

Study of Relation and Condition of Regional Industry Clusters on the Niche Theory and Model

UNE ÉTUDE SUR LA RELATION ENTRE DES GROUPEMENTS RÉGIONAUX INDUSTRIELS SOUS LA THÉORIE ET LE MODÈLE DE LA SUPERPOSITION D'ADAPTATION ÉCOLOGIQUE

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Abstract: Regarding of the similarity between regional industry clusters and biologic species, and referencing the niche theory of biology, this paper analyzes the characters and rule of regional industry clusters, and provides the niche model of industry clusters, and then a case study was done to two industry clusters, which produces similar products. Niche model provides a new method and tool for the study of regional industry clusters, a different angle and thinking for the development and programming of regional economy, and a reference to the decision of economic management.

Keywords: regional industry cluster、niche model、niche overlap、niche shift、standard parts

Résumé: Cet article se base sur la similarité des espèces écologiques et des groupements régionaux industriels, en utilisant la théorie de la superposition des adaptations écologiques, il analyse la règle et des caractères des groupements régionaux industriels, et bâtit le modèle de la superposition d'adaptation écologique pour les groupements régionaux industriels, et puis il fait une étude d'exemple sur deux groupements régionaux industriels qui ont des produits similaires. La méthode de cette étude offre un nouvel instrument pour les recherches des groupements régionaux industriels, une nouvelle option ou idée au plan du développement régional économique, et aussi une consultation à la politique de la gestion d'économie.

Mot-clé: des groupements régionaux industriels, le modèle d'adaptation écologique, la superposition des adaptations écologiques, le déplacement des adaptations écologiques, standard parts

1. INTRODUCTION: CHARACTERS OF INDUSTRY CLUSTER

Industry cluster is a noticeable and studying economic phenomenon, and playing a very important role in the regional economic development. In china, Pearl River delta, and Wenzhou area are typical industry-cluster examples. Industry cluster is also called "industry area" etc. there are many definitions of industry cluster from different views. Italy economist Becatini defines it as an economic body where similar firms gather in large

number; Swith and Florida view it as externality, in certain area, such as the business related scale and scope economy and also the union of related production organization. Bagella Et Cd views it as a highly centralized industry cluster of small and middle size firms, in which input and output relationship, common rules and positive and negative overflow exist. Based on those identifications, it can be seen that, on the organization, industry cluster is a form of organization between individual company and market; on the exchange of materials, industry cluster is an organism in which the input and output of materials and information

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is processed, and the exchange has two levels. The inner is the exchange in a company in cluster and the outer is the exchange between the cluster and other economic organizations, at the base of the inner. Just as an organization of industry, industry cluster forms a system similar to the “ecosystem” in nature. Therefore industry cluster is an exoteric self-organized organism that is it is similar to economists and ecologists on study (David Bulini, 2003).

2. THE NICHE THEORY AND MODEL OF INDUSTRY CLUSTER

2. 1 Niche theory

In ecology, niche is the summation of adaptability of a biologic unit (including the individual, the species) (Pianka, 1973), which includes the ability to use and rebuild the ambience and resources, embodies the interrelation of species and environment, and is often used among those species at the same level. And in reality, the stability of species depends on the competition of niches (Chen Yuezeng , 1997). But in practice, the rate of utilizing of materials is often used to denote the adaptability.

Niche overlap is a method of Metric of the ecology relation among species, which means different species take use of the same resources, and shows the relation of different species. In reality, the niche overlap is common among species.

As an organism, industry cluster must obtain resources from the outside, and output a product, that is the exchange of materials, energy and information, accompanied the competition with other economic organizations, and raw materials and market competitions are the most important forms of those competitions. Therefore, the similarity to the ecology systems leads the possibility to study industry cluster by the theory of niche theory, which is the thought of this essay. This essay built a framework to study the industry cluster and provided a case study on the niche theory.

2. 2 Relation of industry cluster and other economic organizations

The development of an industry cluster depends on

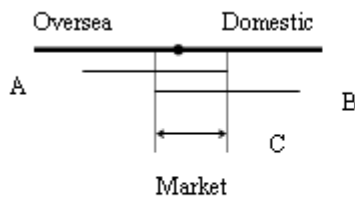


Fig 2a

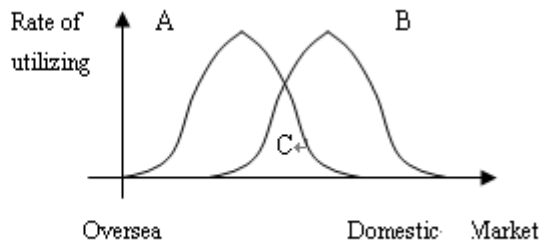


Fig 2b

the raw materials, energy, and other resources, which are required by most other economic organizations; therefore, competitions exist directly or indirectly. On the view of ecology, that is there are niche overlaps between industry cluster and other organizations, such as the market competition.

2. 3 Niche model of industry cluster

2. 3. 1 Introduction of niche model of industry cluster

Referring the definition of niche in ecology, industry cluster is the adaptability of the industry cluster. There are many factors which influence the industry cluster and form the space of adaptability of the economic environment of the cluster, in the language of math, the niche of industry cluster is an vector space of $n+1$ dimension, in which n means the factor, and usually, the rate of utilizing of resources denotes the adaptability. Because of the complexity of multidimensional vector space, a feasible method is to study the relation of adaptability and resource separately, and a sample of planar vector space is given on figure 1. The following is the detailed explanation of niche overlap of industry cluster.

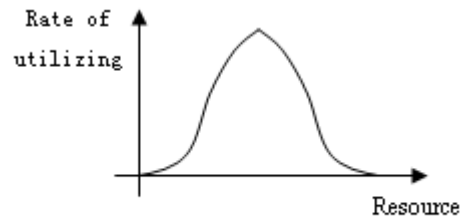


Fig 2

2. 3. 2 Niche model of industry cluster

The niche overlap indicates the relation of an industry cluster and other economic organizations on the utilization of resources. And the extent of overlap denotes the position in competition on this resource. There are two methods to show the niche overlap. The first is the chart, and the other is the mathematic equation.

Seeing figure 2a and 2b, it means on the dimension of market, two industry clusters, A and B, A takes up the overseas market more than B, and C is the overlap of industry cluster A and B.

On mathematic equation, we define $P_{ij} = \frac{(k'_i \cap k'_j)}{(k'_i \cup k'_j)}$, that is, P_{ij} is the index of niche overlap of industry clusters k'_i and k'_j ; while $k'_i \cap k'_j$ means the consumption of industry cluster i and j on a certain resource, and $k'_i \cup k'_j$ means the total consumption on this resource. However, this equation can be used for the analysis to single resource easily, but difficult for multi-resources.

2. 4 The change of niche

The main reasons of the change of niche of industry clusters are the competition and the requirement to resources, and the following are the results of the change.

(1) Change of breadth of niche. This includes the extension and reduction. When it extends, requirement of resource increases, while reduction is on the contrary. But by the change of the breadth of niche only without other information, it is hard to judge the environment of resources facing with the industry cluster.

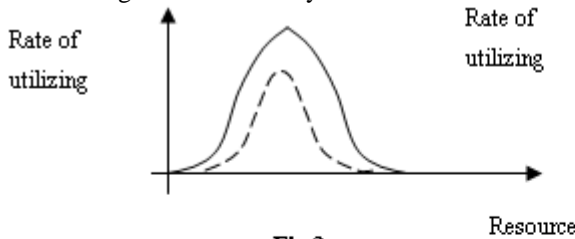


Fig 3a



Fig 3b

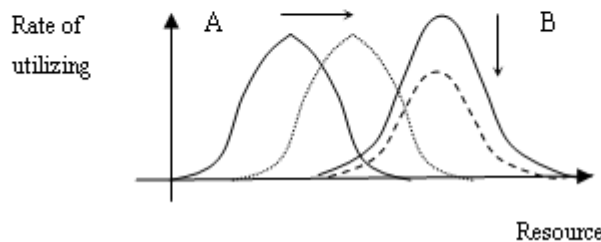


Fig 3c

Figure 3a is the change of the niche's breadth of an industry cluster on the dimension of market, which shows the reduction of market. And figure 4b denotes the niche's movement of an industry cluster, which means the change of the requirement of a resource, for example, the center of market changes from the domestic to the oversea. While figure 3c is the change of the niche overlap of industry cluster A and B. a case is because of the competition, industry cluster A takes up of the market of industry cluster B, which causes the following results: the niche's breath of cluster B reduces, while A extends; the niche's center of cluster A moves to B's position which forces cluster B to give up some

(2) movement of niche. The movement of niche is the change of the center of the niche of industry cluster, which is the reflection of the change of kinds and scopes of required resources. The change of center of a niche would happen with the change of breadth of the niche usually. And as the change of breath of the niche, the judge of the environment facing with an industry cluster should be made by other information beside of the move of niche.

(3) change of adaptability. The change of adaptability points the change of adaptation of an industry cluster to the environment. Generally speaking, environment is in change, so that industry cluster should change to suit with it, and if it suits, the adaptability will increase, and the position of the cluster will be enhanced in this industry; on the contrary, the position of the cluster would decline. Thus, the adaptability of industry cluster and the environment is an important researching field.

There are many cases according with the upper conditions, furthermore, in reality the change of niche includes the change of breath and center, but it is seldom that only the change of breath or center happens. The following figure (figure 3a, 3b, 3c) shows the upper conditions.

market's share, and the niche center of B moves too. And we can draw a conclusion that when the scope of overlap enlarges, the competition on this dimension enhances.

3. CASE STUDY

3. 1 Introduction of two industry clusters

In the niche theory and model, a case study was made in

this essay. We selected two industry clusters, which produce the similar products: standard parts (including nuts, screws and so on), and locates in Wenzhou, Zhejiang province and Yongnian, Hebei province. Both of the two clusters are the distributing center of standard parts including fabrication and selling in China.

This essay made analysis by the field study on samples and public data. Here we selected the market and industry product line to analyze limited to the essay's space.

3. 2 Market

Market's share is very important to the existing and development of an economic organization. On the data, the domestic is the main market to Yongnian, and the export is indirect and in small quantity. However, Wenzhou exports much more than Yongnian, and the niche overlap mode shows on figure 4.

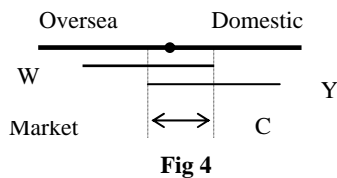


Fig 4

3. 3 Industry organization

The product line of standard parts includes the fabrication of equipment, product and selling, appending the design and machining of pattern. On the view of industry organization, Yongnian has the characters of centralization and specialization in manufacture and selling, appending the design and

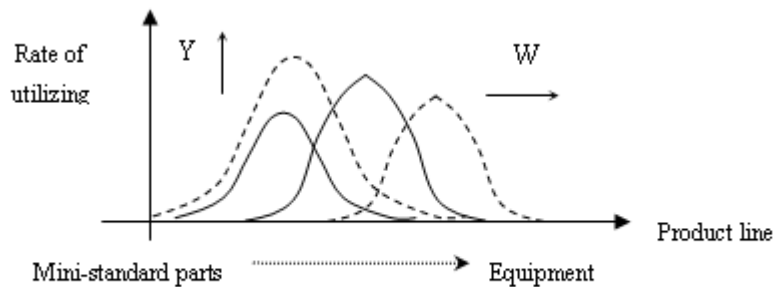


Fig 6

4. DISCUSSION AND CONCLUSION

This article introduces the niche overlap model of industry clusters and makes a metric study by two-industry cluster. The niche overlap theory has the advantages of perspicuity and intuition so as to express the occupation and consumption of resources taken by

machining of pattern, however the equipment is input from the outside of the cluster. While, Wenzhou has the section of fabrication of equipment of mini-standard parts, but the condition of produce and selling is inferior to Yongnian. And from the survey, the first choice to equipment in Yongnian is not those fabricated in Wenzhou.

Here the niche overlap model of industry organization is seen on figure 5.

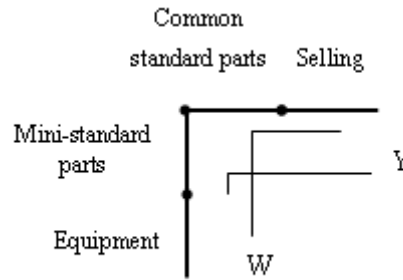


Fig 5

By the niche overlap model (seeing figure 6), on the historical data, the center and breadth of the niche of Wenzhou have changed much. This change includes two respects. First, the breadth moved from the produce of standard parts to the fabrication of equipment, and the center moved from the common products to the special and mini standard parts. But the change of Yongnian is the breadth of niche mainly, which is the produce and selling is strengthened, and the catalog riches in common and special standard parts which inflects the centralization and specialization. So that we can draw the conclusion that on the breadth of niche, Wenzhou is more effective than Yongnian, while in the section of produce and selling, Yongnian is stronger. Also in the market, Yongnian has a higher occupation rate than Wenzhou.

industry cluster, and proved that the niche can describe the situation and change of occupation and consumption of source on this dimension of source, the be used to studied the relation of industry cluster and other economic organizations, including competition, cooperation and symbiosis directly and quantitatively in a certain degree. At the same time, the niche overlap model gives the following revelations:

- 1st. A highly adaptable industry cluster

has a niche model of outstanding center and broad wing, that is an industry cluster with a focus on a certain section in the industry line, and a broad supporting assistant sections so that it owns a stronger adaptability in competition;

2nd. Centralization and specialization is an effective strategy in the programming of industry cluster. The industry cluster has the externality and scope economy. In the view of ecology, the industry cluster could process sources highly effectively;

3rd. In the programming of industry cluster, the conditions of environment should be

analyzed carefully, and develop the industry cluster which could taken dominating niche;

However, there is some shortness, such as, it is hard to make complex quantitative analysis and to analyze in multidimensional vector space, etc. but general speaking, it is similar to economists and ecologists on study (1st), and it is an important research field to introduce the theory and methods of ecology into the economics.

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