

The Impact of Financing Capacity on R & D Investment

— Empirical Analysis Based on Micro Data of Manufacturing Enterprises in Guangdong

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Abstract

Under the background of the rapid expansion of R & D investment of industrial enterprises in China, this paper based on the 2005-2007 China Industrial Enterprise Database, conducted research on manufacturing enterprises in Guangdong Province, and used the micro-data at the enterprise level to empirically study the impact of financing capacity on R & D investment. It is found that the financing ability of enterprises has a significant positive effect on their R & D investment. Among them, with the expansion of the scale of enterprises, the promotion of corporate financing capacity to its R & D investment has gradually increased; the financing capacity has also significantly affected the R & D investment of all types of enterprises, and for state-owned enterprises, foreign-funded enterprises and Hong Kong, Macao and Taiwanese investment enterprises. The impact is significantly stronger than that of the private sector. Its promoting effect is not affected by regional differences. Finally, based on the results of the quantitative analysis and the actual situation in Guangdong Province, the author has put forward some countermeasures and suggestions.

Keywords

Financing Capacity, R & D Investment, Manufacturing Enterprises

1. Introduction

As known to all, since the implementation of reform and opening up in China, with the gradual establishment of the household contract responsibility system and the socialist market economic system, China's economy has achieved

leap-forward development, Guangdong Province has become the frontier of reform and opening up, Guangdong's economy has been with the rapid development, and the achievements of this economic development are world-famous. After entering the 21st century, with the gradual arrival of the knowledge economy and the continuous improvement of China's scientific and technological level, the economy of Guangdong Province has developed more rapidly, with the gradual adjustment and transformation of Guangdong's economic structure, and the level of opening up to the outside world. With the continuous improvement, its industrial enterprises, especially manufacturing enterprises, are facing increasing competitive pressure. It is true that in such a technological competitive environment, enterprises can only continue to develop if they continue to carry out technological innovation. Moreover, according to the new economic growth theory, technological progress is the core driving force for economic growth. However, an important way of technological progress is the improvement of corporate R & D capabilities. Obviously, enterprises are the micro-subjects of the social economy. The improvement of R&D capabilities of enterprises can help enterprises develop new products and improve product quality; besides improving the production efficiency of enterprises to a certain extent can enable the company to improve its core competitiveness and promote the overall progress of social technology and the rapid growth of the social economy. Therefore, the research on the impact of financing capacity on corporate R & D investment has certain theoretical and practical significance.

By studying the relevant literature, we can find that the impact of corporate financing ability on R & D investment has not been reached until now, and the relevant research of foreign scholars mainly focuses on developed countries. The research is still relatively rare, and research on some provinces in China is rare. However, the financing capacity of developing country enterprises is different from that of developed countries. Moreover, at present, China's domestic research on the impact of corporate financing capabilities on its R & D investment is relatively small. Fazzari *et al.* [1] used the Tobin Q investment model and Value Line data to study the relationship between corporate investment and cash flow sensitivity, and the results of the study found that corporate investment behavior is a comparison of corporate cash flow sensitive. Hall [2] studied the impact of cash flow on corporate R & D investment based on US manufacturing data from 1973 to 1987. It was found that corporate cash flow has a significant positive correlation with R & D investment. However, the scholar Bond *et al.* [3] found that there is no correlation between the internal cash flow of the enterprise and the R & D investment of the enterprise through internal research. The internal cash flow has no influence on the R & D behavior of the enterprise. Lu Xin *et al.* [4] took high-tech listed companies as research objects and found through research that corporate cash flow will promote the R & D investment intensity of enterprises. Yan Xiaosheng *et al.* [5] used the method of calculating the SA index of each enterprise based on the data of industrial enterprises of

listed companies. Moreover, using the size of the index to measure the strength of the financing ability of the enterprise, they found through research that the more restrictive in external financing in the worst case, the incentive for companies to continue to innovate through internal and working capital is greater. Sun Xiaohua *et al.* [6] based on the research results of large and medium-sized industrial enterprises show that there is a significant positive correlation between firm R & D intensity and internal cash flow. Luo Jun [7] found that when the use of interest expenses as a percentage of sales revenue to measure financing constraints, if the destination of foreign direct investment of enterprises is developed countries, the impact of financing constraints on enterprise technological innovation is not significant, and If the investment destination is a developing country, financing constraints can significantly hinder technological innovation.

It can be seen that the R & D investment of enterprises is affected to some extent by the financing ability of enterprises. Therefore, this paper is based on the industrial enterprise database and selects the manufacturing enterprises in Guangdong Province to empirically study the impact of financing capacity on R & D investment of enterprises, and Further research and analysis were carried out on the manufacturing enterprises in Guangdong by region, enterprise scale and ownership type.

The article is organized as follows. In the next section, we discuss the data and our strategy for estimating the impact of financing capacity on R & D investment. Then, we develop the robustness test analysis. Finally, we draw some conclusions and put forward several suggestions.

2. Data Description and Measurement Model

2.1. Data Description

The micro-level data of this paper mainly comes from the “China Industrial Enterprise Database”. Since the industrial enterprise data in 2004 and 2008 lacks the key indicators of enterprise R & D investment, the sample selected in this paper is manufactured in Guangdong Province from 2005 to 2007. Because the data of China Industrial Enterprise Database has not been updated to 2017-2018, this paper uses data from 2005 to 2006.

In order to ensure the data quality of the paper, the research conclusions of this paper are more credible. The author has done some processing on the collected raw data as follows: First, only the manufacturing enterprise data of Guangdong Province is retained; secondly, only those who are in business are retained. Enterprise data for the state; then, delete some duplicate or erroneous observations of the same year; then, exclude those records where the key indicators have missing or obvious errors (e.g., excluding industrial gross value, industrial added value, total fixed assets), the total assets and the total number of employees at the end of the year are 0 or negative. Such enterprises with abnormal data; in addition, the total amount of current assets exceeds the total of assets, and the total of fixed assets exceeds the total of assets. Finally, the author also

removed some small-scale enterprise samples, that is, those who had less than 8 employees at the end of the year. In addition, we remove samples with missing values.

2.2. Measurement Model

2.2.1. Model Construction

Through the previous analysis, we can know that enterprises will face financing ability from within and outside the enterprise when conducting R & D investment behavior. In this paper, the author mainly considers the external financing ability that the enterprise faces, namely this article. The financing capacity referred to in the term is external financing capability. Therefore, in order to study the impact of external financing ability on corporate R & D investment, and to combine the actual information content of our sample data, to explore the actual relationship between corporate R & D investment behavior and financing ability, the author has constructed the following econometric model:

$$_Rdexp_{it} = \alpha + \beta \ln taxrate_{it} + \gamma \chi_{it} + industry_i + city_t + year_t + \varepsilon_{it}$$

Among them, the equation represented by the variable set χ_{it} is as follows:

$$\begin{aligned} X_{it} = & \gamma_0 + \gamma_1 curassratel_{it} + \gamma_2 per_output1_{it} + \gamma_3 idebratel_{it} \\ & + \gamma_4 longidebt4_{it} + \gamma_5 age_{it} + \gamma_6 kldensity1_{it} \end{aligned}$$

where i is the enterprise entity, t represents year, X_{it} is a set of other control variables that affect the R & D investment behavior of the enterprise, and $city_t$, $industry_i$ and $year_t$ are the urban fixed effects, industry fixed effects and time fixed of the model respectively. The effect, ε_{it} , is the random perturbation term of the model.

2.2.2. Variable Indicator Selection

It is true that in the context of economic and social development in Guangdong Province, there are many factors affecting the R & D investment behavior of enterprises. However, this paper is based on the actual situation of the development of manufacturing enterprises in Guangdong Province, and based on the availability and indicators of relevant data. The quantitative principle incorporates indicators such as R & D investment, financing capacity, corporate current assets ratio, per capita output, corporate debt ratio, long-term debt ratio of enterprises, enterprise age and capital intensity into the econometric model analysis. The specific indicators are as follows:

In this paper, R & D investment is used as the explanatory variable, which is represented by $_Rdexp_t$. Its measurement index is the research and development cost of the enterprise. This index is a good measure of the R & D investment of the enterprise. Obviously, the larger its value, the more it reflects the company's R & D investment will increase. Through the analysis of the data, the author knows that the expenditure of research and development expense items of most manufacturing enterprises is 0. If it is directly logarithmized, it will obviously lead to the occurrence of a large number of missing values. Therefore, the author

handles this. The method is: add 1 to the variable and then take the logarithm.

Based on the research purpose of this paper, the author sets the key explanatory variables of the model as the financing ability of the enterprise. In this paper, the financing ability of the enterprise mainly refers to the external financing ability faced by the enterprise, that is, the difficulty for the enterprise to obtain funds from the outside. Easy level. Since the sample of this study is all manufacturing enterprises above designated size in Guangdong Province, among them, there are very few enterprises that can be financed by issuing stocks or bonds. Most of the manufacturing enterprises are financing through bank credit. Li *et al.* [8] believe that the financing ability of a company is related to the interest payment of the enterprise to a certain extent, that is, the bank loan obtained by the enterprise will increase with the increase of interest payment, which reflects the financing ability of the enterprise. Happening. Therefore, the author uses the interest-to-income ratio of the enterprise to measure the financing ability of the enterprise. Its specific formula is: interest expenditure/fixed assets total, which obviously controls the scale factor of the enterprise. After the data processing, it is found that there are many interest expense ratios. A value of 0, if directly logarithmized, will also generate a large number of missing values, so I still take the logarithm after adding 1 to the interest expense ratio.

In addition, X_{it} in the model refers to a set of other control variables that affect the R & D investment behavior of the enterprise, including: the ratio of corporate liquid assets ($curassrate1_{it}$), calculated by dividing the total value of the company's current assets by the natural logarithm of the total assets; The per capita output ($per_output1_{it}$) is measured by the natural logarithm of the ratio of the industrial production value of the enterprise to the total number of employees at the end of the year; the enterprise debt ratio ($idebrate1_{it}$) is the total debt of the enterprise using the total assets of the enterprise. The natural logarithm value after the proportion is reflected; the long-term debt ratio ($longidebt1_{it}$) of the enterprise is calculated by the proportion of the total long-term liabilities of the enterprise in its total assets. Because there is a large number of zero values, the value of the calculation is also added. 1 then take the logarithm; the age of the enterprise (age_{it}), the author uses the difference between the year and the establishment year of the enterprise; the capital intensity of the enterprise ($kldensity1_{it}$), the total fixed assets of the enterprise divided by the total number of employees at the end of the year Naturally represented by a numerical value. Finally, the paper also controls the fixed effects of the city ($city_i$), industry ($industry_i$) and year ($year_t$). Moreover, the economic meanings of the parameters in the model are: β is the elasticity of the R & D investment of the enterprise to the financing ability of the enterprise, and γ is the elasticity of the R & D investment of the enterprise to various enterprise characteristics. In addition, the paper also divides the selected manufacturing enterprises into state-owned enterprises, private enterprises, Hong Kong, Macao and Taiwanese investment enterprises and foreign-funded enterprises, and divides manufacturing enter-

prises into large enterprises, medium-sized enterprises and small and micro enterprises, and Guangdong manufacturing enterprises. It is classified into the Pearl River Delta, Yuedong, Yuexi, Yuebei and other regions, and the binary dummy variables are introduced into the equations to control the investment characteristics of enterprises with different ownership types, different scales and different regions. The influence of the measurement results in this paper is tested to enhance the credibility of the conclusions of this paper.

In summary, the selection of relevant indicators in this paper can be summarized as **Table 1**.

2.3. Results and Analysis

2.3.1. Preliminary Measurement Analysis

This paper selects the data of the relevant indicators of manufacturing enterprises in Guangdong Province from 2005 to 2007 to establish panel data. By constructing the econometric model and using Stata13.0 software for quantitative analysis, the paper studies the impact of financing ability on R & D investment. Among them, the data in this paper is mainly from the “China Industrial Enterprise Database”, and the author also carried out the necessary sorting of relevant data collected. Moreover, due to the difference in the measurement units of each indicator, this may cause the occurrence of heteroscedasticity. Therefore, the author uses logarithmic processing on the relevant data of the selected indicators before the model estimation. Descriptive statistical analysis of the main indicators of this paper and the correlation analysis between the variables are shown in **Table 2**.

From **Table 3**, we can see the correlation between the enterprise R & D investment and the variables in the model. From the table, we can see that the company’s R & D investment and financing capacity, corporate liquidity ratio, per capita output, long-term debt ratio, enterprise age and capital intensity are significant at the level of 1%. It shows that the R & D investment and financing ability of the enterprise has a significant positive correlation. This shows that the

Table 1. Relevant variable indicator selection.

variable	Measurement method
R & D investment	$\ln(\text{Research and development costs} + 1)$
Interest expense ratio	$\ln(\text{Interest expense}/\text{Total fixed assets})$
Current assets ratio	$\ln(\text{Total current assets}/\text{Total assets})$
Per capita output	$\ln(\text{Industrial production value of the year}/\text{Total employee at the end of the year})$
Debt ratio	$\ln(\text{Total Liabilities}/\text{Total assets})$
Long-term debt ratio	$\ln(\text{Total long-term liabilities}/\text{Total assets} + 1)$
Business age	Present year- Year of establishment
Capital intensity	$\ln(\text{Total fixed assets}/\text{Total employee at the end of the year})$

Table 2. Descriptive statistical analysis of main indicators.

indicators	Observations	Mean	Standard deviation	Min	Max
_Rdexp	56,542	0.6143	1.9148	0	15.7816
Intaxrate	56,525	0.0240	0.1124	-4.9910	5.6802
curassrate1	56,542	-0.5354	0.5137	-6.2425	-0.0001
per_output1	56,544	5.4126	1.0175	0.1354	13.5200
idebtrate1	56,324	-0.8020	0.8444	-11.6182	2.8507
longidebt1	56,544	0.0291	0.0905	0	2.1092
age	56,544	9.5895	7.6993	0	407
kldensity1	56,544	3.4623	1.4575	-6.0799	14.3609

Data source: According to the relevant data of China Industrial Enterprise Database from 2005 to 2007.

Table 3. Spearman correlation analysis between variables.

	_Rdexp	Intaxrate	curassrate1	per_output1	idebtrate1	longidebt1	age	kldensity1
_Rdexp	1.0000							
Intaxrate	0.1207*	1.0000						
curassrate1	0.0201*	-0.0923*	1.0000					
per_output1	0.1192*	0.1324*	0.0448*	1.0000				
idebtrate1	-0.0211*	0.0991*	0.2467*	0.0289*	1.0000			
longidebt1	0.1006*	0.2173*	-0.1965*	0.0631*	0.0947*	1.0000		
age	0.0496*	0.0324*	-0.0460*	-0.0567*	-0.1322*	0.0868*	1.0000	
kldensity1	0.0954*	0.1461*	-0.5890*	0.4692*	-0.1528*	0.2292*	0.0849*	1.0000

Data source: According to the relevant data of China Industrial Enterprise Database from 2005 to 2007. Note: * indicates a level of significance at 1%.

improvement of the financing ability of the enterprise has a significant impact on its R & D investment behavior, that is, the financing ability has a certain promotion effect on the R & D investment of the enterprise.

2.3.2. Model Estimation Result Analysis

The author substitutes the logarithmized panel data into the econometric model to study the impact of the financing capability index on the R & D investment of the enterprise and uses the Stata13.0 statistical software to estimate the model and measure the results. A statistical analysis was carried out and the estimated results are as **Table 4**.

According to the econometric model established in this paper, the author adds the explanatory variables selected in this paper to the regression equation-financial ability and a series of control variables that affect the R & D investment of the enterprise (liquid assets ratio, per capita output). Out, corporate debt ratio, long-term debt ratio, enterprise age and capital intensity, etc., and the fixed effects of cities, industries and years are always controlled in all regression equations. The specific model estimation results can be seen in **Table 4**. Columns (1)

Table 4. The impact of financing capacity on corporate R & D investment.

variables	Model							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intaxrate	0.556*** (0.078)	0.549*** (0.078)	0.428*** (0.074)	0.421*** (0.074)	0.407*** (0.074)	0.602*** (0.076)	0.582*** (0.075)	
Intaxrate1								0.483*** (0.102)
curassrate1		0.025* (0.013)	-0.014 (0.013)	-0.020 (0.013)	-0.007 (0.014)	0.188*** (0.016)	0.170*** (0.016)	0.164*** (0.021)
per_output1			0.286*** (0.010)	0.286*** (0.010)	0.286*** (0.010)	0.180*** (0.010)	0.203*** (0.010)	0.215*** (0.013)
idebrate1				0.016** (0.007)	0.007 (0.007)	0.022*** (0.007)	0.029*** (0.007)	0.033*** (0.009)
longidebt1					0.404*** (0.079)	0.242*** (0.078)	0.195** (0.078)	0.250** (0.098)
age						0.153*** (0.007)	0.141*** (0.007)	0.143*** (0.009)
kldensity1							0.020*** (0.001)	0.020*** (0.002)
constant	3.272*** (1.045)	3.316*** (1.047)	0.718 (0.980)	0.743 (0.978)	0.737 (0.979)	0.891 (1.016)	0.585 (1.019)	1.074 (1.298)
year dummies	YES	YES	YES	YES	YES	YES	YES	YES
city dummies	YES	YES	YES	YES	YES	YES	YES	YES
industry dummies	YES	YES	YES	YES	YES	YES	YES	YES
observation	56523	56521	56521	56301	56301	56301	56301	37581
R2	0.107	0.107	0.125	0.125	0.125	0.131	0.136	0.136

Data source: According to the relevant data of China Industrial Enterprise Database from 2005 to 2007. Note: 1) the value in parentheses is a stable standard error corresponding to the estimated coefficient of the variable. 2) *, **, *** indicate the level of significance at 10%, 5%, and 1%, respectively.

through (7). Based on the data and model of this paper, this paper mainly studies the impact of the financing ability of enterprises on the R & D investment of enterprises. Therefore, according to the purpose of this research, the key variable of this paper is the financing ability, that is, the interest expense ratio of enterprises. From the model estimation results in the above table, it can be seen that the impact of the company's financing ability on the company's R & D expenditure is significantly positive at the level of 1%, which clearly shows that the company's financing ability is robust to the company's R & D investment. The promotion role, that is, the increase in corporate financing capacity increases the R & D expenditure of manufacturing enterprises. According to the model estimation results in the column (7), we can find that for each unit of financing capacity of the enterprise, the R & D expenditure of the enterprise will increase by 0.582 units.

In terms of control variables, variables such as current assets ratio, per capita output, corporate debt ratio, long-term debt ratio, enterprise age and capital in-

tensity are also positively related to R & D investment of enterprises. Among them, the ratio of the current assets of the enterprise has a significant effect on the R & D expenditure of the enterprise. That is, the higher the ratio of the current assets of the enterprise, the higher the R & D expenditure of the enterprise, which reflects the internal financing ability of the enterprise to some extent. Expenditure also has a certain role in promoting. Moreover, the capital intensity of the company is also positively related to the company's R & D expenditure and is significant at the level of 1%. The results show that the higher the capital intensity of the enterprise, the higher the R & D investment of the enterprise. Capital-intensive manufacturing companies are more inclined to carry out technological innovation, develop research projects, and increase R & D expenditures, thereby improving their R & D capabilities. In addition, the debt ratio and long-term debt ratio of the company also promote the R & D expenditure of the enterprise to a certain extent. Since these two indicators measure the financial leverage level of the enterprise, the increase of corporate liabilities will promote the R & D of the enterprise to a certain extent. expenditure. In addition, the per capita output of the enterprise and the age of the enterprise also have a significant role in promoting the R & D expenditure of the enterprise. That is, the higher the per capita output of the enterprise and the longer the enterprise, the more expenses the enterprise spends on research and development. It is true that among these control variables, the per capita output index of the enterprise has the largest marginal impact on the R & D investment expenditure of the enterprise. When the per capita output increases by one unit, the R & D expenditure of the enterprise increases by 0.203 units.

Admittedly, we need to pay special attention to the solution of endogenous problems before model regression analysis. We know that the causes of endogenous problems are as follows: measurement error, missing variables and reverse cause and effect. Since enterprise R & D often requires sustained high investment, this will lead to higher debt ratios and increase the difficulty of financing. In addition, the credit department may also believe that it has higher productivity due to the company's R & D projects. Loans to this business may reduce the difficulty of financing. It can be seen that there is a certain reverse causal relationship between the financing ability of the enterprise and the R & D investment of the enterprise. This obviously leads to certain endogenous problems in the research of this paper. Due to the existence of endogenous problems, the model estimation results in this paper will appear certain. The deviation, which will make the conclusion of this paper lack credibility, therefore, according to the author's model in this paper, the enterprise financing ability index—the first period lag of the enterprise interest expense ratio is added to reduce the possible existence of this paper. For the specificity, the specific model estimation results can be found in column (8) of the above table. From the results in the table, it can be seen that the impact of the first-phase lag of corporate financing capacity on the R & D investment of the enterprise is still significantly

positively correlated. This indicates that the financing ability of the previous period of the enterprise is still the R & D expenditure of the current enterprise. It is stimulating and, at the level of 1%, is significant, which also indicates that the model estimates based on this paper are robust.

3. Robustness Test Analysis

In order to make the conclusions of this paper more convincing, the author conducts further comparative analysis by dividing the sample into different sub-samples, so as to test the robustness of the measurement results and enhance the credibility of the research conclusions.

3.1. The Impact of Different Regions on Corporate R & D Investment

Obviously, the level of economic development in the region will also affect the development of manufacturing enterprises to a certain extent. Since the reform and opening up, although the economic level of Guangdong Province has been greatly improved as a whole, there is indeed a regional economic development. The status quo of balance. Here, according to the research needs, the author has made a necessary division of the sample of manufacturing enterprises in Guangdong Province. The criteria for the division are: the region to which the enterprise belongs is the Pearl River Delta region, the eastern Guangdong region, the western Guangdong region, or the northern Guangdong region. Among them, the measurement results of the sub-samples are as **Table 5**.

It can be seen from the model estimation results in the above table that although the financing capacity of the enterprises in the northern Guangdong region is not significant for the R & D expenditure of the enterprise, it is not significant for the Pearl River Delta, Yuedong and Yuexi. The R & D investment expenditure of manufacturing enterprises is a significant positive correlation. Specifically, the financing capacity of enterprises in the eastern part of Guangdong has the greatest impact on the R & D expenditure of the enterprise. That is to say: for each unit of financing capacity of the enterprise, the R & D investment expenditure of the enterprise will increase by 2.343 units. Secondly, for the Pearl River Delta region, for each additional unit of corporate financing capacity, its R & D expenditure will increase by 0.500 units. Finally, for the western Guangdong region, corporate R & D expenditures are also positively correlated with their financing capabilities. That is, corporate R & D expenditures will increase by 0.423 units as their financing capacity increases by one unit. However, in general, the financing ability of enterprises has a significant role in promoting R & D investment of enterprises. It can be seen that the research conclusions of this paper have certain stability in the region.

3.2. The Impact of Different Scales on Corporate R & D Investment

Since the financing constraints faced by enterprises of different scales will be different,

Table 5. Differences between companies in different regions.

Variables	Pearl River Delta	Yuedong	Yuexi	Yuebei
Intaxrate	0.500*** (0.077)	2.343*** (0.568)	0.423** (0.201)	0.622 (0.378)
curassrate1	0.243*** (0.019)	0.246*** (0.042)	0.110 (0.069)	0.201*** (0.044)
per_output1	0.214*** (0.011)	0.017 (0.031)	0.089* (0.049)	0.049 (0.043)
idebrate1	0.025*** (0.008)	0.071*** (0.020)	0.049 (0.031)	-0.019 (0.035)
longidebt1	0.285*** (0.098)	0.250 (0.263)	-0.288 (0.243)	-0.581*** (0.169)
age	0.023*** (0.002)	0.004 (0.003)	0.012** (0.005)	0.013*** (0.004)
kldensity1	0.143*** (0.008)	0.077*** (0.027)	0.134*** (0.032)	0.175*** (0.029)
constant	-0.041 (1.261)	5.885*** (0.234)	-2.080*** (0.494)	-0.687** (0.305)
year dummies	YES	YES	YES	YES
city dummies	YES	YES	YES	YES
industry dummies	YES	YES	YES	YES
observation	45695	5910	2440	2256

Data source: According to the relevant data of China Industrial Enterprise Database from 2005 to 2007. Note: 1) the value in parentheses is a stable standard error corresponding to the estimated coefficient of the variable. 2) *, **, *** indicate the level of significance at 10%, 5%, and 1%, respectively.

the financing ability of enterprises will change with the scale of enterprises. In the process of enterprise development, there are indeed different scales. Here, according to the research needs, the author divides the manufacturing enterprises in Guangdong Province into large-scale enterprises, medium-sized enterprises and small and micro enterprises according to the total number of employees at the end of the year, to further test the conclusions of this paper in enterprises of different scales. The robustness of the situation. Among them, the measurement results of the sub-samples are as **Table 6**.

From the estimation results of the measurement model in the above table, we can clearly see that with the gradual expansion of the scale of manufacturing enterprises, the degree of influence of corporate financing capacity on corporate R & D investment expenditure is also increasing. Through the analysis of the regression results, it can be seen that whenever the corporate financing capacity is increased by one unit, the research and development expenditure of small and micro enterprises can be increased by 0.408 units, and the research and development investment expenditure of medium-sized enterprises can be increased by 0.599 units. The R & D investment of large-scale enterprises has increased the most, which can increase by 2.364 units. It can be seen that corporate financing capacity has the greatest impact on large-scale manufacturing enterprises and is

Table 6. Differences between companies of different sizes.

Variables	Large-scale enterprise	Medium-sized enterprise	Small and micro enterprise
Intaxrate	2.364* (1.286)	0.599*** (0.217)	0.408*** (0.068)
curassrate1	0.236** (0.115)	0.237*** (0.041)	0.136*** (0.015)
per_output1	0.820*** (0.075)	0.463*** (0.029)	0.113*** (0.010)
idebrate1	0.009 (0.059)	0.028 (0.020)	-0.003 (0.007)
longidebt1	1.792** (0.714)	-0.092 (0.212)	0.258*** (0.073)
age	0.023*** (0.007)	0.014*** (0.003)	0.005*** (0.001)
kldensity1	0.112** (0.054)	0.190*** (0.019)	0.083*** (0.007)
constant	2.081 (1.689)	-1.871*** (0.251)	1.786* (1.024)
year dummies	YES	YES	YES
city dummies	YES	YES	YES
industry dummies	YES	YES	YES
observation	3661	11670	40970

Data source: According to the relevant data of China Industrial Enterprise Database from 2005 to 2007. Note: 1) the value in parentheses is a stable standard error corresponding to the estimated coefficient of the variable. 2) *, **, *** indicate the level of significance at 10%, 5%, and 1%, respectively.

significant at the level of 10%. This suggests that for larger companies, R & D investment spending is more sensitive to changes in financing capacity, while R & D investment in smaller companies is less sensitive to changes in financing capacity. However, in general, whether it is a large-scale enterprise, a medium-sized enterprise, or a small and micro enterprise, the impact of the financing ability of the enterprise on the R & D investment of the enterprise is still significantly positive. It can be seen that the research conclusions of this paper are different. The scale of the enterprise sample also has a certain degree of robustness.

3.3. The Impact of Different Ownership Types on Corporate R & D Investment

Based on some previous research results, we can find that the type of ownership of the enterprise may also affect the difficulty of financing the R & D project. In order to test the impact of corporate financing ability on corporate R & D investment in the sample of different ownership types of enterprises, the author has made necessary divisions of selected enterprise samples, and divided Guangdong manufacturing enterprises into state-owned enterprises, private en-

terprises, Hong Kong and Macao. Taiwanese investment companies and foreign-funded enterprises have carried out regression analysis on each subsample. Among them, the measurement results of the sub-samples are as **Table 7**.

From the measurement results of the above table, we can find that whenever the company's financing capacity increases by one unit, the private enterprise R & D investment expenditure will increase by 0.311 units, and the R & D expenditure of Hong Kong, Macao and Taiwanese investment enterprises will increase by 0.804 units. Investment has increased by 0.981 units, while for state-owned enterprises, its R & D expenditure has increased the most—a corresponding increase of 2.094 units. It can be seen that the R & D investment expenditure of state-owned enterprises is most affected by the change of financing ability of enterprises, while the R & D investment expenditure of private enterprises is not greatly affected by the change of financing ability of enterprises. However, we can see from the overall model regression results that the impact of the company's financing ability on the R & D investment of the company is always significantly and positively related, and this is irrelevant to the type of ownership of the enterprise. It can be seen that the research conclusions of this paper also have

Table 7. Differences between different ownership companies.

Variables	State-owned enterprise	Private enterprise	Hong Kong, Macao and Taiwanese investment enterprises	Foreign companies
lntaxrate	2.094* (1.125)	0.311*** (0.070)	0.804*** (0.185)	0.981*** (0.287)
curassrate1	0.133* (0.080)	0.213*** (0.026)	0.093*** (0.027)	0.133** (0.059)
per_output1	0.264*** (0.063)	0.111*** (0.018)	0.207*** (0.017)	0.262*** (0.033)
idebrate1	0.017 (0.071)	-0.088*** (0.016)	0.059*** (0.009)	0.102*** (0.023)
longidebt1	-0.561** (0.284)	0.215* (0.125)	0.270* (0.144)	0.031 (0.362)
Age	0.007*** (0.003)	0.020*** (0.003)	0.018*** (0.003)	0.032*** (0.007)
kldensity1	0.321*** (0.054)	0.143*** (0.012)	0.056*** (0.012)	0.144*** (0.027)
constant	2.664*** (0.981)	1.742*** (0.642)	0.742 (1.213)	-1.374*** (0.366)
year dummies	YES	YES	YES	YES
city dummies	YES	YES	YES	YES
industry dummies	YES	YES	YES	YES
observation	1537	17762	19153	7581

Data source: According to the relevant data of China Industrial Enterprise Database from 2005 to 2007. Note: 1) the value in parentheses is a stable standard error corresponding to the estimated coefficient of the variable. 2) *, **, *** indicate the level of significance at 10%, 5%, and 1%, respectively.

certain robustness in enterprises of different ownership types.

4. Conclusions and Suggestions

4.1. Conclusions

Based on the relevant indicators selected by the sample of manufacturing enterprises in Guangdong Province from 2005 to 2007, this paper establishes panel data. We analyze the corporate financing ability of the enterprise by building an econometric model and using Stata13.0 software to statistically analyze the panel data. And from the empirical research results of this paper, we can conclude that the financing ability of enterprises has a significant positive effect on their R&D investment. Among them, with the expansion of the scale of enterprises, the promotion of corporate financing capacity to its R & D investment has gradually increased; the financing capacity has also significantly affected the R & D investment of all types of enterprises, and for state-owned enterprises, foreign-funded enterprises and Hong Kong, Macao and Taiwanese investment enterprises. The impact is significantly stronger than that of the private sector. Its promotion effect is not affected by the differences in the regions to which the company belongs. And the results are robust.

4.2. Suggestions

In this paper, the author empirically studies the degree of influence of corporate financing ability on R & D investment expenditure by constructing econometric model. Through the regression analysis of the model, this paper also draws some stable research conclusions. Finally, based on the empirical results of this paper, the author also combines the actual situation of Guangdong Province, and puts forward some countermeasures and suggestions in a targeted manner, hoping to give certain reference to the economic decision-making of relevant departments.

It is true that the rapid and healthy development of small and medium-sized enterprises and private enterprises is conducive to the sound and rapid development of Guangdong's social economy. However, the empirical analysis of this paper finds that these enterprises will face higher financing constraints and lower financing capacity in their development process. Therefore, we must conscientiously and conscientiously solve the problem of serious financing constraints faced by small and medium-sized enterprises and private enterprises in carrying out research and development projects and take appropriate measures to actively expand the financing channels of small and medium-sized enterprises and private enterprises and lower the access threshold of financial markets. The market's entry barriers will accelerate the development of small and medium-sized financial institutions corresponding to small and medium-sized enterprises and private enterprises, so as to further improve the financing capacity of small and medium-sized enterprises, to achieve their healthy and orderly development. In addition, we must accelerate the reform of finance, create a fair credit environment, allocate financial resources to market-oriented, and effec-

tively alleviate the financing constraints of small and medium-sized enterprises and private enterprises to promote R & D investment of these enterprises. Moreover, small and medium-sized enterprises and private enterprises are difficult to accumulate sufficient funds for independent innovation because they are at the low end of the industrial value chain for a long time. Therefore, the burden of small and medium-sized enterprises and private enterprises should be reduced through tax reduction and subsidies, and small and medium-sized enterprises should be promoted. Enterprises and private companies rely on their own profit accumulation for R & D investment. Finally, it is hoped that through these measures, it will help to improve the financing capacity of manufacturing enterprises in Guangdong Province and increase the R & D investment expenditure of enterprises to help enterprises develop new products and improve product quality, thereby improving the production efficiency of the enterprise to a certain extent. This enables the company to enhance its core competitiveness, achieve sustainable development, and, in turn, promote the overall progress of social technology and the overall rapid growth of the social economy.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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