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An Analysis of the Distinction Between High-Tech Enterprises and Non High-Tech Enterprises——The Research Object is Listed Manufacturing Enterprises in Shanghai

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ABSTRACT. *In this paper, 43 high-tech enterprises and 43 non-high-tech enterprises were selected as the samples by December 31, 2017.Firstly, the asset size of the two groups of samples is analyzed to test its comparability. Secondly, according to the recognition standard of high-tech enterprises and the financial characteristics of the main aspects of enterprises, 13 financial indicators are selected for independent sample t-test. The results showed that there were significant differences in four indexes between the two groups. Finally, the legist binary regression model is used to establish the identification model. The test results show that the proportion of R&D personnel and R&D investment can be used as the identification variables.*

KEYWORDS: *high tech enterprises, identification analysis, financial indicators*

1. Research motivation and research problems

In the context of mass innovation, the State encourages enterprises to develop independently and have core brands and competitiveness. Therefore, for high-tech enterprises, in the explicit aspect, the state gives tax preference, in the implicit aspect, the inclination of government policies, and the recognition of the public will bring obvious benefits to enterprises. Therefore, to become a high-tech enterprise is the direction of every enterprise.

Manufacturing enterprises, as the most traditional and the largest industry group in China, have always been characterized by capital intensive and labor-intensive. But in such an era when patent technology becomes the core competitiveness and enterprise innovation becomes the mainstream, active transformation becomes the necessity of enterprise survival. Therefore, this paper attempts to test the direction of manufacturing enterprises to grow into high-tech enterprises. However, through the

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analysis of the list of domestic high-tech enterprises at this stage, it is found that the regional distribution of domestic high-tech enterprises shows a very unbalanced state .As the financial center of our country, Shanghai has many high-tech enterprises and relatively perfect identification mechanism. Therefore, in order to ensure the adaptability of identification variables, this paper chooses Shanghai as the research scope.

Therefore, this paper intends to select the manufacturing listed enterprises in Shanghai as the research object, identify high-tech enterprises and non high-tech enterprises, in order to be able to choose a direction for manufacturing enterprises.

2. Sample selection

2.1 Select samples of high-tech enterprises

Step 1. As ST enterprises are in abnormal operation state, 317 samples of the list of non ST enterprises in Shanghai on December 31, 2017 were obtained by excluding ST enterprises.(data sources: CSMAR)

step 2. In order to ensure the accuracy of the identification of high-tech enterprises, it is defined as an enterprise that has been put on record and obtained the list of high-tech enterprises that have been put on record in 2017 in Shanghai, totaling 3247 samples (high-tech enterprise identification network)

step 3. After comparing the samples of listed enterprises in Shanghai with those of high-tech enterprises in Shanghai, 77 samples of high-tech enterprises in Shanghai were obtained.

Step 4. In order to ensure that the enterprise has the basic characteristics of listed enterprises, it is required that the sample enterprises have been listed for at least one year, and 61 samples are obtained by excluding the samples listed after December 31, 2016 and one sample with missing data (600627).

Step 5. 45 samples of manufacturing high-tech listed enterprises in Shanghai were selected by using 2012 industry classification standard of CSRC.

Step 6. The total assets scale is used to test the enterprise samples, among which (600104) SAIC and (600320) Zhenhua Heavy Industry Co., Ltd. are abnormally high (see Figure 1). Because the automobile manufacturing industry and equipment manufacturing industry are capital intensive, they are different from general manufacturing enterprises, so they are eliminated. Finally, 43 samples were obtained.

2.2 Select samples of non high-tech Enterprises

Step 1. In order to ensure the comparability of the samples, 73 samples of manufacturing non ST non high tech enterprises in Shanghai were obtained.

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Step 2. Excluding those listed after December 31, 2016, 48 enterprise samples were obtained

Step 3. In order to ensure the comparability of the two groups of samples to the greatest extent, five samples which are far from the average value of high-tech enterprises are eliminated.

Step 4. 43 samples of non-high-tech enterprises corresponding to high-tech regional samples were obtained.

Carry out preliminary statistical analysis on the selected two groups of samples. The analysis results are shown in Table 1. The results show that the average level and dispersion degree of the two groups of samples are very close, and the extreme values are not much different, so they have good comparability.

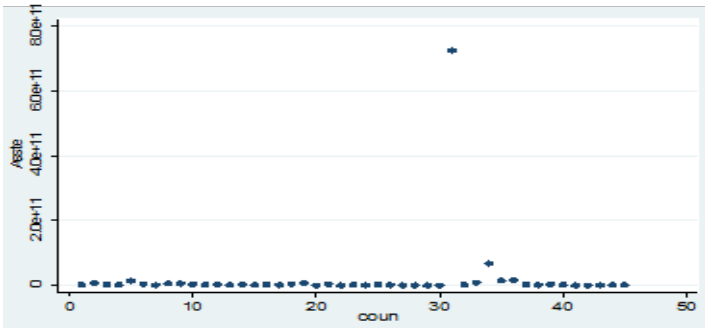

Figure. 1 Total assets

Table 1 Descriptive statistics of the two samples

total assets	Obs	Mean	Std. Dev.	Min	Max
High-tech enterprises	43	36.76843	38.68188	5.505342	173.6339
Non high tech Enterprises	43	37.86326	24.94201	6.501774	100.38

3. Indicator selection

1. Preliminary selection

According to the guidelines for the identification and management of high-tech enterprises, the identification and self-evaluation of high-tech enterprises consists of four aspects: intellectual property rights, the ability to transform scientific and technological achievements, the management level of research and development

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organizations, and the growth of enterprises. They are divided into 30, 30, 20 and 20.Therefore, this paper intends to select the corresponding indicators from these four aspects.

First of all, in terms of intellectual property, the number of patents is selected as an indicator to measure. The patent must be able to query the patent mark and patent number on the website of the State Intellectual Property Office before it can be included in the indicator measurement; Secondly, the transformation ability of scientific and technological achievements, that is, the overall R&D efficiency of the enterprise. In this paper, the output input ratio is used, in which the output is measured by the sum of the net value of intangible assets and the development cost at the end of the period. The development cost is the part after capitalization but not carried forward to intangible assets in the development process. This paper holds that this is also part of the research and development achievements. As for investment, it is the amount of all R&D investment of the enterprise in the year; thirdly, as for the management level of R&D organization, it mainly refers to the overall R&D atmosphere of the enterprise and the management's attention to R&D, etc. Therefore, this paper chooses the ratio of R&D investment to revenue and the ratio of R&D personnel to total employees to measure it. Finally, with regard to the growth of enterprises, this paper chooses four related indicators, namely, the growth rate of net asset net interest rate, the growth rate of operating income, the capital accumulation rate and the sustainable growth rate.

At the same time, in order to ensure that the key indicators are not missed, based on the above indicators, this paper adds some traditional financial indicators, asset liability ratio in terms of capital structure, shareholder equity turnover ratio in terms of operating capacity, capital intensity, dividend distribution ratio in terms of profit distribution and net cash content in terms of operating income in terms of cash flow.

So far, this paper selects 13 Financial Indicators for the selection of identification and analysis variables.

2. Index screening

In this paper, t-test of independent samples of single variable in comparative analysis method is selected, and the test results are shown in Table 3.According to the test results, only output/input, proportion of R&D personnel, R&D input/operating revenue and shareholder equity turnover rate show significant differences between the two groups of samples. These four indicators respectively represent the transformation ability of scientific and technological achievements, the management level of research and development organizations and the operation efficiency of enterprises. It can also be proved that the standards for the identification of high-tech enterprises at this stage are indeed discriminative, but there is no significant difference between the intellectual property rights and the growth of enterprises. This may be because there is a deviation in the measurement of indicators in this paper. According to the work guidance documents, when scoring the number of patents, we should also consider the patent grade, patent source and patent application Use the situation and other factors, which are difficult to collect because of the data, this paper does not consider. However, there are many

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controversies on the measurement of enterprise growth indicators. The four selected indicators are the most commonly used ones, but there may still be errors. At the same time, because of the small size of the sample, the difference cannot be shown. This is also the inadequacy of this paper. The supplementary financial indicators of other aspects of the enterprise, including financial policies and distribution policies, did not show significant differences in the two groups of samples. This shows that whether an enterprise can become a high-tech enterprise is not related to these indicators, but needs to break the routine, introduce new innovation blood and carry out more R&D activities under the condition of maintaining stable and normal operation.

Table 2 Descriptive statistics

Group statistics					
	Type	Number of cases	average value	Standard deviation	Mean value of standard error
Output / input	0	39	4.1538	5.58861	.89489
	1	43	49.2428	34.58220	5.27374
R & D investment / operating revenue	0	39	3.0590	2.09170	.33494
	1	43	5.5091	3.19223	.48681
Patent number	0	43	119.9302	318.43497	48.56088
	1	43	155.4186	201.62757	30.74792
Growth rate of return on net assets	0	43	-.0718	4.34135	.66205
	1	43	.1326	1.70471	.25997
Growth rate of operating revenue	0	43	.1695	.37047	.05650
	1	43	.3303	.70682	.10779
Capital accumulation rate	0	43	.1069	.14552	.02219
	1	43	.1181	.25986	.03963
Sustainable growth rate	0	43	.0660	.08488	.01294
	1	43	.0623	.05314	.00810
Asset liability ratio	0	43	.3437	.16676	.02543
	1	43	.3038	.12364	.01886
Dividend distribution rate	0	42	.2987	.56910	.08781
	1	43	.3305	.25146	.03835
Capital intensity	0	43	2.2221	1.66652	.25414
	1	43	2.2642	1.33423	.20347
Equity Turnover	0	43	1.1977	.81923	.12493
	1	43	.9039	.57899	.08830
Net cash content of operating income	0	43	.0742	.11504	.01754
	1	43	.1078	.08022	.01223
Proportion of R & D personnel	0	43	.1105	.08780	.01339
	1	43	.1814	.13707	.02090

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Table 3 The result of t-test

Independent sample test						
		Levin's test of variance equivalence		T-test of mean equivalence		
		F	Saliency	T	Freedom	SIG. (double tail)
Output / input	Assumed equal variance	19.218	.000	-8.043	80	.000
	Do not assume equal variance			-8.429	44.413	.000
R & D investment / operating revenue	Assumed equal variance	3.472	.066	-4.065	80	.000
	Do not assume equal variance			-4.146	73.076	.000
Patent number	Assumed equal variance	.006	.939	-.617	84	.539
	Do not assume equal variance			-.617	71.014	.539
Growth rate of return on net assets	Assumed equal variance	3.700	.058	-.287	84	.775
	Do not assume equal variance			-.287	54.651	.775
Growth rate of operating revenue	Assumed equal variance	2.906	.092	-1.322	84	.190
	Do not assume equal variance			-1.322	63.457	.191
Capital accumulation rate	Assumed equal variance	.112	.739	-.246	84	.807
	Do not assume equal variance			-.246	65.982	.807
Sustainable growth rate	Assumed equal variance	2.239	.138	.244	84	.808
	Do not assume equal variance			.244	70.539	.808
Asset liability ratio	Assumed equal variance	2.925	.091	1.260	84	.211
	Do not assume equal variance			1.260	77.460	.211
Dividend distribution rate	Assumed equal variance	.856	.358	-.334	83	.739
	Do not assume equal variance			-.332	56.135	.741
Capital intensity	Assumed equal variance	1.051	.308	-.130	84	.897
	Do not assume equal variance			-.130	80.163	.897
Equity Turnover	Assumed equal variance	7.359	.008	1.921	84	.058
	Do not assume equal variance			1.921	75.580	.059
Net cash content of operating income	Assumed equal variance	1.510	.223	-1.571	84	.120
	Do not assume equal variance			-1.571	75.038	.120
Proportion of R & D personnel	Assumed equal variance	1.427	.236	-2.857	84	.005
	Do not assume equal variance			-2.857	71.500	.006

4. Regression analysis

In this paper, the logist regression is carried out for the four indicators selected above. The regression results are shown in Table 4. When the R&D

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investment/operating revenue and the turnover rate of shareholders equity are regressed, they are not significant. Therefore, it should be removed, and finally, the output/input and the proportion of R&D personnel should be regressed. The regression equation is as follows

P=1/ (1+e^y)

y=-7.503927+11.99279*X1+0.3363066*X2

Where X1 is the proportion of R&D personnel, X2 is the input/output, and P is the probability that the enterprise is a high-tech enterprise

Table 4 The result of logist regression

Logistic regression			**Number of obs =**	**86**		
			LR chi2(2) =	105.29		
			Prob > chi2 =	0		
Log likelihood = -6.9668763			Pseudo R2 =	0.8831		
Types of enterprises	Coef.	Std.Err.	Z	P>z	[95% Conf.	Interval]
Input / output	0.3363066	0.0998349	3.37	0.001	0.1406337	0.5319795
Proportion of R & D personnel	11.99279	6.651998	1.8	0.071	-1.04489	25.03046
Constant term	-7.503927	2.409364	-3.11	0.002	-12.22619	-2.78166

5. Analysis of inspection results

First of all, according to the regression equation, the proportion of R&D personnel and R&D/investment, that is, the management level of R&D organization and the transformation ability of scientific and technological achievements, all contribute to the enterprise becoming a high-tech enterprise. Secondly, the proportion of R&D personnel plays a decisive role in these two indicators, which may be related to the fact that the indicator is the hard indicator of the recognition standard.

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6. Research inspiration and practical significance

In this paper, four financial indicators with significant differences between high-tech enterprises and non-high-tech enterprises are selected by using Shanghai listed manufacturing enterprises as the research object. It includes three aspects: the transformation ability of scientific and technological achievements, the management level of research and development organizations and the operation efficiency of enterprises. Although the identification results only show the first two aspects, in fact, each of the four indicators, when doing logit regression alone, is significant, but may not be significant in the first two aspects, because this is a hard indicator under the system. Therefore, manufacturing enterprises try to transform into high-tech enterprises from these three aspects. This also shows that high-tech enterprises are a substantial strength, not simply through the operation of financial policy or distribution policy. This requires the enterprise management to have a dedicated determination and courage, rather than a mere formality. At the same time, the test results of this paper also show that the implementation of the recognition standards of high-tech enterprises in China is implemented in general.

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