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The Industrial Relations of Logistics Industry—Based on China's 2010 Input-Output Table

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Abstract

The paper explores the intrinsic link between logistics industry, national economy and three industries by using Chinese input-output table of 2010. It shows that logistics industry has the strongest inquiry and need on secondary industry; next is itself and the last is Agriculture. Second, the influence coefficient of logistics industry is after the second industry radiation ability; its status in national economy is strong and has become the dominant industry of national economic development. Furthermore, the degree of fluctuation for logistics industry is small, and its restriction role and bottleneck effect are obvious for national economy. Moreover, logistics industry is a sector with strong radiation and weak constraints and its promotion effect on national economy is more pronounced than that of national economy on itself.

Keywords

Logistics Industry, Input-Output Table, Industrial Relations, China

1. Introduction

As the composite of services industries, logistics industry is the integration of transport, warehousing and freight forwarding industry and the information industry, which involves extensive areas, attracts employment and promotes production and consumption. Meanwhile it is a vital part of national economy and its developing level represents the degree of a country's economic development. The State Council specially issued *logistics industry restructuring and revitalization plan* which pointed out that "Formulation and implementation of logistics industry restructuring and revitalization plan is not only the need to promote steady and rapid development of the

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logistics industry as well as its industrial restructuring and upgrading, but also service and support adjustment and development of other industries, expand consumption and absorb employment, also it is of great significance to promote industry reconstruction, transform economic growth pattern and enhance competitiveness of national economy" in 2009. The government work report of NPC (National People's Congress) and CPPCC (Chinese People's Political Consultation Conference) further states that "reducing distribution costs and promoting logistics, express delivery industry and the development of Online Shopping" in 2014.

In recent years, research about the role of logistics in national economy caused wide attention of academia with the development of logistics industry, and more and more scholars discusses the internal relationship between logistics industry and three industry. Li Guanlin is almost the first scholar to analyze the logistics industry from industry level in China. Li Guanlin (2001) discusses logistics industry in China by using the input-out table and the present situation and trend of logistics industry was shown [1]. Li Xinting *et al.* (2013) explore the status, stage, operational characteristics and the change of market demand of logistics industry in Anhui national economy by using input-output approach [2]. Cheng Yongwei, Gong Ying (2014) tries to build up a supply-demand model based on the vertical specialization and input-output theories and measure the interactive development between logistics and related industries in China, especially in China's eight economic regions from 1992 to 2007 [3].

This paper used the data of the basic flow in China's 2010 Input-Output Table to calculate a series of index reflecting the mutual interaction and influence among the industries. Specifically, the paper analysis the correlation characteristics of Chinese logistics industry and other industries, clarify the status of logistics industry in the development of national economy, fully understand the relevance of logistics industry and various sectors of national economy, and provide decision-making reference for industrial upgrading and transformation of economic development.

2. Research Methodology and Data Sources

2.1. Inputs-Output Approach and Analysis Indicators

The input-output approach was first proposed in 1936 by American economist Wassily Leontiet, who used the input-output tables to quantitatively analyze economic problems. The complete input-output table of national economic value model includes intermediate consumption, final consumption, intermediate inputs and value added [4]. For a single sector and the whole national economy, if total output (=intermediate consumption + final consumption) is equal to total input (=intermediate inputs + value added), intermediate consumption table (X) is as following Equation (1):

$$X = (X_{ij})_n \times n (i, j = 1, 2, \cdots, n) \tag{1}$$

where X_{ij} is the intermediate inputs of industry i used by industry j.

The industrial correlation coefficient is also used in this paper, including the influence coefficient (F_i) and sensitivity coefficient (E_j). The former reveals the spread degree of production needs of the remaining sectors in national economy when sector j increase a unit of final consumption; The latter reflects the sensitivity degree of demand for sector j when all the sectors in national economy increased one unit, that is, the supply from sector j to other sectors [5]. The influence coefficients (F_i) and sensitivity coefficients (E_j) are calculated using the Equations (2) and (3):

$$F_i = \frac{\sum_{i=1}^{n} b_{ij}}{\frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{n} b_{ij}} (j = 1, 2, \cdots n) \tag{2}$$

$$E_j = \frac{\sum_{j=1}^{n} b_{ij}}{\frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{n} b_{ij}} (i = 1, 2, \cdots n) \tag{3}$$

2.2. Data Sources

The basic data came from *China's 2010 Input-Output Table*. Owing to the current industry classification system

not setting up logistics industry alone, transportation and warehousing service, postal service of the third industry were merged into logistics industry according to definition of input and output table of each industry. Furthermore, the input-output table was adjusted while the principle relationship between sectors in the input-output table kept intact in order to reveal more efficiently the quantity relationship between producer services and the first, second, other third industries. one sector (*i.e.* agriculture, code 01) belongs to the primary industry sector; 25 sectors (*i.e.* code 02 to 26) can be cataloged to secondary industry; transportation and warehousing service, postal service (*i.e.* code 27 to 28) can be cataloged to logistics industry and the other sectors in third industry were merged into another new sectors, named as other third industry. From a calculation principles point of view, the treatment of producer services industry as one sector does not affect the identity property of the input-output table. Such mergence results in a highly integrated input-output table composing of four categories of industrial sectors, and the quantity relationship between producer services industry and national economy as well as all three industries can be more explicitly revealed [6] [7].

3. China's Logistics Industry Correlation Analysis

3.1. Direct Consumption Coefficient of Logistics Industry and Various Industries

We have calculated the direct consumption coefficient of Chinese logistics industry and other industries in 2010 according to the formula (1), as shown in **Table 1**. The direct consumption coefficient of logistics industry to primary industry, the second industry, logistics industry itself and third industry is 0.0233, 0.0338, 0.3602, 0.0873 and 0.1348 respectively. It means that if producing 10,000 yuan logistics industry products , you will need to be directly consumed the first, second, other third industry output value, 233, 3602, 873 and 1348 respectively. Logistics industry has the strongest demand and reliance on second industry, namely logistics industry consumed more second industry products or raw materials, next is itself and the last is Agriculture.

3.2. China Logistics Industry's Influence Factor and Sensitivity Coefficient

We have calculated the influence coefficient of logistics industry in accordance with the formula (2) as shown in **Table 2**. As we can see, the influence coefficient of Chinese primary industry, the second industry and logistics industry and other third industry in 2010 is 1.3173, 0.8116, and 0.8160 respectively, indicating that logistics industry to increase the added value of a unit of each final product will promoting national economy increased by 1.0551 units of total output. Influence coefficient of logistics industry are ranked second only to the second industry of social production radiation, but stronger than the primary and other third industry on Community production capacity. With the rapid development of electronic commerce, the driving force for the development of logistics industry in national economy will be further increased.

The sensitivity coefficient of primary industry, the second industry, logistics industry and other third industries is 0.5559, 2.2018, 0.5151, and 2.9210 calculated according to formula (3), indicating that national economy increase added value of 1 per unit of final product will boost logistics industry to increase the added value of 0.5151 units of total output.

We can see that the induction coefficient of logistics industry is the lowest among the first industry, the second industry and other third industries, and the least affected by other industries. Furthermore, Sensitivity coefficient of logistics industry induction coefficient in China is less than other third industries, which means

Table 1. The direct consumption coefficient of China's logistics industry to various industrial.

Year	The First Industry	The Second Industry	Logistics Industry	Other Third Industry
2010	0.0233	0.3602	0.0873	0.1348

Table 2. logistics industry's influence coefficient and the sensitivity coefficient of China.

Industry	Influence Coefficient	Sensitivity Coefficient
First industry	0.8116	0.5559
Second industry	1.3173	2.2018
Logistics industry	1.0551	0.5151
Other third industry	0.8160	0.7272

that logistics industry is relatively stable in the third industry, and its sensitivity to the change of national economical operation was inferior to the other third industries.

Sensitivity coefficient of China's logistics industry is less than 1, which means the impact of the production of various departments on logistics industry is far below the average induction extent of national economy, and shows that the industry has an obvious restriction on the economic, the bottleneck effect is becoming more and more highlighted.

In addition, departments whose influence coefficient is greater than the average one and sensitivity coefficient less than the average 1, belongs to the department of strong radiation and weak radiation, as can be seen in Table 2, influence coefficient of logistics industry is much higher than its sensitivity coefficient, and the influence coefficient is greater than the average one while the sensitivity coefficient is less than the average one. It indicates that logistics industry's role in promoting national economy is much larger than the pulling effect of national economy on logistics industry, and therefore it should be to promote the development of national economy by active development of logistics industry.

4. The Main Conclusions and Recommendations

First, logistics industry's demand and dependence for the second industry are the strongest, namely logistics industry consumed more products or raw materials of the second industry, followed by other third industries and the last is Agriculture.

Second, influence coefficient of logistics industry ranked second only to the second industry of social production radiation, but stronger than the first industry and other third industry's social production radiation. Influence coefficient of logistics industry in China exceeds 1, means that the degree of influence spread to the primary industry, second industry and third industry surpasses the average impact level of the whole society, logistics' stimulating effect on other sectors of national economy enhanced, the high position in national economy, is the leading industry of national economic development.

Third, sensitivity coefficient of logistics industry is the lowest among the first industry, the second industry and other third industries, therefore, the least affected by other industries. Furthermore, Sensitivity coefficient of China's logistics industry is less than other third industries, which means that logistics industry is relatively stable in the third industry, and its sensitivity to the change of national economical operation was inferior to the other third industries. Sensitivity coefficient of logistics industry were less than 1, which means the impact of the production of various departments on logistics industry is far below the average induction extent of national economy, and restraining effects of the industry on the economy is obvious, the bottleneck has become increasingly prominent role.

Forth, influence coefficient of logistics industry is much higher than its sensitivity coefficient, and the influence coefficient greater than the average one while the sensitivity coefficient less than the average one, belonging to strong radiation and weak constraints force sector, which clearly defined logistics industry "basic" industry status from the empirical point of view, indicating that logistics industry's role in promoting national economy is much larger than the pulling effect of national economy on logistics industry, and therefore it should be to promote the development of national economy by active development of logistics industry.

5. Limitation

China built input-output tables every 5 years. So far, China has built up in 1987, 1992, 1997, 2002, 2007 input-output table (2012 input-output table is still in preparation). In addition, China's national bureau of statistics also released the extended input-output table, such as the 1990, 1995, 2000, 2000 and 2010 through adjusting base year data. Therefore, the input-output table of 2010 which this article involves is the latest input-output tables. It is pity, however.

Acknowledgements

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