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Research on the Value-added Effect of Venture Capital Supporting the Development of Venture Enterprise

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Abstract: The key to national innovation driven development is to leverage the supportive role of venture capital in the development of venture enterprises. This paper takes companies listed on the New Third Board from 2016 to 2021 as samples and uses a multiple linear regression model to study the impact of venture capital on the development of venture enterprises. It further explores the value-added effect of the impact from the probability dimension of being selected into the innovation layer.Research has found that venture capital entering the New Third Board has a higher probability of being selected for the innovation layer, and exerts a positive value-added effect; The impact of venture capital on listed companies on the New Third Board is mainly reflected in the strong screening ability of venture capital, which can screen high-quality risk enterprises, and increase the probability of listed companies being selected for the innovation layer through the value-added mechanism of venture capital. The research not only reveals the impact and value-added effect of venture capital on the development of venture enterprises, but also provides empirical evidence for the country to improve its financial service system and use the capital market to promote national innovation driven development.
Keywords: Venture Capital, Venture Enterprise, Value-added Effect, Innovation **L**ayer

1. Introduction

For venture capital enterprises, firstly, venture capital is a direct investment model without intermediate links. Venture capital enterprises can quickly obtain financial resources to alleviate financing constraints, solve the problem of insufficient investment in start-up enterprises, and facilitate the formation of initial competitive advantages. Secondly, venture capital institutions have a rich network of relationships [1] that can assist venture capital enterprises in obtaining subsequent financial resources, compensate for the shortage of resources invested by venture capital enterprises, and lay a financial resource foundation for the survival and innovative development of venture capital enterprises. Finally, venture capital institutions focus on investment in certain industry sectors, participating in post investment management by appointing board seats and leveraging their industry expertise and network advantages to provide regulatory functions for the development of venture capital enterprises. They provide assistance in talent introduction, strategic consulting, optimization incentives, and other aspects to improve the corporate governance capabilities of venture capital enterprises and enhance their management level, Assist venture capital enterprises in obtaining sustained competitive advantages. The effective integration and integration of heterogeneous resources from venture capital with existing resources can form a complementary resource combination, create unique advantages for venture enterprises, and enhance their core competitiveness [2].

The theory of "value-added" effect suggests that venture capitalists have rich management experience and industry expertise, and can provide value-added services to venture capital enterprises, thereby promoting venture capital support for their development. Venture capital mainly provides two types of value-added services: firstly, by entering the board of directors of venture enterprises after investment, it improves the internal corporate governance of venture enterprises and enhances the level of business management; The second is to expand the external resources of venture capital enterprises and provide diversified resource services [3].

The industry expertise of venture capital institutions is conducive to their value-added effects [4]. The value-added service effect of venture capital is influenced by investment methods and the background of venture capital institutions. The value-added service effect of joint investment is higher, while the value-added effect of government background venture capital is not significant. The value-added effect of foreign background venture capital is significantly positive, and the mixed background value-added effect of joint investment is more significant [5]. Based on the perspective of executive compensation, research on venture capital has found that by improving corporate governance and incentivizing management to engage in long-term investment activities that are conducive to corporate value, venture capital significantly increases the sensitivity between executive compensation and market performance in private enterprises [6].

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Tang Yunshu et al. found that after an IPO, the business performance and market performance of venture capital supported enterprises are no different from those of non-venture capital supported enterprises in their research on Hong Kong ChiNext listed companies [7]. Chen Jianli found in her study of Chinese companies listed on the ChiNext that the value-added effect of venture capital is limited [8]. As the proportion of venture capital holdings increases, the performance of venture capital supported companies does not significantly improve. Research on domestic IPO listed companies suggests that venture capital support has not fundamentally improved the operational efficiency of listed companies, and joint venture capital has had a negative impact on corporate growth [9].

The existing literature provides a reference for the research in this article, but most of them choose A-share listed companies as the sample for research. The impact of venture capital on enterprises cannot be better reflected in the effect of venture enterprises. At the same time, existing research mainly focuses on the impact on enterprise innovation, and there is little discussion on the impact of venture enterprises, especially those listed on the New Third Board. This paper takes enterprises listed on the New Third Board from 2016 to 2021 as a sample to explore the impact of venture capital on the development of venture enterprises. In order to better study the correlation between the explained variable and other variables, reduce prediction bias, and improve prediction accuracy, a multiple linear regression model is used to study the impact of entrepreneurial investment on the development of venture enterprises. Furthermore, this impact effect is explored from two dimensions: the probability and time of being selected into the innovation layer, which are value-added effects.

2. Research hypothesis

In June 2015, the National Equities Exchange Corporation issued the "Layered Management Measures for Listed Companies in the National Equities Exchange and Quotations System (Trial)", which decided to implement differentiated management for companies listed on the New Third Board, dividing them into basic and innovative layers. In 2017, the official draft of the "Layered Management Measures for Listed Companies in the National Equities Exchange and Quotations System", hereinafter referred to as the "Management Measures", was released, and in 2019, the layered management measures were improved, Implement a hierarchical management dynamic adjustment mechanism, establish a new selection layer, and cultivate target enterprises for companies listed on the New Third Board to go public.

Due to the short implementation time and small sample size of the selected layer of the New Third Board, this project mainly focuses on the selection of venture enterprises for the innovation layer.

Based on the analysis of the Longitudinal Research Database (LRD) of the US Census Bureau, it was found that the overall efficiency of venture capital supported enterprises is significantly higher than that of non venture capital supported enterprises, and there is no significant difference in investment effectiveness between different time periods. Venture capital has a significant screening function, and when a venture enterprise has a significant financial competitive advantage, it is more likely that venture capital will intervene in the venture enterprise [10].

Based on the above analysis, the following research hypotheses are proposed:

H: Under the control of other factors, the probability of companies listed on the New Third Board supported by venture capital in the New Third Board market being selected for innovation is higher.

3. Desing of the study

3. 1 Description of the study area

The purpose of this paper is to analyze the impact of entrepreneurial investment on the selection of innovation tier companies listed on the New Third Board based on a research perspective that distinguishes between the ex ante and ex post effects of entrepreneurial investment. That is to explore whether venture capital chose a target enterprise with better performance in advance, or whether its post supervision assisted in improving the operational performance of participating enterprises. Compare and analyze whether there is a significant difference in the post event effect between phased investment and individual rounds of entrepreneurial investment on the business performance of enterprises listed on the New Third Board; Is there a significant difference in the post event effect between joint venture capital and individual venture capital on the business performance of enterprises listed on the New Third Board; Is there a significant difference in the post processing effect of political "connected" background entrepreneurial investment and non political "connected" background entrepreneurial investment on the operating performance of enterprises listed on the New Third Board.

3.2 Data sources

Considering that China has implemented the New Third Board tiered system since 2016, enterprises listed on the New Third Board from 2016 to 2021 were selected as the research object. According to the research needs, the initial sample was screened and adjusted as follows: (1) Sample data of delisting, ST, application for suspension, termination of listing, and conversion of listed companies were excluded, while data samples of companies in their normal state were retained; (2) Eliminate missing samples of important data; (3) Exclude samples with missing data on investment rounds and obvious errors in the establishment time of venture capital institutions in venture capital events; (4) The sample of venture capital participation after excluding risky enterprises and being selected as the innovation layer; (5) To avoid the negative impact of outlier samples on statistical results, a 1% tail reduction was applied to the sample values. After the above processing, the remaining sample consists of 29660 annual observations from 6039 companies. The financial and corporate governance data of the research sample comes from the Wind database, while the venture capital data comes from the Qingke Private Equity Database.

3.3 Variable Declaration

3.3.1 Dependent Variable

Based on the reference of Ye Xiaojie and Jia Haoyang et al. (2020), the proxy variable for enterprise transformation and upgrading is whether a venture enterprise is selected as the innovation layer [11]. Whether the construction is included in the innovation layer (Layer_innov) dummy variable. According to the "Announcement on Issuing the List of Companies Listed in the Innovation Layer" released on the official website of the National Equities Exchange and Quotations System for Small and Medium Enterprises, it is determined whether the New Third Board enterprises were selected as innovation layer companies from 2016 to 2021. If selected, the value is 1, otherwise it is 0.

3.3.2 Explanatory variable

To comprehensively analyze the impact of heterogeneity in venture capital on the selection of venture capital firms for innovation, this project constructs the venture capital variable VC, with a value of 1 for venture capital firms participating, otherwise 0.

3.3.3 Control variable

Three types of control variables have been added to this paper. The first type is the company's financial indicators, which include three indicators: the size of the listed company, capital structure, and company growth, measured by the natural logarithm of total assets, asset liability ratio, and company sales revenue growth rate. The capital structure represents the capital structure and solvency of a company, reflecting its ability to borrow and operate. When a company faces lower financial leverage, continuous investment is more guaranteed, which enables it to expand its knowledge base through mergers and acquisitions, resulting in stronger innovation capabilities. To control endogeneity, financial indicator variables are analyzed using lagged one period data. The second type is the characteristic factors of the company, including the transfer method, company age, and regional marketization level. The transfer method is determined according to the "Guidelines for the Determination and Change of Stock Transfer Methods in the National Small and Medium Enterprise Stock Transfer System". If the listed company adopts market making transfer, the value is 1, otherwise it is 0; The age of the company is measured by the natural logarithm of the number of years since its establishment plus 1; The third category is corporate governance variables, mainly considering the indicators of the nature of corporate property rights (Soe). The specific variable definitions are shown in Table 1.

Variable	Variable Name	Variable Definition
Dependent Variable	Layer_innov	Selected to the innovation layer: Whether the listed company is selected to the innovation layer, the selection is 1, otherwise it is 0.
Explanatory variable	VC	The variable of venture capital is 1 for the venture capital enterprise, otherwise it is 0.
Control variable	Trade	Transfer method: When a listed company makes a market transfer, the value is 1, otherwise it is 0。
	Size	Enterprise size。
	Lev	The capital structure of a listed company lags behind its asset liability ratio by one period.
	Soe	The state-owned background variable is set to 1 when the actual controller of the company is the central or local State owned Assets Supervision and Administration Commission, state organs and ministries, local governments, or state-owned enterprises. Otherwise, it is set to 0.
	Market	The degree of marketization in the city where the enterprise is located.
	Age	The natural logarithm of the company's age and years of establishment.

Table 1: Variable Definition

3.4 Econometric model specification

We analyze the value-added effect of venture capital from the perspective of the probability of listed companies being selected into the innovation layer and the time of being selected into the innovation layer.

This paper constructed a Logit model to test the impact of venture capital on the probability of listed companies being selected into the innovation layer, which is the probability of listed companies being selected into the innovation layer. The coefficient reflects the impact effect of venture capital on listed companies being selected into the innovation layer. If the coefficient is positive, it indicates that venture capital participation can significantly increase the probability of listed companies being selected into the innovation layer.

$$Layer\_innov_{i,t} = \beta_0 + \beta_1 VC_{i,t} + \beta_2 Trade_{i,t} + \beta_3 Size_{i,t-1} + \beta_4 Lev_{i,t-1} + \beta_5 Soe_{i,t}$$
$$+\beta_5 Market_{i,t} + \beta_6 Age_{i,t} + YearDummy + IndDummy + \varepsilon_{i,t}$$

Drawing on existing research, models also control for factors such as trading methods, listed company size, capital structure, property rights nature, regional marketization level, and company age. Among them, represents the trading

method of the listed enterprise in year t; It is the asset size of a listed enterprise that lags behind one period, measured by the natural logarithm of the company's total assets at the beginning of the period; Represents the capital structure of company i at the beginning of year t, measured by the ratio of company liabilities to total assets; It is the property nature of a listed company, with a value of 1 for state-owned background companies, otherwise it is 0; It is the degree of marketization of the location where Company i is located in year t, measured by the degree of marketization of prefecture level cities[12]; It is the age of the listed enterprise, measured by the natural logarithm of the annual time interval between the establishment of the listed enterprise and its inclusion in the innovation layer; The dummy variables YearDummy and IndDummy are year and industry control variables.

4 Estimation

4.1 Descriptive statistics of main variables

Table 2 present descriptive statistical results for the main variables. From the selection of listed companies in the innovation layer, it can be seen that the dummy variable of the innovation layer is Lay_ The average innov is 0.19, which means that 19% of companies listed on the New Third Board in China have entered the innovation layer, and 81% of companies listed on the basic layer. The average value of VC is 0.47, indicating that 47% of listed companies have venture capital participation; From the perspective of trading methods and company characteristics of listed companies, 7% of listed companies use market maker trading methods, and 93% of listed companies use agreement transfer trading methods; The average size of listed enterprises is 18.37, the median is 18.38, and the maximum value is 21.22, indicating that the average size of enterprises is not large and the degree of dispersion is relatively small; The average value of capital structure is 40.59%, with a minimum value of 3.53% and a maximum value of 95.36%, indicating a high degree of dispersion in the capital structure of listed companies, with a maximum value of 28.89 times the minimum value; The average Soe of property rights is 0.05, indicating that the proportion of Chinese background enterprises in the New Third Board is only 5%; The average level of corporate financing constraints is 0.92, with a median of 0.88, indicating that the financing constraints of listed companies are leftward biased, with more than half of the companies facing strong financing constraints.

Variable	average	median	minimum	maximum	standard deviation	sample
Lay_innov	0.19	0.00	0.00	1.00	0.39	29660
VC	0.47	0.00	0.00	1.00	0.50	29660
Trade	0.07	0.00	0.00	1.00	0.25	29660
Size	18.37	18.38	15.75	21.22	1.12	29660
Lev	40.59	39.65	3.53	95.36	20.58	29660
Soe	0.05	0.00	0.00	1.00	0.21	29660
Age	2.61	2.64	1.61	3.40	0.38	29660
Market	13.73	13.67	9.34	18.15	1.80	29660

Table 2: Descriptive statistics of main variables

4.2 Pearson's correlation coefficient of the main variable

Tables 3 report the Pearson correlation coefficients of the main variables. Overall, the correlation coefficients between variables are all less than 0.5, and there is no significant multicollinearity.

	Lay_innov	VC	Trade	Size	Lev	Soe	Market	Age
Lay_innov	1							
VC	0.314***	1						
Trade	0.215***	0.101***	1					
Size	0.335***	0.247***	0.228***	1				
Lev	-0.019***	-0.043***	-0.039***	0.175***	1			
Soe	0.001	0.006	0.014**	0.158***	0.050***	1		
Market	-0.009	-0.015***	-0.047***	0.020***	0.058***	0.017***	1	
Age	0.028***	-0.004	0.052***	0.255***	0.045***	0.028***	0.112***	1

Note: *, * * and * * * represent significance levels of 10%, 5%, and 1%, respectively for all tables.

Table3: Pearson's correlation coefficient of the main variable

From the perspective of the influencing factors of listed companies being selected for the innovation layer, factors such as venture capital, trading methods, enterprise size, capital structure, and enterprise age can all affect the probability of listed companies being selected for the innovation layer. Venture capital variable VC and variable Lay_Innov correlation coefficient is significantly positively correlated, indicating that participation in venture capital helps listed companies to be selected into the innovation layer.

4.3 The Impact of Venture Capital Participation on the Probability of Listed Companies Being Selected into the Innovation Layer

Tables 4 present the impact test of entrepreneurial investment on the probability of listed companies being selected into the innovation layer. Equations (1) - (2) take the entire sample as the research object to test whether entrepreneurial investment helps listed companies to be selected into the innovation layer. The results show that the VC coefficient of the entrepreneurial investment variable is significantly positive, indicating a significant positive correlation between entrepreneurial investment and the selection of listed companies into the innovation layer. It is verified that the probability of entrepreneurial investment participating in enterprises being selected into the innovation layer is higher, and the research hypothesis H is verified. The coefficient of market maker trading methods is significantly positive, indicating that adopting market maker trading methods can significantly increase the probability of listed companies being selected for the innovation layer. The profitability, company size, and regional marketization degree of listed companies that lag behind one period are significantly positively correlated with the probability of being selected into the innovation layer, indicating that larger and more profitable enterprises have a higher probability of being selected into the innovation layer, while enterprises in regions with higher marketization degree have a higher probability of being selected into the innovation layer. The variable coefficients of capital structure, state-owned property nature, and enterprise age are significantly negative, indicating that a higher asset liability ratio reduces the probability of listed companies being selected for the innovation layer; Compared to private enterprises, state-owned enterprises have a lower probability of being selected into the innovation layer; Enterprises with a longer establishment time have a lower probability of being selected for the innovation layer.

Variable	(1) Lay_innov	(2) Lay_innov
VC	1.777	1.474
	(50.10)***	(39.22)***
Trade		0.907
		(15.80)***
Size		0.882
		(46.14)***
Lev		-0.008
		(-8.94)***
Soe		-0.618
		(-7.79)***
Market		0.028
		(2.77)***
Age		-0.309
		(-6.21)***
Constant	-2.213	-18.043
	(-18.58)***	(-45.61)***
Observations	29,627	29,627
pseudo_R2	0.111	0.221

Note: *, * * and * * * represent significance levels of 10%, 5%, and 1%, respectively for all tables.

Table 4: The Test of the Impact of Venture Capital on the Probability of Listed Companies Being Selected into the Innovation Layer

5 Results and Discussion

5.1 Conclusion of the study

This paper takes enterprises listed on the New Third Board from 2016 to 2021 as samples, collects financial and corporate governance data from the Wind database and venture capital data from the Qingke Private Equity Connect database, uses a multiple linear regression model to study the impact of venture capital on the development of venture enterprises, and further explores the value-added effect of this impact from two dimensions: the probability and time of being selected as the innovation layer. The empirical results indicate that: (1) participation of venture capital in enterprises listed on the New Third Board increases the probability of enterprises being selected into the innovation layer. After considering the control variables of enterprise size, capital structure, marketization degree, and market trading methods, venture capital has a more significant effect on improving the probability of listed enterprises being selected into the innovation layer; (2) Compared to venture capital companies that did not participate in the New Third Board listing, venture capital shortens the time it takes for venture capital companies to be selected for innovation. Therefore, after entering the New Third

Board listed companies, venture capital has a higher probability of being selected for the innovation layer and a shorter time for being selected for the innovation layer, exerting a positive value-added effect.

5.2 Policy recommendations

In order to better leverage the value-added effect of venture capital on the development of venture capital enterprises, this paper proposes the following suggestions: (1) establish a guiding mechanism for venture capital institutions, improve the investment level of venture capital institutions, strengthen communication between venture capital institutions, achieve information and other resource sharing, alleviate information asymmetry issues, and improve the value-added service capabilities of venture capital institutions; (2) Establishing incentive mechanisms for venture capital, promoting venture capital institutions to invest in venture enterprises, and promoting venture capital to promote innovative development of venture enterprises; (3) Improve the disclosure system for venture capital enterprises, strengthen the supervision of venture capital investment, alleviate the information asymmetry between venture capital and venture capital enterprises from the perspective of venture capital enterprises, and provide a screening scope for the development of venture capital enterprises; (4) Accelerate the development of the capital market, lower the entry threshold for venture capital institutions, encourage the establishment of venture capital institutions, expand the sources of venture capital funds, and guide venture capital to enter venture enterprises.

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