Tianjin University of Finance and Economics, 2019.

[8] YAN Ruosen, Chen Jing, Li Hao. Research on the influence of government subsidies on firm innovation input based on the mediating effect of financing constraints and firm risk-taking [J]. Journal of Management, 2019, 17(08):1188-1198.

[9] Chen Tao, Zhao Jingjun. Research on government subsidy, R&D investment and profit quality [J]. Industrial Technical Economics, 2019, 39(05):91-99. (in Chinese)

[10] Yin Xiuqing, Ren Shijia, Zhang Feng. Government R&D funding, firm R&D investment and technological innovation efficiency: An empirical study from China's equipment manufacturing industry [J]. Journal of Harbin University of Commerce (Social Science Edition), 2020(03):74-84.

[11] Chen Dong, Fa Chengdi. Research on the incentive effect of government subsidies and tax incentives on enterprise innovation [J]. East China Economic Management, 2019, 33(08):5-15.

[12] HU Huaxia, Hong Hong, XIAO Lulu, Liu Wen. Tax incentives and R&D input: The mediating role of property rights regulation and cost stickiness [J]. Science Research Management, 2017, 38(06):135-143.

[13] Zhuang Qinqin. Research on the influence of financing constraints on R&D investment of Chinese manufacturing enterprises [J]. Contemporary Economic Management, 2019, 42(10):47-53.

[14] Cheng Yao, Yan Huihui. Research on the policy effect of tax incentives on enterprises' R&D input [J]. Journal of Quantitative and Technical Economics, 2018, 35(02):116-130.

[15] TANG Dapeng, Li Yuan, ZHENG Hao, WANG Bolun. Government expenditure on science and technology, fiscal policy tools and firm risk taking: An analysis from the perspective of public risk [J]. Fiscal Research, 2021(05):55-69.

[16] Chen Yanning. Incentive effect of government subsidies and tax incentives on R&D investment of enterprises: Based on empirical data of listed companies in IT industry [J]. Business Economics, 2020(07):144-147.

[17] He Kang, Wang Yunchen, Zhang Liguang, Wan Limei. Tax incentives, innovation output and innovation efficiency: An empirical test based on R&D expense deduction policy [J]. East China Economic Management, 2019, 34(01):37-48.

[18] Yang Dongmei, Wan Daoxia, Guo Junyan. Investment in R&D and firm performance: on the moderating effect of government innovation policy [J]. Shandong Social Sciences, 2021(05):129-135.

[19] Wu Qian, Pan Ailing, Liu Xin. Industrial policy support, firm life cycle and risk taking [J]. Business Economics and Management, 2019(01):74-87.

[20] Li Xiangju, Yang Huan. Industrial heterogeneity, tax incentives and independent innovation: An empirical study of A-share listed companies in China's strategic emerging industries [J]. Science and Technology Progress and Countermeasures, 2019, 36(09):60-68.

[21] Wen Zhonglin, Ye Baojuan. Moderated Mediation Model Testing: Competition or Substitution? [J]. Acta Psychologica Sinica, 2014, 46(05):714-726.

[22] Liu P. The main effect and moderating effect of physical exercise intention in predicting physical exercise behavior: Evidence based on meta-analysis [J]. Sports Science and Technology Literature Bulletin, 2019,30(04):87-91.

[23] Fang Jie, Wen Zhonglin, Liang Dongmei, Li Nini. Analysis of moderating effects based on multiple regression [J]. Psychological Science, 2015, 38(03):715-720.

[24] Bu, H., Song, J. Government Subsidies, R&D Investment, and Corporate Value: A Perspective from the Power Industry [J]. Accounting Friends, 2019, 0(8), 36-40.

[25] Wang, X., Wu, S. Tax Incentives, Financing Constraints, and Corporate R&D Investment: A Quasi-Natural Experiment Based on the Accelerated Depreciation Policy for Fixed Assets [J]. Industrial Organization Review, 2021, (1), 89-107.

[26] Liu, S., Ling, W. Multiple Mediation Models and Their Applications [J]. Psychological Science, 2009, 32(2): 433-435.