The Effect of Technology Innovation Fund on SMEs' Financial Growth——Using Manufacturing Company Data from China [*]

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Abstract

The paper examines the effect of Technology Innovation Fund on financial growth of SMEs. We take manufacturing companies listed on the China SMEs' board as sample, and employ factor analysis to calculate the composite score of the SMEs' financial growth. In our study both the t-test for independent samples and regression analysis are taken to investigate the incentive effect of the Technology Innovation Fund on SMEs' financial growth. The empirical results lead to three implications, firstly, the findings provide empirical evidence that the Fund has really take effects on prompting the financial growth of the SMEs; secondly, the bigger size or the better current ratio it owns, the better financial growth of the firm; finally, the asset-liability ratio and employee scale have no significant effect on financial growth.

Key word: Technology Innovation Fund financial growth factor analysis

JEL Classifications: G380, H320, M480

1. Introduction

From the international perspective, there are a large number of small and medium-sized enterprises (SMEs) from developed to developing countries, and SMEs have become the rapidest and most dynamic momentum for the socio-economic development for the countries, so supporting the SMEs' development is treated as a basic national policy for almost all countries. In the market economy, under certain circumstances, market mechanism served as "invisible hand" is inefficient in the process of allocating credit resources and cannot play due role in the regulation, hence, government should act as the "visible hand" to give positive amendment to the "market failure".

SMEs face extremely high risk of technology and finance, considering the externality of the innovation activity, market failure of SMEs' innovation becomes an inevitable issue. At the stage of the start-up or climbing, the SMEs may keep high technical project, but the R&D need large amounts of fund and do not necessarily bring immediate benefits, because of the high level of risk, the commercial capital is reluctant to get involved in, the lack of direct finance from the securities market becomes the bottleneck for the SMEs' development, the situation become more serious for the countries which are of poor social credit environment and high tax burden.

*This study is supported by grants from the "*Project 211*" Fund of the Central University of Finance and Economics (CUFE) and the Graduates' Innovation Project of CUFE (*Approval No.201218*); the data collection is conducted with the help of Qiuchan Huang, Liwen Cheng, Xianya Zhang, Changwei Li, Yazhou Yan and Chuan Chen. The authors appreciate the helpful comments of two anonymous reviewers, and all errors are our own.

Given these main bottlenecks that hinder their development, government should implement fiscal policy incentives, legal protection and technical support on the SMEs. The Chinese government attaches great importance to support the SMEs, especially for high-tech SMEs. In recent years, the Ministry of Finance, the Ministry of Science and Technology and local government departments, has set up hundreds of projects to promote SMEs' R&D and growth; supportive policies and measures for SMEs are constantly being improved, such as SMEs Promotion Law of the People's Republic of China was issued in 2002, which establishes the legal form to regulate explicitly the support polices for the first time; governments at all levels introduced a series of financial supports to ease the pressure in the process of SMEs' growth, especially for financing difficulties.

In 1998, by the recommendations of the oversea scholars, the Chinese government set up Innovation Fund for Technology based Firms (hereinafter referred to as the "Innovation Fund") administrated by the Ministry of Science and Technology. Innovation Fund is not for the purpose of profit, and is applied and managed on the principal of honestly-applied-for, justly-accepted, preferentially-supported, scientifically and transparently-managed, and earmarking. Innovation Fund for all kinds of technology-based SMEs registered in China, to support the project which is of higher levels of innovation and strong market competitiveness, better potential economic and social benefits.

According to different characteristics of SMEs and its projects, Innovation Fund is categorized into several types, including interest payments on loans, free financing and capital injection. More importantly, Innovation Fund acts as a crucial instrument for Chinese government to support the growth of technology-based SMEs, does it perform effectively compared with the initial goal, in other words, and do the SMEs that are supported by the fund have significant better performance compared to that is the rejected? To answer this question, it is necessary to give both in-depth theoretical analysis and more empirical evidence. Based on prior literature, we use the Chinese data to examine the effectiveness of the government intervention on market failure.

The rest of the paper is organized as follows. Section 2 envelops literature review; Section3 shows the study design; Section4 presents the empirical methodologies and results; Section5 concludes the paper.

2. Literature Review

To test the government support policy incentive effect on the growth of SMEs has caught wide attention among scholars. Large scales of prior studies document the issue on SMEs growth and effectiveness of the government supports, including:

1. Focus on SMEs' growth factors. The resources that the company keeps determine corporate capacity, and corporate capacity determines the speed of business growth, the growing mode and limits. Scholars believe that the innovation ability of enterprises plays a critical role in product innovation and organizational innovation which are the motivating factors for firm growth (Penrose, 1959; Wang Liangjun, 2007; Lv Yibo, *et al.* 2008); Firm size (Blank & Stigler, 1957), the quality of managers, the intrinsic quality of SMEs and corporate business development strategies are also important factors in determining its growth (Storey, 1994; Zhi-Cheng Li, 2003).

(Barkhma *et al.* 1996) verify that the manager's age and professional quality, collaborators condition, product market strategy and other factors will have an impact on business growth; meanwhile, the corporate life cycle, size and ownership (Konings, 1997), external financing constraints, the legal system are also important factors to firm growth (Ari Hyytinen & Mika Pajarinen, 2002; Thorsten, 2002); In recent years, many scholars begin to analyze enterprises growth from the point of view of the enterprises' competitiveness, the task environment, resources and mechanisms of growth, innovation capability, government support management, industry cluster, development mode and others (Y. Chen, *et al.* 2010; H. Qing, 2011).

2. Evaluating and measuring SMEs' growth. Most prior scholars select single indicator to measure the growth rate of SMEs, such as operating income (sales) growth rate (Calvin, 1981; Juan, 2012; C. Hao, 2006), the growth rate of the employees(Jozef Konings, et al. 2002; Alex Coad, 2010), the rate of profit growth, market share growth rate (Y. He, 2007). Other scholars generally believe that analysis that evaluates the enterprise growth from the point of view of a single indicator is biased, for the reason that a single indicator variables is difficult to make a reliable assessment of business growth, on the contrary, to evaluate the growth of enterprises should be on a multi-dimensional and deeper level.

Scholars are increasingly inclined to try to appraise the financial growth by establishing the evaluation index system to make a comprehensive evaluation (Fre'de'ric Delmara, *et al.* 2003; W. Li, 2005; Y. Zhang, *et al.* 2009; X. Bao, 2010; J. Liu, 2011; Y. Zhu, 2012). With regard to the evaluation method, the analytic hierarchy process (AHP) (H. Zhu, *et al.* 2004), structural equation model (Y. Chen, *et al.* 2010), catastrophe progression method (X. Chen, *et al.* 2005; X. Bao, 2010), principal component analysis (X. Zheng, 2005), factor analysis (X. Lu, 2011).

3. Government support effect on SMEs. Considering the SMEs has smaller size, lower managerial levels, relatively higher tax burden, resulting in lack of internal capital accumulation, while the external financing channels are narrow for the SMEs, and are faced with limited available finance; due to technology and knowledge characterized with externality as the public goods, the R&D activities will inevitably encounter market failure and insufficiently-invested problem (Arrow, 1962; Tassey, 2004). Therefore, scholars agree that it's necessary for the government to give subsidies and tax concessions to support R&D activities of SMEs; but they keep quite different opinions on the point of the government R&D support effectiveness.

Most scholars believe that the government plays an important role in the process of technological innovation of SMEs, the government constructs a favorable external environment for SMEs technological innovation, and guides its technical innovation by issuing a variety of supportive policies, which is conducive to enhancing the competitiveness of SMEs, development and expansion of the market (Scott, 1984; Duguet, 2004; V. Chandler, 2004; A. Briozzo, *et al.* 2012; C. Hao, 2006; J. Xia, *et al.*2007; X. Na, 2011; H. Yuan, 2012).Some other scholars believe that there is a serious dislocation between the initial intention of the government support policy and the actual effect; in other words, the effect of government support is far from the expectation.

Overall, the literatures study the effect of the government support, are only focus on the corporate R&D inputs, new product output and other point of view to examine the efficiency of government support policies, but the papers that evaluate the government technology innovation fund effect from the financial viewpoint are still uncommon and rare. So this paper looks forwards to making up the research gap by providing empirical evidence.

3. Study Design

Growth of enterprises is a complex concept, so only by means of systematical framework and theoretical modeling can it make comprehensive evaluation. This study draws on the idea of establishing business growth multi-index evaluation system, to condense the system of financial indicators from different dimensions using factor analysis, and to measure the growth of SMEs from point of view of finance; then do the empirical tests on the basis of the Fund:

1. According to the theoretical analysis, constructing the index system to evaluate the growth of SMEs, to extract the main factors could reasonably measure the growth we choose the principal component method and use factor score matrix to calculate each main factor score, and the appropriate weights for each factor score to calculate the final-weighted-average factor score;

2. Applying independent sample significance test (two-tailed t-test or non-parametric test) on the final-composite factors and integrated score variable to make preliminary appraisal of the growth differences between the innovation fund supported companies (observation group) and unsupported samples(control group) ;

3. Set the dummy variable to reflect the fact that whether the company received the Fund or not, and considering other non-financial characteristic as the control variables to implement regression analysis, and make comments on the real support impact of the Innovation Fund on SMEs, the research map is demonstrated as Figure 1.

3.1 Variable Selection and Definitions

As mentioned above, although many scholars have examined the government support effect on the growth of SMEs, but the ones specifically focus on the support validity of Technology Innovation Fund is still rare. It is remarkable to select the appropriate index system and test the Innovation Fund support effect on the SME financial growth through quantitative analysis. We believe that it is necessary to take various factors and appropriate variables into account to measure the growth of SMEs:

1. Correlated. The selected indicators must be able to reflect the certain aspects of the SEMs growth, and must be a concrete manifestation of the SMEs growth in these situations;

2. Important. It is unrealistic to establish a set of desirable and perfect index system when building evaluation index system, and only be focused on the proper dimension can maintain the appropriate evaluation;

3. Operational. The using data of the evaluation variables should be easily-collected from publicly available database;

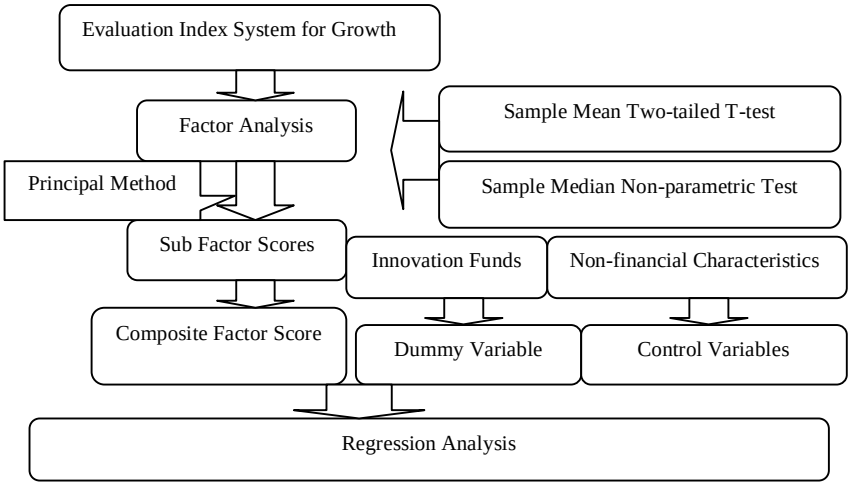

Figure 1: Research Technical Directions

4. Static and dynamic binding. Firm growth is a dynamic changing process; it's necessary to make comprehensive analysis of past and present development model and speed. Both dynamic indicators such as sales growth, profit growth and static indicators including sales and profit margin should be comprised in the evaluation index system. Accordingly, the variables chosen in the evaluation index system are shown in Table 1.

3.2 Sample Selection and Data Sources

Considering the significant industry-specific characteristic among SMEs, to minimize the error caused by the industrial factors, we only select the SMEs in manufacturing sector as the example[1]. To make more scientific and rational evaluation of SMEs financial growth, all the financial growth indicators for each enterprise are calculated based on average value of the sample data within three consecutive years. In order to ensure the integrity of the index value and to calculate the required data, we only select 495 companies which give the IPO before December, 2011 from all the listed 530 companies on SMEs sector, and calculate the mean of the relevant variables between 2009 and 2011[2].

To eliminate interference of the variable outliers, we make the truncation of the variables on the base of 3% and 97% quintiles; and finally get 368 firms observations. The raw data of growth evaluation indicators, asset-liability ratio, current ratio, the size by market value, age, as well as number of employees are available from the database RESSET[3] and CSMAR[4] respectively.

The Innovation Fund dummy variables is generated by hand-collected data according to both government grants information records in database (iFinD) and annual report of the detailed data; the scale of market value, firm age, the average number of employees, and other variables range from 2009 to 2011.

4. Empirical Methodologies and Results

4.1 Evaluating Financial Growth by Factor Analysis

1 By the end of 2011, we collect a total of 537 manufacturing enterprises from SMEs board, excluding the samples in textiles, clothing, fur, wood, furniture and food, beverages sector according to the Chinese SFC Industry Classification Standard.

2 All the growth rate-related indicators in this article are calculated in the geometric mean method, and other indicators in the arithmetic mean method.

3 http://www2.resset.cn/product/common/main.jsp

4 http://www.gtarsc.com/p/sq/

The factor analysis can convert the correlated indicators into several irrelevant main components, to avoid the false caused by information correlation, and the main components extracted may reflect most of the information of the original variables. But using factor analysis requires that there is a strong correlation between the variables chosen; it should be firstly examined whether the indicator variables selected are appropriate for using principal component analysis or not.

Table 1 Variables Definitions

Variables		Definitions	Indicators
Financial indicators on the growth	Sales growth	(Sales of year t - Sales year t-1)/ Sales of year t-1	X1
	Net profit growth	(Net profit of year t - Net profit of year t-1)/ Net profit of year t-1	X2
	Total assets growth	(Total assets at the end of year t - Total assets at the end of year t-1)/ Total assets at the end of year t-1	X3
	Equity growth	(Equity at the end of year t - Equity at the end of year t-1)/ Equity at the end of year t-1	X4
	Sales margin	Operational profit of year t/Operational revenue of year t	X5
	Return on equity	Net profit of year t/Owners' equity of year t	X6
	Return on total asset	Net profit of year t/Total asset at end of year t	X7
	Tobin' Q	Market value at end of year t / Book value at end of year t	X8
	Total assets turnover	Operational revenue of year t / Average total assets of year t	X9
Funds support		1 if the company is supported by the funds from 2006 to 2009; 0 otherwise	fdm
Control variables	Asset-liability ratio	Total liabilities at end of year t/Total assets at end of year t	da
	Current ratio	Current assets at end of year t/ Current liabilities at end of year t	cr
	Firm size	Logarithm of the average market value from 2006 to 2011	size
	Firm age	Logarithm of the span from being established	fage
	Employee	Logarithm of the average employees from 2006 to 2011	emp

The correlation coefficients of the selected variables (X1-X9) for evaluating financial growth are shown in Table 2 Panel A, and the results of KMO test and Bartlett's test of sphericity are demonstrated in Table 2 Panel B, which show that absolute value of most correlation coefficients between the variables are greater than 0.3 and significant, except for the correlation coefficients between the sales growth (X1) and sales margin (X5), and that between the total assets growth rate (X3) and total assets turnover ratio (X9).

According to the criteria given by the statisticians Kaiser, the KMO value is 0.557> 0.5 (*i.e.* indicates quite suitable for factor analysis), the statistics of the Bartlett of spherical is 2573.046, the p-value is 0.000 and far less than 5% of the accepted significance level, therefore reject the null hypothesis of the Bartlett's test of sphericity, thus indicating that the selected indicator variables of this article are more suitable to carried out the factor analysis.

Using principal component method to determine the number of the main factors, by the general criteria that the eigenvalues are larger than 1.00 or the cumulative variance contribution rate is greater than 80% corresponding to the number of the main eigenvalues. The eigenvalues contribution rate and cumulative contribution rate of the principal factors are shown in Table 3.

This paper selects the first four factors whose characteristics root is bigger than 1.00 as the main factors, and whose accumulated variance contribution rate comes to 0.83775, which means the four factors explain 83.775% of the total variance of the original variables, in other words, the selected factors retain more than 80% of the initial data information. Consequently, the subsequent analytical results are reliable.

When conducting the factor analysis, it's necessary to rotating the general component loading matrix orthogonally to make sure that each main component is of its own obvious economic implication, and that the load of each original variable on the principal components is centralized to 0, 1 and -1, so that we can make a more clear explanation of the practical significance of each principal component. In this paper, we take the proportion of the main factor variance contribution rate in the cumulative variance contribution rate as weighting to calculate the composite score, and the rotation component matrix is generated by the method of the Kaiser standardized quarter rotation method(the results see Table 4).

Tabel2 Panel A: The correlation coefficients of the selected indicator variables

	X1	X2	X3	X4	X5	X6	X7	X8	X9
X1	1.000								
X2	0.340	1.000							
	(0.000)								
X3	0.439	0.129	1.000						
	(0.000)	(0.003)							
X4	0.200	0.231	0.791	1.000					
	(0.000)	(0.000)	(0.000)						
X5	0.052	0.154	0.355	0.331	1.000				
	(0.136)	(0.001)	(0.000)	(0.000)					
X6	0.268	0.412	0.437	0.648	0.415	1.000			
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)				
X7	0.196	0.301	0.467	0.507	0.665	0.812	1.000		
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
X8	0.120	-0.059	-0.173	-0.420	0.164	-0.354	-0.118	1.000	
	(0.005)	(0.108)	(0.000)	(0.000)	(0.000)	(0.000)	(0.006)		
X9	0.133	0.244	0.007	0.101	-0.429	0.352	0.208	-0.284	1.000
	(0.002)	(0.000)	(0.442)	(0.017)	(0.000)	(0.000)	(0.000)	(0.000)	

Panel B: The results of KMO test and Bartlett's test of sphericity

	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.557
	Approx. Chi-Square	2573.046
	d.f	36
Bartlett's Test of Sphericity	Sig.	0.000

Note: Figures in brackets is the significance p-value of correlation coefficient.

Tabel3 Total Variance Explained

factor	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	total	variance %	cumulative %	total	variance %	cumulative %	total	variance %	cumulative %
1	3.573	39.700	39.700	3.573	39.700	39.700	2.386	26.510	26.510
2	1.677	18.631	58.331	1.677	18.631	58.331	2.094	23.265	49.775
3	1.246	13.845	72.176	1.246	13.845	72.176	1.694	18.820	68.595
4	1.044	11.599	83.775	1.044	11.599	83.775	1.366	15.180	83.775
5	0.665	7.394	91.169						
6	0.418	4.644	95.813						
7	0.210	2.328	98.141						
8	0.103	1.144	99.285						
9	0.064	0.715	100.00						

Communalities results (Table 4 column a) show the extent to which the raw data has been reserved by the principal component analysis method. From the extraction results analysis we can conclude that common degree of the selected variables is higher, more than 80% of the information is extracted for all the variables, what's more, variable decimation ratio of the total assets growth rate (X3), the sales margin (X5) reaches more than 90%, indicating that the selected main factors extract most of the original data information. Matrix in the column b of

Table 4 shows that sales margin (X5), ROE (X6), return on total assets (X7) loads heavily on the principal component 1, which can be defined as factor of corporate profitability, primarily reflecting the ability of enterprises to take advantage of a variety of resources to generate profit. Only if the Companies keep profitability can they achieve sustained financial growth.

Principal component 2 can be defined as firm size, whose loadings is mainly on the total assets growth rate (X3), the net assets growth (X4), reflecting the growth rate of corporate assets. The assets growth can be good measurements of the growth of SMEs, by which we can judge the corporate growth conditions according to the difference of the growth rate of total assets and net assets. Principal component 3 can be defined as the market value, which show the maximum loadings on the Tobin's Q (X8) and the total assets turnover ratio (X9), reflecting the company's market value and operating efficiency of assets, the market value is better rational indicator of future operating conditions for the market investors, and reflects the company's future growth propensity; operating is very important to the prospect of the SMEs growth.

Tabel4 Composite Component

variables	communalities a		rotated component matrix b				component score matrix c			
	initial	extraction	components				components			
			1	2	3	4	1	2	3	4
X1	1.000	0.864	0.024	0.273	0.036	0.888	0.117	-0.019	0.548	-0.453
X2	1.000	0.628	0.499	-0.102	0.329	0.510	0.131	-0.118	0.439	0.255
X3	1.000	0.902	0.199	0.862	-0.139	0.316	0.209	0.087	-0.067	-0.537
X4	1.000	0.874	0.365	0.855	0.088	0.036	0.231	-0.025	-0.251	-0.294
X5	1.000	0.934	0.739	0.163	-0.601	-0.021	0.153	0.443	-0.059	0.270
X6	1.000	0.881	0.782	0.399	0.319	0.091	0.247	-0.090	-0.025	0.267
X7	1.000	0.876	0.890	0.282	0.021	0.066	0.235	0.100	-0.008	0.365
X8	1.000	0.778	-0.036	-0.518	-0.572	0.426	-0.092	0.344	0.465	0.053
X9	1.000	0.803	0.118	-0.018	0.876	0.149	0.066	-0.491	0.150	0.181

Note: Extraction method is Principal Component Analysis; Rotation method is Varimax with Kaiser Normalization.

Only maintains a higher operating capacity in the same industry can the company takes advantage of internal resources efficiently, so as to enhance the confidence of the market. There is no significance difference between the principal component 1 and principal component 4 for the loadings of net profit growth rate (X2), but the principal component 4 reflects 88.8% of the loadings for the sales growth (X1), it can be considered that the principal component 4 mainly reflects the main business growth status of enterprises. In summary, we select profitability, firm size, market value and the main business growth status as the four main factors to measure SMEs financial growth.

According to the component score coefficient matrix in the column c of Table 4, we can describe the calculation of each factor score as follows:

$$F1=0.117X1+0.131X2+0.209X3+0.231X4+0.153X5+0.247X6+0.235X7-0.092X8+0.066X9 \quad (1)$$

$$F2=-0.019X1- 0.118X2+0.087X3- 0.025X4+0.443X5-0.090X6+0.100X7+0.344X8-0.491X9 \quad (2)$$

$$F3= 0.548X1+0.439X2- 0.067X3-0.251X4-0.059X5- 0.025X6- 0.008X7+0.465X8+0.150X9 \quad (3)$$

$$F4=-0.453X1+0.255X2-0.537X3-0.294X4+0.270X5+0.267X6+0.365X7+0.053X8+0.181X9 \quad (4)$$

Where the definition of X1-X9 is described as Table 1, and the composite factor score calculated on the basis of the weighting of each factor's variance contribution rate of the total cumulative contribution rate, the equation is shown as equation (5).

$$F=0.3164*F1+0.2777*F2+0.2246*F3+0.1812*F4 \quad (5)$$

According to equation (5), we calculate the composite factor score of all SMEs' financial growth, and thus make appraisal of SMEs' financial growth by the evaluation index system for multi-dimensional data, to overcome multicollinearity among the common indicators and avoid the defects which probably occurs when applying the Efficacy Coefficient Method, the evaluation method of AHP and Weighted Scoring Method, additionally, taking the composite score from factor analysis as dependent variable to implement regression analysis can greatly reduce the complexity of inspecting government support efficiency.

4.2 Significance Test of the Fund Support Validity

The existing research literature about the implementation effect of the Innovation Fund emphasizes mostly on vertical comparison, concerning the amount of support, and the payment, but rarely on horizontal comparison. This paper investigates the validity of the Innovation Fund from horizontal comparison perspective: do the enterprises supported by the Funds show better financial growth compared with that of the ones are not supported? If the Fund supported enterprises generally show better growth performance, on one hand indicating the Fund plays a catalytic role in business growth; on the other hand proving that the Fund has been acting properly and the government's resources are reasonably configured.

To test the effectiveness of the Fund on the financial growth of SMEs, this paper implement the independent sample mean test of four main growth factors and composite factor score, such as the mean of growth factor score between "Supported Group" and "Unsupported Group", thus we can conclude preliminarily that the Fund has significant impact; If the supported firms show significantly higher mean score than that of the unsupported group, and the Fund can be considered as positive in promoting the financial growth of SMEs, and *vice versa*.

There are mainly two ways concerning mean difference test for independent samples: in the case of variables follow a normal distribution one can do two-tailed t test for independent samples' mean, but if the variables do not follow a normal distribution one can carried out non-parametric test (Wilcoxon Z signed rank and Mann-Whitney U test) which does not rely on any distributional hypothesis. In the paper we examine the factor scores variables follow a normal distribution before the significance test, as it illustrated in Figure 2. According to the frequency distribution of the standardized factor scores, reporting that each score can be approximately deemed to follow a normal distribution and can be done two-tailed mean t test.

The results of independent sample two-tailed t-test are listed in Table 5, presenting the mean of factor scores for the supported and unsupported groups. There are totally 368 manufacturing SMEs observations, including 74 firms are supported by the Fund, while 294 firms do not get the support during the 2006-2009; The difference of each factor score variance within the supported and unsupported groups is quite slight, indicating that the two groups almost have the same volatility for the factor scores; However, judging from the mean of each factor score, the mean factor score of the unsupported group is significantly lower than that of supported group(the p-value <0.01), indicating preliminarily that the Fund has been the positive impetus on increasing the profitability, firm size, market value and the main business growth status.

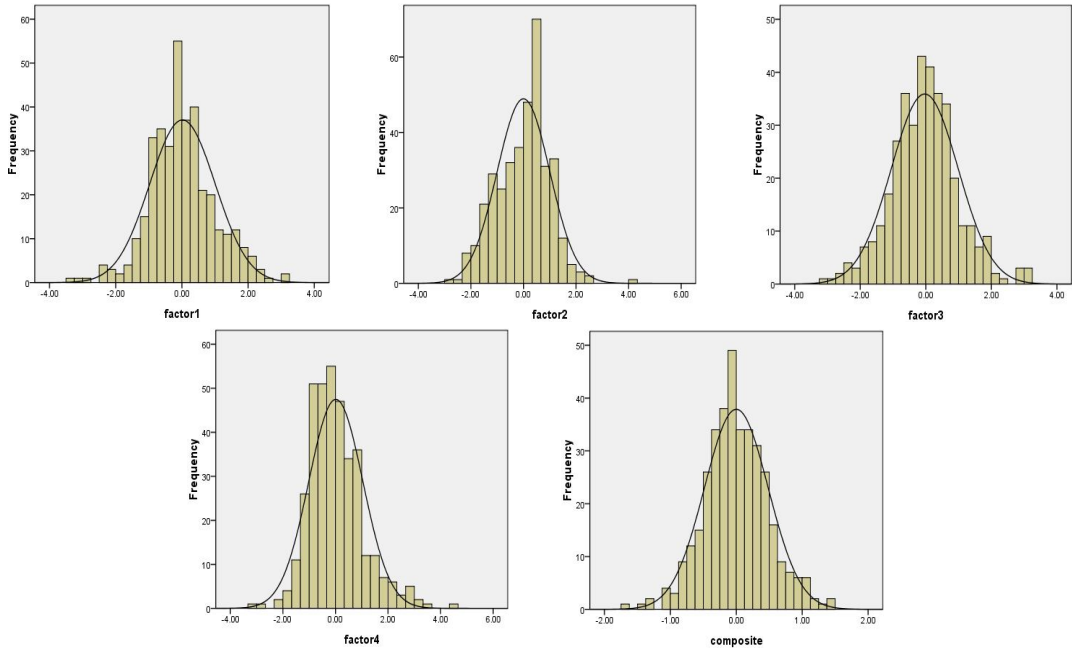

Figure 2: the Factor Scores Frequency Distribution

Table 5 The Results of Independent Samples Two-tailed t-test

Variables		Unsupported group			Supported group			independent samples t-test	
factors	indicators	mean	s.d	Obs.	mean	s.d	Obs.	t-value	p-value
factor1	F1	-0.076	0.973	294	0.383	0.982	74	-3.625***	.000
factor2	F2	-0.115	0.999	294	0.454	0.872	74	-4.482***	.000
factor3	F3	-0.125	0.985	294	0.333	1.090	74	-3.492***	.001
factor4	F4	-0.067	1.007	294	0.332	1.068	74	-3.015***	.003
composite	F	-0.096	0.455	294	0.382	0.403	74	-8.260***	.000

Note: ***, ** and *indicates the results are significant on the level of 1%, 5% and 10% respectively.

4.3 Regression Analysis

To further verify the validity of the Fund support on the financial growth of SMEs, we take the aforementioned financial growth score (F) as dependent variable, set dummy variable for Government Innovation Fund and treat asset-liability ratio, liquidity ratio, firm size and age of such non-financial character as control variables to establish a multiple regression analysis in model1, as shown in equation (6):

$$F_i=\alpha_0+\alpha_1 fdm_i+ \alpha_2 cr_i +\alpha_3 da_i +\alpha_4 fage_i+ \alpha_5 size_i +\alpha_6 emp_i +\varepsilon_i \quad (6)$$

The regression analysis results are provided in Table 6(Column 2), using the mostly-common and widely-accepted method of ordinary least squares, the model fitted goodness (R^2)has reached 0.273, the adjusted R^2 is 0.257, so the model can explain more than 25% of the basic information changes for dependent variables. We can see the dummy variable (fdm), which indicating the government support fund, has a significant positive coefficient, so we can draw that the Fund has really take effects on prompting the financial growth of the SMEs, and the coefficients of firm size (size) and current ratio (cr) also have positive coefficients and economically significant, showing that the larger size or the better current ratio it owns, the better financial growth of the firm; while the asset-liability ratio (da) and employee (emp) have no significant effect on financial growth.

In order to examine the different impact of the control variables on the financial growth at length and make sure the results of Model 1 are robust and reliable, we generate the interaction terms of the fund dummy variable and the control variables and construct the modified Model2-Model5, and the regression results are presented in the Table 6(Column3-6).The interaction terms of the control variables and dummy variable are all significant(*i.e.* the p-value<0.01) and positive, indicating that the firm size, current ratio, asset-liability ratio and firm age of the supported firms have much more marginal effects on the financial growth than that of the unsupported firms, giving new evidence that not only the support fund is valid, but also the firm size, current ratio, asset-liability ratio and firm age have significant different impact on the financial growth between supported and unsupported groups, which is consistent with the results from the Model 1.

Generally, the bigger the firm is, the more resources it owns, and the easier to obtain the external financial support and staffs with high educational level, so it shows better financial growth performance on the whole; the current ratio is the indicator reflects the short-term financial liabilities, the higher current ratio, the less short-term financial pressures and the better operating capability, the current ratio have the same effect on the financial growth as we expected; asset-liabilities ratio is another sign directs the solvency, but its coefficient is not significant in other models except for model 3 and 4; the coefficient of employee is not significant in all models.

5. Conclusions

In this paper we take 368 manufacturing SMEs from Chinese SMEs board as example, build systematical indicators for evaluating the financial growth of SMEs by factor analysis, four main factors are extracted by principal component analysis to measure the financial growth, and the composite factor is calculated by taking the proportion of each variance contribution rate as the weighting; thereby, we implement the independent sample two-tailed t-tests on each factor score and do multiple regression analysis and robustness test.

The study finds that Government Innovation Fund support has a positive effect on the financial growth of Chinese SMEs, judging from both independent sample two-tailed t test results and the results of the regression analysis. What's more, there is better financial growth for the firms which maintain the larger assets or the better current ratio, but the scale of employee has no significant effect on the financial growth. Current ratio and asset-liability ratio represent solvency and have significant different impact on the financial growth between the supported and unsupported group, therefore the SMEs should take measures to optimize the solvency indicators and lower the operational risks.

Table 6 The Results of Regression Analysis

Model	Model 1	Model 2	Model 3	Model 4	Model 5
Variables	OLS	OLS	OLS	OLS	OLS
fdm	0.406***				
	(6.45)				
size	0.196***	0.189***	0.242***	0.195***	0.195***
	(4.55)	(4.38)	(5.61)	(4.42)	(4.52)
size*fdm		0.031***			
		(6.51)			
cr	0.022***	0.022***	0.016*	0.023***	0.021***
	(2.67)	(2.69)	(1.83)	(2.73)	(2.61)
cr*fdm			0.065***		
			(4.96)		
da	0.261	0.261	0.364*	0.115	0.250
	(1.34)	(1.34)	(1.81)	(0.57)	(1.28)
da*fdm				0.971***	
				(5.70)	
fage	-0.121*	-0.121*	-0.134*	-0.126*	-0.150**
	(-1.78)	(-1.79)	(-1.93)	(-1.83)	(-2.21)
fage*fdm					0.163***
					(6.45)
emp	-0.017	-0.017	-0.039	-0.007	-0.016
	(-0.50)	(-0.51)	(-1.13)	(-0.20)	(-0.47)
_cons	-2.501***	-2.415***	-2.902***	-2.485***	-2.418***
	(-4.75)	(-4.57)	(-5.44)	(-4.63)	(-4.57)
N	284	284	284	284	284
R^2_adjusted	0.257	0.259	0.215	0.235	0.257
R^2	0.273	0.274	0.231	0.251	0.273
F	17.300***	17.457***	13.902***	15.486***	17.305***

Note: ***, **,*indicates the results are significant on the level of 1%, 5% and 10% respectively.

We do the paired test between the "Supported Group" and "Unsupported Group" and the regression analysis, but not yet rule out the problem of endogeneity which is caused the non-random distribution of the allocation of the Innovation Fund (*i.e.* the government may be more inclined to choose blue-chip enterprises or better-financially-performed firms to authorize the Fund). In this study, we try to take enterprise-scale as control variable in examining the finance growth, but still cannot get rid of the inference factors that incurred due to business growth, macroeconomic cycle and so on; Given the difficulties of data collection, some control variables are not included in the empirical research model which may affect the effectiveness of empirical research; in addition, time window length selected in this article is relatively shorter, and we are executing manual-data-collection, distributing the questionnaires and looking forward to refining the research.

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