Empirical Analysis of Influence of Venture Capital on the Growth of Small and Medium-sized Enterprises

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***Abstract*—Venture capital is the incubator and booster for developing small and medium-sized industries. As a form of capital, venture capital plays an important role in the modern financial investment system. In the process of growth of small and medium-sized enterprises, venture capital has realized the organic combination of technology and finance. Not only can the venture capital obtain the investment income of the project itself, but more importantly, it can promote industrial upgrading and change the mode of economic growth, and affect the development of small and medium-sized enterprises, even the national economy. In modern economic society, small and medium-sized enterprises construct an important factor of GDP growth and they are also the dominant force and main carriers promoting the development of modern society. In spite of this, the small and medium-sized enterprises in China still have some obstacles at present such as the shortage of capital. It requires a great many improvements among the aspects of talents, funds and management. The emerging venture capital can make up for this deficiency and provide the SMEs with both capital and management methods. Thus it can be seen that it is necessary to apply venture capital into small and medium-sized enterprises.**

***Index Terms*—Venture capital, the Background of venture capital, Small and medium-sized enterprises, the growth of enterprises**

I. Introduction

In the modern economic society, the small and medium-sized enterprise represents an important force in economic development -- they are an important part of the national economy to ensure the steady growth of the national economy, alleviate employment pressure and promote technological innovation etc. In 2016, a set of data from the Ministry of industry and Commerce showed that: at the end of 2015, there were more than 2000 SMEs in the industrial and commercial registration area, and more than 54 million businesses were self-employed.

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But on the other hand, small and medium-sized enterprises are facing difficulties in financing because of their serious shortage of capital, financial system, low technology level and high asset liability ratio. And many technological innovation projects are also stranded or unable to continue. There are two main types of financing in small and medium-sized enterprises: banks or venture capital. Compared with banks, venture capital has more professional knowledge background, and can make a more accurate judgement of the value of small and medium-sized enterprises, so that it can better solve the problem of information asymmetry between investors and entrepreneurs [1]. At the same time, venture capital can find the invisible value of the enterprise through the professional evaluation system, and then provide the necessary financial support for it. The development of small and medium-sized enterprises are considering investment and risk investment institutions closely related to the interests, risk investment institutions will be closely monitored by investment enterprises operating conditions, and the use of their own advantages to help the commercial cyber source to improve the governance structure, even personally involved in enterprise management, to provide advice and help the company succeed in important decisions. Besides, with the injection of venture capital can also reflect the development of a company from side to side so as to play an exemplary role for other potential fund providers. Considering the different sources of venture capital, venture capital can be divided into four categories: government background venture capital, private background venture capital, foreign capital background risk investment and mixed background venture capital. Based on this, this paper will study the positive role of venture capital in the growth of SMEs, and the positive and negative influence of different background risk investment on the growth of SMEs.

II. Research Hypothesis and Model Design

The paper chooses enterprises listed on the Shenzhen SME board in 2011-2015 as the research object. The data

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for empirical research were selected in accordance with the sample selection criteria according to the design variables from the listed companies in the prospectus and financial statement. In order to analyze the relationship between risk investment and the growth of small and medium-sized enterprises, we examine the impact of venture capital participation, government background venture capital, foreign capital background risk investment, private background venture capital and mixed background venture investment on the growth of the invested enterprises from the perspective of profitability.

A. Theoretical Analysis and Hypothesis

Hypothesis 1: the growth of enterprises involved in venture capital is better than those involved in risk free investment.

Barry (1990) put forward the hypothesis of "screening" and "supervision". After 1978-1987 years' Empirical Research on the US stock market, it is concluded that the underpricing rate of IPO with VC investment is lower, and the enterprises invested by VC are better than the other listed companies in the same period [2].

Gompers (1995) put forward the "value-added services" hypothesis that the risk investment can not only provide funds for the enterprise, but also provide "value-added services". These value-added services mainly include: professional management experience, the company's strategic decision-making, corporate governance capital structure and human resources aspects provide professional services [2].

Davila and Foster (2003) put forward the "certification" effect hypothesis, they think only those enterprises which are considered to have high potential for the development of good prospects for development can get the favor of venture capital. This kind of enterprise are easier to gather talents and technology, so as to form a virtuous cycle is conducive to the development of enterprises [2].

According to the above research we can found that, as a new way of financing, venture capital absolutely provide a convenient channel for small and medium-sized enterprises to get finance, which provides an effective solution to solve the problem of financing. VC can participate in the company management and strategic decision for the invested enterprise community interest. In addition, the good and effective operation ability they also bring value-added services for enterprises, and improve the operation and management efficiency. In a word, the mechanism of venture capital achieves "win-win" objective. From the above three points, we can see that the participation of venture capital has a positive role in promoting the growth of investment enterprises.

Hypothesis 2: the growth of small and medium-sized enterprises with government background VC is better than those without it

The government's background venture capital refers to the investment which are established and (partly) funded by the government. As the supreme authority of a country, the government not only can gather and dominate the national income, but also holds two monopoly exclusive resources for other economic entities is, namely management resources and the system of policies and regulations of design resources [3]. Therefore, the government background risk investment has a very important influence on the invested enterprises.

The primary purpose of the government's background risk investment is to provide financial support for small and medium-sized high-tech enterprises and make up for the shortage of market mechanism. Lerner believes that government background venture capital institutions will help attract private capital to new investment and improve R & D investment below the lowest level of social investment [4]. Such institutions do not usually pursue the goal of maximizing the return on investment as the main goal [5]. Therefore, it plays an irreplaceable role in the economic operation for the small and medium enterprises which lack capital support. Based on this, this paper puts forward the second hypotheses.

Hypothesis 3: the growth of small and medium-sized enterprises with foreign investment background risk investment is better than those without foreign investment background venture investment.

The institutions with foreign background of venture capital usually have more experience and more extensive international network. The venture capitalists with stronger professional ability, rich experience and professional skills can deal with uncertainty and asymmetric information and adverse selection of high tech industry R & D investment better[6].Based on this, this paper puts forward third hypotheses.

Hypothesis 4: the growth of small and medium enterprises with private background risk investment is better than that of private venture capital without private venture investment.

The capital structure of private venture capital investment is diversified, including enterprise capital, individual capital, institutional fund and foreign capital [7]. Private background of venture investment institutions invest in start-up enterprises mainly aims to obtain huge returns. So private capital tends to choose the high rate of return of the project, which requires the accumulation of the reputation of the industry, and improve the success rate of listed companies to withdraw.

Hypothesis 5: the growth of SMEs with mixed background venture investment is better than those without mixed background venture investment.

Mixed background venture capital refers to the capital offered by two or more venture investors at the same time or successively to the same growth start-ups. Due to the demand of multi - wheel financing and capital demand, many small and medium-sized enterprises have introduced venture capital with different capital attributes. Since the characteristics of syndicate are not only embodied in the

scale, quantity and capital of venture capital institutions, but also lied in the complementarity of resource advantages among different institutions and different backgrounds. Among them, the syndicated members of mixed structure have a high degree of diversification, and the advantage of resource complementation is more significant.

B. Sample Selection and Data Sources

The selected samples came from the small and medium-sized board in Shenzhen. And the data came from the prospectus of listed companies and the Tai'an data center. This chapter uses panel data model to analyze the impact of venture investment and different background risk investment on the growth of small and medium-sized enterprises. The specific screening criteria for data samples are as follows.

(1) The company that has been listed on the small and medium board from January 1, 2011 to December 31, 2015. This paper choose financial data of the listed board after as the basic data. The latest listed company's financial statements can be referred to as the 2015 annual financial statements. Therefore, the paper eliminates the sample of enterprises listed in small and medium-sized board companies after 2015.

(2) On the basis of meeting the time requirements of listing, the listed companies must meet the requirements for the definition of SMEs in People's Republic of China's SME Promotion Law in three aspects: operating income, total assets and the number of employees.

C. Measurement of Enterprise Growth

On the basis of combing a large amount of literature at home and abroad the paper come to the conclusion that the majority of domestic scholars tend to choose the growth rate of net assets, operating income growth rate and earnings per share growth rate as the substitution variable of financial indicators of enterprise growth. Considering the limited space and the limited ability of the author, the paper choose ROE (return on equity) as a dependent variable and measure the growth of SMEs from the perspective of profitability. To ensure the accuracy of the data, the paper uses the average value of ROE from 2011 to 2015, which names Growth.

D. Variable Definition and Model Construction

The paper uses the rate of return on equity as the dependent variable, and uses VC and the background of venture capital as independent variables. At the same time, considering the scale of enterprise, the ratio of venture, the holding time of risk investment and the rate of corporate assets-liabilities will also affect growth of enterprises, those four variables will be the control variable in this paper. Table I lists the specific definitions of the various variables.

TABLE I. VARIABLE DEFINITION

Variable Type	Variable Name	Variable Symbol	Variable Definition
Dependent Variable	Return of Equity	Growth	Return of Equity = net profit / owner's equity
Independent Variable	Venture Capital	VC	1 for VC participation ; otherwise 0
	Government Background	Gov	1 for Government investment background ; otherwise 0
	Foreign Background	FI	1 for Foreign Background investment; otherwise 0
	Private Background	PC	1 for Private Background investment; otherwise 0
	Mixed Background	Mix	1 for Mixed Background investment ; otherwise 0
Control Variable	the Size of Enterprise	Size	The logarithm of the total assets of an enterprise
	Shareholding Ratio	PESR	the number of VC shares/total equity
	Shareholding Period	PESJ	The logarithm of the month of stock holding
	Asset-liability Ratio	Debit	Asset liability ratio =total Liabilities / total assets

To verify the hypothesis, the paper construct 5 models as follows:

$$Growth = b_0 + b_1 VC + b_2 Size + b_3 PESR + b_4 PESJ + b_5 Debit + e \quad (1)$$

$$Growth = b_0 + b_1 Gov + b_2 Size + b_3 PESR + b_4 PESJ + b_5 Debit + e \quad (2)$$

$$Growth = b_0 + b_1 FI + b_2 Size + b_3 PESR + b_4 PESJ + b_5 Debit + e \quad (3)$$

$$Growth = b_0 + b_1 PC + b_2 Size + b_3 PESR + b_4 PESJ + b_5 Debit + e \quad (4)$$

$$Growth = b_0 + b_1 Mix + b_2 Size + b_3 PESR + b_4 PESJ + b_5 Debit + e \quad (5)$$

III. Empirical Analysis of the Impact of Venture Capital on the Growth of Small and Medium-Sized Enterprises

A. Descriptive Statistics

According to the data calculated and listed in the article, the descriptive statistical analysis is carried out. Table 2 lists the growth of the listed companies and the statistical characteristics of other variables. We can see from the table that the maximum value of ROE is 1.46, and the minimum value is -0.01. The average value is 0.07, so the research space of the growth of small and medium-sized enterprises is relatively large. The average value of VC is 0.66, which means nearly 66% of SMEs introduced venture capital before IPO. The mean value of the venture capital invested by the government is 0.08， which means government - backed venture capital accounts for 8% in total venture capital enterprises. The mean value of the venture capital invested by foreign capital is 0.08， which means foreign - backed venture capital accounts for 8% in total venture capital enterprises. The mean value of the venture capital invested by private capital is 0.03， which means private - backed venture capital accounts for 3% in total venture capital enterprises. The mean value of the venture capital invested by mixed capital is 0.08， which means mixed-backed venture capital accounts for 8% in total venture capital enterprises. The mean, maximum and minimum of the enterprises are not very different from each other, which indicates that the scale of each enterprise of the sample are similar.

TABLE II. Descriptive Statistics

	Min	Max	Average	Standard deviation
ROE	-0.01	1.46	0.07	0.11
VC	0	1	0.66	0.47
Gov	0	1	0.08	0.27
FI	0	1	0.21	0.41
PI	0	1	0.3	0.46
Mix	0	1	0.08	0.27
Size	19.24	25.82	21.14	0.76
PESR	0.01	0.94	0.32	0.19
PESJ	-2.88	4.47	0.45	0.46
Debit	0.18	0.94	0.51	0.14

TABLE III. Correlation Analysis

	Growth	VC	FI	PC	Gov	Mixed	SIZE	PESR	PESJ	Debit
Growth	1.00									
VC	.18*	1.00								
FI	.48**	.36**	1.00							
PC	.38**	.46**	.33**	1.00						
Gov	.25*	.20**	.15	.19*	1.00					
Mixed	.11*	.21**	.15*	.15*	.86	1.00				
SIZE	.01	.10*	.04	.07	.03	.12	1.00			
PESR	.10*	.15**	.19*	.23**	.09	.14	.32**	1.00		
PESJ	.01	.04	.03	.08	.10	.02	.27**	.11**	1.00	
Debit	-.04	.07	-.01	.03	.09	.12	-.02	-.56**	.12	1.00

**means significantly related at the level of 0.01; *means significantly related at the level of 0.05.

B. Correlation Analysis

From the Pearson correlation analysis results of Table III. we can see that the correlation coefficient between the independent variable Growth and the dependent variables VC, FI, PC, Gov and Mix are respectively 0.18, 0.48, 0.38, 0.25, 0.11. Apparently the correlation coefficient are significantly and positively correlated, while the scale of institutional investors, the shareholding ratio, the shareholding time and the asset-liability ratio are relatively low. So there is no common linear problem between the explanatory variables of the model, and the model can better explain.

C. Multiple Regression and Result Analysis

In this paper, we choose the enterprises listed on the small and medium board in Shenzhen in 2011-2015, including 132 venture capital enterprises and 68 enterprises without venture capital. The paper chooses ROE to measure the growth of enterprises not only it reflects the income of the shareholders of SMEs. It is also the core indicator of DuPont's analysis.

Model (1) verifies the influence of venture capital on the growth of SMEs. This paper predicts that venture capital has a positive impact on the growth of small and medium-sized enterprises. The results are as Table IV:

TABLE IV. THE REGRESSION ANALYSIS OF THE IMPACT OF VENTURE CAPITAL ON THE GROWTH OF SMES

	Coefficient	Statistics	Significance
Constant	0.09	3.631	0
VC	0.036	1.678	0.048
Size	0.006	0.727	0.468
PESR	0.037	1.158	0.247
PESJ	0.016	1.363	0.173
Debit	-0.012	-0.625	0.454

The empirical results show that the correlation coefficient between venture capital and ROE is 0.036, which has a positive correlation under the level of 5%. The empirical results further indicate that enterprises with venture capital have better growth than those without government venture capital.

Model (2) verifies the influence of government venture capital on the growth of SMEs. This paper predicts that government venture capital has a positive impact on the growth of small and medium-sized enterprises. The results are as Table V:

TABLE V THE REGRESSION ANALYSIS OF THE IMPACT OF GOVERNMENT VENTURE CAPITAL ON THE GROWTH OF SMES

	Coefficient	Statistics	Significance
Constant	0.09	3.631	0
VC	0.036	1.678	0.048
Size	0.006	0.727	0.468
PESR	0.037	1.158	0.247
PESJ	0.016	1.363	0.173
Debit	-0.012	-0.625	0.454

The empirical results show that the correlation coefficient between government venture capital and ROE is 0.026, which has a positive correlation under the level of 5%. The empirical results further indicate that enterprises with government venture capital have better growth than those without government venture capital.

Model (3) verifies the influence of foreign venture capital on the growth of SMEs. This paper predicts that foreign venture capital has a positive impact on the growth of small and medium-sized enterprises. The results are as Table VI:

TABLE VI. THE REGRESSION ANALYSIS OF THE IMPACT OF FOREIGN VENTURE CAPITAL ON THE GROWTH OF SMES

	Coefficient	Statistics	Significance
Constant	0.068	3.975	0
FI	0.039	1.608	0.045
Size	0.002	0.231	0.456
PESR	0.025	0.314	0.575
PESJ	0.023	0.536	0.631
Debit	-0.037	-0.541	0.597

The empirical results show that the correlation coefficient between foreign venture capital and ROE is 0.039, which has a positive correlation under the level of 5%. The empirical results further indicate that enterprises with foreign venture capital have better growth than those without foreign venture capital.

Model (4) verifies the influence of private venture capital on the growth of SMEs. This paper predicts that private venture capital has a positive impact on the growth of small and medium-sized enterprises. The results are as Table VII :

TABLE VII. THE REGRESSION ANALYSIS OF THE IMPACT OF PRIVATE VENTURE CAPITAL ON THE GROWTH OF SMES

	Coefficient	Statistics	Significance
Constant	0.071	3.904	0
PI	0.016	1.568	0.038
Size	0.001	0.031	0.975
PESR	0.037	0.573	0.568
PESJ	0.008	0.444	0.658
Debit	-0.022	-0.697	0.487

The empirical results show that the correlation coefficient between private venture capital and ROE is 0.016, which has a positive correlation under the level of 5%. The empirical results further indicate that enterprises with private venture capital have better growth than those without private venture capital.

Model (5) verifies the influence of mixed venture capital on the growth of SMEs. This paper predicts that mixed venture capital has a positive impact on the growth of small and medium-sized enterprises. The results are as Table VIII:

TABLE VIII. THE REGRESSION ANALYSIS OF THE IMPACT OF MIXED VENTURE CAPITAL ON THE GROWTH OF SMES

	Coefficient	Statistics	Significance
Constant	0.023	0.722	0.471
Mix	0.568	7.564	0
Size	0.213	0.485	0.345
PESR	0.058	2.136	0.467
PESJ	0.154	0.023	0.556
Debit	-0.021	-0.268	0.569

The empirical results show that the correlation coefficient between mixed venture capital and ROE is 0.016, which has a positive correlation under the level of 5%. The empirical results further indicate that enterprises with mixed venture capital have better growth than those without mixed venture capital.

IV. Conclusion and Suggestions

A. Countermeasures to Promote the Growth of Small and Medium-sized Enterprises with Venture Capital

The above empirical research shows that: Venture capital firms have higher ROE than those without venture capital, and the conclusion is that venture capital has a positive effect on the growth of SMEs. Based on this, this paper suggests that small and medium-sized enterprises should actively introduce venture capital and establish an effective exit mechanism of venture capital.

The most effective way to maintain the vitality of venture capital is the circulation of funds. In order to get excess profits from the invested SMEs, SMEs should not only actively introduce venture capital, but also establish an effective exit mechanism for venture capital. At present, the threshold of A share market is too high, and there are many insurmountable obstacles for small and medium-sized enterprises whose capital and scale are expanding or stabilizing. Therefore, small and medium-sized enterprises should establish a diversified exit mechanism based on the establishment of a multi-level stock market, OTC market, main board market and other multi-level equity and property rights trading markets[8].

B. Countermeasures to Promote the Growth of Small and Medium-sized Enterprises with Various Background Venture Capital

Based on the above empirical research, we come to the conclusion that the four kinds of background venture capital all have a positive impact on the growth of SMEs. This paper puts forward the following countermeasures and suggestions for small and medium-sized enterprises.

Give full play to the guiding role of government capital. Chinese government should play the guiding role and actively corporate with different background private and foreign investment institutions.

Make full use of the resources advantage of foreign capital. Foreign background venture capital institutions usually have stronger international relations network, richer management experience and professional skills, which can help venture capital organizations to select potential enterprises and play a value-added role in supervising their development. Therefore, small and medium-sized enterprises should make good use of foreign background venture capital resources to enhance their profitability and management level.

Coordinate the conflict of interest among the mixed venture capital institutions. Mixed background of venture capital can realize the sharing of resource, knowledge structure and other aspects among different kinds of venture capital institutions. While making full use of the abundant funds and sharing resources of the mixed background VC, SMEs should coordinate the interests of investors.

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