# Empirical Research on the Performance of Circulation Industry Based on Input-Output Analysis –Evidence from Zhejiang Province, China

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*Abstract:* Taking Zhejiang Province as an example and using input-output model, this article adjusts the input-output tables over the years and compiles input-output tables of circulation industry. Through analysis of the calculated results and vertical and horizontal comparison (with the economically developed regions in China), it studies industrial properties of Zhejiang circulation industry. The results show that, the position and role of circulation industry in national economy continue to strengthen; Circulation industry has strong ability to absorb labor force, but its basic industrial characteristics are not obvious enough; There is a certain gap between Zhejiang province and the economically developed regions in circulation industrial features; Circulation industry is consumer-driven, investment-driven and export-driven industry; The induced role of final consumption, investment demand and export demand is strong to circulation industry, of which the induced role of consumption is strongest; Currently, to stimulate the final demand, particularly, to positively develop rural consumer market and cultivate new consumption hot in cities and towns can promote circulation industry to rapidly develop.

*Key–Words:* Zhejiang Province; Circulation industry; Performance; Input-output model; Industrial characteristics; Vertical and horizontal comparison

## 1 Introduction

Since the open-up and reform carried out for 30 years in China, circulation industry has played an important role in national economy, which is a vital factor for determining the speed, quality and benefit of economic operation. Currently, under the influence of the international financial crisis, it is of great importance to relocate the status and role of circulation industry in the national economy in order to make the circulation industry fit in with the general requirements of growth, transformation and stability. Also it plays an important role in aspects such like promotion of production, guide consumption and promote the readjustment of the economic structure and economic development mode. We need reconfirm the interaction relationship between circulation industry and the first, second, third industry and within the circulation industry, which will reveal the industry characteristics of circulation industry relevance and spread as well as provide the government and relevant departments with the basis in establishing the strategy of development.

## 2 Review of Relevant Research

Wassily W. Leontief, an American economist, started working on input-output analysis in 1931 based on the previous study of the interdependence of economic activities. He compiled in 1919-1929 the United States input-output tables with the national census and then published the article about ”input-output relationship in United States economy” in 1936 based on the analysis of United States economic structure and economic equilibrium problems, which marked the birth of input-output analysis. The appearance of input-output analysis provided economic with a powerful analysis tool, which made the whole economy of very detailed statistical facts within the scope of on the economic theory of control [1]. As the developing of the input-output analysis of the theory and methods and the spreading of computers and related software development, it is easier to research the practical problem and has been widely applied in most of the world's countries and regions. In Chenery's famous book ”comparative study of industrialization and economic growth”, he studied the comparative advantage of the links between industries and manufacturing

problems by the application of input-output method [2]. The institute of international input-output made many efforts in method of input-output. It established the input-output tables of United States and the United Kingdom, Australia and Japan, which provided the researchers who studied macroeconomic and industrial structure with the basic data. Starting from the late 1950s, under the initiative of the Economist Y. F. Sun, China had introduced input-output analysis and in 1974-1976 years successfully established the first sheet of the 1973 national physical input-output table of 61 products. Since then, a variety of input-output tables about national, regional, sectoral and enterprise levels have been compiled, which means the improvement of input-output analysis methods. Since the 1990s, many scholars have studied the effects of urbanization and the impact of economic growth of circulation industry to other industries, labor and employment, seeking growth path of circulation industry in order to promote the readjustment of the economic structure, achieve the sustainable development of the national economy. G. X. Huang, L. L. Ma and Y. Liu (1998), W. L. Chen, Y. Liu and Z. L. Lu (1999), D. H. Zhao, W. Q. Shao (2004), Z. F. Liu (2005), Y. M. Yang (2006), D. Z. Wang and D. J. Song (2007), X. D. Liu, X. J. Zhang, M. M. Shi. (2009), Z. Song and K. Zhao (2009) analyzed respectively the contribution of circulation industry, the associated measurement methods, third industry from economic growth, social welfare and employment, urban formation and development dimensions using qualitative and quantitative methods, and given the appropriate conclusions, and made recommendations for the policy of promoting the circulation industry development [3]-[10]. But so far, it is rare to use input-output analysis on circulation industry development performance. J. H. Yuan (1997, Taiwan) analyzed the relationship between business and other industries based on the 1994 industrial associated tables. It showed there were the closest connection between business and industry, and the least association between business and agriculture [11]. T. G Gan (2003) elicited that business ranked in the 2nd, catering ranked in the 16th and transportation and postal services in the 5th place in the model of 33-department national economy input-output tables in Guangdong Province. The common economic characteristics of these industries are high overall economic efficiency and big pulling force of social production [12]. Take the Guangdong Province as an example and through the relevant research, Y. He (2005) demonstrated importance of circulation industry in the economy based on circulation industry characteristics and the economic evaluation model [13]. J. W. Yuan (2009) studied on circulation industry in Guangdong Province with input-output and econometric methods, which showed that the efficiency of circulation industry in 2005 had significantly increased compared with it in 2002 in Guangdong Province and it had a long-term stable and balanced relationship between circulation industry and other industries. Circulation industry had increased the substantial growth of the industries and stimulates the growth of the national economy as a whole [14]. Currently, input-output analysis has achieved certain results in the field of industry research in China, but only to the first, second, third industry, or the division industries such as information, environment, energy and water resources. It is rare to use quantitative analysis methods in perspective of input-output and system research in lateral and longitudinal aspects. This article is based on the predecessor research results and reality of Zhejiang Province with the perspective of multiple quantitative analysis and attempts to reflect the dialectical relations of interdependence between circulation industry and other industries with the quantity, from which we will know how the circulation industry contributes to development of the national economy.

# 3 Circulation Industry Input-output Analysis

## 3.1 Circulation Adjustment of the Input-output Tables

General circulation industry refers to the all trade in business flow, logistics, information flow and business flow, capital flow, also including wholesale, retail, catering, logistics, and finance and many other industries. Narrow circulation industry refers to the wholesale, retail, catering, logistics. According to the classification of the industries of the national economy in July 2002 from the national statistical office, we know that wholesale and retail trade, accommodations restaurants, transportation, warehousing and postal service belong to circulation industry. The circulation industry in this article refers to narrow circulation. At present, the nation and province compile the basic input-output table and the extend table of input-output in the interval of every 5 years. The basic table of input-output in Zhejiang Province was compiled in 2007 and the extend table of input-output in 2005, which include 42 departments. The input-output tables are needed for proper adjustment of industrial classification in order to highlight the industrial relationship of circulation industry and quantity characteristics of ripple effects, because the classification is according to national industrial classification system in establishing input-output table in China. On the basis of industry classification and input-output ta-

bles of 42 departments in Zhejiang, this article elicits the input-output tables of 5 departments which includes circulation department of Zhejiang Province in 1997, 2002, 2005 and 2007. The 5 departments are agriculture, industry, construction, circulation industry and other services, in which circulation industry including wholesale and retail trade, accommodation and catering, transport, warehousing and postal service. Through such adjustment of industrial classification, it doesn't change the basic relationship between input-output tables. However, it can highlight the associated characteristics between circulation industry and other industries.

### 3.2 Analysis on the Pulling and Support Role of Circulation Industry to National Economy

The influence coefficient of circulation industry refers to the demand and pulling degree produced by circulation industry in increasing each unit of final product to related department goods and services of national economy. The formula of the influence coefficient is:

$$F_j = \frac{\sum_{i=1}^{n} \bar{b}_{ij}}{\frac{1}{n}\sum_{j=1}^{n}\sum_{i=1}^{n} \bar{b}_{ij}} \quad (j = 1, 2, \cdots, n) \qquad (1)$$

In the formula, $\bar{b}_{ij}$ means the total demanding coefficient that the $j$ department need for the $i$ department; $\sum_{i=1}^{n} \bar{b}_{ij}$ means the sun of the $j$ line in Leontief inverse matrix $\bar{B}$ ;$\frac{1}{n}\sum_{j=1}^{n}\sum_{i=1}^{n} \bar{b}_{ij}$ means the mean value of the sum of all lines in $\bar{B}$ . The bigger the influence coefficient is, the bigger the pulling effect of one department to other departments is. The smaller the influence coefficient is, the less the pulling effect of one department to other departments is. According to the formula (1), we can obtain the influence coefficient in 5 years, which is showed in table 1.

From table 1, we know that the pulling effect of circulation industry to other departments is increasing compared with other departments. The influence coefficient of circulation industry in 2007 was 0.812682, which was 0.0374 higher than that in 2002 and located at third place. It is obvious that the circulation industry plays a leading role in the service industry. The role of circulation industry on promoting the national economy is not big enough compared with the industry and construction, and we can still dig out the bigger effect to the economic growth, although circulation industry in Zhejiang Province has some influence

Table 1: Influence coefficients of 5 departments at each year in Zhejiang

| year | Agriculture | Industry | Construction |
|---|---|---|---|
| 1997 | 0.709989 | 1.278196 | 1.254331 |
| 2002 | 0.782879 | 1.297122 | 1.277519 |
| 2005 | 0.753862 | 1.326542 | 1.305630 |
| 2007 | 0.753372 | 1.325986 | 1.333221 |
| year | Circulation Industry | Other Service Industry | |
| 1997 | 0.823613 | 0.933871 | |
| 2002 | 0.775257 | 0.867224 | |
| 2005 | 0.825531 | 0.788436 | |
| 2007 | 0.812682 | 0.774740 | |

on promoting economic growth and its market level has increased. Sensitivity coefficient of circulation industry refers to the demand and impact on circulation industry when all relevant departments of the national economy increase each unit final product in productive activities. The sensitivity formula of influence coefficient is:

$$E_i = \frac{\sum_{j=1}^{n} \bar{b}_{ij}}{\frac{1}{n}\sum_{j=1}^{n}\sum_{i=1}^{n} \bar{b}_{ij}} \quad (i = 1, 2, \cdots, n) \qquad (2)$$

In the formula, $\sum_{j=1}^{n} \bar{b}_{ij}$ means the sum of the $i$ row in total demanding coefficient matrix $\bar{B}$, $\frac{1}{n}\sum_{j=1}^{n}\sum_{i=1}^{n} \bar{b}_{ij}$ means the mean value of the sum of all rows in total demanding coefficient matrix $\bar{B}$ . The bigger the sensitivity coefficient is, the bigger the pulling effect of one department to other departments is. According to formula (2), we can calculate the sensitivity coefficient of 5 departments in Zhejiang, which is showed in table 2.

From table 2, we know sensitivity coefficient of circulation industry on other industry departments is decreasing. Sensitivity coefficient was 0.639832 in 2007, which ranked after industry and was comparative with other services. It reflects the influence of other industries on circulation industry is reducing, and restriction of circulation industry on the economic development is less than industry and other services. Circulation industry is bottleneck industry of economic development in Zhejiang and its lag of development restricts industrial upgrade and transformation. Also from table 3, we can see, in recent years, the proportion of other services increases year by year

Table 2: Sensitivity coefficients of 5 departments at each year in Zhejiang

| year | Agriculture | Industry | Construction |
|---|---|---|---|
| 1997 | 0.524214 | 2.832349 | 0.356171 |
| 2002 | 0.559787 | 2.685022 | 0.381287 |
| 2005 | 0.529283 | 2.871723 | 0.355722 |
| 2007 | 0.457415 | 2.876266 | 0.361376 |
| year | Circulation Industry | Other Service Industry | |
| 1997 | 0.764527 | 0.522739 | |
| 2002 | 0.682527 | 0.691377 | |
| 2005 | 0.609775 | 0.633498 | |
| 2007 | 0.639832 | 0.665112 | |

in the national economy, but circulation industry has declined. These results show that, on the one hand, circulation industry in Zhejiang hasn't played an important role in the national economy and we need enhance infiltration of circulation industry to other industries; On the other hand, it is obvious that circulation industry's potential for development and growth is stagflationary and it is urgent to change the development mode of circulation industry.

Table 3: The Proportion of added value in national economy of 5 departments at each year in Zhejiang

| year | Agriculture | Industry | Construction |
|---|---|---|---|
| 1997 | 13.8 | 49.7 | 5.5 |
| 2002 | 8.9 | 45.3 | 5.3 |
| 2005 | 6.6 | 47.3 | 6.1 |
| 2007 | 5.2 | 48.3 | 5.5 |
| year | Circulation Industry | Other Service Industry | |
| 1997 | 19.4 | 11.6 | |
| 2002 | 19.4 | 21.2 | |
| 2005 | 15.0 | 25.0 | |
| 2007 | 14.8 | 26.2 | |

Source: input-output tables in 1997, 2002 and 2007, extend table of input-output in 2005 of Zhejiang Province.

### 3.3 Analysis on Effects of Circulation Industry to Other Industries

Influential effect of an industry refers to the direct and total dependency relation from certain department to other departments reflected by direct consumption coefficient and total consumption coefficient, which shows the spread and sensitivity from the department to others. In which, the direct effect of the industry is the sum of all lines in direct consumption coefficient matrix and the total effect of industry is the sum of all lines in total consumption coefficient matrix.

Table 4: Direct effect of 5 departments at each year in Zhejiang

| year | Agriculture | Industry | Construction |
|---|---|---|---|
| 1997 | 0.364772 | 0.794559 | 0.753911 |
| 2002 | 0.391277 | 0.779710 | 0.765758 |
| 2005 | 0.374891 | 0.796479 | 0.781400 |
| 2007 | 0.382442 | 0.785807 | 0.782217 |
| year | Circulation Industry | Other Service Industry | |
| 1997 | 0.455070 | 0.531542 | |
| 2002 | 0.396045 | 0.483108 | |
| 2005 | 0.453697 | 0.423559 | |
| 2007 | 0.450112 | 0.407790 | |

Source: input-output tables in 1997, 2002 and 2007, extend table of input-output in 2005 of Zhejiang Province.

Table 5: Total effect of 5 departments at each year in Zhejiang

| year | Agriculture | Industry | Construction |
|---|---|---|---|
| 1997 | 1.133354 | 2.840684 | 2.768977 |
| 2002 | 1.185427 | 2.620950 | 2.566229 |
| 2005 | 1.228550 | 2.921493 | 2.859676 |
| 2007 | 1.186247 | 2.847941 | 2.868937 |
| year | Circulation Industry | Other Service Industry | |
| 1997 | 1.474768 | 1.806068 | |
| 2002 | 1.164151 | 1.420878 | |
| 2005 | 1.440417 | 1.330756 | |
| 2007 | 1.358360 | 1.248256 | |

Source: input-output tables in 1997, 2002 and 2007, extend table of input-output in 2005 of Zhejiang Province.

From the data in table 4 and table 5, we can know that circulation industry falls behind industry, construction, and other service industry regardless of direct effect and total effect, and was in fourth place in 1997 and 2002. But circulation industry exceeded the other industries of direct effect and total effect, and was in the third position in 2005 and 2007. It means circulation industry is playing a significant role in promoting the national economy of Zhejiang and influences the other departments a lot. Speeding up the development of circulation industry will promote the economic development of Zhejiang Province.

### 3.4 Analysis of Final Demand Induced Effect on Circulation Industry

Production induction effect of an industry refers to the impact of industrial production and induction of production from final demand projects (such as consumption, investment, exports, and so on) within the economic system, which means when the final demand in the social-economic system increases, the production force will be inspired through technical and economic relation between the industry and industrial ripple effect. The indicator of production induction effect is production induction coefficient. It is the quotient that the amount of production induction of certain final demand project is divided by corresponding total final demand project. The calculation formula is:

$$W_{im} = \frac{\sum_{j=1}^{n} x_{im}\bar{b}_{ij}}{\sum_{i=1}^{n} x_{im}} \quad (i = 1, 2, \cdots, n, m = 1, 2, 3) \tag{3}$$

In which,$x_{im}$ is the demand amount of the $i$ industry demand for the $m$ final demand, $\bar{b}_{ij}$ is the total demanding coefficient from the $j$ department to the $i$ department, $n$ is the amount of departments, $m = 1, 2, 3$, which represents respectively consumption, investment and exports. It can reveal the induction extent of all final demand projects to industrial production by production induction coefficient. From that, we can know how to add the kind of final demand (consumption, investment, export) that can generate the biggest induction of certain industrial production. Then we can divide the industry into three types, that is, consumer-led, investment-led and export-led. According to formula (3), we can calculate the production induction coefficient of consumption, investment and export at each year in Zhejiang Province, which is showed in table 6.

Based on input-output model and table 6, the investment induced coefficients in Zhejiang Province's three kinds of demands of consumption, investment and exports to the national economy in 1997, 2002, 2005 was the maximum, consumption induced coefficient fell slightly in the fluctuation, and export induced coefficient had a pronounced decline trend. By 2007, the consumption induced coefficient continued to decrease, investment and export induced coefficient had an upward trend. This indicates that in recent years, Zhejiang economic growth relies mainly on capital investment and is the extensive growth. From industry, circulation industry suffers the induced effects by export in the years after industry, ranking second, and suffers the influence of total consumer demand-induced after industry and other services, ranking third, and suffers effects induced by investment which is less than that by the industrial and construction industries, ranking third. By comparison, circulation industry belongs to consumption, investment and export-led industry, and suffers strong effects induced on the national economy of final consumption, investment and export demand, which are induced by consumption of effects to the maximum. Therefore, stimulating final demand, in particular, expanding the rural consumption market and fostering hot points of new consumption in cities and towns can promote the rapid development of circulation industry.

Table 6: The production-induced coefficients of consumption, investment and exports in 5 industrial departments in Zhejiang

| project / Industry | 2005 | | |
|---|---|---|---|
| | Consumption | Investment | Exports |
| Agriculture | 0.1656 | 0.1330 | 0.1656 |
| Industry | 1.8136 | 2.4517 | 1.8136 |
| Construction | 0.0180 | 0.5532 | 0.0180 |
| Circulation industry | 0.2774 | 0.2346 | 0.2774 |
| Other service industries | 0.6452 | 0.2928 | 0.6452 |
| Total | 2.9198 | 3.6654 | 2.9198 |
| project / Industry | 2007 | | |
| | Consumption | Investment | Exports |
| Agriculture | 0.1330 | 0.1656 | 0.1330 |
| Industry | 2.4517 | 1.8136 | 2.4517 |
| Construction | 0.5532 | 0.0180 | 0.5532 |
| Circulation industry | 0.2346 | 0.2774 | 0.2346 |
| Other service industries | 0.2928 | 0.6452 | 0.2928 |
| Total | 3.6654 | 2.9198 | 3.6654 |

Source: The input-output tables in 1997 and 2002, extended input-output tables in 2005 and the input-output tables in 2007 in Zhejiang Province.

### 3.5 Analysis of Circulation Industry Employment Effect

Employment is an important indicator which used in macroeconomics to measure economic performance, which has special effects to "the people's livelihood and promoting stability". Circulation industry development not only makes itself expand job demands, but also because of leading to the industry's forward and backward development, so as to further expand the

needs of employment. Therefore, circulation industry's contribution to employment refers not only absorbing directly personnel engaged in circulation industry itself, but also including the total number of employment that circulation industry and other sectors require for directly or indirectly, which can truly reflect the circulation industry's role in creating employment opportunities. Employment effect becomes effective and direct index in assessment industry employment performance because input-output table can reflect all industry sectors of mutual associated relationship in certain historical periods and its coefficient is technical parameter and effected less by social other factors, and industry employment effect reflects the employment volume of all industry raised by increasing a units of the industrial ultimate using.There are multiple methods to discussion industry absorbing employment ability, but here we use the input-output method to research circulation industry employment effects. A comprehensive contribution to the industry on employment can be measured from the following perspectives: the number of opportunities (employment effects) created by expanding the industry output value of production units for the industry itself (employment coefficient) and other industry sectors.

Table 7: The employment coefficients of 5 departments each year in Zhejiang Province

| year | Agriculture | Industry | Construction |
|---|---|---|---|
| 1997 | 0.914 | 0.065 | 0.149 |
| 2002 | 0.798 | 0.244 | 0.413 |
| 2005 | 0.718 | 0.183 | 0.291 |
| 2007 | 0.693 | 0.144 | 0.272 |
| year | Circulation Industry | Other Service Industry | |
| 1997 | 0.243 | 0.191 | |
| 2002 | 0.295 | 0.254 | |
| 2005 | 0.301 | 0.100 | |
| 2007 | 0.244 | 0.091 | |

Calculated as [15]: Industry employment coefficient = industry employment / gross output value of industry; Employment effect coefficient = Industry employment coefficient corresponding coefficients in Leoniief inverse matrix. According to the above formula, we can calculate industry employment and employment effect coefficient of 5 departments each year in Zhejiang Province (Showed respectively in table 7 and table 8).

From table 7, the employment coefficient was 0.244 for circulation industry in 2007, circulation industry's ultimate using increased $ 100 million, which could lead to increased 2,440 people to the employment of

Table 8: The employment effects of 5 departments in Zhejiang Province each year

| year | Agriculture | Industry | Construction |
|---|---|---|---|
| 1997 | 1.137 | 1.742 | 0.164 |
| 2002 | 1.055 | 2.671 | 0.433 |
| 2005 | 0.928 | 2.331 | 0.303 |
| 2007 | 0.804 | 2.015 | 0.283 |
| year | Circulation Industry | Other Service Industry | |
| 1997 | 0.534 | 0.322 | |
| 2002 | 0.626 | 0.568 | |
| 2005 | 0.525 | 0.321 | |
| 2007 | 0.459 | 0.340 | |

Source: the input-output tables in 1997 and 2002, extended input-output tables in 2005, the input-output tables in 2007 in Zhejiang Province and related year Statistical Yearbook of the Zhejiang Province.

circulation industry. The employment coefficient of circulation industry was lower than that of agriculture, and higher than that of industry, construction and other service industries in 1997, 2002, and 2005. By the year 2007, although the circulation industry employment coefficient had decreased, it was still higher than other service industries with 15.3%, which reflected fully that the circulation industry had a large employment "cistern" function. Table 8 shows that the employment effects of circulation industry was 0.459 in 2007, which means increasing of the ultimate use circulation $ 100 million can lead to increase about direct or indirect employment of 4,590 in other industries. Employment effects of circulation industry ranked third in 1997, 2002, 2005 and 2007, which had averaged more than other service industries up to as much as 20%. Above results can explain fully that, in the case of the current employment situation is grim, solving the employment problem lies in developing circulation industry, circulation industry development drives to a large extent to the social employment, so as to ease the employment pressure in Zhejiang.

# 4 Comparative Analysis on the Characteristics of Circulation Industry

To horizontally compare with the situation development of circulation industry in Zhejiang, in accordance with the principle of availability and comparability of data and the industry classification to be adjusted accordingly, this article establishes respectively input-output tables of 5 sectors, namely, agri-

culture, industry, construction, circulation industry and other service industries, and calculates their direct consumption coefficient matrix, Leoniief inverse matrix and influence, induction coefficients, etc., which is based on the input-output tables of three economically developed regions-Jiangsu, Guangdong, Shanghai, and 42 sectors of the nation in 2005, and input-output tables of 42 sectors of Zhejiang in 2005. By comparison with the indicators of the nation and three regions, it further analyzes the problems in circulation industry development of Zhejiang Province.

## 4.1 Comparative Analysis of the Industrial Association

As ties and bridges of linking production and consumption, circulation industry is called the national economic artery, and its development is bound to have a great driving and promoting effect on other sectors to promote the sustainable development of the national economy as a whole. Industrial association reflects technical and economic links of various inputs and outputs between the industries, and its essence is the relationship of supply and demand between various industries. Industrial association effects can be measured by using the degree of dependence and direct correlation coefficients and other indicators.

### 4.1.1 Comparative Analysis of the Circulation Industry Dependence Degree

Table 9: Circulation industry direct consumption coefficient to various industries in 2005

| Region / Industry | Zhejiang | Guangdong | Shanghai |
|---|---|---|---|
| Agriculture | 0.0375 | 0.0161 | 0.0126 |
| Industry | 0.2269 | 0.2160 | 0.2219 |
| Construction | 0.0125 | 0.0028 | 0.0242 |
| Circulation industry | 0.0615 | 0.0212 | 0.1657 |
| Other service industries | 0.1153 | 0.1456 | 0.1763 |
| Region / Industry | Jiangsu | The nation | |
| Agriculture | 0.0655 | 0.0322 | |
| Industry | 0.1068 | 0.2876 | |
| Construction | 0.1065 | 0.0128 | |
| Circulation industry | 0.0554 | 0.1170 | |
| Other service industries | 0.0605 | 0.0810 | |

Direct consumption coefficients reflect the technical and economic links between various industrial sectors in the input-output tables, and are the most important and fundamental data of industry-related analysis. The larger the coefficient is, the more closely direct interdependence between the two sectors is. Through calculating, we can get direct consumption coefficients of Zhejiang, Guangdong, Shanghai, Jiangsu and national circulation industry on their own and the other 4 industries in 2005(See table 9 and table 10).

Table 10: Various industrial direct consumption coefficient to circulation industry in 2005

| Region / Industry | Zhejiang | Guangdong | Shanghai |
|---|---|---|---|
| Agriculture | 0.0202 | 0.0292 | 0.0531 |
| Industry | 0.0576 | 0.0372 | 0.0879 |
| Construction | 0.0766 | 0.0551 | 0.0702 |
| Circulation industry | 0.0615 | 0.0212 | 0.1657 |
| Other service industries | 0.0484 | 0.0566 | 0.0612 |
| Region / Industry | Jiangsu | The nation | |
| Agriculture | 0.0299 | 0.0451 | |
| Industry | 0.0490 | 0.0807 | |
| Construction | 0.0593 | 0.1138 | |
| Circulation industry | 0.0554 | 0.1170 | |
| Other service industries | 0.0367 | 0.1092 | |

We can see from table 9 and table 10, circulation industry of the nation and 4 regions have maximum direct consumption coefficient to their industries, which means that circulation industry development have the greatest consumption on industry products. This shows that speeding up the development of circulation industry is beneficial to promoting industrial economic growth. By comparison, the circulation industry of Zhejiang Province has large consumption to various industries, especially to industry, which consumption coefficient is maximum. It describes that circulation industry in Zhejiang Province has relatively high dependence to industry. It is also a major restriction of circulation industry development in Zhejiang Province. According to the views of G. L. Li [16], the circulation industry development in Zhejiang is still in "quantity expansion" phase. From the consumption factor of circulation industry on other services, while Zhejiang's is higher than the nation,

but compared with Guangdong, Shanghai of circulation developed areas, there is a gap. It describes that the circulation industry in Zhejiang Province has small consumption on information industry, software and computer service industries in the tertiary industry, which explains that circulation industry should speed up the pace of informationization construction in Zhejiang Province. It also can be seen in the above table, direct consumption of agriculture is smaller to circulation industry, and Zhejiang's is the smallest, which shows the needs of agriculture is very low to circulation products. It reflects the necessity and urgency of speeding up the modernization of circulation in rural areas. Compared with the three regions of Guangdong, Shanghai, Jiangsu, in addition to agriculture, direct consumption of various industries in Zhejiang Province on circulation industry are larger, which shows that, with the rapid development of economy, the development of industry, construction and other service industries in Zhejiang Province is more dependent on circulation industry than that in the other three areas. But generally speaking, direct consumption coefficient of circulation industry on various industries in Zhejiang is smaller than the nation. Therefore, Zhejiang should further strengthen fusion and penetration between the circulation industry and industry, so as to achieve mutual promotion and common development.

Table 11: Direct forward-associative indices of the nation and all regions of the country 5 sectors in 2005

| Region / Industry | Zhejiang | Guangdong | Shanghai |
|---|---|---|---|
| Agriculture | 0.3749 | 0.4164 | 0.6300 |
| Industry | 0.7965 | 0.7547 | 0.7604 |
| Construction | 0.7814 | 0.7474 | 0.7817 |
| Circulation industry | 0.4537 | 0.4439 | 0.6007 |
| Other service industries | 0.4236 | 0.3986 | 0.4549 |
| Region / Industry | Jiangsu | The nation | |
| Agriculture | 0.4379 | 0.4135 | |
| Industry | 0.7629 | 0.7485 | |
| Construction | 0.7421 | 0.7443 | |
| Circulation industry | 0.3948 | 0.5306 | |
| Other service industries | 0.4245 | 0.4923 | |

### 4.1.2 Comparison Analysis of the Circulation Industry Correlation Effect

Industry correlation effect refers to the direct and indirect impact of the forward and backward associated relationships caused by industrial production, output value and technical changes on other sectors. It can be divided into forward and backward linkage effects, and they are respectively measured by the direct forward-associative indices (rates of intermediate demand) and direct backward linkages indices (rates of intermediate inputs). By calculating, we can get direct correlation indices of 5 sectors of the nation and all regions in 2005 (See table 11 and table 12).

From table 11 and table 12, we can see that the direct

Table 12: Direct backward linkages indices of the nation and all regions of the country 5 sectors in 2005

| Region / Industry | Zhejiang | Guangdong | Shanghai |
|---|---|---|---|
| Agriculture | 0.4012 | 0.2029 | 0.1846 |
| Industry | 1.7861 | 1.9168 | 2.0241 |
| Construction | 0.0612 | 0.0061 | 0.0619 |
| Circulation industry | 0.3778 | 0.1993 | 0.4381 |
| Other service industries | 0.6271 | 0.3938 | 0.5190 |
| Region / Industry | Jiangsu | The nation | |
| Agriculture | 0.2820 | 0.3128 | |
| Industry | 1.7129 | 1.8228 | |
| Construction | 0.3072 | 0.0456 | |
| Circulation industry | 0.2304 | 0.4658 | |
| Other service industries | 0.2296 | 0.2823 | |

forward-associative indic of industry and construction industry in Zhejiang is greater than the regional and national levels, the direct forward-associative indic of circulation industry stays at secondary level, but higher than the average level for other services in the area. As far as the national average level, the intermediate demand rate of the circulation industry gets 53.06%, which is higher than that of the other services. The intermediate demand rate of circulation industry in Zhejiang Province is 45.37%, less than Shanghai, and national level. The circulation industry of Zhejiang Province as one of the main departments within the services, input rate of 37.78%, is much smaller than the average for other services (62.71%), which capacity of leading to economic is lower than the average for other services. The input rate of cir-

culation industry in Guangdong (19.93%), Jiangsu (23.04%) is lower than that of Zhejiang Province and the intermediate inputs of the circulation industry in Shanghai (43.81%), the nation (46.58%) is higher than that in Zhejiang Province. Generally speaking, direct forward-associative indic of circulation industry in Zhejiang province is much larger than that of direct backward linkages indic, which explains that circulation industry has much more association to upstream industries than downstream industries, and it has more dependence on its downstream industries such as industry and less demand on upstream industries such as manufacturers. The circulation industry, which is high intermediate demand rate and low intermediate input rate in Zhejiang, is product-based industries, and provides circulation services for other industrial production [17].

## 4.2 Comparison Analysis of Influence Coefficients and Induced Coefficients

In accordance with the foregoing formula for calculating industry influence factors and induction coefficients and the input-output tables of circulation industry in the national and 5 departments in various areas in 2005, this article evaluates the influence and induced coefficients in the nation and various regional industries to compare the pulling and pushing effects of circulation industry on the national economy in varies regions(See table 13 and table 14).

Table 13: Influence coefficients of the nation and 5 departments in various areas in 2005

| Region / Industry | Zhejiang | Guangdong | Shanghai |
|---|---|---|---|
| Agriculture | 0.7539 | 0.8067 | 1.0025 |
| Industry | 1.3265 | 1.3123 | 1.1590 |
| Construction | 1.3056 | 1.3023 | 1.1927 |
| Circulation industry | 0.8255 | 0.7998 | 0.9020 |
| Other service industries | 0.7884 | 0.7788 | 0.7437 |
| Region / Industry | Jiangsu | The nation | |
| Agriculture | 0.8181 | 0.7735 | |
| Industry | 1.2958 | 1.2127 | |
| Construction | 1.2691 | 1.1891 | |
| Circulation industry | 0.7786 | 0.9317 | |
| Other service industries | 0.8383 | 0.8929 | |

Table 14: Induced coefficients of the nation and 5 departments in various areas in 2005

| Region / Industry | Zhejiang | Guangdong | Shanghai |
|---|---|---|---|
| Agriculture | 0.5293 | 0.5149 | 0.4420 |
| Industry | 2.8717 | 2.8614 | 2.6176 |
| Construction | 0.3557 | 0.3734 | 0.3694 |
| Circulation industry | 0.6098 | 0.5622 | 0.7799 |
| Other service industries | 0.6335 | 0.6882 | 0.7910 |
| Region / Industry | Jiangsu | The nation | |
| Agriculture | 0.5833 | 0.6431 | |
| Industry | 2.7296 | 2.5455 | |
| Construction | 0.5534 | 0.3932 | |
| Circulation industry | 0.5943 | 0.8018 | |
| Other service industries | 0.5394 | 0.6165 | |

Table 13 shows that the influence coefficient of circulation industry is less than 1, which indicates the influence level of circulation industry to other industries is lower than the community average influence levels. Table 14 shows that the induced coefficient is less than 1, which indicates that the nation economy development has low demand and leading effect to circulation industry. Compared with the regions and the nation, the pulling effect to national economy in Zhejiang circulation industry stays at the medium level (0.8255), the circulation industry's radiation is not large enough in various sectors of the national economy in Zhejaing. As can be seen from table 13 and table 14, the induced coefficient of circulation industry in Guangdong, Shanghai, Jiangsu, Zhejiang, is less than 1 and less than the national level, but stays at second or third in their industries. The demand of induction levels of circulation industry in the nation and Shanghai is greater than that in Zhejiang Province, their induction coefficients are respectively 0.8018 and 0.7799, which notes pulling effect of national economy is insufficient in circulation industry in Zhejiang Province. On the whole, induction coefficient of the circulation industry is low, but the influence coefficient is high, which notes circulation industry has greater influence to other industries than other industries to its effect. Promoting the development of circulation industry will drive the rapid development of other industries.

# 5 Conclusion

The main conclusion of this article is as follows. Circulation industry of Zhejiang Province's position and role in the national economy continues to strengthen. Circulation industry has strong capacity to absorb labor force, but its basic industry characteristic is not clear enough. In the area of industrial property, there is a gap with the coastal economic developed areas. Therefore, wholesale and retail trade in Zhejiang Province should change traditional business and organizational forms, the use of chain operations, logistics, e-commerce, and other modern circulation method. Traditional warehousing and transportation, the postal industry should change the simple service way of providing transportation and storage services, gradually towards modern logistics enterprise transformation, accelerate the development of the emerging circulation industry. To actively develop and expand the rural consumer market, foster the hot points of urban new consumption. At the same time, to further open market access, allow and encourage individuals, the private sector, foreign investment and other non-state-owned economy to enter circulation industry, form competing situation with circulation industry of state-owned enterprisers, strengthen the role of market mechanisms, improve the comprehensive quality of the entire industry, and realize fundamental changes in the way of implementation of circulation industry development.

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