Factor Analysis of Chinese Provincial Logistics Industry Level

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ABSTRACT: Based on the 31 provinces (city) data in 2012, we adopt factor analysis and select seven factors to establish index system. By extracting and compute sores of public factors, we obtain comprehensive scores of logistics and ranking 31 provinces. The results show that the development level of Chinese provincial logistics industry can be divided into three types: strong type, general type and weak type, which is closely related with the level of regional economic development. Therefore, we must vigorously develop the logistics industry to promote the economic development of the region.
KEYWORD: Logistics development level; Factor analysis; 31 provinces (cities) of China

1 INTRODUCTION

At present, China's logistics industry to present a good momentum of development, logistics market become one of the rapid development of the global market. The logistics industry has played an important role on stimulating the development of Chinese economy. According to China’s “12th five-year plan”, the logistics industry was one of China's top ten emerging industries. In order to promote the rapid development of logistics industry, it is necessary to research the logistics level of all over the country provinces and cities, and make comments and suggestions.

Research on logistics started early abroad. Goh and Ling argued that despite the improvements and ad-vancements undertaken by the Government and other agencies, the logistics infrastructure, particularly those of transportation networks, telecommunications systems, warehousing facilities and customs procedures were still lacking. [1] De Marco (2007) carried on the analysis to the transportation infrastructure investment decision based on the model of system dynamics. [2] Chinese Zhao Li (2013) analyzed the current situation of the development of China's logistics industry and the existing problems. Shen Si (2014) proposed to construct the statistical index system of logistics industry in China. [3]

However, previous research mainly focused on national level. Few scholars give quantitative analysis from region’s perspective. In this case, how to construct the regional logistics core evaluation system become an important direction in the research of the logistics. In this paper, the author apply factor analysis to measure logistics development of 31 Chinese provincial regions .

2 ANALYSIS OF THE REGIONAL LOGISTICS INDUSTRY IN CHINA

2.1 *Methods of analysis*

In the process of exploration, we adopt factor analysis method and SPSS statistical analysis software to process the raw data.

The basic purpose of factor analysis is to describe the linkage of many indicators or factors by a few factors, that is several intimate variables put into the same class to become a new factor. In this way, several factors with less reflect most information of original data.

2.2 *The selection of evaluation indicators*

The logistics development level is reflected by some important factors. In this paper, we selected seven indicators, which is X1 for logistics industry output value (RMB billion Yuan), X2 for the logistics industry output value accounted for the proportion of GDP, X3 for the number of employment of each region logistics industry (person), X4 for railway destiny (km/10000km2), X5 for road destiny (km/10000km2), X6 for cargo turnover (ten millions ton-kilometers), X7 for freight transfer amount (10000 tons). Additionally, we obtain the data of 31

Chinese provincial region in 2012 from "China Statistical Yearbook 2013".

2.3 *Results Analysis*

2.3.1 *KMO and Bartlett's Test*

Through the SPSS19.0 analysis, the KMO value is 0.677>0.5, the Bartlett value is 107.956, P=0.000<0.0001(as shown in table1). This shows that the correlation matrix is not a unit matrix, and the correlation exists between variables, so the seven indicators selected is suitable for factor analysis.

Table 1. KMO and Bartlett's Test

Kaiser-Meyer-Olkin of	Sampling Adequacy	0.677
Bartlett's Test of	Approx. Chi-square	107.956
Sphericity	df	21
	Sig.	0.000

2.3.2 *Extract the public factors*

According to the principle of eigenvalue >1, we selected three common factors from Figure 1 , of which accumulated variance contribution rate is 83.737> 80%. The figure shown in table 2 indicates that these three factors can be more comprehensive to reflect all available information, so they are effective.

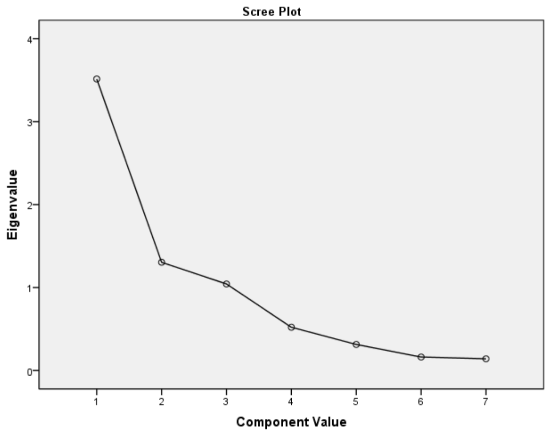

Figure 1. Scree Plot

Table 2. Total Variance Explained

Compo-nent	Initial Eigenvalues			Extraction of square and loading		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.514	50.203	50.203	3.514	50.203	50.203
2	1.305	18.636	68.839	1.305	18.636	68.839
3	1.043	14.898	83.737	1.043	14.898	83.737
4	0.521	7.446	91.183			
5	0.314	4.485	95.668			
6	0.162	2.316	97.984			
7	0.141	2.016	100.000			

2.3.3 *Compute scores of public factors*

As the public component matrices of some index variables cannot be clearly distinguished, we need to rotate treatment on the component matrix in order to get more distinct public factors. Rotation is a way of maximizing high loadings and minimizing low loadings so that the simplest possible structure is achieved. Component matrix after rotation is presented in Table 3.

Table 3. Rotated Component Matrix

	Component		
	1	2	3
X1	0.915	0.131	0.146
X2	0.001	-0.028	0.992
X3	0.665	0.439	-0.230
X4	-0.059	0.962	0.008
X5	0.525	0.693	-0.079
X6	0.686	0.518	0.021
X7	0.932	-0.095	-0.067

Seen from Table 3, the first public factor F_1 is decided by variables X1, X3 ,X6, X7, their factor loadings are 0.915, 0.665, 0.686 and 0.932. The second public factor F_2 is decided by variables X4 and X5, their factor loadings are 0.962 and 0.693. And the last one F_3 is dependent by X2, whose factor loading is 0.992.

Table 4. Table 4. Component Score Coefficient Matrix

	Component		
	1	2	3
X1	0.357	-0.105	0.159
X2	0.021	0.043	0.935
X3	0.180	0.125	-0.180
X4	-0.234	0.635	0.067
X5	0.069	0.328	-0.024
X6	0.175	0.187	0.061
X7	0.411	-0.268	-0.056

Table4 is component score coefficient matrix, which is based on rotated component matrix. From table 4 we can draw the public factor score function:

$$F_1=0.357\times X1+0.021\times X2+0.18\times X3+......+0.411\times X7$$

$$F_{2=}-0.105\times X1+0.043\times X2+0.125\times X3+.....-0.268\times X7$$

$$F_3=0.159\times X1+0.935\times X2-0.18\times X3+......-0.056\times X7$$

By the three factors of linear combination model above, we could calculate the three common factor score of each area.

2.3.4 *Measuring comprehensive scores of logistics and ranking 31 provinces*

We put the contribution rate of each factor as the weighted number to calculate the comprehensive evaluation score and rank of each area, the formula is as follows:

$$F_i=0.5595F_{1i}+0.2226F_{2i}+0.1779F_{3i}\ (i=1, 2, 3...31)$$

Results of the comprehensive scores and rank of 31 provinces logistics development level are presented in Table 5.

Table 5: Provincial Logistics Capability in China

Region	FAC	Rank	Region	FAC	Rank
Shandong	1.260	1	Jiangxi	-0.179	17
Hebei	1.076	2	Tianjin	-0.195	18
Guangdong	1.021	3	Beijing	-0.213	19
Jiangsu	0.781	4	Shanxi	-0.214	20
Liaoning	0.513	5	Sichuan	-0.234	21
Henan	0.503	6	Chongqin	-0.275	22
Shanghai	0.430	7	Ningxia	-0.328	23
Neimenggu	0.389	8	Heilongjiang	-0.391	24
Anhui	0.319	9	Gansu	-0.465	25
Zhejiang	0.313	10	Xinjiang	-0.538	26
Hunan	0.189	11	Jilin	-0.566	27
Shanxi	0.169	12	Hainan	-0.685	28
Guizhou	0.114	13	Yunnan	-0.741	29
Fujian	-0.032	14	Qinghai	-0.896	30
Hubei	-0.040	15	Xizang	-0.972	31
Guangxi	-0.113	16			

3 CONCLUSIONS

See from the table 5, the comprehensive level of 31 provinces and cities of China is not balanced, can be obviously divided into three types: strong type, general type and weak type. Shandong, Hubei, Guangdong, Jiangsu, Liaoning and Henan belongs to the strong type, their scores are more than 0.5 point; Shanghai, Neimenggu, Anhui, Zhejiang, Hunan, Shanxi, Guizhou belongs to the general type, the scores of which are between point 0 to 0.5; and the others are weak type as the scores are below 0.

As can be seen, the development level of regional logistics industry is largely affected by the regional economic development level. At the same time, the development of the logistics industry will promote the development of regional economy.Therefore, we must make full use of regional advantages to develop logistics industry.

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