Modeling of Across-Chain Network Dynamic Competition for MNC in Industrial Cluster

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ABSTRACT
The huge market and perfect production system in China are attracting more multi-national companies’ interest to invest in China in the form of Foreign Direct Investment (FDI). Therefore, multi-national companies are willing to integrate and optimize global supply chain networks of their own, which enable them to reduce cost and improve market response. As a result, multi-national companies usually embed into local industrial clusters through financial and technological comparative merits to sharpen their competitive edge. This paper considers the across-chain network equilibrium problem involving process of competition and melting between this new global chain and an already existing local chain. The authors model the optimizing behavior of these two chains, derive the equilibrium conditions, and establish the variational inequality formulation, and solve it by using the modified algorithm. Finally, the authors illustrate the model through numerical example and discuss relationships among the price, quantity, technological progress, and satisfaction among two dynamic phases.

Keywords: Embed, Foreign Direct Investment (FDI), Global Supply Chain, Industrial Cluster, Multi-National Company (MNC)

1. INTRODUCTION
The rapidly developing worldwide marketplace has spawned a new allure for the multi-national company (MNC) to seek out attractive labor markets to reduce cost, locate to close to customers to improve customer service, and build new markets in developing countries to enhance profits. For instance, companies in Western European and the United State have begun to establish similar networks to serve the evolving free markets in China. However, to be profitable the multi-national company must deal with a variety of issues. Companies must consider a number of trade-offs; for example, centralized manufacturing to achieve economies of scale versus decentralized operations that seek to improve customer service by locating assembly plants closer to customers. However, achieving a favorable trade-off may not straightforward.
since costs depend upon the countries in which plants are located.

The effect of facility location of multinational company on competitive advantage is well known. Day and Wensley (1988) point to three components that form the framework for diagnosing competitive superiority: source of advantage, positional advantage, and performance outcomes. Porter (1988) believes that achieving competitive advantage requires having superior resources and customer satisfaction. Porter (1988) also advises that to gain competitive advantage over their rivals, companies must perform their primary activities more efficiently and effectively than their competitors. He asserts that these primary activities are inbound logistics, operations (manufacturing), outbound logistics, marketing and sale, and after-sale services. The location of these activities plays a significant role in the success and future of businesses in the domestic and global markets.

Owing to the recent changes in the world economy and technological advances, industrial clusters provide a platform for multi-national companies to operate multiple facilities and to become more agile. In particular, in China, there usually exist a couple of paralleled supply chains at industrial cluster, members around them not only vertically cooperate along their own supply chain, but also horizontally cooperates with other different supply chains. It means firm’s coordination evolves from firm-wide to chain-wide, and even to across-chain. On this basis, these supply chains located in industrial cluster are referred to as cluster supply chains (CSC) network. For it has an easy access to sources of raw materials, to lower cost labor but with high technical training, to potential markets, as well as to just-in-time delivery in supply chain system, thus attracting multi-national companies move closer to industrial cluster more than they used to be.

These multi-national companies enter and embed in industrial cluster, and build the production base, reconstruct their global supply chain. As a result, the initial equilibrium network in cluster supply chain will be broken and renewed. After multi-national companies’ fusion and competition in industrial cluster for awhile, the new equilibrium network will gradually be formed.

A majority of researches regarding equilibrium network mainly focused on a supply chain network, and ignored changes caused by other adjacent supply chain network and MNC embedded in industrial cluster.

In this paper, we explore multi-national companies embedded in the cluster supply chain to form a new supply chain (i.e., global supply chain) and compete with existing one (local supply chain), this process will enable network equilibrium to dynamically change. The remaining parts of the paper are organized as follows. Section 2, the literature review, gives a brief explanation of relevant researches. Variables and assumptions are given in Section 3. Dynamic equilibrium models are formulated and discussed in Section 4 followed by discussion of equilibrium algorithm in Section 5. Finally, experiment and concluding remarks are outlined in Sections 6 and 7.

2. LITERATURE REVIEW

2.1. Industrial Cluster and Supply Chain

With the development of new organizational paradigm and globalization, industrial cluster not only is main source of national competition from a state perspective, but also is becoming one of major competitive weapons for individual firm. Industrial agglomeration firstly originates from Marshall’s ‘industrial districts’ (1920) and Weber’s ‘classic district’ (1929), then followed by Hoover (1948), who further explored and illustrated agglomeration economy. Li, Xiong, Park, Liu, Ma, and Cho (2009) urged that firms within industrial cluster link forward and backward through innovation chain and product chain to sharpen the competitive edges, Theo et al. (1998) denoted that in order to share new complementary technologies, obtain gains from shared specialized assets, speed up learning process, reduce transaction cost, overcome market barriers and diffuse in-

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