

Research on the Impact of R&D Investment Under Tax Preferences on the Long-Term Debt Paying Ability of Enterprises

——Based on the Empirical Analysis of China's Shanghai and Shenzhen Listed Companies

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Abstract

Science and technology are the primary productive forces. Nowadays, most countries attach great importance of R&D investment. According to data released by OECD and other institutions, the United States continues to rank first in the world in terms of specific R&D expenditures, with US\$612.7 billion in 2019; China After surpassing the 27 EU countries in 2015, it has been firmly ranked second, with 514.8 billion U.S. dollars in 2019. However, from the perspective of growth trends, China's R&D investment in science and technology is growing at a significantly higher rate than other countries. According to the growth rate, it is expected that China's R&D investment in science and technology is expected to surpass around 2022. In the context of the Chinese government's strong support for technological innovation of enterprises, various preferential tax policies have encouraged enterprises to invest in research and development. However, under preferential tax policies, enterprises have reduced their capital occupation, which in turn increases their cash flow and reduces their research and development. Risks promote the increase in corporate R&D investment, and the impact on corporate R&D investment in its long-term debt servicing ability is different. Therefore, under the preferential after-tax policies, it is of practical significance to study the relationship between the R&D investment of Chinese listed companies and the corporate solvency. This paper selects China's Shanghai and Shenzhen A-share listed companies as the research sample. The time span is from 2015 to 2019. A panel model is constructed and multiple regression analysis is performed to empirically test the impact of R&D investment on the long-term solvency of companies. On this basis, Incorporate taxes incentives into the model. Research shows that: R&D investment is significantly negatively correlated with corporate debt solvency; corporate R&D investment under tax incentives has a stronger impact on its long-term debt solvency.

Keywords: tax incentives, R&D investment, solvency

1. Introduction

With the continuous development of the times and the continuous development of knowledge-intensive industries, technological innovation is of strategic significance for enterprises and the country. As early as September 1975, Deng Xiaoping pointed out that science and technology are productive forces. In early 1992, when Deng Xiaoping visited the south, Deng Xiaoping once again emphasized the first productive force of science and technology. In the 18th National Congress of the Communist Party of China, it was clearly stated that "Science and technology innovation is the strategic support for improving social productivity and overall national strength, and must be placed at the core of the overall national development." "China's economy has shifted from a stage of rapid growth to a stage of high-quality development, and is now in a critical period of transforming development mode, optimizing economic structure, and transforming growth momentum." General Secretary Xi Jinping pointed out in the report of the 19th National Congress of the Communist Party of China: In the context of supporting enterprise technological innovation, a variety of preferential tax policies have encouraged enterprises to invest in R&D. However, under preferential tax policies, enterprises have reduced their capital occupation, which in turn increases their cash flow, reduces their R&D risks, and promotes with the

increase of enterprise R&D investment, the impact of enterprise R&D investment on its long-term debt servicing ability will be different. In order to study the effectiveness of China's preferential tax policies and their impact on the R&D investment and corporate performance of listed companies in Shanghai and Shenzhen, this article uses panel data of listed companies in Shanghai and Shenzhen from 2015 to 2019 as a sample and adopts a multiple regression model. From the perspective of R&D investment intensity and corporate debt solvency, analyze whether the R&D investment intensity of listed companies in Shanghai and Shenzhen under tax incentives is significant of corporate performance, and reveal the relationship between tax incentives for R&D investment and corporate debt solvency. Provide feasible suggestions for enterprises to further to improve the relevant R&D investment management mechanism, and further set up reasonable R&D investment intensity according to their own debt solvency and overall scale.

2. Literature Review

2.1 Literature on the Correlation Between R&D Investment and the Company's Long-Term Debt Solvency

Regarding the relationship between R&D investment and corporate long-term debt solvency, different scholars have reached inconsistent conclusions through empirical tests, which are manifested in two mutually opposed results:

First, R&D investment is positively related to the long-term solvency of companies. Jensen and Meckling (1976) proposed that debt financing have played a role in reducing agency costs and increasing corporate R&D revenue; Smith and Warner (1979), Gul and Tsui (1998) and others believe that debt is an important signal for high-quality companies, and the company's debt ratio The higher the company's growth opportunities, the better. Bronwyn (1992), Li and Roy (2002) found that R&D intensity is significantly positively correlated with debt ratio.

Second, R&D investment is negatively related to the long-term solvency of enterprises. Hall (1990) took the panel data of American manufacturing companies from 1973 to 1987 as a sample and found that the company's financial leverage was significantly negatively correlated with its R&D investment. Bester (1985) and Hubbard (1998) conducted a large sample study of American companies and found that the leveraged financing ratio was significantly negatively correlated with the company's intangible asset investment ratio. Zhao Longchang, Yue Yiran, and Xu Xiongwei (2021) proposed that the company's debt-to-asset ratio is negatively correlated with innovation investment, that is, the higher the company's debt-to-asset ratio, the lower the possibility of the company's R&D investment.

In addition, some scholars believe that R&D investment and the long-term solvency of enterprises are not a simple linear relationship, but a more complex relationship. Chiao (2002) research results show that debt has significantly different effects on the level of R&D investment performed by companies in different industries. In high-density R&D industries, leverage and R&D investment are positively correlated, while in relatively low R&D-density industries, it's correlation are negative; the research of Kang Sungcheon (2005) found that the debt-to-asset ratio has a U-shaped relationship with R&D intensity, and the higher the degree of debt, the more active the company is to invest in R&D.

2.2 Literature on the Correlation Between Tax Preferences and R&D Investment

This paper sorts out the related literature on government subsidies and technological innovation, and finds that the influence of government subsidies on enterprise technological innovation mainly includes the following three categories:

First, government subsidies promote technological innovation of enterprises. Singaporean scholars LeeEY and CinBC (2010) found that with the financial support of government departments, the problem of low R&D efficiency has been significantly improved, and the R&D costs of enterprises have been controlled. Research by Freitas et al. (2015) shows that with the support of government subsidies, companies will invest more in R&D; especially in companies with strong R&D capabilities and a high market share, corporate R&D is more likely to be motivated by government subsidies. Zhan Jintao, Shao Xingjuan, and Xu Meng (2019) based on the balanced panel data of listed agricultural companies from 2012 to 2014, constructed a simultaneous equation models to empirically analyze the impact of government subsidy policies on corporate R&D investment behavior. The study found that government subsidies can significantly stimulate R&D investment in enterprises.

Second, government subsidies have a depressing effect on enterprise technological innovation. Yan Zhijun and Yu Jinping (2017) pointed out that government subsidies have a negative effect on the innovation ability of enterprises, and it is easy to cause enterprises to form dependence, which makes enterprises transfer part of their energy from market competition to obtaining government subsidies. Kou Mingting, Wei Jianwu, and Ma Weinan

(2019) selected high-tech enterprises in Beijing from 2008 to 2014 as a sample, and believed that government R&D subsidy policies had a negative impact on the R&D investment of high-tech enterprises.

Third, government subsidies have a mixed effect on enterprise technological innovation. Some scholars have pointed out that there is uncertainty in the relationship between government subsidies and technological innovation, which may show a "U" shape, an inverted "U" shape, or other influences. Lin Zhouyu, Lin Hanchuan, and Deng Xinghua (2015) found that the effect of government subsidies on the patent output of enterprises is to promote first and then suppress, that is, the relationship between the two is inverted "U" shape, and the promotion of government subsidies to the patent output of enterprises is only limited. Establish within the interval. Dimos (2016)¹ believes that R&D subsidies provided by the government have neither positive nor negative effects on the R&D investment of enterprises.

2.3 Literature on the Correlation Between Tax Preferences and the Company's Long-Term Solvency

This article combs through the relevant literature on tax incentives and corporate solvency, and finds that the impact of tax incentives on corporate solvency is mainly in the following two categories:

First, tax incentives have a positive effect on the solvency of enterprises. Lin Shaochun (2020) proposed that in the operation of enterprises, obtaining subsidy income can bring a large amount of cash flow, which has a positive impact on the solvency of enterprises. Gao Xiuping and Peng Yuelan (2018) proposed that based on the analysis of the panel data of listed new energy vehicle companies, they found that tax incentives can significantly improve the solvency of new energy vehicle companies.

Second, tax incentives have a negative effect on the solvency of SMEs because they will increase R&D investment in high-risk projects after receiving government subsidies, thereby affecting their solvency. Wang Zhi and Liu Danyang (2021) believe that the large amount of cash inflow directly brought about by government subsidies has a certain degree of positive impact on the solvency of enterprises. However, the influence is only focused on the initial stage of the enterprise receiving government subsidies, and its radiation scope is only the short-term solvency of the enterprise. In the following years after receiving government subsidies, especially under the policy background of the decline of government subsidies in the past two years, the impact of government subsidies on the solvency of enterprises has gradually weakened or even become negative.

Third, the impact of tax incentives on the solvency of enterprises is not significant for a long time. Tzelepis and Skuras (2004) chose new energy vehicle listed companies as the research object of the article to study the impact of government subsidy policies on the performance of listed companies in Greece. The results show that overall, the effect of the policy implementation is not obvious. Among them, the impact of government subsidies on the solvency of enterprises is not significant in the long run.

3. Theoretical Analysis and Research Hypothesis

3.1 Research on the Impact of R&D Investment on the Corporate Solvency

In the era of rapid development of science and technology, the pace of corporate innovation cannot be delayed. More and more companies attach importance to R&D investment. Under normal circumstances, when a company has more liquidity, the debt ratio is smaller, and the company is more inclined to invest. As Lin Zhonggao (2011) wrote in the empirical study: "The higher the debt ratio of a company, the less its R&D investment". Similarly, when companies want to conduct research and development investment and other activities, the debt-to-asset ratio is particularly important. So, does R&D investment has an inverse effect on the company's debt-to-asset ratio? Debt solvency has always been the key to reviewing the healthy growth and development of an enterprise. Based on this, research on the impact of R&D investment on the solvency of an enterprise has practical significance. Therefore, this article proposes the following hypotheses:

H1: R&D investment has a negative impact on corporate solvency

3.2 The Impact of R&D Investment on the Corporate Solvency Under Preferential Tax Policies

The R&D activities of enterprises are mainly for technological innovation, so production factors and production conditions are recombined. However, due to the externality and high risk of R&D investment, enterprises' enthusiasm for R&D investment is greatly reduced, and enterprise innovation is inhibited to a certain extent. Therefore, in order to reduce the uncertainty in the R&D process of enterprises and ensure a normal supply of working capital, the preferential tax policies issued by the government have an important impact on the R&D investment of enterprises. This article first analyzes the relationship between R&D investment and the company's solvency. On this basis, the impact of after-tax incentives on R&D investment is added to the model to study the three aspects of corporate R&D investment and corporate long-term solvency under preferential tax

policies. The relationship between. Therefore, this article proposes the following hypotheses:

H2: Corporate R&D investment under preferential tax policies has a stronger negative impact on corporate long-term debt solvency

4. Research and Design

4.1 Sample Selection and Data Sources

This article selects the Shanghai and Shenzhen A-share listed companies from 2015 to 2019 as the initial sample, and processes the data as follows: exclude financial and insurance listed companies; exclude companies that have been delisted and not in business, and exclude ST, *ST, etc. Companies that have been warned of delisting risks; remove samples with missing key variable data; finally get 11064 panel data. All data comes from the CSMAR database. This article uses Excel2016 to organize data, and uses stata15.0 for empirical research.

4.2 Variable Setting

4.2.1 Explained Variable

The explained variable in this paper is the solvency of the enterprise. Existing research points out that companies generally use asset-liability ratios, equity ratios, shareholder equity ratios, interest protection multiples and their industry evaluation standards to measure their solvency (Peng, D., 2019). The debt-to-asset ratio can more intuitively reflect the capital structure of an enterprise, and it is also more significant to measure the solvency of an enterprise. Therefore, this paper uses the total debt-to-asset ratio (TDR) to measure the solvency of an enterprise. The calculation formula is: $\text{asset-liability ratio} = \frac{\text{total liabilities at the end of the year}}{\text{total assets at the end of the year}} \times 100\%$

4.2.2 Explanatory Variables

The explanatory variable of this article is the intensity of R&D investment. This article uses the amount of R&D investment/operating income to calculate the company's annual R&D investment intensity, which is represented by the symbol R&D.

4.2.3 Control Variables

Because of the differences in total assets and scale among various enterprises, this paper selects the size of the enterprise, the rate of return on total assets, and the solvency of the company as the control variables.

4.2.4 Virtual Variable

The dummy variable in this article is tax incentives. If the enterprise enjoys the deduction policy for R&D expenses in the current year, it is assigned a value of 1, otherwise it is assigned a value of 0.

Specific variable definitions are shown in Table 1.

Table 1. Variable definition

Variable type	Variable name	Variable symbol	Variable description
Explained variable	Corporate solvency	TDR	Asset-liability ratio (the ratio of total liabilities to total assets)
Explanatory variables	R&D investment intensity	R&D	The ratio of R&D investment to operating income for the year
	Enterprise size	SIZE	Ln (Total assets at the end of the period)
Control variable	Return on total assets	ROA	Ratio of net profit to total assets
	Company's solvency	LDR	Expressed by current ratio
virtual variable	Tax incentives	TAX	If the enterprise enjoys the deduction policy for R&D expenses in the current year, it will be assigned a value of 1, otherwise it will be assigned a value of 0

4.3 Model Construction

To test H1—H2, construct model (1)—model (2):

$$TDR = \alpha_0 + \alpha_1 R\&D + \alpha_2 SIZE + \alpha_3 ROA + \alpha_4 LDR + \varepsilon(1)$$

$$TDR = \beta_0 + \beta_1 R\&D + \beta_2 TAX + \beta_3 SIZE + \beta_4 ROA + \beta_5 LDR + \varepsilon(2)$$

Among them, α_0 , β_0 are constant terms, α_i , β_i ($i=1, 2, 3, 4, 5, 6$) are coefficients, and ε is a random error term.

Model 1 examines the impact of R&D investment on the solvency of an enterprise to test H1; Model 2 examines the impact of R&D investment on the solvency of an enterprise under tax incentives to test H2;

5. Empirical Research

5.1 Descriptive Statistics

5.1.1 Descriptive Statistics of Dependent Variables

First, this article uses stata15.0 to process data and perform descriptive statistics to analyze the distribution of long-term solvency in the sample companies. The statistical results are shown in Tables 2 and 3.

Table 2. Overall descriptive statistics of corporate performance

variable	Minimum	Max	Average	Standard deviation
TDR	0.015	0.990	0.437	0.205

Table 2 describes the overall status of the sample's corporate long-term debt solvency. Looking at the overall sample, the long-term solvency of listed companies in China's Shanghai and Shenzhen companies is between (0.008, 1.352), with an average value of 0.437 and a standard deviation of 0.213. According to statistics, it is found that most companies have a positive debt-to-asset ratio. This shows that Most of the high-tech enterprises have good profitability, but there are still some enterprises with lower performance.

5.1.2 Descriptive Statistics of Independent Variables and Control Variables

Table 3. Overall descriptive statistics of R&D investment

variable	Minimum	Max	Average	Standard deviation
R&D	0	119.986	5.041	5.806
LDR	0.049	67.586	2.391	2.740
ROA	-1.575	3.735	0.024	0.103
SIZE	17.826	31.036	22.380	1.522

It can be seen from the descriptive statistics in Table 3:

(1) The average value of R&D is 5.041, the maximum value is 119.986, and the minimum value is only 0. This indicates that the R&D investment intensity of different companies is very different. This may be due to the fact that the listed companies in Shenzhen and Shanghai include different industries. Depending on the degree of dependence on technological innovation, there are differences in the degree of importance they place on R&D activities. It may also be due to the lack of innovation awareness of some companies, which has led to the phenomenon of low R&D investment. The standard deviation is 5.806, which shows that the overall R&D investment intensity of my country's GEM listed companies is at a relatively stable level.

(2) Generally speaking, when the current ratio is equal to 2, it is healthy for the enterprise. The average value of LDR is 2.391, which reflects that my country's Shenzhen and Shanghai listed companies have strong short-term debt solvency. The maximum value is 67.586, the minimum value is 0.049, and the standard deviation is 2.740. This reflects the long-term debt solvency between companies. There are big differences.

(3) The difference between the maximum and minimum ROA is relatively large, the average is 0.024, and the standard deviation is close to 0, which shows that most companies have weak profitability. The China's

Shenzhen and Shanghai listed companies overall return on total assets is at a relatively stable level.

(4) The average size of SIZE companies reached 22.380, with a standard deviation of 1.522, which indicates that the scale of my country's Shenzhen and Shanghai listed companies is quite different.

5.2 Correlation Analysis

5.2.1 Correlation Analysis of R&D Investment, Corporate Long-Term Debt Solvency and Control Variables

When performing hierarchical regression analysis on data, correlation analysis should be performed first, which is mainly to test whether there is autocorrelation among the explanatory variables in the regression model, so as to ensure the feasibility of hierarchical regression analysis. Therefore, this article uses Stata15.0 to test the correlation coefficient. The analysis results in the following table mainly include the coefficients of the correlation between R&D investment, the long-term solvency of the enterprise and the control variables. The following will be based on the correlation analysis results in the table, respectively Explain the relationship between the explanatory variables and the explained variables and the control variables in the model. The analysis results are shown in Table 4 below:

Table 4. Correlation analysis results

	TDR	LDR	ROA	R&D	SIZE
TDR	1.000				
LDR	-0.054***	1.000			
ROA	-0.182***	0.025***	1.000		
R&D	-0.060***	0.033***	-0.004	1.000	
SIZE	0.515***	-0.045***	0.036***	-0.071***	1.000

Note: ***, **, and * are significant at 1%, 5%, and 10% respectively.

By observing the data in Table 4, the correlation between the variables is analyzed in detail as follows:

(1) The relationship between R&D investment and corporate solvency. It can be seen from Table 4 that the correlation coefficient between R&D investment and corporate solvency is -0.060, and it is significant at the 1% significance level. According to the positive and negative correlation coefficients between R&D investment and corporate solvency, it can be preliminarily judged that there is a negative correlation between the two, which is preliminary in line with the research hypothesis proposed in this article. Therefore, regression analysis of the relationship between the two can be performed. At the same time, it also laid a certain foundation for further research on the adjustment effect of tax preferential policies on R&D investment and corporate debt solvency. Among them, the long-term solvency of the company and the size of the company are significant at the level of 1%, this is because the size of each company is different and it can be used as an important indicator to measure the strength. Also, the size of the company has a significant impact on the long-term solvency of the company; Conversely. The long-term solvency of a company also reflects the size of its scale. Although the correlation coefficient is larger than other correlation coefficients, it does not break through the critical point of 0.7.

(2) Observing Table 4, it is found that there is a significant correlation between explanatory variables (R&D) and control variables (LDR, SIZE). This shows that in addition to considering the impact of R&D investment on corporate solvency, this paper also fully considers the impact of other related variables on corporate performance, thereby further improving the thesis model.

5.3 Regression Analysis

5.3.1 Hausmann Test

In order to ensure the robustness of the regression results, first perform the Hausman test on the panel data model. The results are shown in Table 5. The results obtained by the Hausman test support the fixed effects model.

Table 5. Hausman test results

	(b) FE	(B) RE	(b-B) Difference	Sqrt(Diag(V_b-V_B)) S.E.
R&D	0.000	0.000	0.000	0.000
LDR	-.000	-.0007	0.000	0.000
ROA	-.142	-.1613	0.020	0.002
SIZE	0.068	0.072	-.004	0.002

5.3.2 Verification of the Relationship Between R&D Investment and Corporate Solvency

This section mainly performs linear regression on the R&D investment and corporate solvency indicators of Shanghai and Shenzhen listed companies from 2015 to 2019. The relevant regression results are shown in Table 6. Prior to this, the p-value of 0.000 can be obtained by Hausmann's test, so the fixed effect is selected. The F test in the regression model is used to determine whether the regression model (1) has a significant linear relationship. The study found that the F value of the model built in this paper is 1223.02, and the Sig value is less than 0.01, so the linear relationship of the regression model is considered to be significant. Finally, from Table 6, we can see that the coefficient value of innovation investment is significantly negative, which preliminarily shows that R&D investment has a negative correlation with the long-term solvency of enterprises. Therefore, this regression result confirms Hypothesis 1.

Table 6. Empirical results of the impact of R&D investment by Shanghai and Shenzhen listed companies on corporate debt solvency

Variable	Non-standardized coefficient	Sig
β_0	-1.261***	0.000
R&D	-.001***	0.004
LDR	-.0018***	0.001
ROA	-.295***	0.000
SIZE	0.077***	0.000
F value	1223.020***	0.000
R ²	0.3067	
R ² -Adjust	0.3064	

Note: ***, **, and * are significant at 1%, 5%, and 10% respectively.

5.3.3 Verification of the Relationship Between Corporate R&D Investment and Corporate Long-Term Debt Solvency Under Preferential Tax Policies

5.3.3.1 No Tax Incentives

Table 7. Empirical results of the impact of R&D investment on corporate solvency without tax incentives

Variable	Non-standardized coefficient	Sig
β_0	-1.251 ^{***}	0.000
R&D	-.001 ^{**}	0.023
LDR	-.0015 ^{**}	0.044
ROA	-.278 ^{***}	0.000
SIZE	0.0760 ^{***}	0.000
F value	767.320 ^{***}	0.000
R ²	0.327	
R ² -Adjust	0.326	

Note: ***, **, and * are significant at 1%, 5%, and 10% respectively.

Table 7 shows that the correlation coefficient of R&D investment on corporate solvency is -1.251, and it is significantly correlated at the 1% level, which fully shows that R&D investment has a significant negative impact on corporate solvency.

5.3.3.2 There Are Tax Incentives

Table 8. Empirical results of the impact of R&D investment on corporate solvency when tax incentives are available

Variable	Non-standardized coefficient	Sig
β_0	-1.286 ^{***}	0.000
R&D	-.001 [*]	0.069
LDR	-.002 ^{**}	0.011
ROA	-.330 ^{***}	0.000
SIZE	0.0778 ^{***}	0.000
F value	454.220 ^{***}	0.000
R ²	0.279	
R ² -Adjust	0.278	

Note: ***, **, and * are significant at 1%, 5%, and 10% respectively.

Table 8 shows that under the conditions of tax incentives, the correlation coefficient of R&D investment on corporate solvency is -1.286, which is also significantly correlated at the 1% level, which fully shows that R&D

investment has a significant negative effect on solvency.

By observing Table 7 and Table 8, it can be found that for dummy variable tax incentives TAX, in Table 7, the adjusted R² of the regression model is 0.326; tax incentives TAX are added to Table 8 After the middle, the adjusted R² is 0.278. By comparing the adjusted R² of the two models, it can be found that R² in Table 8 is smaller than R² in model 5.3.3.1. Therefore, the significant negative impact of tax incentives on R&D investment and corporate solvency is existing. And the F test results of Table 7 and Table 8 are both significant, so the goodness of fit of the two models is acceptable.

By observing Table 8, further analyze the impact of tax incentives on the relationship between R&D investment and corporate solvency. By observing the data in Table 7 and Table 8, it is found that the correlation coefficient has changed from -1.251 to -1.286, and it is significant at the 1% significance level. It is concluded that tax incentives have a stronger impact on the significant negative correlation between R&D investment and corporate solvency. Hypothesis 2 of this article has been verified.

5.4 Robustness Test

In order to test the robustness of the aforementioned hypothetical results, this paper uses the variable measurement method and the substitution variable to test: replace the total asset return ROA with the cash flow liability ratio Cash Coverage Ratio (CCR) to measure corporate profitability. Table 9 shows the results of the robustness test of Hypothesis 1.

Table 9. Robustness test: the impact of corporate R&D investment under tax incentives on corporate long-term debt solvency

Variable	Model 5.3.3.1 Non-standardized coefficient
β_0	-1.261 ^{***}
R&D	-.0007 ^{***}
LDR	-.002 ^{***}
CCR	-.295 ^{***}
SIZE	0.077 ^{***}
F value	1223.02 ^{***}
R ²	0.307
R ² -Adjust	0.306

Note: ***, **, and * are significant at 1%, 5%, and 10% respectively.

From the regression results in Table 9, it can be seen that the coefficient of R&D investment is significantly negative. This result further verifies Hypothesis 1: R&D investment has a negative impact on the solvency of enterprises, which requires enterprises not to pay too much attention to R&D because the continuous increase in investment will reduce the ability of enterprises to resist risks. The following Table 10 mainly conducts the robustness test on Hypothesis 2. The specific results are as follows:

Table 10. Robustness test: the impact of tax incentives on the relationship between R&D investment and corporate solvency

Variable	Model 5.3.3.2	
	(1)No tax incentives	(2)There are tax incentives
	Non-standardized coefficient	Non-standardized coefficient
β_0	-1.251 ^{***}	-1.286 ^{***}
R&D	-0.001 ^{**}	-0.002 [*]
LDR	-0.002 ^{**}	0.002 ^{**}
CCR	-0.278 ^{***}	-0.330 ^{***}
SIZE	0.075 ^{***}	0.078 ^{***}
F	767.320 ^{***}	454.220 ^{***}
R ²	0.326	0.278
R ² -Adjust	0.326	0.278

Note: ***, **, and * are significant at 1%, 5%, and 10% respectively.

From the regression results in Table 10, it can be seen that the coefficient of R&D investment is significantly negative. This result further validates Hypothesis 1: For Shanghai and Shenzhen listed companies, R&D investment has a negative impact on the solvency of the company. Through observation model 5.3.3.2, it is found that in the absence of tax incentives, the company's R&D investment coefficient is -1.251; in the case of tax incentives, the company's R&D investment coefficient is -1.286, so the enterprise R&D under the tax incentives Investment has a stronger negative impact on the long-term solvency of enterprises, and Hypothesis 2 has been verified. And it can also be seen that in model 5.3.3.2, the adjusted R² of model (2) is greater than the adjusted R² of model (1), which further validates hypothesis 2. Therefore, under the preferential tax policies, R&D investment has a stronger negative impact on the solvency of enterprises.

6. Conclusion and Suggestion

6.1 Conclusion

This article selects Shanghai and Shenzhen A-share listed companies from 2015 to 2019 as a sample to conduct empirical testing and analysis on the impact of R&D investment under tax incentives on the long-term solvency of companies. This paper uses the selected 11064 panel data as the research object to conduct an empirical test to explore the relationship between R&D investment and corporate long-term debt solvency, and the impact of R&D investment on corporate long-term debt solvency under preferential tax policies. The empirical results found that: (1) R&D investment has a negative impact on the long-term debt solvency of enterprises; (2) R&D investment of enterprises with tax incentives has a stronger negative impact on the long-term debt solvency. In order to test the robustness of the aforementioned hypothetical results, this article changes the variable measurement method and tests the substitution variables, and the results obtained further verify the robustness of the hypothesis.

6.2 Suggestion

6.2.1 Reasonably Use Government Subsidies and Use Financial Leverage to Optimize the Financial Structure of the Company

Enterprises should rationally use and distribute the government subsidies they receive, increase the proportion of government subsidies invested in technology research and development, and strengthen the management and supervision of research and development investment, rational use of research and development funds, while reducing unnecessary costs and expenses, and improving use efficiency. Issue bonds and bank loans, carry out

debt financing, flexibly use financial leverage, optimize the financial structure of enterprises, get rid of dependence on government subsidies, and promote the sustainable development of enterprises.

6.2.2 Shanghai and Shenzhen A-share Companies Should Control the Company's Asset-Liability Ratio Within a Reasonable Range

The debt-to-asset ratio is too high, and the company is under pressure to repay the debts of creditors, which will affect the operation of the company in severe cases. In this case, creditors are usually unwilling to lend funds to the company, which brings high risks to themselves. Enterprise managers should consider improving the solvency of the enterprise so that the innovation efficiency of the enterprise can play the greatest role in the innovation investment.

6.2.3 Strengthen the Supervision of Government Subsidies

6.2.3.1 For government subsidy funds, a special account shall be established and a special person shall be assigned to conduct management and supervision. Note that the special funds should be used exclusively during the supervision process and cannot be mixed with other funds. Assign a dedicated person to keep the funds, and strictly record the source and distribution of each fund. At the level of corporate supervision, the government should pay attention to whether companies use government-supported funds as planned, and conduct surprise inspections after regular inspections. Companies are strictly prohibited from embezzling them for other purposes.

6.2.3.2 The issuance of government subsidy funds should be specifically combined with the capital needs of the enterprise and rationally allocated. To avoid unnecessary investment of funds, it is also necessary to avoid the occurrence of untimely subsidy funds. It is necessary to communicate with enterprises in a timely manner to improve the efficiency of capital utilization. At the same time, the scale and timing of capital investment are in place. Before starting capital investment, a detailed analysis of the company's capital needs and usage conditions must be done to achieve reasonable and effective investment.

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