Research on the Impact of Financial Investment on Enterprise R&D Innovation
——Empirical Evidence from China's Growth Enterprise Market

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Abstract: This article uses the 2012-2017 GEM listed companies as a sample, and uses a multiple linear regression model to group regressions of companies with different technical levels and different organizational forms, and discusses the adjustment effect of corporate technology level and organizational form on financial subsidies and R&D investment. The empirical test shows that financial subsidies have a significant role in promoting R&D expenditure of enterprises, and their role in stimulating R&D expenditure of non-high-tech enterprises is more obvious than high-tech enterprises, and the role of promoting R&D expenditure of non-state-owned enterprises is higher than state-owned enterprises.
Keywords: Financial Subsidies; R&D Expenditure; GEM

1. Introduction

With the development of my country's capital market in the direction of internationalization and marketization, high-tech enterprises with technological innovation as the core have sprung up in people's field of vision. The most typical ones are high-tech services represented by Alibaba and Huawei. Enterprises have become the leading force in promoting sustainable economic growth and social progress, and their own technological innovation level largely determines their future development. R&D activities are the center and focus of technological innovation. However, the externality and risk characteristics of enterprise R&D activities make R&D efficiency unsatisfactory, and affect the enterprise's innovation enthusiasm. Financial subsidies are an important means for the government to crack the externalities of R&D activities, which are conducive to guiding the increase of R&D investment by enterprises, and usually do not cause adverse crowding-out effects [1].

This article analyzes the impact of government financial measures on the R&D expenditures of listed companies on the GEM from different corporate technology levels and organizational forms, in order to provide several constructive suggestions for the enhancement of Chinese corporate R&D capabilities and the maximization of government financial subsidies.

2. Literature review and research hypotheses

Dirk.etc (2012) studied the impact of fiscal subsidy policies on corporate R&D expenditures from the perspective

of tax incentives [2]. Through empirical analysis, it is concluded that corporate R&D expenditures increase with the decrease in tax revenue. For small and medium-sized enterprises with relatively difficult financing, the effect of fiscal subsidies is better than tax incentives, and for large enterprises with better financing, the effect of tax incentives is better than fiscal subsidies, but the short-term effect is more significant. The long-term impact is small l [3]

An Tongliang et al. (2009) studied the incentive effect of fiscal subsidies on enterprise R&D through published statistical data, and believed that the Chinese government's incentive policy of fiscal subsidies to enterprises is an effective means to stimulate enterprises to increase R&D investment [4]. However, direct fiscal subsidies will have a certain degree of substitution for the company's own R&D expenditures, and to a certain extent, they will affect the company's enthusiasm for technological innovation. Taking hundreds of enterprises in the Pearl River Delta region as the survey object, it is found that the improvement of enterprise competitiveness is closely related to the technological and management innovation of enterprises. The technological innovation of enterprises is significantly affected by the government's financial subsidy policy, and management innovation is affected by the financial subsidy policy. The impact is not significant, and there is no obvious correlation between corporate management innovation and financial subsidies [5]. Some scholars have adopted standardized research methods and found that the government's fiscal policy should play a role in technology-based small and micro enterprises with insufficient scientific and technological innovation capabilities, weak protection of intellectual property rights, and less research and development results, so as to gradually reduce the tax burden of enterprises and increase enthusiasm for enterprise research and development, enhance the enterprise's technological innovation ability. While adopting fiscal subsidy policies, various development policies for small and micro enterprises should also pay attention to strengthening regulations [6]

3. Research Design

High-growth, highly innovative small and medium-sized enterprises can achieve the purpose of financing by listing on the ChiNext, which exists to provide a financing platform for independent innovation national strategies. This article selects 724 listed companies on the ChiNext from 2012 to 2017 as the research sample. After excluding some companies whose R&D expenditures and financial subsidies are not disclosed, there are 248 eligible companies. The data are all from the ChiNext listed companies downloaded by the choice financial terminal. The annual reports from 2012 to 2017 are processed by Excel software. The names and meanings of the variables studied in this paper are as follows:

Table 1. Variable description.

Variable Type	Variable Name	Symbol
Explained variable	R&D investment intensity	R&D
	Financial subsidy intensity	GOV
Explanatory variables	Cross term	G*O
		G*T
	Enterprise size	SIZE
	Years of establishment of the company	AGE
Control variable	Corporate Human Capital	LA-BOR
	Assets and liabilities	LEV
	Return on net assets	ROE

According to the definition of the research variables and the research hypothesis put forward in the previous article, we establish the basic model R&D=a Gov+Z. Among them, R&D represents the R&D investment intensity of the company. Gov said the government's financial subsidies to enterprises. Z represents other variables that have an impact on the company's R&D investment. a is the regression coefficient indicating the degree of influence of financial

subsidies on the R&D investment of enterprises. In order to better test the impact of financial subsidies on corporate R&D investment, we established the following multiple linear regression model:

$$R\&D = a + b_1GOV_{it} + b_2SIZE_{it} + b_3AGE_{it} + b_5LABOR_{it} + b_6ROE_{it} + \varepsilon_{it} \qquad (1)$$

In order to study the regulatory effects of financial subsidies on corporate R&D investment under different corporate organizational forms and technical levels, we added these two regulatory variables, and obtained the following regression equation:

$$R\&D = a + b_1GOV_{it} + b_2GOV*Technology_{it} + b_3SIZE_{it} + b_4AGE_{it} + b_5LEV_{it}$$
$$+b_6LABOR_{it} + b_7ROE_{it} + \varepsilon_{it} \qquad (2)$$

$$R\&D = a + b_1GOV_{it} + b_2GOV*Ownership_{it} + b_3SIZE_{it} + b_4AGE_{it} + b_5LEV_{it}$$
$$+b_6LABOR_{it} + b_7ROE_{it} + \varepsilon_{it} \qquad (3)$$

4. Empirical Analysis

4.1 Descriptive analysis

From the data in Table 2, it can be found that the maximum value of the R&D expenditure intensity of the enterprises in the sample is 37, the minimum value is 0, and the standard deviation is 5.244. Large; the maximum value of the financial subsidy intensity of the enterprise is 9, the minimum value is 0, and the standard deviation is 1.22, indicating that the difference in the promotion of the R&D expenditure of different enterprises by the financial subsidy intensity is relatively small, and fluctuates, but the overall range is not large; about the two cross-terms of organizational form and technological level of enterprises, the observed mean values are close to 0 and 1, respectively. It can be inferred that the proportion of non-state-owned enterprises and the proportion of high-tech enterprises in the sample is higher.

Table 2. Descriptive statistical analysis results.

Variable Name	N	Min	Max	Mean	S.TD
R&D	248	0	37	7.07	5.24
GOV	248	0	9	1.47	1.22
OWERSHIP	248	0	1	0.03	0.17
TECHNOLOGY	248	0	1	0.72	0.45
SIZE	248	4	200	23.96	21.81
AGE	248	11	32	17.61	3.89
LABOR	248	0	1	0.41	0.09
LEV	248	4.86	62.77	27.28	12.78
ROE	248	1,21	28.38	9.56	4.84

4.2 Correlation test

Use the SPSS software to test the correlation of the variables involved in the regression model to examine whether there is multicollinearity between the variables. The results show that the correlation coefficient between the variables is between |0.27-0.74|, and there is no multicollinearity among the variables. That is, financial subsidies, enterprise technology level, enterprise establishment years, enterprise human capital and return on net assets are all positively correlated with enterprise R&D investment. The possibility of the hypothesis is initially verified, and the specific results are subject to regression testing.

4.3 Regression analysis

In this regression process, the adjusted R2=0.258, the model fitting result is acceptable. The F value is 15.301, which is significant at the 5% level, which indicates that the model fit is established. From the perspective of specific variables, the significance of the fiscal subsidy intensity is 0.000, which is significant at the level of 5%, and the regression coefficient is 1.176. More, the R&D investment of enterprises will also increase accordingly. Therefore, we can think that financial subsidies have a certain promotion effect on the R&D investment of enterprises. The government should increase financial support for enterprise R&D and promote enterprise technological innovation, which verifies Hypothesis 1 of this article.

Table 3. The regression model of financial subsidies on enterprise R&D investment.

Variable	Non-standardized coefficient		Standard coefficient	t	Sig
	B	Standard error			
c	0.66	1.912	0.273	0.345	0.045
GOV	1.176*	0.247	-0.052	4.763	0
SIZE	-0.013	0.015	0.012	-0.848	0.04
AGE	0.017	0.074	0.299	0.226	0.465
LABOR	15.776	3.064	-0.207	5.148	0
LEV	-0.085	0.025	0.068	-3.377	0.001
ROE	0.073	0.062		1.189	0.236
F		15.301			0

Because high-tech enterprises have an important impact on social and economic development, government subsidies are more inclined to high-tech enterprises to a certain extent. This article divides the 248 enterprises in the sample data into high-tech enterprises and non-high-tech enterprises according to their technical level. For each sample, perform regression analysis and compare the results.

From the empirical regression results in table 4, financial subsidies for both high-tech and non-high-tech enterprises have a positive correlation with the R&D investment of enterprises, that is, the financial subsidies promote the R&D investment of enterprises. At the same time, from the interaction item of fiscal subsidies and technological level, it can be seen that the effect of fiscal subsidies on R&D expenditure of non-high-tech enterprises is more obvious, which is consistent with Hypothesis 2. The state's emphasis on science and technology has made fiscal policy tilted towards high-tech enterprises. Compared with non-high-tech enterprises, they have more funds to invest in R&D and innovation activities. Higher than non-high-tech enterprises, non-high-tech enterprises have received less attention from the state in this regard. Once the state gives them relevant policy support, it can obviously stimulate the research and development enthusiasm of such enterprises. The age of the company is positively correlated with the high-tech level at the 5% confidence level, indicating that the company's establishment period has an impact on the R&D investment of high-tech companies. From the perspective of human capital, they all have a significant impact on the R&D investment of enterprises, which shows that for enterprises, talents are the guarantee of continuous and stable innovation operations. The R&D investment of the company is inseparable from high-quality talents; the company's asset-liability ratio and return on net assets have no significant impact on the company's R&D investment.

Table 4. Regression results of technical level grouping and enterprise organization form grouping.

Variable	high-tech enterprises	Non-high-tech enterprises	State-owned enterprise	Non-state-owned enterprise
GOV	1.171*	0.880	6.743	1.396
	(0.300)	(0.252)	(0.000)	(0.262)
G*T	0.006	0.054	0.029	0.114
	(0.009)	(3.12)	(0.043)	(0.583)

SIZE	-0.010	-0.003	-0.148	-0.011
	(0.023)	(0.008)	(0.000)	(0.015)
AGE	0.073	-0.104	-2.560	0.020
	(0.099)	(0.054)	(0.000)	(0.074)
LABOR	14.600	7.766	2.285	15.015
	(4.197)	(2.433)	(0.000)	(3.093)
LEV	-0.106	-0.037	-1.429	-0.083
	(0.036)	(0.017)	(0.000)	(0.026)
ROE	0.103	-0.065	-3.373	0.095
	(0.078)	(0.055)	(0.000)	(0.063)
c	0.846*	4.363	90.368	0.315
	(2.544)	(1.393)	(0.000)	(1.928)
N	179	69	7	241
R2	0.217	0.408		0.277
F	9.239	8.805		16.318
Sig.F	0	0		0

5. Conclusions

From an overall point of view, government financial subsidies can increase the possibility of enterprises investing in R&D and the extent of R&D investment. To a certain extent, financial subsidies can make up for the external risks of enterprises'

R&D activities, ease the financing pressure of enterprises, stimulate enterprises to actively carry out R&D activities, and increase the output rate of R&D results. The empirical test shows that financial subsidies have a clear promotion effect on the R&D expenditure of enterprises, and the incentive effect on non-high-tech enterprises is more obvious, and the promotion effect on R&D expenditure of non-state-owned enterprises is also higher than that of state-owned enterprises.

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