

Research on Relevance of Supply Chain and Industry Cluster

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Abstract

Supply chain and industry cluster are the two important ways to enhance the competitiveness of regions or industries. By discussing the differences and links between the two, this paper concludes that industrial cluster and supply chain carry features of compatibility and symbiosis. The combination of the two can effectively increase the competitive advantage of industries so as to enhance regional economic competitiveness.

Keywords: Industry cluster, Supply chain, Relevance

Industrial cluster and supply chain belong to two different fields of study. The phenomenon of industrial clusters is part of economic study, and supply chain is amongst study areas of logistics. Comparatively speaking, the former tends to focus on macroeconomic research, and the latter lays emphasis on microeconomic study. Supply chain management is an analysis tool, which uses the combined knowledge of operational research, mathematics, economics, and information discipline to do the qualitative and quantitative analysis of personnel, financial, goods, and information flow problems in enterprise management. It is a management tool aimed to reduce the cost, paying attention to the micro-operation, operation management, and quantitative studies and application. Industrial cluster is an economic phenomenon, and the current industrial clusters mainly apply the theory related to industrial economics to research classification of industrial clusters, formation mechanism, innovation networks, competitive advantages and so on, attaching much more importance to the macro-level, strategic, qualitative study and application. Although the perspective of the research problem is totally different, we can still find some common aspects of those two research areas.

1. The concepts of supply chain and industrial cluster

1.1 The basic elements of supply chain theory

The concept of supply chain has different connotations at different times, and different scholars have different views. Domestic and foreign researchers in related fields give points of view on supply chain from different perspectives. However, an official study of the supply chain issue is generally believed to date back to the 1960s. Jay Forrester (1961) used the system dynamics model to optimize the upstream and downstream industry dynamics. He first put forward the term supply chain, so he is considered the father of supply chain design. A lot of modern design principles on supply chain can be traced back to his production and distribution systems. In 1985, Michael Porter, a famous professor in Harvard Business School, proposed in his book *Competitive Advantage* "value chain" theory, which becomes the theoretical basis for further study on supply chain.

Through research on supply chain theory, we can easily see that the early understanding of the supply chain was confined to the production process within manufacturing enterprises. This process refers to the fact that firms purchase raw materials and components from the external, and convert them into products needed by external users through such activities as production, processing, marketing, etc. The focus of the study is on how to improve production efficiency and the effective use of internal resources. This point of view pays attention to only the company's trading activities, as well as the relations between purchasing agents and suppliers. The follow-up study of supply chain gradually transferred the perspective from the internal to the external business, began to focus on study of the external environment of supply chain, and thought that the supply chain should be a conversion process in which through manufacturing, assembly, distribution, retailing processes of different enterprises raw materials are converted into finished goods, which are delivered to end-users.

At present, research on supply chain diverts from the "chain" to "networks", with more focus on research around the

"supply network" relationship formatted by the core business - core business and suppliers, suppliers of vendors and all relationships prior to them, as well as customers, users of customers and all backward relationships. At this point, awareness of supply chain gradually formed a "network chain" concept, such as Wal-Mart, Toyota, Changchun Automobile, Anshan Iron and Steel, etc., which implement supply chain management in terms of "network chain".

The so-called supply chain refers to a whole chain of the functional network in which suppliers, manufacturers, distributors, retailers, and even end-users are combined together, and in which the chain starts with the procurement of raw materials, then intermediate goods and final products are produced based on core businesses and through control over the flow of information, logistics, and capital flow, and final products will be sent by the sale network to consumers. Supply chain management means that through the coordination and control of logistics, information and capital flow in the entire supply chain, and by means of regulation and control of every link of product production and circulation, the supply chain can be maximized in terms of efficiency in order to provide customers with the largest value at the minimum cost and fastest speed.

1.2 Basic idea of industrial cluster

Due to its unusual regional economic competitiveness, there are more and more concerns of industrial cluster as a regional economic phenomenon. Speaking of industrial clusters, scholars at home and abroad have different views on them. The industrial agglomeration theory was first put forward by Marshall, the originator of neo-classical economics (1890). In his *Principles of Economics*, he defined the meaning of local industrial clustering from the perspective of the external economic concept, which is later known as the Marshall Cluster. This concept does not only reflect the geographical characteristics of businesses and industrial clustering, but also shows the "one-industry-oriented" characteristics of the industrial structure. Since the 1820s, the study of industrial clusters has never ceased, but has increasingly become the academic focus. In foreign countries, there are a number of related theories on study of industrial clusters, such as external growth pole theory, transaction cost theory, professional labor division theory, flexible specialization theory, socio-economic network theory, innovation network theory and so on.

According to Michael Porter, industry cluster refers to a phenomenon in which a large number of interrelated enterprises and support agencies involved in a specific area accumulates in the same geographical location and a strong and sustained competitiveness is accordingly formed (usually with a leading industry as the core). The mechanism of industrial clusters is to promote specialization and technological innovation by means of geographical proximity, while reducing too high transaction costs arising from frequent transactions. What needs to be particularly emphasized is that the sum of similar enterprises in a certain region is not an industrial cluster, nor many companies with a low degree of association, flocked together in the same region in a disorderly way, are considered as an industry cluster. The important factor in the formation of industrial clusters is the same demand and supply relationship as the food chain, which can consolidate resources, reduce production costs and improve the competitive advantage of the whole industry.

2. Differences and Links of Supply Chain and Industry Cluster

2.1 Differences of Supply Chain and Industry Cluster

Supply chain and industry cluster have different characteristics in terms of the form and content, specially characterized in the following areas:

- (1) Supply chain is a cross-regional (even global) functional network chain, and management of supply chain is cross-cultural; industry cluster is a type of local network, which is rooted in local culture and has similar geo-culture.
- (2) Supply chain node information exchange between enterprises mainly relies on EDI technology, local area networks, and the Internet; non-coding information (or knowledge) within industrial clusters permeates in the cluster region like the air, and the transmission of information between enterprises are mostly informal.
- (3) The main body of supply chain functional network is the technological node, and because of differences in specialized fields managed by these firms as chain nodes, the competition pressure within the chain is less and susceptible to "free-rider" behavior, with its innovative pressure mainly from rivals outside the chain; the main part of industrial cluster network is similar to small and medium-sized enterprises of similar industries, network competition is intense, and there is a stronger sense of innovation.

2.2 The Links of Supply Chain with Industrial Cluster

The production of supply chain and the emergence of industrial clusters are in the background of economic globalization, and are under the guidelines of integrated thinking based on value chain. Although both form and content have different characteristics, the starting point is to maximize the advantages of individuals among the system, so as to enhance the corporate/industry competitiveness on the basis of collaboration and integration; a lot of similar characteristics have been shown in the process of operation: external economic effects, both competition and cooperation mechanisms, specialized flexible production, trust and cooperation-based Internet culture and so on. Therefore, there is a link between supply chain and industry cluster.

(1) Enterprises as the supply chain node constitute the entity

In accordance with the strategic thinking of supply chain management, enterprises as supply chain nodes conduct specialized division of labor to choose a partner. Because of close inter-firm relations, the functional linkage of network chain is formed, and these companies realize a coordinated operation and collaboration under an overall management; at the same time, these node enterprises can also be the integral entity of industrial clusters: on the one hand, industry cluster is composed of support institutions and similar firms with a specialized division of labor or related enterprises on the value chain; On the other hand, industry clusters have vertical specialization and horizontal scale in the value chain. In that sense, industry cluster is a selected set of a group of chains, and accordingly the node enterprises on the supply chain are also integral entities of industrial clusters.

(2) Industry cluster is the geographical concentration of the supply chain

If supply chain is spread in a number of spatial locations, it is possible that supply chain superposition can occur in one or more spaces. In a sense, it could be considered that industry cluster is a local concentration of one or more supply chains in the certain space, and the local concentration of the supply chain includes the fact that supply chain concentrate in the local area, as well as the concentration of a part of supply chain in a certain space; in fact, it is very difficult to find out a supply chain concentrate entirely on a spatial location.

(3) Industrial cluster provides quality environment for the sound development of the supply chain

What's the most intuitive about industrial cluster is reflected in the fact that a large number of companies concentrate in a certain geographical location, but this concentration is based on specialized division of labor and socialized collaboration. Big, medium-sized and small enterprises co-exist in the cluster, and different types of enterprises exist in a symbiotic way, thus constituting an ecological enterprise group. In this eco-group, all enterprises collaborate in terms of the logistics, information flow, and capital flow. Upstream and downstream support firms can share industrial infrastructure, human resources, intellectual property rights, and managerial knowledge so that they can be organically combined together so as to exist in a symbiotic way. This offers a good operational environment for the supply chain in the industry cluster, directly resulting in the increase in overall performance of supply chain.

1) Industrial cluster increase collaboration and shared effects between enterprises as each node of supply chain.

In the process of the protracted and localized competition and cooperation, what's formed within an industrial cluster are unique network of relationships, knowledge and cultural atmosphere, and regional information exchange platform. The geographical concentration, more close link between operations of its internal members, and their more complementarity make it possible to conveniently and economically require needed knowledge and facilities in the behavior of knowledge innovation by way of free or paid means; enterprises can also take advantage of public facilities and professional service organizations provided by industrial cluster, and even share its brand image. Enterprises in the cluster unite closely and share interests, which is a substantial boost to collaboration between enterprises as supply chain nodes. In addition, the enterprise cooperation within the cluster carries a unique advantage. Because of geographical proximity, close ties between the leaders, and the fact that the operating mechanism of industrial clusters is based on such human factors as trust and commitment, the businesses within the cluster form a common formal or informal code of conduct and practice, and establish a close cooperative relations among one another, thus reducing the opportunistic tendency and minimizing the risk and cost of cooperation. Such cooperation will bring together suppliers, customers and even competitors in the supply chain to share skills and resources, enhancing inter-enterprise sharing effects of supply chain.

2) Industrial clusters reduce inter-enterprise transaction costs and improve operational efficiency of supply chain.

Industry cluster is an institutional arrangement to reduce transaction costs between businesses in the supply chain. This is due to the fact that formation of industrial clusters makes related industries constitute a virtual entity. In this system, members of enterprises comply with the same institutional arrangements, avoid friction between different systems, and makes information transfer more smooth; as a result of space aggregation advantages brought about by industry cluster, enterprises in the clusters can reduce transaction costs such as transportation costs in each of the transaction process and reduce the occupancy of funds; more importantly, combined with an atmosphere of innovation, knowledge and talent integration, good credit environment and convenient infrastructure the cluster provides for firms, the relatively stable structure relationship in the cluster allows businesses to possess an "embedded" nature and higher migration costs, and enterprises would sustain great losses should they lose trust. Therefore, in a cluster, information costs and the possibility of dishonor opportunism will be reduced, so that the transaction costs within the cluster can be made less than market transactions, thus increasing business efficiency. Trust and cooperation system between enterprises will lead directly to a significant decrease in internal negotiation costs, bargaining costs, the cost of formulation and monitoring of contract performance between upstream and downstream enterprises in the supply chain, so as to minimize the transaction costs in the whole supply chain. Low-cost operations by businesses in the supply chain will eventually bring about the rise in overall level of profits and competitive capabilities.

(3) The sound development of supply chain leads to an increase in the overall level of cluster

In order for the enterprise as horizontal nodes of the value chain to gain a foothold in the competition, the competition between them is inevitable. A certain degree of competition will lead to the occurrence of innovation; however, cooperation is not without necessity. Because innovation is often a project of consuming a great deal of manpower, material and financial resources, it's difficult for individual enterprises to make successful innovation in an independent manner. In the face of attractive market opportunities as well as their limited technology and resources, it's one of the best options to be cooperative. Enterprises in a vertical relationship of the value chain can also achieve common development because of the fact that they can share with each other and learn from each other in cooperation. However, competitions between them still exist, because the high or low ability to innovate and the strong or weak advantage directly determine their profitability and status of the supply chain. This regulation function of the supply chain can ensure the maintenance of a high level of cooperative relations and a simultaneous participation in competition in a proper way, thereby leading to a rise in the overall competitiveness of industrial clusters. In addition, the supply chain also carries an important significance for the industrial cluster, namely the integration by the supply chain of enterprises in industry clusters, as well as the transfer function of the value chain. The operation concept of the supply chain is combining enterprises located in different geographical locations and possessing relevant core technologies to form them into an industrial cluster on the basis of information technology and through business outsourcing, virtual operations, and so on. According to the division of labor and cooperation, firms jointly conduct activities of creating value, and commercialize the advantages of industrial clusters in the form of support objects. The resulting economic gains can be passed onto industry clusters in an opposite way, so what's finally formed is the phenomenon we can see: industrial clusters promote regional economic growth and enhance economic competitiveness.

In short, the intrinsic relationship between the supply chain and industry cluster makes it possible for both of them to co-exist in a symbiotic way and seek common development. This relationship solves such issues as insufficient resources existing in the operations of traditional enterprises and development of regional economy, as well as paradoxes between dispersed operation and diversity from market demands. Therefore, we should make full use of the intrinsic relationship between the supply chain and industry cluster to make an integration so as to boost industrial competitiveness, thereby making it pave the way for economic development and stepping up the competitiveness of the regional economy.

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