Study on the logistics industry agglomeration in China

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Abstract

Logistics had become an important source of growth in China. Some part of this rapid logistics industrial development could be attributed to the industrial agglomeration in the country. This paper analyzed the developing environment and the current situation of the logistics industry, and calculated the location quotient of 21 national logistics nodes cities of China. The results show that regional logistics agglomeration level is rising. Then chose six factors as independent variable, the location quotient in terms of logistics industry as dependent variable, and did an analysis with Panel Data model for the purpose of determining the influencing factors. The GDP is negatively related to agglomeration degree, while the others such as the output value of secondary industry, the output value of Tertiary industry, Total Investment in Fixed Assets in Transport, Storage and Post, Number of Employed Persons in Transport, Storage and Post and Freight Ton-Kilometers are contrary.

Keywords: Logistics Industry; Industrial Agglomeration; Location Quotient; Panel Data

1. Introduction

Industry agglomeration is one of the important contemporary models of regional economic development, whose effect leads to regional economic development [1]. Logistics is the part of the supply chain process that plans, implements and controls the efficient flow and storage of goods, services and related information from the point of origin to the point of consumption, in order to meet the customers' requirements. The success of the logistics industry depends on the promptness with which the products can be delivered to a particular destination or to a client. Time and location are two factors which can either make or mar the logistics industry. The logistics industry is governed by technology, integration, globalization, legislation and confederations. Today's modern, efficient logistics centers are the heart of city, and provide control, efficiency and velocity for goods moving through the system. Logistics industrial agglomeration is geographical agglomeration of logistics activities and it is an important process for promoting industrial and economic development [2][3].

2. Measurement of logistics industry agglomeration

2.1. Location quotient technique

Location Quotient is the most commonly utilized economic base analysis method to measure industrial cluster [4].

Let $i = 1,2,...,I$ denote regions, then the LQ of industry in region i is defined as

$$LQ_i = (e_i / e)/(E_i / E) \qquad (1)$$

Where, LQ_i represents location quotient of industry in region i, e_i is employment (output) of industry in region i,

e is total employment (output) of industry in all regions. E_i is total employment (output) of all industries in region i, and E is total employment (output) of the overall economy.

When $LQ_i = 1$ that means the local employment (output) is exactly sufficient to meet the local demand for a given good or service. If $LQ_i < 1$, the industry is not even meeting local demand for a given goods or service. If $LQ_i > 1$, the industry under study is more concentrated in the region i than the national average.

2.2. Empirical analysis

Transport, storage and post have always been an important part of logistics. The paper uses the value of regional output of transport, storage and post to compute cluster for logistics industries.

The paper selects 21 national logistics nodes cities of China as the example. The data were taken from China Statistical Yearbook for the individual cities [5]. The results are shown in Table I.

Table Ⅰ Location quotient in the terms of the value of output

	2004	2005	2006	2007	2008	2009	2010	2011
Beijing	1.14	1.02	1.03	0.98	0.93	0.93	1.06	1.07
Tianjin	1.67	1.07	1.03	1.06	0.97	1.28	1.33	1.21
Shanghai	1.13	1.10	1.15	1.41	1.08	0.86	1.02	0.98
Shenyang	0.99	1.02	0.96	0.93	0.92	0.95	0.97	0.93
Dalian	1.53	1.70	2.04	1.96	1.78	1.53	1.49	1.29
Qingdao	1.93	1.85	1.90	1.91	1.80	1.48	1.59	1.57
Jinan	1.13	1.04	1.04	1.06	1.11	1.22	1.27	1.45
Nanjing	1.13	1.03	1.05	1.03	1.01	0.84	1.07	1.21
Ningbo	1.07	0.79	0.84	0.81	0.94	0.89	0.95	0.95
Hangzhou	0.59	0.53	0.55	0.54	0.57	0.60	0.57	0.58
Xiamen	1.15	1.14	1.19	1.04	1.13	1.10	1.16	1.29
Guangzhou	2.00	1.91	1.94	1.88	1.48	1.44	1.46	1.44
Shenzhen	0.93	0.76	0.77	0.78	0.73	0.77	0.83	0.82
Zhengzhou	1.83	1.46	1.46	1.43	1.46	1.36	1.36	1.23
Wuhan	0.98	1.28	1.15	1.06	1.11	1.04	1.15	1.07
Chongqing	0.99	1.24	1.32	1.17	1.17	1.09	1.03	0.98
Chengdu	0.89	0.90	0.91	0.86	0.92	0.96	0.98	0.98
Nanning	0.95	0.90	0.64	0.69	0.86	0.93	0.97	1.05
Xi’an	0.86	0.91	0.89	0.87	0.87	0.83	0.81	0.63
Lanzhou	1.87	1.48	1.47	1.49	1.45	1.42	1.36	1.41
Urumqi	2.40	1.70	1.75	1.59	1.63	1.81	2.10	2.25

The Table I show that the 13 cities’ logistics industry has $LQ_i > 1$ which are predominantly characterized by concentration of logistics industry, such as Urumqi, Qingdao, Jinan, Guangzhou, Lanzhou, etc. The main cause is that these cities emphasis on the development of modern logistics industry. Since 2009 March the state promulgated the "logistics industry restructuring and revitalization plan", these cities introduce some related policy to promote the modern logistics industry to develop rapidly. There is 5 cities’ logistics industry close to 1, such as Shanghai, Shenyang, Ningbo, Chongqing, and Chengdu. Logistics industry is nearly approaching to concentrate in the region as they are at the national level. Contrary, there are 3 cities’ logistics industry have $LQ_i < 1$, such as Hangzhou, Shenzhen and Xi’an. Logistics industries are not yet as concentrated in the region as they are at the national level. It indicates that logistics industry takes up a smaller proportion of national economy, which fully demonstrates the limitations of location quotient method. The method does not consider the different level of regional economy.

3. Influencing factors of logistics industry agglomeration

It is very important to thoroughly study quantitative and qualitative factors when studying the overall level of the logistics industry agglomeration. Panel data models have become increasingly popular among applied researchers due to their heightened capacity for capturing the complexity of human behavior as compared to cross-sectional or time series data models. Eviews can be used for general statistical analysis and econometric analyses, such as panel data analysis and time series estimation and forecasting. So the paper will bring a quantitative analysis using Eviews to solve panel data model [6].

3.1. Panel Data Analysis

Panel data are data on individuals that are followed through time. For each individual there are multiple observations at different point in time [7].

The fundamental advantage of a panel data set over a cross section is that it will allow the researcher great flexibility in modeling differences in behavior across individuals.

The basic framework for this discussion is a regression model of the form.

To define the models estimated, assume we have observations on $i = 1, 2, \ldots, N$ individuals for each of $t = 1, 2, \ldots, T$ years. The dependent variable is denoted by y_{it} and the independent variables by x_{it}. The basic pooled or regression model is

$$y_{it} = x_{it}\beta + \alpha + u_{it}$$

Where α is the overall intercept, β is the slopes and u_{it} is the error term. This model assumes a single set of slope coefficient for all the observations.

There are two kinds of models: fixed effects models and random effects models.

Some variants of the fixed effects models can be viewed as special cases of the classical linear regression model, while random effects models are special cases of the generalized regression model

The equation for the fixed effects model becomes:

$$y_{it} = x_{it}\beta_i + \alpha_i + u_{it}$$

The random effects model is:

$$y_{it} = x_{it}\beta + \alpha + u_{it} + \varepsilon_{it}$$

Where u_{it} is between-entity error and ε_{it} is within-entity error.

To decide between fixed or random effects we can run a Hausman test where the null hypothesis is that the preferred model is random effects vs. the alternative the fixed effects. It basically tests whether the unique errors (u_{it}) are correlated with the repressors, the null hypothesis is they are not.

3.2. Model specification

According to the data available, location quotient is considered as a dependent variable. Then add six independent variables to the model, they are GDP, the output value of secondary industry (SE), the output value of Tertiary industry (TI), Total Investment in Fixed Assets in Transport, Storage and Post (AS), Number of Employed Persons in Transport, Storage and Post (LA) and Freight Ton-Kilometers (FR).

We can write the model:

$$(LnLQ)_{it} = \alpha_i^* + \beta_1(LnGDP)_{it} + \beta_2(LnSE)_{it} + \beta_3(LnTI)_{it} + \beta_4(LnAS)_{it} + \beta_5(LnLA)_{it} + \beta_6(LnFR)_{it} + u_{it}$$

Where, i is cross sections (21 cities), t is time (2004-2011), α_i^* is intercept, and u_{it} is between-entity error.

We can use the unit root testing techniques to identify variables which have stable long-run relationships with one another, then detect cointegration. Taking into account the cross-sectional differences, and after Huasman test, fixed effects, variable-intercept model is adopted. Heteroscedasticity is common in cross-sectional data, in order to reduce these effects, cross section weights are chosen. It implementation of an estimated generalized least squares (EGLS), use Eviews to calculate. It is calculated as follow.

$$(LnLQ)_{it} = -0.665308 + \alpha^* - 0.996129(LnGDP) + 0.233530(LnSE) + 0.522169(LnTI) + 0.013893(LnAS) + 0.043515(LnLA) + 0.021002(LnFR)$$

R-squared is 0.946043; Adjusted R-squared is 0.936093, F-statistic is 95.08369; Prob (F-statistic) is 0.

Intercept term for each city is shown in Table Ⅱ.

Table Ⅱ Intercept term for each city

Region	Beijing	Tianjin	Shanghai
Intercept	-0.005276	0.138765	0.07759
Region	Shenyang	Dalian	Qingdao
Intercept	-0.068146	0.415885	0.491501
Region	Jinan	Nanjing	Ningbo
Intercept	0.033741	-0.11662	-0.128147
Region	Hangzhou	Xiamen	Guangzhou
Intercept	-0.566069	-0.141606	0.448074
Region	Shenzhen	Zhengzhou	Wuhan
Intercept	-0.251115	0.295385	-0.052462
Region	Chongqing	Chengdu	Nanning
Intercept	0.13595	-0.165171	-0.375077
Region	Xi'an	Lanzhou	Urumqi
Intercept	-0.430344	0.054559	0.208582

It can be seen that variables can have both negative and positive effects on logistics industry agglomeration.

For each 1 unit increase in GDP, increases 0.996129 units in LQ. This data reflects that need to comprehensive analyze the effects of national economy and logistics industry agglomeration. In some situations, the development of industry will promote the degree of logistics industry agglomeration.

LQ increase 0.233530 when the output value of secondary industry increases by one unit, LQ increase 0.522169 when the output value of Tertiary industry increases by one unit. This can reflect that the logistics industry is demand-oriented industries.

LQ increase 0.013893 when Total Investment in Fixed Assets in Transport, Storage and Post increases by one unit. LQ increase 0.043515 when the Number of Employed Persons in Transport, Storage and Post increases by one unit. LQ increase 0.021002 when Freight Ton-Kilometers increases by one unit. This shows that the level of logistics supply directly impact the logistics industry agglomeration.

4. Conclusion

Logistics industry agglomeration present opportunities for balanced movements in and out of cluster efficient and increased the level of service. Focusing on logistics industry agglomeration in which city enjoys a competitive advantage can help the city understand the strengths and challenges of the local economy and better focus on factors that may foster continued growth for the region. Secondary industry, Tertiary industry and the level of logistics supply can directly promote the development of logistics industry agglomeration. Therefore, it is important to make great efforts to develop industry to promote the logistics serving.

5. References

[1] Zou, Zhengqiang, Che, Mei, "Study on the Logistics Industry Agglomeration in Chongqing," *Proceedings of the 2010 International Conference of Logistics Engineering and Management*, pp: 509-514, 2010.

[2] Meidute I, "Comparative Analysis of the Definitions of Logistics Centres," *Transport*, Vol.20, pp.106-110, 2005.

[3] Kuchiki, A., and M. Tsuji, "Industrial Clusters in Asia: Analyses of their Competition and Cooperation," *Palgrave Macmillan*, 2005.

[4] Isserman, Andrew M, "The Location Quotient Approach for Estimating Regional Economic Impacts," *Journal of the American Institute of Planners*, Vol.43, pp.33-41, 1977.

[5] National Bureau of Statistics of the People's Republic of China, 2012 China Statistical Yearbook, Beijing: China Statistics Press, 2012.

[6] Zhang Xiaotong, A Guide to Using Eviews, Beijing: China Machine Press, 2007.

[7] Badi H. Baltagi, Econometric Analysis of Panel Data, U.S.A:Wiley, 2008