

The Moderating Effect of Financing Structure on Innovation Investment and Corporate Performance: A Case of Chinext Listed Companies in China

Jia Wang^{1, *}

¹Kings University College at Western University, London, ON, Canada, N6A 2M3.

*Corresponding author. Email: jwan989@uwo.ca

ABSTRACT

The enhancement in enterprises' technological innovation and industrial core competitiveness forms the driving force for the development in Chinext, requiring further promotion in the optimization of financing structure to realize the improvement in enterprise performance. Based on the panel data of listed companies on Chinext from 2009 to 2019, this paper conducts an empirical study on innovation investment, financing structure and corporate performance. The results show that: 1) Innovation investment is not conducive to enhancing firm performance; 2) Internal financing is an indispensable financing channel for R&D activities in Chinext, playing a more significant positive moderating effect; 3) Diversified financing structure makes the restraining effect of equity financing on corporate performance change into a positive moderating effect; 4) The increase of debt financing scale has a negative moderating effect on innovation input and firm performance, and the negative moderating effect of long-term loan is greater than that of the short-term loan; 5) Commercial credit has a significant negative moderating effect; 6) The interaction between financing structure and enterprise innovation weakens enterprise performance. The above research results can be used as a reference for decision-making: the government should accelerate the construction of the capital market system, further optimize the social financing structure to mitigate financing constraints and reduce financing costs. Chinext listed companies should improve the awareness of innovation efficiency and effectively promote corporate performance by adjusting the financing structure.

Keywords: *Financing structure, Innovation investment, Corporate performance, Moderating effect*

1. INTRODUCTION

The increasingly serious contradiction between excess production capacity and resource misallocation marks China's macro economy entering a "new normal." To adapt to the "new normal" of the economy, the innovation-driven development strategy is an inevitable requirement and strategic measure to accelerate the transformation of economic development mode and improve China's comprehensive national strength and international competitiveness. As an important force to promote China's supply-side economic reform, small and media-sized enterprises (SMEs) are an important carrier of mass entrepreneurship and innovation, playing an essential role in promoting industrial upgrading and enhancing economic development. However, most innovative SMEs with great development potential but not yet reaching the threshold of the main board have been

facing the dilemma of insufficient internal capital and high debt financing cost. Chinext provides a financing platform, which broadens its financing channels and relieves the financing pressure of innovative enterprises.

Financing innovation is measured as increases in net debt and equity [1]. With the support of financing innovation, China has gradually changed from material intensive to intangible intensive. With increasing technological competition, the significant increase in intangible capital intensity means that enterprises need to provide long-term adequate funding sources for R&D activities. R&D investment has the characteristics of large amount, long cycle and high risk. To meet the capital demand of innovation activities, enterprise innovation needs diversified financing channels to obtain stable financial support. It will inevitably prompt enterprises to determine their own financing methods to gradually form a financing structure matching the future

path. Different financing structures will affect the channel choice, financing cost and financing scale. The technological innovation is affected, resulting in the ultimate interactive effect of enterprise performance can not grow steadily. In addition to breaking through financing constraints, effectively using technological innovation as long-term development of competitive advantages to enhance enterprise performance is also the imperative of business operators and policymakers.

Chinext, as an emerging sector in China, is the platform that can best represent the overall development level of innovation-oriented enterprises, so this paper selects listed companies on Chinext for research. At present, there are much research on the direct impact of innovation input on firm performance, but there exists relatively little literature on the moderating effect between those. Based on previous literature research, this paper takes innovation input as the entry point, introduces financing structure as the moderator variable, and subdivides the financing structure to study enterprise performance. By selecting the data of Chinext enterprises from 2009 to 2019, the correlation between innovation input and enterprise performance is tested in the first stage and then adds financing structure to explore the moderating effect of different financing methods on innovation input and enterprise performance which enriches financing theory to some extent.

This paper is divided into five parts, which are as follows: the first part is the introduction to the research topic; the second part explains the theoretical basis and research hypothesis of the literature; the third part describes sample data, variable definition and model design; the fourth part presents an in-depth analysis of regression results; the final part summarizes research conclusions and put forward suggestions.

2. LITERATURE REVIEW

2.1. Impact of Innovation Investment on Corporate Performance

There is no consistent conclusion about the correlation between innovation input and firm performance, and the research conclusion can be divided into positive correlation, negative correlation and irrelevant correlation.

Sougiannis verified that residual income came from the expenditure of R&D input through the Ohlson model [2]. On this basis, Booth conducted an empirical study on American listed companies from 1999 to 2004 and found that R&D investment increased the company's future cash flow and market value [3]. Du et al. proposed that innovation input was positively correlated with enterprise profitability [4]. Ren et al. showed a significant positive correlation between

innovation input and enterprise performance in the information technology industry [5].

Brown selected 30 high-tech enterprises in the United States, Europe and Japan from 1978 to 1990 as research samples and conducted an empirical analysis with sales revenue growth rate and profit as dependent variables and R&D as independent variable [6]. Based on the result that the R&D investment increased by 4 times but the sales revenue growth rate was only 11%, the "accelerating trap" theory of innovation input was proposed. Lu and Wang focused on 99 enterprises in the manufacturing and information technology industries from 2005 to 2008. They explored the lag effect of innovation input on enterprise performance: innovation input was negatively correlated with enterprise performance in the current period but positively correlated with enterprise performance in the lag period [7]. Ding and Guo selected SME board listed companies from 2011 to 2012 as samples [8]. In the current period, financial performance and market performance were explained variables, and R&D expenditure was negatively correlated with financial performance.

Scherer proposed that there was a significant positive correlation between the number of patents and enterprise sales volume, but it had no significant impact on profitability [9]. Finally, Luo and Zhu made a comparative empirical study of high-tech and non-high-tech listed companies from 2002 to 2006. They proposed that innovation input was positively correlated with the profitability of the lagging period without any significant impact [10].

Previous scholars have made a lot of exploration on the empirical relationship between innovation input and firm performance, and the diversification of results depends on different research perspectives: foreign scholars stand on the perspective of investors. In contrast, domestic scholars mostly conduct research and analysis from a macro perspective. In addition, the research indexes of innovation input and enterprise performance are different.

2.2. Influence of Different Financing Methods on R&D and Corporate Performance

2.2.1. Internal Financing

Hall considered that innovation input was characterized by high risk, unstable income and unpredictability, so there existed a capital gap in innovation input. With the growth of enterprises and the accumulation of internal funds, innovation investment prefers internal financing [11]. Martinsson studied the relationship between innovation investment and internal and external financing in the UK and Europe [12]. Through the dynamic regression model, he showed that

internal financing was positively correlated with the innovation performance of most enterprises. In contrast, only British high-tech enterprises had a more significant effect through external equity financing than internal financing. However, Jiang conducted an empirical study on Chinext listed companies and found that the positive correlation between internal financing and R&D investment did not pass the significance test [13].

2.2.2. Equity Financing

Muller and Zimmermann made an empirical analysis of the relationship between innovation investment and equity financing of German SMEs. They found that enterprises carrying out innovative activities emphasized equity financing, while those not accounted for a relatively low proportion of equity financing [14]. Vito and Laurin focused on Canadian manufacturing enterprises and proposed that the highly concentrated ownership structure had a negative impact on the improvement of R&D intensity [15]. Finally, Wang and Sun established an econometric model based on the Euler equation and selected Chinese A-share listed companies from 2006 to 2011 as samples [16]. The research results showed that equity financing had a great inhibitory effect on enterprise innovation investment.

2.2.3. Debt Financing

The main forms of debt financing include bond financing, short-term and long-term bank loans and commercial credit. Peng et al., based on the principal-agent theory, proposed a significant negative correlation between debt financing and corporate performance of listed companies in China's automobile manufacturing industry [17]. Chang and Yue proposed that the managers' incentive and constraint effect of corporate bonds encouraged the abandonment of high-yield and high-risk projects, which had a negative impact on innovation input and further weakened the positive effect on corporate performance [18]. Allen et al., found that due to the imperfect financial system, China's commercial credit financing might support the national economy more than bank financing, which alleviated the financing constraints faced by enterprises and sharpened their performance [19]. Auerbach found that there was a strong correlation between loan terms and innovation input [20]. Due to the lag of innovation input, the long-term loan had a significant positive impact on innovation performance. In contrast, the short-term loan had an insignificant negative impact on innovation performance. Dou proposed an inverted U-shaped relationship between debt maturity structure and innovation performance, indicating an optimal debt maturity structure interval [21].

Based on the above analysis, the past researches could be further improved in the following perspectives:

1) Most of the literatures mistaking asset-liability ratio measures the financing structure, ignore that the detailed classification and diversification of financing channels will differentiate and bias the empirical conclusion. 2) There are few in-depth discussions on the correlation between innovation input, financing structure and firm performance. Most scholars have analyzed the two of them, especially ignoring the moderating effect of financing structure. This paper mainly explores the moderating effect of financing structure on innovation investment and enterprise performance of Chinext enterprises in China, committed to developing relevant research in the existing field.

3. METHODS

3.1. Hypotheses

Based on the above literature review, this paper puts forward the following hypotheses:

H1: Innovation input of SMEs in Chinext is negatively correlated with enterprise performance.

H2: The increase of internal financing scale of SMEs in Chinext has a positive moderating effect on innovation input and enterprise performance.

H3: The increase of equity financing scale of SMEs in Chinext has a negative moderating effect on innovation input and enterprise performance.

H4: The increase of the SMEs debt financing scale on Chinext negatively affects innovation input and enterprise performance.

H5: Compared with equity financing, the increase of internal financing scale has a more significant positive moderating effect on innovation input and enterprise performance.

H6: Compared with internal financing and equity financing, the increase of debt financing scale has the least negative moderating effect on innovation input and enterprise performance.

H7: The increase of the asset-liability ratio of SMEs in Chinext has a negative moderating effect on innovation input and enterprise performance.

H8: Compared with long-term loan financing, the increase of short-term loan financing has a more significant negative moderating effect on innovation investment and enterprise performance.

H9: Compared with bank loans, the scale increase of commercial credit financing has a more significant

negative moderating effect on innovation investment and enterprise performance.

H10: Financing structure directly impacts corporate performance and negatively affects corporate performance when the ratio of equity to debt financing is too large. Therefore, it has a negative moderating effect on innovation input and corporate performance.

3.2. Data Source

The samples selected in this paper were 745 Chinext listed companies in China, and the research data were from the CSMAR database. The sample period from 2009 to 2019 was selected to analyse the relationship between technological innovation input, financing structure, and enterprise performance. The data selection criteria were as follows: (1) the listed years should be relatively long to ensure that the company had an R&D foundation and a market strategy system. Only companies listed before December 31, 2019, should be selected; (2) Due to the differences in accounting treatment methods among the financial industry and other industries, data related to the financial industry were removed; (3) Remove ST and PT listed companies to avoid outliers; (4) Excluding Chinext listed companies with missing financial data. A total of 3900 annual observations were obtained, and data processing and regression analysis were performed using STATA 15.1 statistical software.

3.3. Variable Definitions

3.3.1. Dependent Variable ---- Corporate Performance

When measuring enterprise performance, domestic and foreign literature summarizes three forms: Tobin's Q, return on total assets, and net assets. Foreign scholars mostly use Tobin's Q to measure corporate performance. However, considering that China's capital market is not fully developed and the market allocation and operation efficiency are relatively low, ROA is utilized to indicate the enterprise performance.

3.3.2. Independent Variable ---- Innovation Investment

The input and output of innovation are usually emphasized when measuring the enterprises' technological innovation capability. Although patent achievement is the main form of innovation output, it is

not comparable as an independent variable due to the time lag, large fluctuation of exogenous factors and few controllable management factors. Therefore, the index of R&D investment intensity (R&D) commonly used in previous literature measures innovation input, calculated from the proportion of R&D investment in total sales.

3.3.3. Moderator Variable

In testing the moderating effect of financing structure on the relationship between innovation input and firm performance, financing structure (E/D) is defined as the equity-to-debt ratio.

Internal financing (IF) reflects retained earnings and depreciation expenses as internal sources of funds for R&D and innovation.

Equity financing (EF) measures the financing of enterprises through equity transactions, which directly reflects the change of enterprise equity financing status and scale.

Debt financing (DF) represents external financing channels other than equity transactions, taking banks as an example. Long-term loan financing (LRDF) shows the ratio of long-term loans to total assets at the end of the year. Short-term loan financing (SRDF) reflects the ratio of short-term loans to total assets at the end of the year. The asset-liability ratio (LEV) is on behalf of corporate financial leverage. Bank loan financing (BDF) is used to measure the difficulty of obtaining bank loans by calculating the ratio of the sum of short-term and long-term loans to the total assets. Commercial credit financing (TC) is defined as the ratio of the funds that rose through commercial credit to the total assets of enterprises at the end of the year. The change in commercial credit will cause the corresponding fluctuation of enterprise financing structure and then influence the moderating effect of financing structure on innovation investment and enterprise performance.

3.3.4. Control Variable

To explore the moderating effect of corporate financing structure on the relationship between innovation input and corporate performance, in addition to the above independent variables and moderating variables, corporate size (Size), ownership concentration (Cr5), capital intensity (CI) and cash flow (CF) are also added. See Table 1 for specific definitions of relevant variables.

Table 1. Variable Descriptors

Type	Variable Name		Description (in CNY)
Dependent			
Variable	ROA	Return on Total Assets	Net Income/Total Assets
Independent			
Variable	R&D	Innovation Input	R&D Expenses/Operating Income
Moderator			
Variable	IF	Internal Financing	(End-of-year Surplus Reserves+End-of-year Undistributed Profit)/Total Assets
	EF	Equity Financing	(End-of-year Equity+End-of-year Capital Reserves)/Total Assets
	DF	Debt Financing	(Long-term Borrowing+Short-term Borrowing+Bonds Payable)/Total Assets
	LRDF	Long-term Borrowing Financing	Long-term Borrowing/Total Assets
	SRDF	Short-term Borrowing Financing	Short-term Borrowing/Total Assets
	LEV	Financial Leverage	Total Assets/Total Liabilities
	BDF	Bank Loan Financing	(Long-term Borrowing+Short-term Borrowing)/Total Assets
	TC	Commercial Credit Financing	(Accounts Payable+Notes Payable+Deferred Revenue)/Total Assets
Control Variable			
Size	Asset Size		Ln(Total Assets)
	Cr5	Concentration Ratio	Sum of the Percentage Ownership Shares Held by Five Biggest Owners
	CI	Capital Intensity	Total Assets/Operating Income
	CF	Cash Flow Rate	Cash Flow from Operating Activities/Total Assets

3.3.5. Benchmark Models

As the multivariate samples selected for empirical research were multiple companies in different periods, the panel data processing method should be adopted for regression analysis. Based on the Hausman test, the fixed effect model was used for regression estimation. Statistical software STATA 15.1 was used to empirically analyze the relationship between technological innovation input, financing structure and firm performance. The results were based on goodness of fit and statistical significance.

Based on the above assumptions, the influence of innovation input and enterprise performance was tested in the first stage, and the model was constructed as follows:

$$ROA_{i,t} = \alpha_0 + \alpha_1 RD_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 Cr5_{i,t} + \alpha_4 CI_{i,t} + \alpha_5 CF_{i,t} + \varepsilon_{i,t} \tag{1}$$

In Equation (1), the dependent variable $ROA_{i,t}$ represents the corporate performance of sample company i at time t , α_0 is a constant term, α_i is the coefficient of the corresponding independent variable, $i=1,2,\dots,3900$, $\varepsilon_{i,t}$ is the residual term, satisfying the assumption of independent identical distribution.

To estimate the moderating effects of different financing structures on innovation input and firm performance, the benchmark models were constructed as follows:

$$ROA_{i,t} = \beta_0 + \beta_1 RD_{i,t} + \beta_2 X_{i,t} + \beta_3 Size_{i,t} + \beta_4 Cr5_{i,t} + \beta_5 CI_{i,t} + \beta_6 CF_{i,t} + u_{i,t} \tag{2}$$

$$ROA_{i,t} = \beta_0 + \beta_1 RD_{i,t} + \beta_2 X_{i,t} + \beta_3 X_{i,t} * RD_{i,t} + \beta_4 Size_{i,t} + \beta_5 Cr5_{i,t} + \beta_6 CI_{i,t} + \beta_7 CF_{i,t} + u_{i,t} \tag{3}$$

In Equation (2) and (3), the dependent variable $ROA_{i,t}$ represents the corporate performance of sample company i at time t , β_0 is a constant term, β_i is the coefficient of the corresponding independent variable, $X_{i,t}$ represents the moderating variables of different financing structures, $i=1,2... ,3900$, $\varepsilon_{i,t}$ is the residual term, satisfying the assumption of identical independent distribution.

4. RESULTS

4.1. Descriptive Statistics Analysis

The enterprise performance was between (-0.965, 0.466), with an average of 0.047, indicating that SMEs in Chinext had desirable profitability, but there were still low or even negative performance samples.

According to EU statistical standards, more than 5% of enterprises were considered to have high R&D intensity, and thus enterprises had sufficient R&D competitiveness advantages. Furthermore, the mean innovation input was 7.282%, preliminarily demonstrating competitive advantages through a relatively high R&D level.

SMEs in Chinext were more inclined to choose equity financing in terms of the proportion of equity financing and debt financing, which was consistent with a greater mean of equity financing. Nevertheless, the large standard deviation demonstrated that there were differences in financing structure among enterprises, leaving research space to further explore the factors of financing structure selection.

Regarding debt financing, enterprises were more inclined to use commercial credit for financing, followed by short-term loans, and finally, consider long-term loans. The standard deviation of long-term loans was the lowest, meaning that long-term loans had smaller differences among enterprises. In contrast, commercial credit had a relatively noticeable difference on the contrary.

The mean asset-liability ratio was 0.288%, and the maximum was 168.7%, consistent with the high-risk

characteristics of high-tech enterprises in Chinext. When financing, compared with other industries, the demand for capital was enormous, the risk was higher, and lag periods were longer, explaining the related results of equity financing being higher than debt financing on the whole.

Table 2. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	3900	0.047	0.08	-0.965	0.466
RD	4493	7.282	6.439	0.06	98.39
ED	4499	4.777	6.122	-0.407	89.633
IF	4499	0.206	0.16	-5.149	0.7
EF	4499	0.51	0.196	0.07	6.116
DF	4499	0.088	0.103	0	0.534
LRDF	4499	0.017	0.037	0	0.387
SRDF	4499	0.066	0.082	0	0.503
TC	4499	0.125	0.095	0	1.202
LEV	4499	0.288	0.171	0.011	1.687
Size	4499	21.227	0.813	19.491	25.342
Cr5	4499	0.183	0.16	0	0.851
CI	4499	2.669	1.581	0.088	28.072
CF	4499	0.235	0.184	-0.165	0.925

4.2. Correlation Analysis

When the absolute value of the correlation coefficient was greater than 0.7, it indicated the existence of multicollinearity between variables. It could be seen from Table 3 that both short-term loans and asset-liability ratio had a high correlation with debt financing, greater than 0.7 since debt financing mainly included short-term loans and long-term loans, and short-term loans accounted for a large proportion in SMEs on Chinext. Therefore, a strong positive correlation was reasonable. Other variables were in low correlation, so the moderating effect could be verified among other related variables except short-term borrowing and asset-liability ratio.

Table 3. Matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) ROA	1													
(2) RD	-0.064	1												
(3) ED	0.155	0.3	1											
(4) IF	0.59	0.024	0.152	1										

(5) EF	-0.235	0.198	0.429	-0.549	1									
(6) DF	-0.252	-0.201	-0.443	-0.259	-0.441	1								
(7) LRDF	-0.122	-0.114	-0.249	-0.141	-0.284	0.573	1							
(8) SRDF	-0.249	-0.186	-0.409	-0.245	-0.379	0.902	0.22	1						
(9) TC	-0.157	-0.249	-0.435	-0.154	-0.411	0.119	0.043	0.13	1					
(10) LEV	-0.316	-0.25	-0.638	-0.345	-0.571	0.755	0.455	0.675	0.633	1				
(11) Size	-0.06	-0.113	-0.293	-0.142	-0.292	0.374	0.331	0.257	0.213	0.452	1			
(12) Cr5	-0.093	-0.055	-0.134	-0.02	-0.136	0.153	0.092	0.139	0.068	0.167	0.236	1		
(13) CI	-0.18	0.424	0.308	-0.124	0.247	-0.079	0.062	-0.14	-0.275	-0.183	0.05	-0.036	1	
(14) CF	0.217	0.234	0.473	0.109	0.339	-0.412	-0.257	-0.376	-0.284	-0.501	-0.339	-0.212	0.112	1

4.3. Regression Results

4.3.1. Negative relationship between innovation investment and corporate performance

The coefficient of innovation input was significantly negative, indicating that innovation input was negatively correlated with enterprise performance.

4.3.2. Different moderating effects of financing structures

The hierarchical regression method was employed to verify the moderating effect of financing structure. By observing whether the interaction coefficient was significant and whether the addition of R squared in the interaction term model increased, the moderating effect of variables was judged.

Internal financing was positively correlated with enterprise performance. After adding the interaction term IFxRD, R squared was 29.9%, slightly larger than the original model. Therefore, Chinext SMEs internal financing had a moderating effect on innovation investment and enterprise performance. The IFxRD coefficient was 0.010, showing a significant positive correlation at the significance level of 1%. Therefore, internal financing had positive moderating effects on innovation input and firm performance.

Similarly, both equity financing and debt financing were negatively correlated with corporate performance, having a significantly negative moderating effect on innovation input and corporate performance.

There was a positive correlation between financing structure and firm performance but with a significant negative moderating effect. It should be noted that the

positive correlation between financing structure and enterprise performance turned into a negative correlation moderating effect after interacting with innovation input.

4.3.3. Comparison of moderating effects of different financing structures

Internal financing, equity financing, debt financing with interaction terms are all added for regression analysis. The positive moderating effect of internal financing on innovation input and firm performance was significantly higher than that of equity financing. The positive moderating effect of internal and equity financing was significantly greater than the negative moderating effect of debt financing. Under the conditional existence of both internal financing and equity financing, the negative moderating effect was turned into a positive one.

There was a negative correlation between the asset-liability ratio and firm performance, playing a significant negative moderating effect on innovation input and firm performance.

Both long-term and short-term borrowing and financing had a negative impact on firm performance. However, the negative moderating effect of short-term loan financing was slightly higher than that of long-term loan financing.

Both bank loans and commercial credit were negatively correlated with corporate performance. Bank loans and business credit had significant negative moderating impacts on innovation input and firm performance. The negative moderating effect of commercial credit was significantly higher than that of bank loans.

Table 4. Fixed Effect Model Regression Results

Item	1	2	3	4	5	6	7	8	9	10	11	12	13
RD	-0.003***	-0.004***	-0.0004*	-0.002***	-0.005***	-0.002***	-0.002***	-0.002***	-0.001**	-0.002***	-0.0003*	-0.0001*	-0.003***
IF		0.174***			0.257***								

IFxRD	0.010***				0.010***									
EF					-0.117***									0.002***
EFxRD					-0.003**									0.011***
DF														-0.111*** -0.025*
DFxRD														-0.013*** -0.003*
LRDF														0.059* -0.034*
LRDFxRD														-0.039*** -0.022***
SRDF														-0.096*** -0.118***
SRDFxRD														-0.019*** -0.014***
LEV														-0.171***
LEVxRD														-0.011***
BDF														-0.096*** -0.140***
BDFxRD														-0.017*** -0.008***
TC														0.041* 0.011*
TCxRD														-0.043*** -0.039***
ED														0.0003*
EDxRD														0.0005***
Size	-0.003	0.003	-0.011***	0.005*	0.013***	-0.006	0.002	0.004	0.015***	0.004	-0.002	0.005*	-0.002*	
Cr5	***	-0.041***	-0.046***	-0.038***	-0.035***	-0.042***	-0.036***	-0.037***	-0.030***	-0.037***	-0.037***	-0.034***	-0.042***	
CI	-0.004***	-0.004***	-0.003**	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.007***	-0.005***	-0.006***	-0.007***	-0.005***	
CF	0.096***	0.102***	0.131***	0.077***	0.073***	0.091***	0.077***	0.076***	0.034***	0.076***	0.067***	0.051***	0.079***	
Constant	0.121**	-0.045	0.339***	-0.029	-0.304***	0.07	0.046	-0.002	-0.180***	-0.01	0.136**	-0.0005	0.126	
R-squared	0.079	0.299	0.151	0.114	0.322	0.092	0.109	0.116	0.183	0.115	0.143	0.169	0.086	
F-value	54.908	***	194.100***	81.348***	58.926***	137.912***	46.143***	55.968***	46.329***	102.250***	59.376***	76.031***	72.028***	42.675***
N	3899	3899	3899	3899	3899	3899	3899	3899	3899	3899	3899	3899	3899	3899

*** p<0.01, ** p<0.05, * p<0.1

5. DISCUSSION

There are differences between pecking order theory and empirical results from Chinext enterprises in China. The pecking order theory puts forward that enterprises will primarily choose internal financing, then debt financing, and finally equity financing. However, empirical research shows that Chinext usually considers equity financing when internal financing is insufficient and chooses debt financing in the final stage. Although some scholars, such as Sun et al., believed that debt financing was superior to equity financing and internal financing [22], the risk aversion of debt investors leads to the mismatch between corporate financing risk and income structure.

The increase of the internal financing scale has a positive moderating effect on innovation input and firm performance. Internal financing directly obtains the required funds, avoiding the examination and approval process without bearing financing interest costs, which to some extent reduces the cost of utilized capital and improves the financing efficiency. Based on the information asymmetry theory, internal financing has no impact on external investors of enterprises, playing a

positive role in maintaining enterprise value and market value. Therefore, it is called for SMEs in Chinext to actively expand the scale of internal financing and give full play to its positive moderating role between innovation input and enterprise performance. However, it should be emphasized that the scale of internal financing is usually limited, and innovation investment only through internal financing cannot guarantee adequate and stable long-term capital sources. Thus, diversified external financing methods are still needed.

When Chinext enterprises are faced with diversified financing structure choices, the restraining effect of equity financing on enterprise performance is transformed into positive promotion on innovation investment and enterprise performance. Compared with internal financing, the positive moderating effect of equity financing is smaller, mainly because internal financing has higher efficiency, lower financing cost, the higher utilization rate of capital, providing freedom of capital use and lowering financing risk.

The increase of the debt financing scale has a negative moderating effect on innovation input and firm performance. Compared with internal financing and

equity financing, its effect on enterprise innovation input is weak. The main reason is that debt financing has a relatively strong constraint on selecting financing projects and financing subjects, given that Chinext enterprises with high-tech R&D often make venture investments. Creditors need to bear the risk of failure of enterprise innovation activities, and the excess profits brought by successful innovation do not belong to the category of return. The output of innovation activities is mainly in the form of intangible property such as patents, which cannot be quantified and is difficult to meet the financing mortgage conditions of bond investors.

Debt financing is further divided into short and long term loans, bank loan financing and commercial credit. It is found that commercial credit has the strongest negative adjustment effect, which is quite different from previous research results, especially under the premise that commercial credit has a promoting effect on firm performance. Zhang et al., found that there was an inverted U-shaped relationship between commercial credit financing and the capital effect of business activities from the perspective of economic policy uncertainty [23]. Commercial credit is affected by the operation scale of enterprises, the direction of commodity circulation, whether the industry and region to which they belong have a sound commercial credit system and the change of economic and financial environment. Therefore, it has the characteristics of short term, dispersion and instability. Although the accessibility and flexibility of commercial credit give enterprises comparative advantages in information acquisition and supervision, the financing utilization and efficiency still need to be further investigated.

Because short-term borrowing urges top management to make investment decisions more effectively and prudently, thus reducing agency costs, long-term borrowing has a greater negative moderating effect than short-term borrowing. The short-term loan repayment period speeds up the frequency of principal and interest payment, forcing to give up investing in projects with high risk. Nevertheless, driven by interests, SMEs are prone to participate in speculative activities, which increase agency costs and negatively affect enterprise performance during the long-term loan repayment period.

The interaction term between innovation investment and financing structure is significantly negatively correlated with corporate performance, so there is an interaction, but it is not conducive to corporate performance optimization. This finding is inconsistent with previous literatures, as innovation input has a significant negative correlation with firm performance. Ensuring the supply of funds for firm R&D activities does not necessarily lead directly to a corresponding

enhancement in firm performance with a competitive advantage. The conclusion of financial slack may not apply to the pursuit of enterprise performance by SMEs enterprises in Chinext with high intensity technological innovation at the present stage. Due to the possibility of using additional funds in other strategic directions, profitability improvement does not mean that operators will reduce the debt ratio. If an enterprise has confidence in the innovation ability and long-term future development, the operators may choose to appropriately increase the debt burden to comprehensively upgrade. From the perspective of innovation efficiency, the positive impact of technological R&D competitive advantage on enterprise performance needs a long lag, depending on the marketization degree.

6. CONCLUSION

Taking Chinext listed companies as an example, data from 2009 to 2019 are selected to explore the moderating effects of different financing structures on innovation input and enterprise performance, and the following conclusions are drawn: Chinext usually considers equity financing in the case of insufficient internal financing, and finally chooses debt financing. In the face of diversified financing structure, the direct negative effect of equity financing on corporate performance will change into a positive moderating effect; Internal financing has a more significant positive moderating effect than equity financing; The increase in debt financing scale plays a negatively moderating role; The negative moderating effect of long-term loan is greater than that of the short-term loan; Commercial credit has the strongest negative moderating effect; The interaction between innovation input and financing structure is negatively correlated with firm performance.

Based on the above in-depth analysis, the following suggestions are put forward: 1) The government still needs to launch relevant supportive policies to expand the financing channels to reduce financing costs through financing innovation and other aspects; 2) The previous implementation of the sound capital market has been effectively verified, and the continuous deepening of equity investment relaxation policy makes equity financing gradually become the preferred choice of external financing channels, and enterprises no longer rely on floating debt to improve the overall factor productivity; 3) Taking the volatile internal cash flow and the high cost of short-term credit that cannot be mortgaged by intangible capital as an example, the single source of capital will evolve into potential financing risks and even reduce the efficiency of technological innovation. Therefore, the multilevel vigorous development of the capital market is imperative for enhancing the technological innovation ability of China's Chinext enterprises.

Independent innovation is to obtain effective output from intangible capital input, form competitive advantage and develop steadily. Operators need to make strategic trade-offs between R&D investment and effective output, optimize financing structure and improve independent innovation ability on the premise of ensuring sustainable cash flow. A successful transition to intangible capital intensity requires improved efficiency of technological innovation and incubation of highly marketable patents. The market competition of technological innovation ability cannot only rely on the continuous increase of intangible capital input. The limitation of resources negatively affects enterprise performance by limiting the efficiency of technological innovation.

This paper focuses on the micro perspective of the Chinext financing structures' meditating effects. The research on how the economic environment and policy macro-control affect the financing structure and channel selection can be regarded as a promising research topic. Based on the construction of the innovation efficiency model, it is still worth further verification by scholars on what premise the interaction effect of financing structure and technological innovation can effectively improve enterprise performance. As an important source of funding for enterprise R&D investment, whether government subsidies are used in the innovation activities and whether there exists a crowding out effect also need to be further investigated.

REFERENCES

- [1] Mann, W. (2018). Creditor rights and innovation: Evidence from patent collateral. *Journal of Financial Economics*, 130(1), 25–47.
- [2] Sougiannis, T. (1994). The accounting based valuation of corporate R&D. *Journal of Accounting Review*, 69 (1): 44- 68.
- [3] Booth, G. G., Junttila, J., Kallunki, J.-P., Rahiala, M., & Sahlström, P. (2006). How does the financial environment affect the stock market valuation of R&D spending? *Journal of Financial Intermediation*, 15 (2), 197–214.
- [4] Yong Du, Bo Yan, & Jianying Chen. (2014). Research on the impact of R&D investment on business performance of high-tech enterprises. *Science and Technology Progress and Countermeasures* (02), 87-92.
- [5] Ge Ren, & Hui Sun. (2019). Internationalization, technological innovation investment and firm performance: A Case study of listed information technology companies. *Technology and Innovation Management*, 040 (002), 173-181.
- [6] Brown, J., Fazzari, S., & Petersen, B. (2009). Financing innovation and growth: Cash flow, external equity, and the 1990s R&D Boom. *The Journal of Finance*, 64(1), 151–185.
- [7] Yumei Yu, & Chunmei Wang. (2011). Research on the impact of R&D investment on the business performance of listed companies -- a case study of manufacturing and information technology industry. *Science and Technology management*, 31(5), 122-127.
- [8] Yangyang Ding, & Zhiyong Guo. (2013). Research on performance correlation of R&D expenditure of listed companies on SME Board. *Introduction to Economic Research*, 000 (029), 173-174.
- [9] Scherer, F. M. (1965). Invention and innovation in the watt-boulton steam-engine venture. *Technology and Culture*, 6 (2), 165-187.
- [10] Ting Luo, Qing Zhu, & Dan Li. (2009). Analyzing the relationship between R&D investment and firm value. *Journal of Financial Research*, 000 (006), 100-110.
- [11] Hall, B. (2002). The financing of research and development. *Oxford Review of Economic Policy*.
- [12] Martinsson, G. (2010). Equity Financing and Innovation: Is Europe different from the United States? *Journal of Banking & Finance*, 34 (6), 1215–1224.
- [13] Yapeng Jiang, & Yiru Wang. (2015). The impact of financing mode of gem listed companies on R&D investment -- based on different life cycles. *Finance and Accounting Communications*, 27 (683), 26-30.
- [14] Müller, E., & Zimmermann, V. (2006). The importance of equity finance for R&D activity -- are there differences between young and old companies? *Small Business Economics*, 33(3):303-318.
- [15] Vito, D. J., Laurin, C. (2010). Corporate Ownership, R&D Investment and Performance of Canadian Firms. *Journal of Global Business Management*, 6 (1):1-12.
- [16] Juan Wang, & Zao Sun. (2014). Does equity financing inhibit innovation investment of listed companies: Evidence from China's manufacturing industry. *Journal of Modern Finance and Economics*, 034 (008), 56-66.
- [17] Yi Peng, Qing Chen, & Guofeng Xu. (2015). Debt financing level, maturity structure and Corporate performance: A test based on the data of listed

- automobile manufacturing companies. *Industrial Technical Economics*, 000 (002), 3-14.
- [18] Lijuan Chang, & Xiong Yue. (2011). An empirical study on corporate governance effect of Corporate bonds in China. *Science, Economics and Society*, (01), 54-59.
- [19] Allen, F., Qian, J., & Qian, M. (2003). Law, finance, and economic growth in China. *Journal of Financial Economics*, 77:57-116.
- [20] Auerbach, A., & Reishus, D. (1987). The effects of taxation on the merger decision. *National Bureau of Economic Research*, 37 (6):121-153.
- [21] Wenlu, Dou. (2015). Debt maturity structure and firm innovation capability: Empirical evidence from listed companies. *Huazhong University of Science and Technology*, 17-20.
- [22] Bo Sun, Shanshi Liu, Junhui Jiang. (2019). *Chinese Journal of Management Science*, 27(04): 179-189.
- [23] Yuanyuan Zhang, Lanlan Sun, Zhuquan Wang. (2020). Whether commercial credit financing can improve the capital efficiency of the real economy: Based on the perspective of economic policy uncertainty. *Modern Finance (Journal of Tianjin University of Finance and Economics)*, 370 (11), 54-68.