

Competitiveness of Machinery Industry of Guangxi Province in China Based on Factor Analysis

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Abstract: This paper has constructed a mechanical industry competitiveness evaluation system, analyzed the development of mechanical industry of domestic provinces and municipalities in 2008, a comprehensive evaluation on Guangxi machinery industry's competitiveness is made. Through comparative analysis, this paper summarized the characteristics of the industry, pointed out the main problems, and gave relevant policy recommendations.

Keywords: Machinery industry; Competitiveness; Factor analysis; Index system

1 Introduction

Machinery manufacturing industry is one of the three pillar industries in Guangxi, its level of development and competitiveness can not only impact on sustainable and stable economic development of Guangxi, but also determines the manufacturing process of economic globalization, division of labor^[1]. Currently, Guangxi is undertaking the eastern industry transfer and facing the opportunities and challenges that China - ASEAN free trade has brought. In this environment, Guangxi's machinery Industry can obtain what kind of results, will depend on the comparison with competitors. Therefore, comparing Guangxi's auto industry manufacturing competitiveness with other domestic provinces, has not only theoretical value, but also has certain practical significance.

This paper uses factor analysis for comparing the correlation between the various factors that influence the machinery industry competitiveness, and transforms multiple variable into a important variable through linear variation in order to construct the evaluation system of competitiveness^[2]. In addition, the premise of scientific evaluation to industries competitiveness is the choice of evaluating indicator. These indicators not only reflect industries competitiveness, but also have to quantify to it.

2 Machinery industry definition

In short, the machinery industry is the industry that is related to machinery manufacturing. The industry is divided into broad and narrow sense of the mechanical industry. General machinery industry refers to any industrial production sectors that use the metal cutting tools in industrial, while the narrow mechanical industry is the machine-manufacturing industry. At present, there is no clear definite scope to the machinery industry; there are some provincial and municipal statistical differences. Based on the 2009 China Industrial Economy Statistical Yearbook of statistics, to make research more focused on the mechanical definition, it includes two industry categories: instruments and office machinery manufacturing; electrical machinery and equipment manufacturing. In order to make a whole facilitate evaluation of the industry, this paper attempts to study the two industries integrally.

3 Index System and Model Construction

In the study of competitive process, in order to fully analyze problems, a lot of related factors are selected. Although each factor can reflect certain information of competitiveness, too much factors will increase complexity. The basic purpose of factor analysis is to select main factors to describe the original data. This paper compared correlation between a number of competitive machine manufacturing factors and classified the factors based on relevance in order to build

* This paper is supported by Key project of Department of education in Guangxi (201012MS121)

competitiveness evaluation system.

This paper selects nine indicators (X), 31 provinces (Y) as the evaluation index system of manufacturing industry competitiveness in Guangxi, as shown in Table 1. According to China Industrial Statistical Yearbook 2009,^[4] selecting the corresponding data, as shown in Table 2.

Table 1 Index System

X	Y	
X1: Gross Industrial Output Value	Y1:Beijing	Y16:Henan
X2: Industrial Sales Value	Y2:Tianjin	Y17:Hubei
X3: Total assets	Y3:Hebei	Y18:Hunan
X4: Net value of fixed assets	Y4:Shanxi	Y19:Guangdong
X5: Value of export goods	Y5:Neimenggu	Y20:Guangxi
X6: Business Income of the Main Products	Y6:Liaoning	Y21:Hainan
X7: Total Profits	Y7:Jinin	Y22:Chongqing
X8: Per capita equipment level=Net value of fixed assets/Worker number	Y8:Heilongjiang	Y23:Sichuan
X9: average size index = Total assets / Enterprise number	Y9:Shanghai	Y24:Yunnan
	Y10:Jiangsu	Y25:Guizhou
	Y11:Zhejiang	Y26:Xizang
	Y12:Anhui	Y27:Shanxi
	Y13:Fujian	Y28:Gansu
	Y14:Jiangxi	Y29:Qinghai
	Y15:Shandong	Y30:Ningxia
		Y31:Xinjiang

4 Measure Analysis

4.1Factor Analysis

According to "China Industrial Economy Statistical Yearbook 2009", collect datas (Table 2), and make factor analysis by using SPSS13.0. As to conducting factor analysis, the first step is to understand the correlation between variables; the second is to determine the appropriateness of factor analysis; the third is to test the correlation between variables, KMO test measure is 0.771 greater than 0.6, and the test of sphericity is significant, which means these data are suitable for factor analysis (Table 3).

Table 2 China 2008 Guangxi Manufacturing Industries by Major Economic Indicators

Pro	X1	X2	X3	X4	X5	X6	X7	X8	X9
Y1	598.51	585.73	107.08	94.48	74	624.68	70.06	0.00099	0.12215
Y2	814.39	784.04	123.51	106.8	282.76	810.39	47.85	0.00125	0.15896
Y3	889.77	843.34	184.29	150.75	103.81	854.51	94.08	0.00117	0.26094
Y4	73.19	67.33	21.27	18.79	1.41	70.24	2.72	0.00101	0.29738
Y5	44.02	39.37	11.68	10.04	1.32	39.83	2.12	0.00060	0.11113
Y6	1172.12	1123.25	343.33	322.72	138.06	1132.09	57.8	0.00151	0.19472
Y7	102.97	94.7	21.67	20.53	1.16	93.39	5.15	0.00110	0.11621
Y8	196.8	195.06	40.26	34.06	8.15	192.35	20.17	0.00073	0.17353
Y9	2092.28	2046.19	340.39	315.78	695.4	2084.4	129.92	0.00087	0.14710
Y10	6910.38	6770.74	1099.85	992.51	1664.64	6714.4	463.34	0.00100	0.21241
Y11	4181.4	4051.36	738.96	644.83	1179.03	4024.85	221.14	0.00065	0.11439
Y12	1160.19	1137.92	172.29	149.59	74.78	992.8	65.65	0.00111	0.18388
Y13	852.72	828.52	128.13	116.55	329.15	821.14	59.03	0.00050	0.15217
Y14	587.69	578.26	186.27	179.88	120.42	571.47	62.61	0.00150	0.45143
Y15	3453.71	3381.95	519.47	473.91	317.29	3361.36	195.84	0.00113	0.21919
Y16	911.85	888.77	140.12	127.99	16.53	851.32	78.68	0.00089	0.19630
Y17	496.75	489.76	149	131.46	40.64	480.74	28.16	0.00100	0.22128
Y18	501.28	490.21	104.74	84.59	22.32	481.9	41.25	0.00099	0.23229
Y19	8496.77	8280.39	1100.99	912.93	3768.86	8289.68	364.66	0.00043	0.19674
Y20	173.68	159.22	24.05	19.3	16.42	141.03	11.91	0.00055	0.12816
Y21	20.89	21.18	2.96	2.96	4.07	21.17	1.89	0.00106	0.32
Y22	355.08	345.43	53.42	44.82	12.24	344.41	25.43	0.00069	0.16662

Y23	626.93	601.43	113.18	101.39	13.71	568.04	43.36	0.00110	0.17300
Y24	63.82	61.63	6.39	6.21	1.87	55.23	1.49	0.00049	0.11049
Y25	81.44	81.84	20.25	16.87	7.65	83.41	4.07	0.00130	0.21671
Y26	0	0	0	0	0	0	0	0	0
Y27	346.89	336.99	113.69	76.28	39.23	312.66	20.32	0.00119	0.56311
Y28	51.36	48.17	8.87	7.54	0.93	47.05	1.62	0.00050	0.1481
Y29	10.75	9.99	2.95	2.67	0.13	10.18	0.53	0.00145	0.3815
Y30	26.71	24.57	7.92	5.47	0.05	25.79	1.62	0.00099	0.4339
Y31	117.89	101.43	10.19	9.78	1.7	125.02	12.94	0.00089	0.14928

Table 3 KMO

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.771
Bartlett's Test of Sphericity	Approx. Chi-Square	974.628
	df	36
	Sig.	.000

Table 4 shows the condition of cumulative contribution of factors and factor choice number. Two common factors whose eigenvalue greater than 1 are extracted. The cumulative variance contribution rate is 93.038%. From this point of view, the greatest contribution factor 1, to 75.285%; factor 2, followed by the 17.754%, can be good coverage of nine indicators.

Table 4 Total Variance Explained

component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.776	75.285	75.285	6.776	75.285	75.285	6.738	74.866	74.866
2	1.598	17.754	93.038	1.598	17.754	93.038	1.636	18.173	93.038
3	.440	4.891	97.929						
4	.147	1.638	99.567						
5	.027	.301	99.868						
6	.011	.125	99.994						
7	.000	.005	99.999						
8	.000	.001	100.000						
9	6.01E-006	6.68E-005	100.000						

Used Varimax (orthogonal rotation Varimax) method factors to rotate, the use of rotated factor loading matrix, can be more easily examine the economic implications of the main factors. Rotation results shown in Table 5: Factor 1 in total industrial output value, industrial sales value, total assets, net fixed assets, industry, export delivery value, main business revenue and gross profit on a large load; factor 2 Per capita equipment level and average size index load on a larger scale .

Table 5 Rotated Component Matrix

	component	
	1	2
Gross Industrial Output Value	0.996	-0.070
Industrial Sales Value	0.996	-0.069
Total assets	0.992	-0.002
Net value of fixed assets	0.986	0.005
Value of export goods	0.921	-0.144
Business Income of the Main Products	0.996	-0.071
Total Profits	0.976	-0.017
Per capita equipment level = Net value of fixed assets/Worker number	-0.067	0.901
average size index = Total assets / Enterprise number	-0.028	0.888

4.2 Guangxi machinery industry competitiveness measure

According to the common factor variance contribution rate and the factor of load factor, the formula to build industrial competitiveness is:

$$F_j = 0.75285F_{1j} + 0.17754F_{2j}$$

Which, F_j ($j = 1, 2 \dots, 31$) that j provinces machinery industry competitiveness, F_{1j} , F_{2j} the main factor for the j , 2 provinces in the corresponding original index value of standardized treatment (treatment received by SPSS). Where the weight of the composite score calculated 0.75285, 0.17754 were rotated factor variance contribution rate. According to this model, you can find the Guangxi's rank of the competitiveness of the machinery industry as shown in Table 6.

Table 6 National Machinery Industry Competitiveness Score

province	C1	rank	province	C1	rank
Guangdong	3.406299292	1	Hubei	-0.298367189	16
Jiangsu	2.674860173	2	Chongqing	-0.364541947	17
Zhejiang	1.405525832	3	Shanxi	-0.368376997	18
Shandong	1.072094117	4	HeiLongJiang	-0.437497127	19
ShangHai	0.440741031	5	Guangxi	-0.44941539	20
Liaoning	0.012192722	6	Xinjiang	-0.475561667	21
Anhui	0.009048792	7	Jilin	-0.481764304	22
Henan	-0.106608647	8	Yunnan	-0.490999519	23
Hebei	-0.119003598	9	Shanxi	-0.495407528	24
Fujian	-0.134235883	10	Guizhou	-0.499439979	25
Tianjin	-0.152634397	11	Gansu	-0.505327349	26
Sichuan	-0.239447245	12	NeiMenggu	-0.508878159	27
Beijing	-0.251522168	13	Ningxia	-0.516708153	28
Jiangxi	-0.256256456	14	Hainan	-0.519191034	29
Hunan	-0.296624913	15	Qinghai	-0.52400668	30
			Xizang	-0.528945634	31

5 Conclusions and Countermeasures

5.1 Conclusions

Through the above factor analysis of the quantitative analysis, it can be concluded that Guangxi competitiveness of the national machinery industry ranked 20th, in 2008, while in the second level. Although GuangXi's machinery industry already has certain scale, the product technical content is not high and the profit level is low. Therefore, when directly facing the ASEAN market, it's machinery manufacturing will meet fierce competition.

5.2 Strategic suggestion

Guangxi must take development strategy into account, not only short-term interest, more importantly, future development of machinery industry should be concerned. The industry should focus on its overall ability to enhance the mechanical industry and provide a clear direction of long-term, stable and rapid development in Guangxi.

(1) Improving the resource using efficiency of machinery industry, after making a clear direction, can effectively use mechanical resources, reduce the opportunity cost, and gain better earnings, to realize the maximization of enterprise value.

(2)Product management strategy: to reinforce the main industry, the expand industrial chain, industrial capital market for enhance the development of new products.

(3)Marketing strategy: to change the past simple idea of "emphasis on production market" and establish a modern marketing concept; to build a modern chemical products marketing system to adapt to market competition, according to market conditions and competitive characteristics, focused on product, price, distribution channels and promotional measures to develop appropriate coping strategies.

(4)Human resources strategy: completely abandon the planned system of personnel management; establish a modern concept of human resource management; optimize personnel abilities; clear the human resource channels; change human resource structure; establish an

effectively incentive and restraint mechanism.

(5) Change corporate governance structure and organizational structure. According to the modern enterprise system, further clean up shares of the company's property rights, and strive to make a diversification of ownership structure and regulate the shareholders, board of directors and the supervisory board to adjust the organizational structure, development strategy to meet the requirements and to achieve a "science decision, strong commanding, efficient management, appropriate checks and balances" effect.

(6) Capital operation strategy. Make an inventory of existing assets; eliminate bad or invalid assets; put the company's major financial resources into the most efficient business (short-term should focus on the main industry and extension of the main chain) through the introduction of strategic partners; redesign financing channels; optimize the structure of property rights, to achieve a overall strategy that enhances the operational level.

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