

Empirical Study on the Affecting Factors of China's Spatial Distribution of Logistics Industry Cluster

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Abstract: Logistics cluster has not only become a key factor to enhance the region's industrial competitiveness and economic vitality but also become an engine for the economic growth and manufacturing industrial upgrading. This paper builds up the affecting factors for the spatial distribution of logistics industry cluster based on Porter's "diamond model". We analyze the affecting factors of the spatial distribution of logistics cluster based on Panel Data analysis. It concludes that there is huge difference among the spatial distribution of logistics cluster, while the labor factor inputs have a great influence on this. These factors have a higher influence on the logistics industry cluster based on the number of employees than that based on the number of professional and technical personnel.

Keywords: Logistics Industry Cluster, Spatial Distribution, Affecting Factors, Panel Data

I. Introduction

Logistics cluster has not only become a key factor to enhance the region's industrial competitiveness and economic vitality but also become an engine for the economic growth and manufacturing industrial upgrading. The research on industrial cluster has reached a relatively mature stage since Marshall has concentrated most research on the manufacturing sectors, while the research on logistics industry is still at a preliminary stage. What are the characters of China's logistics industry cluster? What are the affecting factors of the clustering phenomenon? Study on this issue has a certain theoretical and practical significance.

II. Literature Review

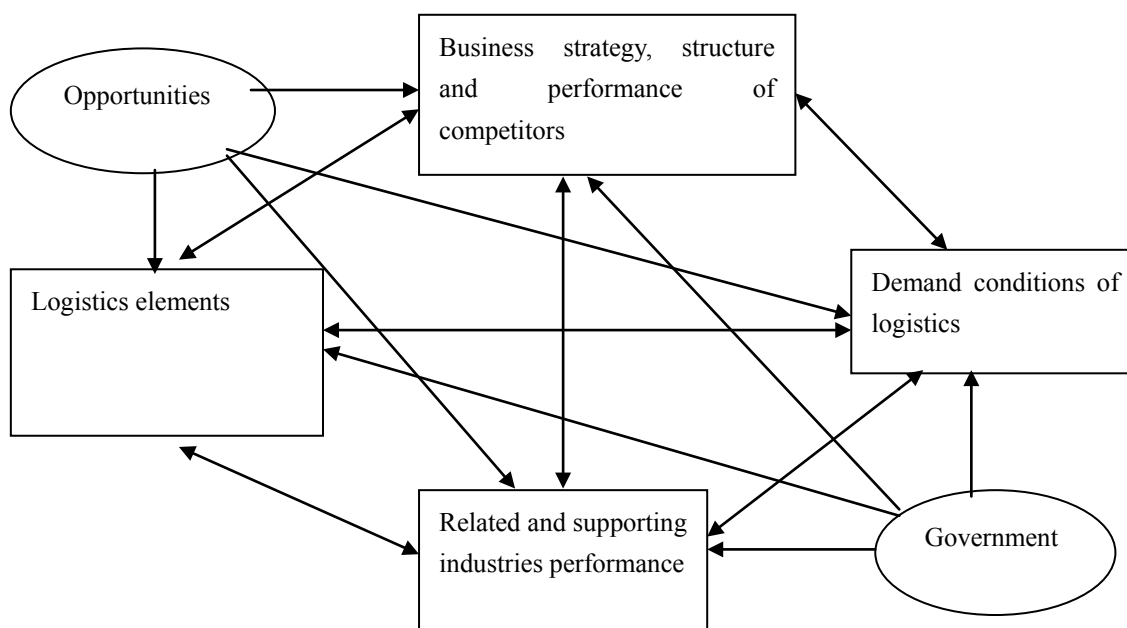
The research on the affecting factors of industrial cluster has reached a relatively mature stage, the impact of industrial agglomeration factors include allocation of resources (labor, natural resources), market demand and potential economies of scale within the enterprise, corporate external economies of scale, industry contacts and regional economic integration from the current study([1],[4],[6]). Kim (1999) found that there is a strong positive correlation between natural resource inputs and industrial cluster[5]. Paluzie et al (2001) considered the expansion of global trade was likely to increase geographic concentration of cities and industries in developing countries[7]. Qi Liang

(2004) uses the spatial economics as theoretical analysis framework to analyze the phenomenon influence factors of China's manufacturing industry cluster which includes transportation costs, increasing returns, externalities, local market demand, product differentiation, market correlation and trading costs[2]. Lin Li-Sheng and Wang Ye Qian (2006) also analyzed influence factors on the regional distribution of manufacturing sector which includes transportation costs and labor mobility[3].

The current research is focused on the manufacturing sector, but not on the logistics industry. In this paper, we intend to use the "diamond model" to build up a framework to analyze the affecting factors of China's logistics cluster based on 31 provincial-level panel data.

III. Analysis on the Affecting Factors of China's Logistics Industry Cluster - Based on Diamond Model

Porter's "diamond model" is mainly used to analyze why a particular industry has a stronger competitive edge. Their impact factors include: (1) production factors; (2) demand conditions; (3) business strategy, structure and performance of competitors; (4) related and supporting industries performance; (5) government; (6) opportunities. The formation of logistics industrial clusters is influenced by the six conditions mentioned above, specifically shown in Figure 1:



Graph 1 "Diamond Model" of the Logistics Industry Cluster

Logistics Elements

Porter classifies production factors as primary factors and advanced factors. The reason why logistics industry concentrates on a special region is not only because of geographical location but also because of a number of high-level factors. Particularly, modern communications, information, transport infrastructure have important influence on the competitiveness of logistics industry cluster.

Firstly, geographical location is resource endowment of a specific location and the most important factor of formation of logistics industry cluster. In some regions, the industries are clustering to reduce the transportation costs. Drs. Joost M.J.Rongen (1995), Tomoya Mori and Koji Nishikim (2001), Philip Me Cann and Daniel Shefer (2003), Markus Hesse and Jean Paul Rod Rigue (2004) proposed that the reduction of transportation cost and distribution of transport spatial have an important influence on the cluster.

Secondly, some industries' economic activities are correlated with the climate, soil, water and other specific geographical conditions. If an area has these geographical conditions, it is more likely to attract other enterprises to start a business in this area, therefore, it will contribute to the formation of industrial clusters. Nowadays, airports, highways interchanges, ports and other freight transport hub are likely to attract logistics companies. In addition, land prices, labor costs and other factors also affect the spatial distribution of logistics industry cluster. QingTao, a former Bay International Industrial Park, attracting Maersk Logistics (China) Co., Ltd., Itochu International Logistics Co., Ltd. Love, South Korea Hanjin Shipping Co., Ltd.,

Hong Kong Singamas Container Co., Ltd., Israel, ZIM (China) Shipping Co., Ltd is mainly due to its advantages of resources and the port.

Demand Conditions of Logistics

Logistics is the intermediate stage to link the production and consumption, without production and consumption, there would be no logistics activities and no logistics cluster. Young (1928), North (1981) and Krugman (1991a) consider that the industrial cluster is completely formed spontaneously by market. Good industrial atmosphere can bring a wealth of logistics demands to attract the majority of logistics enterprises to join in, which led to the creation of regional logistics industry cluster. Therefore, changes in demand factors will affect logistics industry cluster. For example, when Yiwu International Logistics Park opened, APL, Maersk, OOCL, China Shipping and other logistics companies come to settle down here. Industrial structure reflects the composition of national industrial sectors. Different-intensive industries require different kinds of logistics development. For example, resource-intensive industries highly depend on natural resources, so the demand for transport is relatively large. The demand for transportation infrastructure is also greater in some places with high degree industrialization.

Business Strategy, Structure and Performance of Competitors

Customers will require different kinds of logistics services like rapid response and efficient services since the market which logistics industry serves for is dynamic. Therefore,

the choice of corporate strategy has a significant impact on their competitiveness.

Since logistics activities can be divided into seven parts: transportation, warehousing, packing, loading and unloading handling, distribution processing, distribution and information services, the logistics industry needs to develop its own business according to their characteristics of enterprises. The refinement and deepening of the specialization will not only promote the professional standards of logistics service enterprises and service efficiency but also market integration process in the interests of development and diversification of economic structure. It promotes industrial cooperation between enterprises to play its core competencies, reduce costs and make enterprises gather, thus it will promote the formation of logistics industry cluster.

Related and supporting industries performance

Porter believes that different companies have different core competence, companies can outsource other stages to strengthen cooperation among different enterprises and make full use of resources among various enterprises. Therefore, a competitive industry needs the support from related industries, which is also true for the development of logistics industry. Logistics industry has differentiated in the provide of services, according to different demands from consumers, logistics enterprises provide different services, such as freight services, exhibition logistics services, supply chain consulting services. Logistics companies with the strength of large-scale are able to provide more professional and efficient services, they often have a long-term cooperation with regional companies in other industries and are more tend to be settled with its partners.

Government Factors

Enterprises are the main part in the development of modern logistics industry while at the same time the policy is the guarantee. The development of logistics industry cluster is guided by the government, therefore, it's policies play a vital role for the development of logistics industry. Governments need to make appropriate policy and legal system to support the development of logistics industry cluster. Specifically, the Government's promotion and support plays a vital role in the development of logistics "booster" in the early development of logistics.

Opportunity

Porter pointed out that there are possible many opportunities affecting the development of enterprises: basic science and inventions; a disruption in traditional technologies; external factors led to a sudden increase in the production cost (such as oil crisis); major changes in financial markets or exchange rate; sharply increase in market demand; Government's massive decision-making and war. The output of logistics industry revitalization plan

and formulation of interactive development between manufacturing and logistics industry make the development of logistics industry received unprecedented attention. Therefore, the phenomenon of logistics industry cluster has also got a wide range of development.

To sum up, we can use the "diamond model" to analyze logistics industrial cluster in space, while these factors' influence on the logistics industry cluster is complementary. Any factor changes would give rise to corresponding changes in the mechanism, but what is the difference among different factors' influence on the logistics industry cluster, which factor occupies a dominant position in the process of logistics industry cluster. The following part will use the Panel Data Model to analyze the influence factors of the logistics industry cluster.

IV. Empirical Analysis on the Influencing Factors of Logistics Industry Cluster

Introduction of Panel Data Model

Panel data model is an econometric model based on panel data for the analysis of the relationship between variables. This research method can solve the multicollinearity problem, the general form is

$$y_{it} = \alpha_i + \beta_i x_{it} + \mu_{it} \quad i=1, 2, \dots, N \quad t=1, 2, \dots, T \quad (1)$$

y_{it} is the $N \times 1$ -dimensional vector of dependent variables,

x_{it} is $1 \times K$ -dimensional vector of independent variables, i represents different individuals, t indicates different time,

k is the number of variables, μ_{it} is random disturbance variables. It will meet basic assumptions of classical econometric model: independence, zero-mean and same variance. The coefficients in the model will change with time and different individuals, so it can reflect the influence factor like time factor and individuals difference. Because of the three-dimensional characteristics of Panel Data Model, the choice will determine the validity of parameter estimation setting, we have to choose the correct one. Usually, we can divide the model into three types, Variable Intercept Model, Fixed Effects Model and Random Effects Model. In general, when the data contained in the individual members is all units, that is to say, the difference between individual members can be seen as changes in the parameters of the regression coefficients, fixed effects model will be a reasonable panel data model.

Model Variable Selection and Interpretation

Many ways can be used to reflect the degree of industry cluster, the Location Entropy Method, Gini Coefficient, Lorenz Curve and Geographic Concentration Index. Here, we use Geographical Clustering Entropy to reflect the level of logistics industry cluster.

Location entropy characterizes specialization issues of regional industrial systems by spatial characteristics (Wang

Z, 2002). According to the characteristics of specialization, we can measure the ratio of employment within region's logistics industry

$$LQ_i = \frac{e_i / e}{E_i / E} \tag{2}$$

LQ_i is the degree of logistics industry cluster, e_i is the employment of logistics industry in region i , e is the employment of all industries in region i , E_i is the employment of logistics industry for the whole country, E is the employment of all industries for the whole country. If the index is greater than 1.25, the region has a high degree of logistics industry cluster and strong specialization, if the index ranges between 1 and 1.25, the region has a general degree of logistics industry cluster, if the index is less than 1, the region has a lack of concentration of industries and weak specialization. As the number of technical personnel will have a significant impact on the future development of logistics industry, we will also calculate the index based on the professional and technical personnel.

There are many influence factors for logistics industry cluster, combined with the characteristics of modern logistics and location factors of data availability, we select the following factors to describe the spatial distribution of logistics industry:

(1) Logistics employee (Labor): the development of logistics industry requires a corresponding investment in human resources, labor has a significant impact on the improvement of logistics industry agglomeration. Here, we select the proportion of employees of provincial transport, postal communications industry practitioners in national employees as the labor of logistics industry.

(2) Level of investment in fixed assets (Capital): we select the ratio of provincial fixed assets investment in logistics industry with the national investment in fixed assets to indicate the level of investment in fixed assets. The level of investment in fixed assets should be proportional to the logistics industry.

(3) Cargo turnover (Transport): the development of logistics industry can also be reflected through region's cargo

$$Cluster_{it} = \partial_0 + \partial_1 Pergdp_{it} + \partial_2 Industry_{it} + \partial_3 Capital_{it} + \partial_4 Labor_{it} + \partial_5 Transport_{it} + \partial_6 Trade_{it} + \mu_{it} \tag{3}$$

$$Allogation_{it} = \partial_0 + \partial_1 Pergdp_{it} + \partial_2 Industry_{it} + \partial_3 Capital_{it} + \partial_4 Labor_{it} + \partial_5 Transport_{it} + \partial_6 Trade_{it} + \mu_{it} \tag{4}$$

turnover to some extent, so we add the freight turnover as one of the explanatory variables.

(4) Level of economic development (Pergdp): the development of logistics industry requires a strong economy, which is the funding prerequisite for demand and supply. Here, we use the ratio of per capita GDP of province in the country to reflect the level of the provincial economy.

(5) Level of industrialization (Industry): the logistics industry offers corresponding services for the development of other industries, the interaction development of manufacturing and logistics industry exactly meets the intention, therefore, the degree of logistics industry cluster is closely related with the level of industrialization. If a certain province has a higher industrialization, the demand for logistics development will be greater, which in turn will lead to the logistics industry cluster in the region, from this perspective, the higher the level of industrialization is, the greater of the logistics industry cluster should be. Here we use the proportion of provincial second industries in the National gross domestic product.

(6) Level of opening up (Trade): International trade can not develop without the support of transportation, therefore, provinces with higher levels of international trade, logistics should be the higher degree of industrial agglomeration. Here we use proportion of provincial total import and export fields with the National international trade.

Model Data Sources and Description

Because the scope of logistics in China is not yet uniform and logistics statistics just started, we mainly select the data from "China Statistical Yearbook". We choose transportation, warehousing and postal industries' employment to analyze the problem.

Model Construction and Analysis of the Result

In accordance with the above variables, we establish the degree of logistics industry cluster based on the number of employees and the number of technical staff. We can set up the influence factors of logistics industry cluster:

Table 1 Result of the Panel Data

	Allogation (based on technical staff)	Cluster (based on employment numbers)
C	0.453211 (2.217098) **	0.227928 (1.373311)
PERGDP	-0.305748 (-3.792352) ***	-0.343566 (-5.248573) ***
INDUSTRY	0.956092 (2.354986) **	0.630701 (1.913366) *
TRADE	0.030369 (0.043745)	1.042294 (1.849148) *
TRANSPORT	1.579979 (2.283939) **	0.733456 (1.305850)
LABOR	10.85938 (5.234008) ***	22.37958 (13.28516) ***
CAPITAL	3.801825 (2.130356) **	4.325566 (2.985306) ***
Adjusted R-squared	0.840812	0.806345
F-statistic	37.26889	29.59158
Prob(F-statistic)	0.000000	0.000000
Total panel (balanced) observations	310	310

Note: The numbers in bracket indicated the t values, *** indicates 1% adopted within the scope of testing, ** indicates 5% adopted within the scope of

testing, * indicates within 10% passed the testing.

We can find that most of the variables passed the test and the empirical findings of the research and coefficients are positive. Labor is the most significant factor for the development of logistics industry cluster, the coefficient is 22.37958 based on the employees, that is to say, for each additional percentage point of labor input, it can lead to 22.38 percent of logistics industry cluster increase; while the coefficient is 10.85938 based on the technical staff, which indicates that the development of China's current logistics industry is based on the amount of labor growth, while technology raise has not shown its advantage. The impact of total fixed capital investment coefficient is 4.325566, the impact of industrial structure is 0.630701, the impact of foreign trade is 1.042294, the impact of freight turnover is 0.733456 based on the number of employees. The impact of total investment in fixed assets is 3.801825, the impact of industrial structure is 0.956092, the impact of foreign trade is 0.030369 based on the professional and technical personnel employees. It is worth mentioning that the impact of per capita gross domestic product is negative, which is different from the result that we are expected. This may be the variable selected years are not enough.

V. Conclusions and Implications

The logistics industry cluster development is one of the hot issues in future study, the influence factors of logistics industry cluster will be manifested many parts, all of which play different roles in the development of logistics industry cluster. The current concentration of China's logistics industry is relying more on the labor force growth, while improving the quality of worker skill levels of logistics industry concentration has not yet played out its desired

effects, with economic restructuring and upgrading, enhancement of skills of workers will gradually occupy an important position. For the further research, we will do a detail examination of the affecting factors among different provinces and choose more dependent and independent variables to analyze the problem.

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