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Research on the Coopetition Relationship of Cluster Enterprises Based on the Network View-taking Central-satellite Type Industry Cluster as Example

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Abstract: With the development of industrial cluster, many clusters have increasingly shown the structure creature of central-satellite type. The central-satellite type has the stronger competition superiority, one important origin of which is the coopetition mechanism on basis of the network structure of cluster enterprises. This study proposes a framework of the coopetition relationship in the industry clusters from the network perspective, then analyzes specifically the cooperation relationships from the two levels of the local and remote network and the coopetition advantage. Present study shows that the coopetition relationship of enterprises in the central-satellite cluster appears different; the coopetition between central-satellite cluster enterprises shows the mode of “single-chain cooperation, multiple-chain competition”, which makes the coopetition more orderly and is good for cluster enterprises innovation, networks structures optimization and sale-upgrading; the coopetition between cluster enterprises and remote network objects contributes to avoiding the phenomenon of local hold-up and energizes the development of cluster enterprises.

Key words: Coopetition, network, central-satellite type industry cluster, leading enterprise

INTRODUCTION

With the development of industrial clusters, many industrial clusters have grown to large core enterprises with leading features. These enterprises play an increasingly important role in the development of the whole cluster. Meanwhile, cluster enterprises, especially the leading ones, show the phenomenon of inter-regional cooperation, whose networks are more hierarchical and structured. This indicates that many clusters gradually have the structure characteristics of central-satellite type. The central-satellite type has the stronger competition superiority, one important origin of which is the coopetition mechanism on basis of the network structure of cluster enterprises, so the research of coopetition relationship of enterprises in the central-satellite cluster have certain practical significance.

There have been a large number of literatures discussing the coopetition relationship of industrial clusters in the academia, most of which implied the assumption of the homogeneity of cluster enterprises. Previous researches adopt the analytical perspectives within the cluster and select relevant competing objects outside cluster (Bengtsson and Kock, 2000). This study aims to analyze the coopetition relationship of enterprises in the central-satellite cluster. Coopetition is a noun synthesized by competition and cooperation, which was

first proposed by Novell's CEO Ray Noorda in 1989 (Adam and Barry, 1995; Dozyl and Prahalad, 1989), but did not attract the attention of personnel in academia and management practice field. Brandenburger and Nalebuff (1996) introduced the idea into the field of strategic management (Brandenburger and Nalebuff, 1996; Lee *et al.*, 2001). They believe that competition and cooperation are not irreconcilable. When a market is created, business operation performance is cooperation; and when the market distributes, business performance is the competition.

This concept greatly expands the scope of enterprise coopetition, make the enterprise coopetition behavior research objects quickly spread from the pure competitors to include suppliers, customers (distributors) and complementary enterprises, etc.

Bengtsson and Kock (2000) pointed out that competing enterprises in the industry will cooperate in activities away from the customer and compete in activities close to the customer. The first type is cooperation-oriented, namely more cooperation than competition between enterprises; the second is a balanced type, namely as much cooperation and competition between enterprises; the third the competition-oriented, that is more competition than cooperation between enterprises. They considered that cooperation and competition between enterprises often

exist in the different process of enterprises' value activities or occur in different departments in the enterprises (Bengtsson and Kock, 2000).

Porter (1998) proposed that clusters promote competition and cooperation. Competition and cooperation can coexist, because competition and cooperation occur in different ranges and participants. Competition and cooperation between enterprises not only provide incentives but also avoid excessive competition.

Ning and Jiebing (2002) through the study of the behavior of enterprises in industrial clusters, found the paradox of enterprises' cooperation. On the one hand enterprises with the same business compete with each other. On the other hand, the acquisition of competitive advantages is dependent on the co-operation. This competition based on cooperation constitutes a new competing picture in cluster.

The current research on cooperation of cluster enterprises still has some insufficiencies, mainly in:

- The current study implies the assumption of homogeneity of cluster enterprises. The research on cooperation of cluster enterprises mostly limit in the cooperation of homogeneous enterprises. In fact, with the continuous development of clusters, the heterogeneity of cluster enterprises is more and more apparent. In central-satellite cluster, leading enterprises play a dominant role in the cluster and supporting enterprises display heterogeneity in scale, technical capabilities, market position, etc., with leading enterprises
- The analytical perspective limits within the cluster. At present the research on cluster enterprises' competing objects is most concentrated in local network, less outside the cluster. The interactive cooperation with the main objects of the remote network is important to cluster enterprises, especially to leading enterprises and even the development of the whole cluster

This study first proposes the network structure of clusters, then analyzes the differences of cooperation relationship of enterprises in the central-satellite cluster from the network perspective. In revealing the difference and advantages of the cooperation relationship between heterogeneous enterprises in cluster, the characteristics of cooperation relationship with the local and remote network objects are presented. Finally, this study dissects the advantages of cooperation relationship. Research findings are important for the building of a benign competing mechanism and the promotion of cluster innovation.

THE NETWORK STRUCTURE OF CLUSTER ENTERPRISES

Porter (1998) thought that the cluster is a collection of enterprises and institutions interrelated in a particular area and concentrated geographically. According to Porter (1988), industrial cluster means a large number of relevant enterprises and associative supporting structures combine to gain strong and sustainable competitive power in a special field (usually a leading industry as the core). Since the cluster have suppliers, manufacturers, intermediary service organizations, local government departments and other actors, the competition and cooperation between them promote enterprises' innovation so as to promote the growth of cluster and its enterprises.

Maskell and Malmberg (2005) proposed the concept of temporary clusters and considered that the global exhibition is an important channel for cluster enterprises to get external information and resources, which is an important component of the cluster enterprise network.

This shows that industrial cluster is the phenomenon that objects with relationship, such as enterprises, suppliers, customers, government and other related support institutions (universities, research institutions and industry associations, etc.) gather in a specific space. For enterprises in the cluster, their growths have a close relationship with the cooperation of objects both within and out of the industrial clusters.

Therefore, to the convenience of study, cluster enterprise network is divided into the local network and the remote network from the geographical spatial distribution, which helps the analysis of cooperation relationship between cluster enterprises and objects in the two different networks. The former refers to the various network relations established by the enterprises in the cluster and the latter refers to the network relationship constituted by cluster enterprises and related objects outside the cluster (Fig. 1).

The local network objects include enterprises, government administrative departments, financial institutions, intermediary service organizations, universities and research institutions, etc. Moreover, almost every node exist a number of enterprises and institutions, which constitutes a realistic basis for cooperation and competition between them. According to the difference of network connection node, combined with the needs of the research, the local network of cluster enterprise is divided into a network and the secondary network in the study. Network constituted by cluster enterprises called a network, while network constituted by

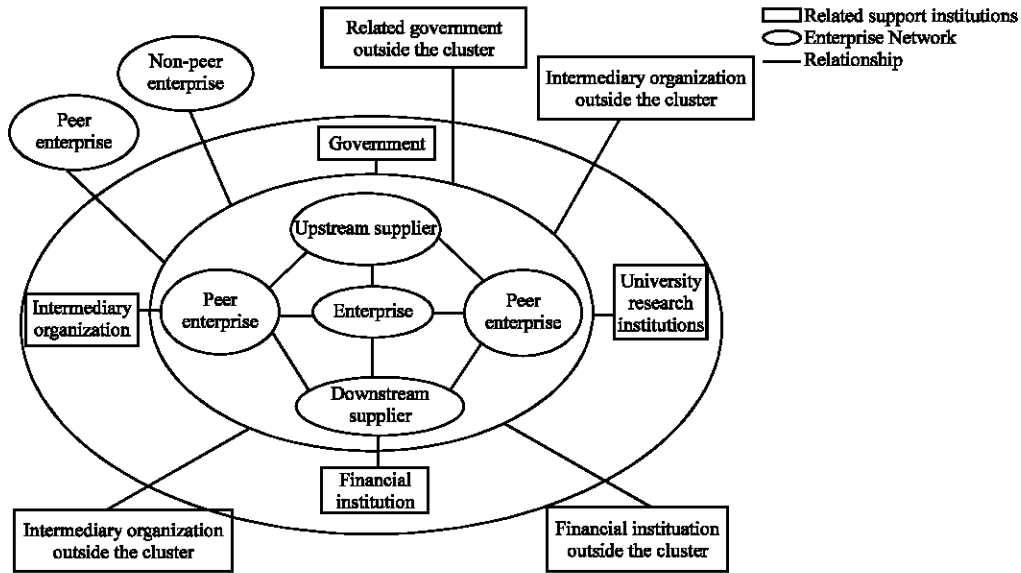


Fig. 1: Diagram for the network of cluster enterprises

related support agencies within the cluster and cluster enterprises is the secondary networks.

The remote network objects include other local governments, other external intermediary organizations and enterprises. For cluster enterprises, the competitive advantage or unique localization capability is formed by the sharing information, knowledge, resources and collective learning (Shuai, 2005; Wang, 2012). However, the advantage of local network will make the development of cluster enterprises depend and stuck in local cluster and lack the power to absorb new external knowledge, making it difficult for cluster enterprises to use the new external resources effectively (Lawson and Lorenz, 1999). Thus the cluster system tends to closed and cluster enterprises is easy to form a self-adhesive risk (Wu and Geng, 2003). For this reason, the cooperation between cluster enterprises and remote network objects have a negligible role in the development of cluster enterprises.

Analysis on the cooperation relationship of enterprises in the central-satellite cluster from the perspective of network: Baoxing (1999) divided clusters into market type, central-satellite type and network type according to the basic structure of industrial clusters. Central-satellite type, also known as axle cluster, is the network of cooperation in production based on the value chain division of labor and built by leading enterprises and other small and medium enterprises. The characteristics are as follows: (1) Cluster enterprises have a property of heterogeneity. In the central-satellite cluster, leading enterprises are dominant in the entire cluster, other small

and medium-sized enterprises are subordinate or in the peripheral, mainly providing special products or services for leading enterprises. So leading enterprises and supporting enterprises have heterogeneity in scale, capacity, market position, etc. (2) Central-satellite cluster is a cluster of supply chain with multi-core and multi-chain paralleling led by one or more leading enterprises. In the central-satellite cluster, there are one or more leading enterprises and each leading enterprise led a supply chain. Upstream and downstream enterprises cooperate with each other in various single-chain and different single-chains compete with each other, thus form a clear network constituted by supply chains with multi-core and multi-chain paralleling.

In the central-satellite cluster, leading enterprises provide technical and financial support for supporting enterprises, as well as put forward stringent requirements on supporting enterprises' technical level and processing capacity, which makes the competition between supporting enterprises more intense. At the same time, some supporting enterprises' innovation achievement will eventually come to the leading enterprises, which enhance the technological innovation capability of leading enterprises. In the cluster, enterprises compete for limited resources and market, as well as carry out various forms of cooperation, thus forming a competitive and cooperative cooperation relationship.

Cooperation relationship of cluster enterprises in the local network: In a network, cooperation relationship of cluster enterprises includes the following three aspects.

Coopetition relationship of leading enterprises: The coopetition relationship of leading enterprises first performs as competitive relationship. In the central-satellite cluster, located in the same link of the value chain, similar market and resources, cluster externalities and other features, leading enterprises inevitably compete fiercely in developing new products, increasing market share, innovating marketing mode, selecting supporting enterprises and enlisting the cooperation with related support institutions, etc. Due to the domination of leading enterprises in the cluster, the competitive relationship between them occupies important and irreplaceable position in the competition of cluster enterprises. For example, developing new products improve the technical level of the entire cluster and ultimately enhance the technical level of the auxiliary enterprises; expanding market share make small and medium-sized supporting enterprise (SMEs) get more outsourcing business opportunities; brand competition enhance the brand image of the entire cluster; competing in marketing mode expand the product's marketability and create more market opportunities for SMEs.

Second, coopetition relationship of leading enterprise also performs in cooperation. Although leading enterprises have a certain conflict in getting market position and interests, it is need for mutual cooperation in making market bigger together and fighting for more resources to support the development of the industry. The cooperation mainly carries out in basic research, industrial standards, obtaining government support and facing uncontrollable external problems. However, the frequency, intensity and importance of cooperative behavior are still far inferior to these of competitive behavior.

In the central-satellite cluster, coopetition relationship of leading enterprises also shows in inter-chain competing in the supply chain. In the competition with each other, in order to lead in cost, quality, service and the market response speed, leading enterprises must integrate the whole supply chain and make it better than other single-chain supply chain, hence the competition of leading enterprises show in the competition of the whole supply chain. On the other hand, because leading enterprises business the same type of products, supporting enterprises in various single-chain supply chains have similar features. When customer demand show diversity and individuality and enterprises must be market-oriented production of mass customization, it is difficult for leading enterprises to realize agile production only depending on its own supply chain. Then leading enterprises tend to meet customer needs through the inter-chain cooperation, so cooperation is also reflected in the single-chain supply chain cooperation.

Coopetition relationship between leading enterprises and supporting enterprises: First, coopetition relationship is cooperation. In order to cope with the rapidly changing market competition, leading enterprises usually reserve core areas, while outsource other non-core areas to more professional and efficient SMEs. In order to survive and develop, supporting enterprises also hope to secure the leading enterprises' business orders, so they cooperate in technical support, information sharing and personnel support and this cooperation is the most obvious and most closely cooperative relationship in the cluster enterprises. Leading enterprise can buy spare parts meeting the quality and time requirements at the lowest cost and supporting enterprises enhance supporting and innovative ability as well as make profit by providing matching pieces, so their partnership is the most complete.

Second, the relationship is also reflected in the competitive relationship. When providing spare parts for leading enterprises, supporting enterprises hope to get a higher price, a more generous payment and more flexible delivery time to get more profits. Similarly, leading enterprises also want to put pressure on higher product quality, lower prices and strict delivery to supporting enterprise. This lead to a competitive game between leading enterprises and supporting enterprises, but the competition is based on cooperation.

Coopetition relationship of supporting enterprises: On the one hand, supporting enterprises are in the same link of the value chain. Because of geographical proximity and the sharing of resources, there is similarity in the management, production and technical. To obtain leading enterprise' orders, supporting enterprises tend to compete in price and sometimes this competition even develop to vicious competition. And in order to seek better collaboration partners, supporting enterprises, in addition to do supporting business within the value chain, also do business with other leading enterprises across borders. So the competition of supporting enterprises not only shows in the competition in the same supply chain, but also display in competition across the supply chain.

On the other hand supporting enterprises have need for cooperation. Supporting enterprises mostly are small and medium enterprises with small scale. When faced with fierce competition in the market, supporting enterprises often show strong willingness to cooperate in the use of limited resources and knowledge exchange, such as joint procurement, unified distribution, etc.

In the secondary network, coopetition relationship between cluster enterprises and support institutions mainly is partnership. These local support agencies play an important role in the development of cluster

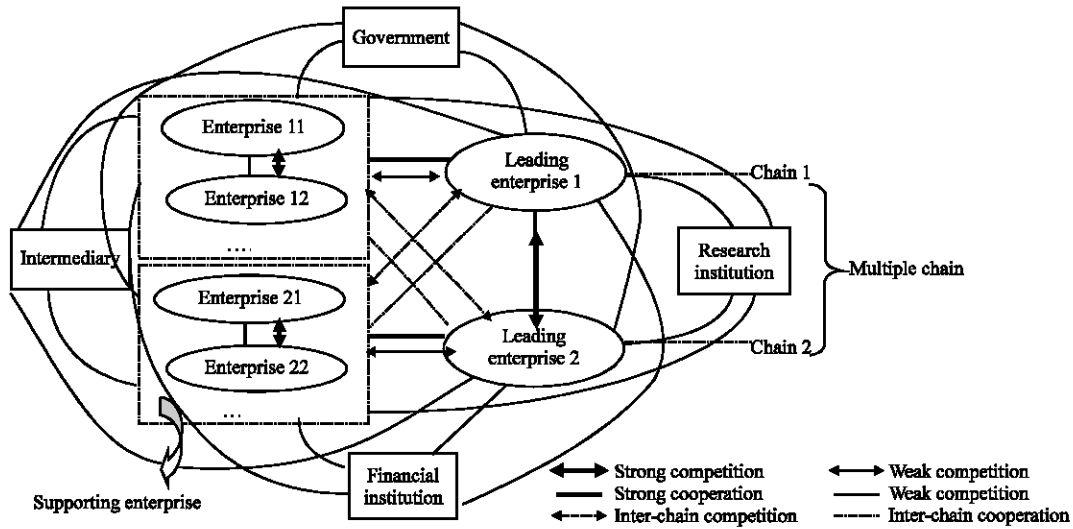


Fig. 2: Coopetition relationship of enterprises in central-satellite cluster in the local network

enterprises. For example, the cooperation with government departments can grasp the technical standards and economic policies, share transport systems and other infrastructure and enjoy preferential policies to reduce the risk and cost of innovation; the cooperation with universities and research institutions can obtain knowledge source and a large number of highly qualified personnel, as well as be able to absorb these knowledge production institutions to participate in the technological innovation activities actively to enhance the innovative capacity and innovation performance; industry associations can provide enterprises with industry developments and provide opportunities and platforms for the construction for the new network. Leading enterprise has a strong relationship in the process of cooperation with the secondary network entities. The cooperation with government has a stronger bargaining power; the cooperation with intermediary organizations have a larger role in promoting the level of service and efficiency improvements, as well as make a greater contribution to promote the cluster infrastructure improvements and the provision of public goods.

Through the above analysis, the coopetition relationship of enterprises in the central-satellite cluster in the local network is represented in Fig. 2.

Coopetition relationship of cluster enterprises in the remote network

Coopetition relationship of leading enterprises: In the central-satellite cluster, leading enterprises act as the “bridge” of internal and external connection within the cluster network. In addition to competing with objects in the local network, leading enterprises also interact with

the remote network subjects, such as enterprises outside the cluster, government, universities, banks, research institutions, consulting agencies, intermediary service agencies, etc.

First, consider the competition and cooperation between leading enterprises and enterprises in the remote network. The competition between them is mainly in the same industry outside the cluster and maintains a competitive interaction with the industrial leader, which is an important motivating factor for the technology innovation of leading enterprises. In addition, leading enterprises cooperate with enterprises in the remote network, joint research and development or deal with the uncertainty of the environment. Their cooperation mainly shows in these aspects: (1) Cooperation based on the vertical division of labor. Leading enterprises move some departments out of the cluster, so the supply chain presents cross-regional characteristics, that is to say, vertical division of labor accomplish product R and D, production, sales and other links. The supply relationship between upstream and downstream in the area can better guide the flow of resources and the interaction of technical elements, thereby strengthening the association of resources and technology. Supply chains then dominate the power to sustain survival and development, namely establishment of sales network, production base, R and D centers, virtual organization structure, etc in the remote place. (2) Cooperation based on the horizontal division of labor. Due to the regional differences of factors of production as well as complementary industrial structure, the horizontal division of labor cooperation promotes the transfer of the factors of production and complementary industries in the region. Realizing labor

cooperation' horizontal division and complementary products can meet the different needs of the market. Through the establishment of strategic alliances with well-known enterprises and international mergers and acquisitions, leading enterprises get technical support, enter the high-end market and improve the overall competitiveness of enterprises (Jilin, 2010).

Secondly, coopetition between leading enterprises and remote network support institutions mainly is partnership. Due to geographical and market constraints, the secondary networks objects in the local network cannot fully meet the service requirements of local enterprises. With the development of network technology, low-cost and trans-regional quick services (such as training services, research services, etc.) become possible and are conducive for cluster enterprises to cooperate with the greater range of objects. Local or remote government's preferential policies, such as land policy, tax policy can attract leading enterprise to compete cross-campus; through the cooperation with the national academic R and D institutions, leading enterprises can grasp industrial technology and dynamic development trend; through the cooperation with the national industry association, leading enterprises can get regular communication opportunities and learning opportunities; through the cooperation with intermediaries organizations, leading enterprises can get more information resources. This coopetition relationship in the cluster has been fully reflected in the phenomenon of leading enterprises' relocation or part of the relocation (Hu *et al.*, 2013).

Cooperation relationship of supporting enterprise in the remote network: The coopetition between supporting enterprises and enterprises in the remote network mainly is the competition of enterprises in the same industry. In the central-satellite cluster, supporting enterprises mainly rely on leading enterprise's business outsourcing to create profits, but if too reliant on leading enterprise overly, supporting enterprises will be bound to face a great risk when the industry or leading enterprise development change. So supporting enterprises compete and cooperate not only in the local network, but also in the same industry in the remote network.

The coopetition between supporting enterprises and other objects in remote network mainly is the cooperation with financial institutions and intermediary organizations in the remote network (Jilin, 2010).

CONCLUSION

The article analyses the coopetition relationship of enterprises in the central-satellite cluster from the network

perspective. Drawing on the above analysis, the following conclusions are reached:

- The coopetition relationships of enterprises in the central-satellite cluster have differences. Due to the heterogeneity of clusters in size, capacity and market position, its coopetition relationship also present differences

As to competitive relationship, competition in homogeneous enterprises, such as leading enterprise or supporting enterprises, are strong; competition in heterogeneous enterprises, such as leading enterprises and supporting enterprises are weak. The competition of leading enterprise show as the competition of the whole supply chain, occupying an important position in the competition of enterprises in the cluster; the competition of supporting enterprise show not only as the competition in the same supply chain, but also in the inter-chain competition.

As to cooperative relationship, cooperation in homogeneous enterprises, such as leading enterprise or supporting enterprises are weak; competition in heterogeneous enterprises, such as leading enterprises and supporting enterprises are close.

- The coopetition between central-satellite cluster enterprises shows the mode of "single-chain cooperation, multiple-chain competition". This mode makes enterprises consciously put themselves into the value system of supply chain, therefore the leading enterprises are motivated to focus on high value-added technology, R and D and brand innovation. The mode supports enterprises to collaborate closely with leading enterprises and take the initiative to enhance the supportive capacity. The technology and information sharing in the same supply chain reduces the intensity of the confrontation competition, while the presences of several cluster supply chains keep the moderate competition vitality. Therefore, in central-satellite cluster, through the integration of the supply chain, the competition mode has been optimized and the competition is more orderly. This competing model is conducive to the innovation, optimization and upgrade of the cluster organization
- The coopetition between cluster enterprises and support institutions mainly is cooperation. Leading enterprises have a strong cooperative relationship with related support agencies in the local and remote network; supporting enterprises have a strong cooperation with the secondary network objects and a weak cooperation with related support agencies in

the remote network. As a "bridge" connecting the entire cluster and external organizations, leading enterprises can greatly enhance the creation and sharing process of knowledge, which can promote new knowledge into the cluster and be easy to diffuse in the cluster. Therefore, the strong cooperation between leading enterprises and support institutions is beneficial to the accumulation of knowledge and innovation

- The coopetition between cluster enterprises and peer enterprises in the remote network give the power and strength of innovation and effectively prevent the phenomenon of cluster enterprises' local lock. So, it is of great significance for the development of leading enterprises and all of the cluster enterprises

Research findings suggest that the government create a favorable environment for enterprises' competing and set up network platforms in multi-dimensional for cluster enterprises. Firstly, strengthen the industry guide and perfect the industry chain system of specialization and collaboration of large, medium and small enterprises; secondly, strengthen infrastructure construction, promote the establishment of industry associations, research institutions, intermediary organizations and other related service agencies and establish platforms of technical exchange and innovative between enterprises and research institutions. At the same time, help to establish broader links between cluster enterprises and the remote network objects to get the support of technology, marketing, human and capital and continue to inject new vitality into the development of cluster enterprises.

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