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Analysis on the comprehensive competitiveness measuring and internal diversity of strategic emerging industries in China's 424 listed companies

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ABSTRACT

According to the feature of strategic emerging industries and the panel data of listed company, this paper constructs the competitiveness-measuring index system of strategic emerging industries, and by using the Analytic Hierarchy Process and Delphi Method to calculate the competitiveness scores of 27 segments, further using Generalized Entropy Index, the trade gap and decisive factors of strategic emerging industries are analyzed. Based on the development status of strategic emerging industries, some related policy recommendations are proposed to improve the comprehensive competitiveness of strategic emerging industries.

KEYWORDS

Strategic emerging industry;
Listed company;
Comprehensive competitiveness;
Industry difference.

INTRODUCTION

Institute of public finance and Administration of Jiangxi University of Finance and Economics Rostov's theory of the stages of economic growth, Schumpeter's innovation theory and Vernon's product life cycle theory showed that any one technology or an industrial technology system was a life cycle. The growth of industry experienced four stages germination period, growth period, mature period and decline period[1]. The law of industry changes is the share of emerging industries in the whole national economy fast rise and decline industry gradually decline. Major changes each time the industrial structure is a group of industry by the emerging industry gradually evolved into a mature industry, while the industry on the other by a group of mature industries become the declining industry. According to the law of the development of the industry in general, strategic emerging industries and traditional industries is a relationship between before and after undertaking (Figure 1). Strategic emerging industry emerges in the development of traditional industries in the mature period and strategic emerging industry growth, accompanied by the transformation of traditional industry recession[2].

The community generally believes that the cultivation and development of strategic emerging industries should reflect the strategic needs of the country and the stage characteristics. At present, all the countries in the world for the development of emerging industries focus are different. America and EU focus on the search for new energy sources in the low carbon idea. England focuses on high-tech bio-industry. Japan focuses on energy and environmental industry. Russia focuses on nuclear technology. According to the relevant national deployment, china focuses on the development of strategic emerging industries including energy saving at

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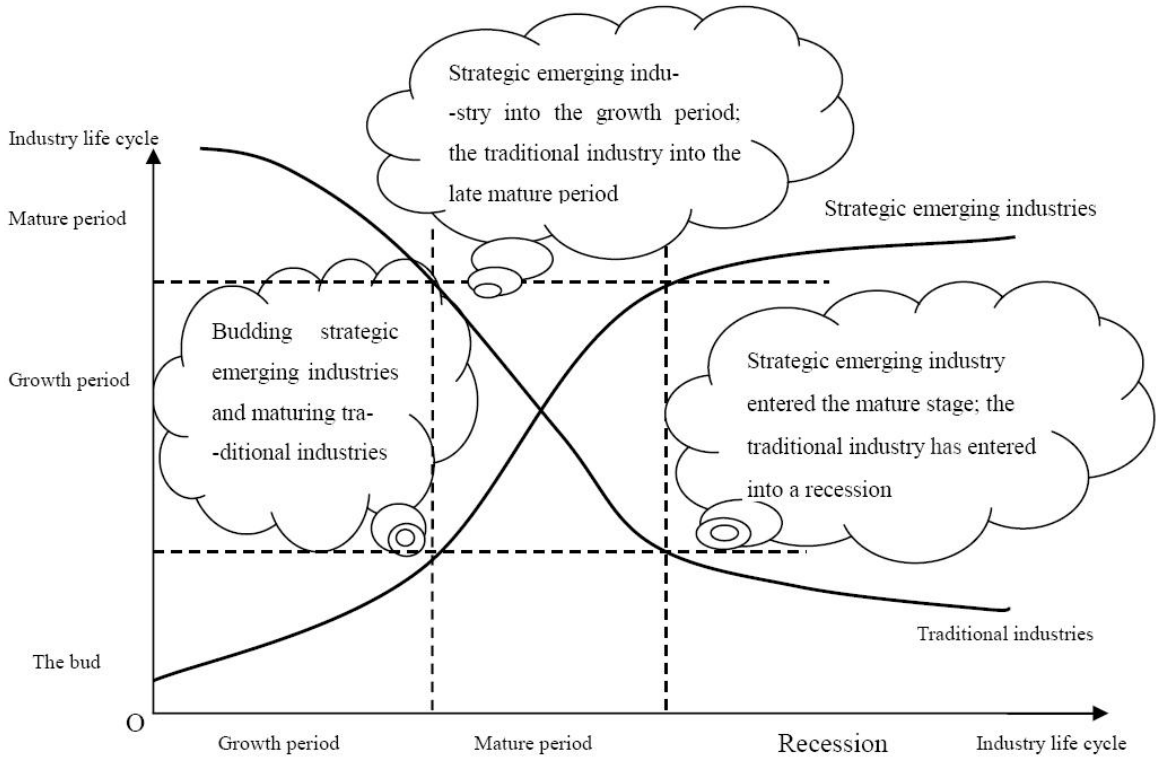

Figure 1 : Strategic emerging industries and traditional industries evolution relationship

this stage, a total of seven new generations of information technology and other industries.

By drawing on leading industry selection theory proposed by foreign scholars, Chinese scholars preliminary exploration of the comprehensive evaluation of strategic emerging industries. Xiao Xingzhi (2010) constructed the construction industry leading force, industrial development, industrial competitiveness index of 3 one class indexes. At the same time, he also constructed the industrial growth potential, industry spread effect standard, technology standard, the efficiency of independent innovation capacity, a total of 9 two level index[3]. Qiao Fangli (2010) the application of the Delphi method to construct the regional competitiveness of industry, industry contribution includes 2 layers, profitable industry growth potential,

TABLE 1 : The categories of China's seven strategic emerg

Industry category name	A category
Energy saving and environme--ntal protection	Environmental protection, energy saving, water saving
A new generation of information technology	The next generation information network, electronic core infrastructure industries, emerging high-end software and information service
Biology	Biological medicine, biomedical engineering, biological manufacturing
High-end equipment manufacturing	Aviation equipment, satellite and application, rail transportation equipment, marine engineering equipment, intelligent manufacturing equipment
New energy	Solar energy, smart grid, wind energy, nuclear energy, biomass energy
New materials	Advanced polymer materials, advanced materials, inorganic non-metallic materials, high performance special metal materials, composite materials, high-end metal structure material
New energy automobile	New energy vehicle, new energy automobile parts

ability, correlation effect 8 criterion layer, increase the income elasticity of demand, industry growth rate of total value of 15 solution layer in the evaluation index system of Civil War strategic emerging industry[4]. Zhou Hongying, He Zhengchu (2011) through the questionnaire survey, and the method of fuzzy membership degree method for emerging industries of strategic evaluation[5]. Liu Yong (2011) by using the calculation method of cloud model, evaluated the strategic emerging industry from the economic efficiency, growth potential, the core technology, driven effect, sustainable development, policy support to the 6 criterion layer[6].

On the whole, study on the evaluation of strategic emerging industries is at the starting stage. Most of the scholars draw the evaluation method and index system of leading industries, emerging industries, pillar industries, which has not yet formed a comprehensive evaluation index system for strategic emerging industries. In addition to strategic emerging industry connotation is controversial and has not been established statistical database dedicated emerging industries of strategic importance, so the scholars for emerging industries of strategic importance evaluation method and evaluation index system was limited in the qualitative analysis level. The characteristics of the connotation of the strategic emerging industry, combined with the State Council promulgated the "on accelerating the fostering and development of strategic emerging industries based decision". The sample of this study was 424 representative listing Corporation. First of all, the comprehensive competitiveness of the 27 segments of the 2011 China's strategic emerging industry estimates.On this basis, through the generalized entropy index and index we further analyzed the impact of China's strategic emerging industry difference and its decisive factors.

EVALUATION INDEX SYSTEM DESIGN AND DATA PROCESSING

(1) Design of evaluation index system

Strategic emerging industries in the continuation of

TABLE 2 : Index system design of strategic emerging industry competitiveness measuring

Target layer A	Criterion layer B	Index C	Meaning of the index
Competitiveness of strategic emerging industries	Management ability B_1	Total assets turnover C_1	All assets management quality and efficiency
		Current assets turnover C_2	Liquid assets turnover rate and efficiency
	Sustainable profitability B_2	Rate of return on assets C_3	Enterprise use all assets profitability
		Sales profit ratio C_4	Unit sales revenue profit level
	Rapid growth B_3	Rate of capital accumulation C_5	The enterprises in the capital accumulation
		Sales revenue growth rate C_6	Changes in a certain period of time the sales revenue of enterprises
	Technological innovation capability B_4	Average number of patents C_7	Industrial technology and innovation ability
		Productivity C_8	Comprehensive performance of staff technical proficiency
	Risk control ability B_5	Interest coverage ratio C_9	Ability to pay off the loan interest
		Barriers to entry C_{10}	The new entrants to the obstacle size

Note: due to the lack of relevant data, this paper uses dummy variable to measure industry strategic emerging industry entry barriers, including 0 that barriers to entry is relatively small; 1 said that the barriers to entry; 2 said that the barriers to entry is relatively large.

certain feature of traditional industry at the same time, it has the strategic and emerging properties. Therefore, in the establishment of the index system, we should fully consider the characteristics of strategic emerging industries, the specific evaluation index, and the difference between traditional industries.

The domestic study on strategic emerging industry is still in the initial stage. The dominant industry, dominant industry or high-tech industry and other similar evaluation industry standards for emerging industries of strategic importance comprehensive competitiveness measure has certain instructive. But as an important force in the future economic and social development of the strategic emerging industry, comprehensive competitiveness measure must be more comprehensive, accurate and flexible. The evaluation of domestic and foreign scholars on the competitiveness of the indicators, we investigated its comprehensive competitiveness from the management ability, profitability, growth ability and evaluation of its comprehensive competitiveness, and also from the technology innovation ability and risk control ability. Comprehensive above, considering the possibility of data constraints and calculation, and some preliminary results, enterprises conduct research and exchanges, we determined the index system of strategic emerging industry competitiveness measure from five dimensions respectively, and detailed analysis, the concrete index system design as shown in TABLE 2 show[7,8].

Because of the strategic emerging industry has not yet been established specialized statistics, the industry data acquisition is difficult. Although individual industry has published industry development report, but due to various development report statistics caliber is different, its availability is not strong. Therefore, this paper analyses the main board, gem and small and medium-sized plate listing Corporation information. At the same time we refer to Ren Zhengyu (2012) to collect part of the original data, do not meet the strategic emerging industry range of listing Corporation samples rejected. Finally, we get 424 listing Corporation data representative as the research sample. Related data were mainly from CSMAR database, listing Corporation annual report and website of the State Intellectual Property Office[9]. Based on the table of index system of 2 established as the basis, we get a conclusion that the original data of each index of the strategic emerging industry listing Corporation in 2011, descriptive statistics are shown in TABLE 3:

(2) Data processing

The order of the difference between the unifying index dimension and narrow index, we need the original non dimensional data processing. At present, the most commonly used dimensionless method is the method of standardization. Therefore, we make the:

$$y_{ij} = \frac{x_{ij} - \overline{x_j}}{\sigma_j} \quad (1)$$

$\overline{x_j}$ is the mean value and σ_j standard deviation index of x_j. After standardization, index of mean is 0 and variance is 1, eliminating the influence of dimension and order of magnitude. But the standardization law also eliminates the difference of each index variation

TABLE 3 : Descriptive statistics of strategic emerging industry evaluation index

Index name	Minimum	Max	Range	Mean	Standard deviation	Coefficient of variation
Total assets turnover	0.19	1.19	1	0.539	0.208	2.591
Current assets turnover	0.38	2023	2022.62	75.862	389.140	0.195
Rate of return on assets	0.01	0.19	0.18	0.045	0.034	1.324
Sales profit ratio	0.02	0.33	0.31	0.097	0.070	1.386
rate of capital accumulation	-0.56	1.56	2.12	-0.148	0.386	-0.383
Sales revenue growth rate	-0.54	0.4	0.94	-0.116	0.182	-0.637
Average number of patents	19.94	1086.83	1066.89	116.313	200.040	0.581
Productivity	39.09	1900.39	1861.3	221.625	355.467	0.623
Interest coverage ratio	-55.58	58.44	114.02	10.468	20.884	0.501
Industry barriers to entry	0	2	2	1.185	0.681	1.740

extent. Therefore, the standardized data can't reflect the information contained in original information. Leading to the comprehensive evaluation result is not accurate. In contrast, the mean of the law can make up the deficiency of the standardization law[10]. We can make:

$$y_{ij} = \frac{x_{ij}}{\overline{x_j}} \quad (2)$$

The mean value of index mean after all is 1, its variance is:

$$\mathrm{var}(y_{ij}) = E\left[(y_j - 1)^2\right] = \frac{E(x_j - \overline{x_j})^2}{\overline{x_j}^2} = \frac{\mathrm{var}(x_j)}{\overline{x_j}^2} = (\frac{\sigma_j}{\overline{x_j}})^2 \quad (3)$$

The variance of each index is the index of mean of coefficient of variation of $\overline{x_j}$ square. It retains the variation degree of information. So we used the mean method to make dimensionless treatment to the original data (Corporation section data of Strategic emerging industry listed in 2011).

(3) Index weight determination

There are many methods to determine the index weight, but not all of the measuring methods are suitable for emerging industries of strategic importance. The weight of the index system of traditional setting method includes the key feature investigation method, Delphy method, expert evaluation method of average, comparison method, AHP, factor analysis method. Because strategic emerging industry development time is short, so there is no complete statistics. We use AHP to determine the weight of each index and use Delphy method to measure strategic emerging industry competitiveness. According to the analytic hierarchy process, the comprehensive

TABLE 4 : The index weight of strategic emerging industry competitiveness measuring

Target layer A	Criterion layer B	Single level sequencing weight	Index C	Single level sequencing weight	The synthetic weight	The total ordering
Competitiveness of strategic emerging industries	Management ability B_1	0.2142	Total assets turnover C_1	0.8	0.1713	2
			Current assets turnover C_2	0.2	0.0428	6
	Sustainable profitability B_2	0.5074	Rate of return on assets C_3	0.75	0.3806	1
			Sales profit ratio C_4	0.25	0.1269	3
	Rapid growth B_3	0.0768	Rate of capital accumulation C_5	0.5	0.0384	8
			Sales revenue growth rate C_6	0.5	0.0384	8
	Technological innovation capability B_4	0.1552	Average number of patents C_7	0.3333	0.0517	5
			Productivity C_8	0.6667	0.1035	4
	Risk control ability B_5	0.0464	Interest coverage ratio C_9	0.8333	0.0386	7
			Barriers to entry C_{10}	0.1667	0.0077	10

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competitiveness of strategic emerging industries in this paper to calculate the target layer hierarchical structure, we set it as A. It corresponds to the next layer as the criterion layer B.B1 ~ B5 correspond to the plan layer C. According to the characteristics of the development of strategic emerging industries, experts and entrepreneurs advice, we are on the same level of index by using the mutual comparison, and construct a two two judgment matrix[11].

The consistency check formula is CR=CI/RI. If CR < 0.1, it means that the consistency of judgment matrix is satisfactory. We calculated according to available: the judgment matrix of target layer and rule layer of each a consistency is less than 0.1, so they are consistent with the inspection requirements. Through the analytic hierarchy process step by step and classify the method we can calculate the synthetic weights (as shown in TABLE 4). Then we sort the weight of each index to reflect the importance of each index. It can been seen from the results, return on assets, total assets turnover, sales profit rate, labor productivity of four indicators are more than 0.1. It shows that the four indexes of the comprehensive competitiveness of the larger strategic emerging industries.

ANALTSIS OF MEASUREMENT AND INDUSTRY COMPETITIVENESS DIFFERENCE

(1) Comprehensive competitiveness measure

Calculation of strategic emerging industry competitiveness is a system with multi-objective, multi index. In this paper, we used the multi-objective comprehensive evaluation method to calculate the strategic emerging industry. Set X1~X5 as the factors of B index decision variable, C1~C10 index weights are denoted by W1~W10.Then, China's strategic emerging industry competitiveness index F is:

$$F = \sum_{i=1}^{10} W_1 C_1 + W_2 C_2 + \cdots + W_{10} C_{10} \quad (4)$$

Based on the above model, we can calculate our country and 27 types of strategic emerging industry competitiveness score. The results as shown in Figure 2. With China's strategic emerging industry competitiveness index estimation, we can divide the 27 strategic emerging industry into four levels. The first layer includes a total of high-end metal structure material, special metal materials, new energy vehicle, and the next generation information network, advanced polymer materials of 5 segments. And the comprehensive index scores were in 1.2 ~ 2.2. The second level includes biological medicine, biomedical engineering, intelligent manufacturing equipment, high-end software and emerging information service, new inorganic nonmetal material, a total of 10 segments. Comprehensive index scores were in 0.8 ~ 1.2. The third level includes a smart grid, energy, wind energy, marine engineering equipment and other 10 segments. Comprehensive index scores were in 0.6 ~ 0.8. The fourth level includes biomass, nuclear 2 segments, and the comprehensive

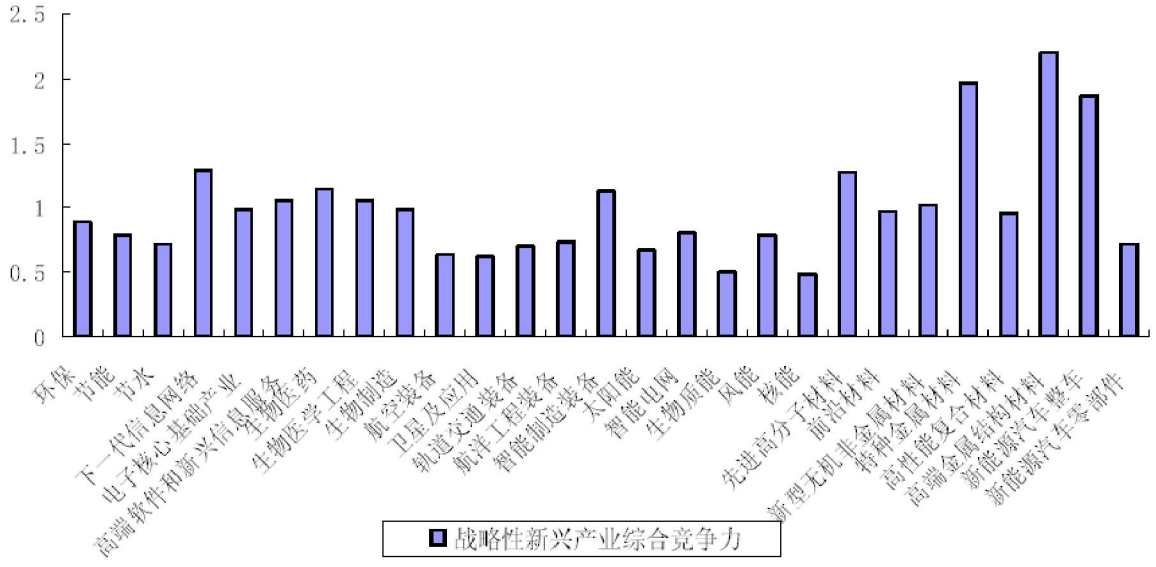

Figure 2 : The competitiveness of China's 27 categories of strategic emerging industries

index scores were below 0.6.

(2) Analysis of industrial difference

In this paper, using the generalized entropy index and index analysis internal differences between strategic emerging industry competitiveness of industry and trade. The generalized entropy index and index of inequality of subgroup decomposition is commonly suitable index. The number of group assumed exogenous total K group, we can divide the generalized entropy index according to formula (1.5) and (1.6) decomposition of inequality within groups and between group inequalities.

$$I(y) = \sum_{g}^{K} w_g I_g + I(\mu_1 e_1, \ldots, \mu_K e_K) \quad (5)$$

$$w_g = \begin{cases} f_g(\frac{\mu_g}{\mu})^c, c \neq 0,1 \\ f_g(\frac{\mu_g}{\mu}), c=1 \\ f_g(\frac{\mu}{\mu_g}), c=0 \end{cases} \quad (6)$$

Among them, the generalized entropy I_g and μ_g respectively represent the Group g indexes' values and the mean score, and e_g is a vector of length of n_g, is thegroup of the sub sectors. If represents a subdivision industry total, the represents the group subdivision industry accounted for the proportion of the total number of total industry.

When c=0, the index is the Theil index of second. When the C =1 for the Theil index. Here we use Theil index decomposition of second. This is because the index is the only can use the sample size as the weight of additively decomposable index. Thus, cross industry differences in strategic emerging industry competitiveness, can be decomposed into the gap between group and seven sectors in each group and the gap. As can be seen from TABLE 5, seven strategic emerging industry group gap between occupy most of the total difference, the proportion is as high as 83.1%.But the seven emerging industries of strategic importance within the group has a smaller gap. This is consistent with the strategic emerging industry comprehensive competitiveness evaluation results. The comprehensive competitiveness of the highest score for high-end metal structure material (2.192), the lowest score for nuclear power (0.491), the difference between scores above 1.7,so there was significant difference. Notable is, internal differences of competitiveness in the new materials industry in the overall difference in maximum, which accounted for 9.4%.This shows that the level of technology and equipment of new material industry of China is uneven, affecting the overall development of the new materials industry.

Specific view, comprehensive competitiveness of the three segments in energy-saving environmental protection industry is lower than the average level. Mainly due to the current number of China's large-scale environmental protection enterprises accounted for less than 5% of the total environmental protection

TABLE 5 : The cross-industry difference subgroups decomposition of China's strategic emerging industries competitiveness

Industry groups	Theil index second	proportion of the overall difference(%)
Energy saving and environmental protection	0.0102	0.14
A new generation of information technology	0.0180	0.24
Biology	0.0052	0.07
High-end equipment manufacturing	0.1226	2.72
New energy	0.1090	2.41
New materials	0.3534	9.40
New energy automobile	0.2171	1.93
Seven industry groups	0.6943	83.10
Overall	0.8355	100.00

enterprises. The comprehensive competitiveness of the three segments of a new generation of information technology in average. Information network of the next generation integrated competition ability is the highest, this is mainly due to the information technology industry has formed certain competitive advantage. Biological industry three segments competitiveness had above average in all areas, development is relatively average, which mainly because of the government policies, industrial agglomeration speed.

The high-end equipment manufacturing industry, in addition to intelligent manufacturing equipment, the other four segments were below average and ranked by. This is because our country manufacturing industry is big but not strong. New energy industries of the five segments of the comprehensive competitiveness are below average and ranked by. This is mainly due to market demand mechanism has not yet formed spontaneously, overcapacity consequences begin to appear. The new materials industry six segments of comprehensive competitiveness are above average, and high-end metal structure material, special metal materials; advanced polymer materials got high score. This is mainly due to increase of new material industry support from the government. The field of advanced metal materials, polymer materials, high performance ceramic material and composite material form a core group of industry. However, carbon fiber, aramid and other high performance composite materials and advanced materials have a large gap between the international advanced technologies. The new energy automotive industry in new energy vehicle's competitiveness is far higher than the new energy automotive competitiveness. This is mainly due to the traditional automobile industry both in scale and efficiency than the emerging industry is relatively mature. But the new energy automotive parts manufacturing technology bottlenecks, technology research and development cannot keep up with the rapid development of the industry.

We conducted a descriptive statistics on the management ability, profitability, growth ability, technical innovation ability and the ability of risk control indicators, in order to further analyze the decisive factors influencing the differences in strategic emerging industry competitiveness (TABLE 6).From TABLE 6, sustained profitability, management ability and technical innovation ability are the main performance evaluation of strategic emerging industry competitiveness. The lasting profit ability is the first, because only the profit ability, ability talks to create wealth, to talk about science and technology innovation. But the level of technological innovation efficiency of asset allocation is the evaluation of strategic emerging industry competitiveness is implicit index. If you ignore the influence of emerging industries of strategic resources, technology and other basic elements, will cause a decrease in their comprehensive competitive power.Therefore, only by constantly improving the continuous profitability of strategic emerging industries, attract all kinds of social capital and innovation elements into the strategic emerging industries, increase investment in technology research and development, to promote optimal allocation of resources, to ensure that the development of strategic industries remain stronger power[12-15].

CONCLUSIONS AND POLICY

TABLE 6 : The descriptive statistics of sources difference between strategic emerging industry competitiveness in China

Index	Management ability	Sustainable profitability	Rapid growth	Technological innovation capability	Risk control ability
Max	1.399	2.030	0.322	0.940	0.222
Min	0.061	0.110	-0.538	0.029	-0.192
Range	1.338	1.920	0.860	0.911	0.414
Mean	0.214	0.508	0.077	0.155	0.046
Standard deviation	0.245	0.362	0.150	0.190	0.077
Coefficient of variation	0.873	1.403	0.513	0.816	0.597

RECOMMENDATIONS

This paper analyzed the main influencing factors of China's strategic emerging industry, development status and characteristics of China's strategic emerging industry based on, through the application of AHP and Delphi method. The study found, there was a significant gap between the comprehensive competitiveness of the seven emerging industries of strategic importance. The traditional advantage industry support higher strategic emerging industry competitiveness is significant, but the internal difference among the industry is small. The sustained profitability; management ability and technical innovation ability are the main factors that influence the comprehensive competitiveness of strategic emerging industry. The sustained profitability is the main index. Asset allocation efficiency and technical innovation is the implicit index to evaluate the comprehensive competitiveness of strategic emerging industry. Therefore, this paper puts forward the following policy recommendations:

First, we should strengthen the state overall planning and coordination for emerging industries of strategic importance. At present, there is a big gap between the development of China's seven strategic emerging industries, while the internal gap and industry is relatively small. Therefore, the state should strengthen macro guidance on the development of strategic emerging industries, and pay attention to coordinate and solve major problems in the development of strategic emerging industries. In the key areas, we should develop characteristic according to the field of strategic emerging industries, promote the differentiation, characteristics of the collaborative development. According to the East, in the west, the current situation and advantages, our government should be, or not to do something, so as to realize the coordinated development of regional emerging industries of strategic importance.

Second, improve the core competitiveness and profitability. For example, there is a lot of photovoltaic industry park repeat construction in the photovoltaic industry. But most of them are in the midst of a vast investment stage, income is relatively less. The local government should actively seize the strategic emerging industry development opportunities, vigorously cultivate innovative enterprises. To create a number of innovative ability, good business environment, features prominent, cluster development strategic emerging industry demonstration base. Thus, it can realize the core competition index in strategic emerging industry, such as the level of technological innovation, management ability, capital accumulation and total sales scale, significantly improve.

Third, perfect the market, financial and taxation policy support system. Because strategic emerging industry is still in its infancy, establish industry standard, therefore, the industry generally faced with insufficient investment, slow development, issues such as lack of profit model. The government should encourage the innovation of system and mechanism. Government departments can be extended the application mode of government procurement, at the same time in the industry policy to give appropriate tilt, foster strategic emerging industries. At the same time, due to the strategic emerging industry product development and commercialization of the existence of a greater risk, the need to open the multi-level capital market. For example, exploring various financing mode of investment fund, venture investment, intellectual property rights pledge, science and technology insurance etc..

Fourth, Strategic emerging industries in essences are a major breakthrough for the development of science and technology innovation and core techniques. Therefore, based on the different stages of development of strategic emerging industry development to choose investment in science and technology, we should give full play to the dominant position of enterprises in technological innovation system. Thereby, achieve from "made in China" to "created in China" the road of industrial revitalization.

Fifth, promote the organic combination of strategic emerging industries and traditional industries. The development of strategic emerging industry must rely on a technology which is formed by the accumulation of traditional industries, manufacturing, industrial organization, etc. Transformation and upgrading of traditional industries at the same time important direction is strategic emerging industries. Through technical innovation, organizational innovation and the transformation of the management system, we can realize the development of traditional industry and strategic emerging industries.

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Thus, it can be to promote industrial upgrading, product upgrading, optimize the industrial structure and to improve the efficiency and the competitiveness of industries.

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