Study on Competitiveness of Automotive Industry in Guangxi Province of China[*]

Pan Yuan, Ma Lu
Department of Management, Guangxi University of Technology, Liuzhou, P.R.China545000
(E-mail:glx_malu@gxut.edu.cn)

Abstract: This paper analyzes opportunities and challenges that Guangxi's automotive industry faces during its development, establishes the index system of automotive industry competitiveness, uses principal component analysis for comparing the correlation between the various factors that influence automotive industry manufacturing competitiveness and transforms multiple variable into a important variable through linear variation to construct the evaluation system of competitiveness，finding out the rank of automotive industry competitiveness in Guangxi. The relevant policy suggestions are given through the comparative analysis, summarizing the main problems existing in this industry

Keywords: Automotive industry competitiveness; Competitiveness; Principal component analysis (PCA); Index system

1 Introduction

Due to the majority of domestic provinces support automotive industry manufacturing, especially the automotive industry and motorcycle industry as pillar industries, their product structure presents identity [1]. Therefore, when direct at the ASEAN market, Guangxi's automotive industry will face fierce competition. Based on these situations, we need to compare and evaluate regional automotive industry manufacturing competitiveness with other domestic provinces, find deficiencies and seek solutions to develop Guangxi's core competitiveness of automotive industry manufacturing in CAFTA.

Guangxi is located in the centre of CAFTA and the bonding point of south China, southwest, Southeast Asia economic circle, so it is an important communication cooperation platform between China and ASEAN and plays an important role because of its special position. Curgently, Guangxi automotive industry manufacturing already has some foundations.It forms a complete industrial structure that contains truck, buses, miniature cars, car combustion, automotive parts industry, and own four national grade technical centres and laboratories, ten provincial technology centres[2]. However the product structure is not rational, the enterprise overall strength is weak, drive ability is not strong. There are many sspecial automotive parts and few common standard parts; matching capacity is low, Reducing the new product development speed and effect. The ability of new technology, new products entering the market is weak, resource integration ability and capital operation ability are not strong, industrial expansion seed is slow .part of enterprises' system structure and shareholders structure are unreasonable, seriously restricts the development of the automotive industry.

In the process of competitiveness research, in order to fully analyze problems, putting forward many related factors or say variables. Although each factor can reflect some of the competitiveness information in different degrees. Too much factors will increase the complexity of the study. This paper uses principal component analysis for comparing the correlation between the various factors that effects auto industry manufacturing competitiveness and transforms multiple variables into an important variable through linear variation in order to construct the evaluation system of competitiveness.

2 Constructing Valuation Index Systems

General literature usually select gross industrial output value, industrial added value, and total profits to be initial indicators in the competitiveness evaluation system of industry[3].So this paper selects several critical factors, those are gross industrial output value, Industrial added value, income of the main products, and total profits to construct competitiveness evaluation index system of automotive industry competitiveness. These four revealed indexes can effectively reflect main content of the competitiveness of the industry such as production ability and market development ability. So, the construction of competitiveness evaluation index system of automotive industry as table 1

Table 1　Automotive　Industry Competitiveness　Evaluation System

	Scope Statement	Index name
The first grade indicator	Evaluation index system of industrial competitiveness	Industrial Competitiveness
The second grade indicator	Revealed indexes	Exterior Competitive Power
The third grade indicator	Production capacity	Gross Industrial Output Value Industrial added Value
	Marketing capability	Income of the Main Products
	The Benefit of Industry	Total Profits

3 Principal Component Analysis of Automotive Industry Competitiveness

3.1 Original data collection

According to the foregoing evaluation index system [4], we collect original data of 31 provinces, municipalities (except Hong Kong, Macao and), see table 2.

Table 2 The Main Economic Index of Automotive Industry　in China,in2008[5]

Unit : a hundred million RMB

Province	Gross Industrial Output Value	Industrial added Value	Income of the Main Products	Total Profits
Beijing	778.52	127.35	869.95	58.16
Tianjin	1089.57	277.42	890.96	115.78
Hebei	580.25	66.27	318.57	27.9
Shanxi	121.39	31.7	37.43	4.63
Neimenggu	89.89	38.85	94.32	4.75
Liaoning	879.95	230	561.02	50.33
Jinin	2494	594	1544.13	200.93
Heilongjiang	206.9	58.6	182.27	15.92
Shanghai	1469	361.8	2019.35	240.55
Jiangsu	2165.79	449.74	1068.26	111.35
Zhejiang	1200	253.76	1254.2	145.57
Anhui	865.51	188.75	587.26	67.24
Fujian	421.35	60.2	251.81	34.53
Jiangxi	356.98	74.68	288.5	23.77
Shandong	1915.72	271.18	1334.35	144.2
Henan	883.17	107.01	639.25	47.34
Hubei	1760.5	541.5	1397.39	195.59
				Continue
Hunan	295.9	74.28	479.76	94.69
Guangdong	2938.54	748.65	2165.04	346.67
Guangxi	662.88	195.17	539.87	69.92
Hainan	71.82	12.23	58.08	0.01
Chongqing	1931.93	401.06	1236.6	128.97
Sichuan	417	73	325	36.52
Yunnan	58.24	7.32	33.5	4.62
Guizhou	91.92	16.52	70.97	5.61
Xizang	0	0	0	0
Shanxi	376.63	110.25	435.03	40.47
Gansu	5.89	0.82	5.079	0.49
Qinghai	7.59	1.028	6.07	1.05
Ningxia	0	0	0	0
Xinjiang	11.03	1.43	12.97	1.22

3.2 Data processing by SPSS

(1) Data standardisation processing. Inputting the original data into SPSS and standardizing data to eliminate dimension and analyzing errors of different types of data.

(2) Getting correlative coefficient matrix. Inputting standardized data into SPSS and calculating the correlations between primitive indexes. Correlative coefficient matrix is symmetric matrix; we can directly obtain the eigenvalues and eigenvector of the correlation matrix, as shown in table 3.

Table 3   Correlative coefficient matrix

Correlations

		Zscore(X1)	Zscore(X2)	Zscore(X3)	Zscore(X4)
Zscore(X1)	Pearson Correlation	1	.965**	.929**	.903**
	Sig. (2-tailed)		.000	.000	.000
	N	31	31	31	31
Zscore(X2)	Pearson Correlation	.965**	1	.918**	.931**
	Sig. (2-tailed)	.000		.000	.000
	N	31	31	31	31
Zscore(X3)	Pearson Correlation	.929**	.918**	1	.969**
	Sig. (2-tailed)	.000	.000		.000
	N	31	31	31	31
Zscore(X4)	Pearson Correlation	.903**	.931**	.969**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	31	31	31	31

**. Correlation is significant at the 0.01 level (2-tailed).

(3) Get the linear expression of main ingredients. We can obtain eigenvalues of the correlation coefficient matrix by SPPS in table 4. Each eigenvectors of eigenvalue forms the component matrix table 5.

Table 4   Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.81	95.190	95.190	3.81	95.190	95.190
2	.127	3.187	98.377	.127	3.187	98.377
3	.051	1.284	99.661	.051	1.284	99.661
4	.014	.339	100.000	.014	.339	100.000

Extraction Method: Principal Component Analysis.

Table   5   Component Matrix(a)

Component	1	2	3	4
Zscore(X1)	0.973	0.197	0.107	0.055
Zscore(X2)	0.977	0.159	-0.128	-0.056
Zscore(X3)	0.978	-0.163	0.119	-0.060
Zscore(X4)	0.975	-0.192	-0.097	0.061

Extraction Method: Principal Component Analysis.

Then, we need to divide each element into the component matrix by $\sqrt{\lambda i}$ in order to get the original factor coefficient of linear expression.

(4) The principal component scores and competitiveness rankings. It can be seen from table 5 that the accumulation of contribution of first principal ingredient is 95.190% and has reached the standard of 85%, so we can only choose first principal component as comprehensive index of competitiveness evaluation.

Computation formula of automotive industry manufacturing competitiveness, through calculation and analysis we can get main ingredients scores and competitiveness rankings of traffic and transportation equipment manufacturing competitiveness as shown in table 6

Table 6   Main Ingredients Scores and Competitiveness Rankings

Rank	Province	C1	Rank	Province	C1
1	Guangdong	5.6391	16	Shanxi	-0.7216
2	Jilin	3.6190	17	Hebei	-0.8780
3	Shanghai	3.0322	18	Sichuan	-0.9033
4	Hubei	2.8941	19	Fujian	-1.0038
5	Jiangsu	2.1439	20	Jiangxi	-1.0401
6	Chongqing	2.1199	21	HeiLongJiang	-1.3032
7	Shandong	1.9512	22	NeiMenggu	-1.5606
8	Zhejiang	1.4189	23	Shanxi	-1.6063
9	Tianjin	0.9430	24	Yunnan	-1.6295
10	Anhui	0.0523	25	Hainan	-1.6959
11	Liaoning	0.0441	26	Guizhou	-1.7091
12	Beijing	0.0194	27	Xinjiang	-1.7891
13	Guangxi	-0.0761	28	Qinghai	-1.7988
14	Henan	-0.2189	29	Gansu	-1.8044
15	Hunan	-0.5047	30	Xizang	-1.8170
			31	Ningxia	-1.8170

4 Conclusion and Countermeasures

4.1 Result analysis

(1) Through quantitative analysis of principal component analysis, it can be seen that regional differences in automotive industry competitiveness is very obvious as shown in table 7. In the distribution of competitive level, Guangxi in the second level, have a certain development advantage and competitive potentiality. Besides, there is a positive correlation between automotive industry competitiveness and economic development.

Table 7　Distribution of Automotive　Industry Competitive Level

competitive level	The area
First level:C1>2	Guangdong, Jilin, Shanghai, Hubei, Jiangsu, Chongqing, Shandong
Second level:2>C1>-1	Zhejiang,Tianjin,Liaoning,Anhui,Beijing,Guangxi,Henan,Human,Chanxi,Hebei,Sichuan
Third lever:C1<-1	Fujian,Jiangxi,Heilongjiang,Neimenggu,Shanxi,Yunnan,Hainan,Guizhou, Xinjiang, Qinghai, Gansu, Xizang, Ningxia

(2) In the competitiveness evaluation index, the rank of automotive industry competitiveness is the 13th, in china, and is a high-ranking, show that as CAFTA have comprehensively built, Guangxi's local advantage is more and more outstanding, but judging from total profit, geographical advantage is not fully transformed into competitive advantage.

4.2 The Counter Measures That Improve Automotive Industry Competitiveness

According to the quantitative analysis, in order to improve the automotive industry in Guangxi, speeding up the competitiveness, developing automotive mobile industry is the inevitable choice of Guangxi. The development of the car industry does not take up the natural resource endowment, but it carries with a lot of knowledge, technology and capital. Automotive industry plays an important and supporting role in lifting the competition ability and the ability of sustainable development of an area [6].

(1)To adapt the requirements of market competition, speeding up the construction of productivity of key enterprises. forming advanced productive forces, constructing automotive industry cluster that Liuzhou as the centre, Yulin, Guilin as base. Take the market as the guidance, accelerating development of dump trucks, tank car, car, powder transporters van semi-trailer, special automotive mobile, etc.

(2)Take efforts to achieve significant breakthrough in the structural adjustment of global resources integration. improving the ability of making cars; supporting the large enterprises listing and financing; encouraging enterprise through the joint, merger, such as assets restructuring measures; realizing the great-leap-forward development.

(3)Establish strategic alliance between enterprise and scientific research institutions. Doing technology research of key parts; developing basic cooperation research to share the risk and achievements. This can avoid low level of competition and disorder between each enterprise, reducing the cost of production, research and development, and focusing on realizing the key technical breakthrough on the limited resources, in a short period of time. And by using different advantage of each unit realize the unification allocation of basic research task.

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