An Empirical Study on the Influence of Internal Resources on R & D Investment in Enterprises

Wang Hang

Sichuan University Business School, Sichuan Chengdu, 610064, China

Keywords: Financial Resources Entity Resources Intangible Resources R & D Investment

Abstract: The coming of knowledge economy age means that "innovation" becomes the main melody of competition among enterprises. This paper studies the influence of internal resources on R & D investment from the perspective of enterprise resources, and divides the internal resources into financial resources, physical resources and intangible resources, taking the data of listed companies on China's small and medium-sized enterprises as samples. The empirical results show that when enterprises only consider the internal single resource factors, financial resources, physical resources and intangible resources will have an impact on enterprise R & D, but if considering the internal and external resource factors, the employee contribution degree can promote the enterprise research and development more.

1. Introduction

General Secretary Xi Jinping said: "Innovation is the first driving force leading development and the strategic support for building a modern economic system." The 13th five-year Plan also points out that innovation should be emphasized in the next five years. Enterprises must strengthen innovation, and innovation depends on R & D investment, so R & D investment plays an important role in enterprise development.

Many scholars at home and abroad have studied the factors that affect R & D investment, but if enterprises want to make a breakthrough, they need to pay more attention to the internal conditions of enterprises. Taking the listed company of small and medium-sized enterprises in China as an example, according to the division of enterprise resources by Chatterjee and Wernerfelt, this paper divides the internal resources of enterprises into financial resources, physical resources and intangible resources. And from these three aspects to study their impact on R & D investment.

2. Research Hypothesis

2.1. Financial resources

Long and Ravenscraft [1] show that equity financing can promote R & D investment more than debt financing, but other scholars find that financial resources have little effect on R & D investment. Accordingly, the following assumptions are made:

Hypothesized that (1) (a): equity financial resources can promote R & D investment of enterprises;

Suppose 1 (b): debt financial resources will restrain the R & D investment of enterprises.

2.2. Substantive resources

Entity resources, refers to resources with "fixed capacity characteristics" [2]. Most scholars think that the larger the enterprise size, the more R & D investment, some scholars draw the conclusion that the relationship between enterprise size and R & D effect is not obvious, while Zenger and Lazzarini [3] think that small enterprise can promote R & D more. Therefore, this paper proposes the following assumptions:

Hypothesis 2: the more physical resources an enterprise has, the more it can promote R & D investment.

  DOI: 10.25236/icemeet.2019.046

2.3. Intangible resources

Intangible resources, refers to the enterprise can create profit and value of the non-physical form of resources. The influence of executive shareholding on R & D is divided into two theories: the theory of interest convergence, which holds that executive shareholding can stimulate R & D investment of enterprises, and the theory of defensive effect, which is contrary to the theory of interest convergence. This paper proposes the following assumptions:

Hypothesis 3: the intangible resources of enterprises can promote the enthusiasm and intensity of R & D investment.

3. Research Design and Sample Selection

3.1. Data source and sample selection

The variables in this article are shown in Table 1.

Table 1 Variable description Table

variable		variable symbol	variable-definition	variable declaration
explained variable		R&D	Research and development investment intensity	Total R & D expenditure / operating income
explanatory variable	Financial resources	FIN	Equity financing	Total year-end owner's equity / total year-end assets
		LEV	Liability financing	Total year-end current liabilities and non-current liabilities / total year-end owner's equity
	Entity resource	SIZE	company size	Natural logarithm of total assets at year-end
		CAI	capital-intensity	Year-end net fixed assets / year-end total assets
	intangible resources	HUC	Employee contribution degree	Number of students above tertiary level / total
		EXP	foreign trade	Foreign trade, foreign investment, setting up subsidiaries overseas, etc., the value is 1, otherwise it is 0
		MGT	Executive shareholding ratio	Total shares held by senior managers / total share capital
controlled variable		CRE	Degree of capitalization of R & D expenditure	Capitalized R & D expenditure / total R & D expenditure
		SOE	Whether it is a state-owned enterprise or not	An enterprise belongs to a state-owned enterprise with a value of 1, otherwise it is 00
		AGE	Years of listing of enterprises	The number of years since the company turned itself on the market
		High-tec	Whether it is a high-tech enterprise or not	An enterprise belongs to a high-tech enterprise with a value of 1, otherwise it is 0
		Dummy Variables	Dumb variables for Industry and year	Take dumb variables of industry and year

3.2. Research design

This paper builds the following models to test the impact of internal resources on R & D investment:

R = α 0 β 1FIN β 2LEV β 3SIZE β 4CAI β 5HUC β 6EXP β 7MGT β 8CRE β 9SOE β 10AGE β 11High-tec Dummy Variables β

Where α _ 0 is a constant term and β _ I (I _ I) is a constant term. 11) is a regression coefficient.

4. Empirical Results and Analysis

4.1. Descriptive statistics

Table 2 presents descriptive statistics of R & D investment of SMEs from 2014 to 2016. As can be seen from Table 2, the intensity of R & D investment is increasing year by year, which promotes the R & D of enterprises.

Table 2 Descriptive statistics on the intensity of R & D input

year	sample number	average value	mid-value	least value	crest value	standard deviation
2014	115	0.072241	0.054	0.0005	0.4097	0.065040
2015	115	0.075185	0.0577	0.0005	0.2908	0.060607
2016	115	0.080170	0.0577	0.0001	0.4672	0.072395

4.2. Variable analysis

In order to analyze the research hypothesis and consider the relationship between internal resources and R & D investment in the case of introducing external factors, the OLS analysis of each resource variable is carried out according to the model. The results show that the degree of capitalization of R & D expenditure and whether it belongs to the nature of high-tech enterprises is positively correlated with the intensity of R & D investment, while other factors have no significant influence. Equity financial resources and employee contribution played a positive role in R & D investment intensity, while debt financial resources and enterprise size were negatively correlated with R & D investment intensity, capital intensity, international trade and investment of enterprises. And executive ownership and R & DThe correlation between input and investment was not significant. Assuming 1 (a) and 1 (b) are supported, employee incentives for enterprise R & D support hypothesis 3 as well.

The analysis results are shown in Table 3 after comprehensive consideration of the influencing factors of each variable.

Table 3 Results of variable regression analysis

	(1)	(2)	(3)	(4)
(constant)	-0.078 (-1.518)	0.167* (1.953)	-0.019 (-0.708)	0.118 (1.12)
FIN	0.102* (1.853)			0.058 (1.044)
LEV	0.015 (0.919)			0.008 (0.508)
SIZE		-0.008* (-1.944)		-0.009** (-2.171)
CAI		-0.018 (-0.591)		0.025 (0.785)
HUC			0.060*** (3.789)	0.057*** (3.307)
EXP			0.004 (0.385)	0.01 (0.956)
MGT			-0.004 (-0.198)	0.01 (0.542)
CRE	0.025*** (5.300)	0.025*** (5.102)	0.027*** (5.801)	0.024*** (5.041)
SOE	0.001 (0.071)	0.0005 (0.011)	-0.010 (-1.098)	0.009 (1.075)
AGE	-0.002 (-1.223)	-0.002 (-1.232)	-0.002 (-1.395)	-0.001 (-0.659)
High-tec	0.031** (2.080)	0.031** (2.040)	0.024 (1.601)	0.027* (1.821)
Dummy Variables	control	control	control	control
Adj-R2	0.277	0.269	0.288	0.3
F	11.127***	10.735***	10.917***	9.204***
sample capacity	345	345	345	345

The results show that when equity and liability financial resources are considered at the same time, equity financial resources are positively correlated with R & D investment at 0.1 level, while

debt financial resources have no significant correlation with R & D investment. Only assumption 1 (a) is supported.

There is a negative correlation between enterprise size and R & D investment intensity at 0.1 level, but there is no significant relationship between capital intensity and R & D intensity, indicating that the increase of assets can not promote R & D, assuming 2 is not supported. Employees' technical resources can significantly increase the intensity of R & D investment, which is consistent with hypothesis 3, but there is no significant correlation between outbound investment and trade, as well as between executive ownership and R & D investment. Model (4) shows a significant negative correlation between enterprise size and R & D investment, and a significant positive correlation between employee contribution and R & D investment intensity after comprehensive consideration of internal and external factors.

5. Conclusions

Through the analysis, this paper draws a conclusion: in the face of a single factor choice, equity financing and employee contribution can promote R & D investment, debt financing and the increase of enterprise size will inhibit R & D investment activities; When considering the internal and external resource factors, employee contribution, capitalized R & D expenditure and tax preferential policies of high-tech enterprises can promote the R & D investment of enterprises, while the larger the enterprise size, the more the R & D investment will be restrained.

Future research will focus on how employees influence R & D and what aspects of staff's quality or skills can drive the intensity of R & D investment.

References

[1] Chatterjee S, Wernerfelt B. The link between resources and type of diversification: Theory and evidence. Strategic Management Journal, 1991, 12(1): 33-48.

[2] Long W, Ravenscraft D. LBOs, debt and R&D intensity. Strategic Management Journal, 1993, 14: 119-135.

[3] Zenger TR, Lazzarini SG. Compensating for innovation: Do small firms offer high-powered incentives that lure talent and motivate effort? Managerial and decision economics, 2004, 25(6): 329-345.