Research on Mechanism of Industrial Cluster Innovation: A view of Co-Governance

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Abstract: Since 1990s, there has been a growing concern about the role of industry cluster in stimulating a regional and in turn a national competitiveness. Especially in the context of emerging technologies and related knowledge-economy business models, linking stakeholders in dynamic clusters is believed to enhance competition and regional innovation (OECD, 1999). Whilst industry cluster contains a huge number of small and medium enterprises (SMEs) varied in the fields of technology, production and marketing, the highlighted issue is to deal with the integrated mechanism of innovation, collective learning, networking and collaboration. The purpose of this paper is to contribute new empirical evidence and theoretical analysis to this issue through a case study of Xiqiao textile industrial clusters.

Key words: Innovation Mechanism, Industrial Cluster, Co-Governance, Knowledge Spillover

1. Introduction

1.1 Background
Since 1990s, the development of market-oriented industrial clusters in Guangdong and Zhejiang Province has to a large extent promoted the upgrading and optimization of regional industrial structure. Industrial cluster, as a new form of economic organization, contains a huge number of small and medium enterprises (SMEs) and has great impact on regional economy and competiveness. The advantage to be gained from innovation, collective learning, networking and collaboration are claimed to be particularly important for those SMEs in helping offset the size-related advantages of larger firms. However, in reality, there is still a considerable number of SMEs that fail in the process of innovation and collaboration due to low capacity and vicious competition, and thus cannot realize a positive cluster effect. Further, local government and intermediary networks such as trade associations cannot play to their full strengths and fail in initiating effective mechanism to help SMEs in innovation and collaboration. In fact, with rapid changes within and beyond industrial clusters, SMEs are facing not only the passive pressure of innovation, but also the initiative demands of innovation under the long-term competition and collaboration.

By reviewing some literatures on innovation theory, this paper first identifies the integrated innovation mechanism for the industrial clusters, namely, the driving mechanism, the learning mechanism, the incentive mechanism and the constraint mechanism. Drawing from the case study of Xiqiao textile industrial clusters, this paper further develops an analysis framework of innovation mechanism based on a view of co-governance, and suggesting some possible conclusions towards better understanding and practice of innovation mechanism for the SMEs in clusters.

1.2 Review of literature on innovation
The pioneer of innovation theory Joseph A. Schumpeter believes that innovation is a new combination of the production function, the purpose of which is to obtain potential excess profits. Innovation can be summed up into five types: (1) producing new products, (2) introducing new production methods and new process, (3) exploiting new markets, (4) developing new raw materials or semi-manufactures supply sources and, (5) introducing or redesigning new organization[1]. Since then, researchers have put these five innovation forms into two categories, with the former four referring to technological innovation, and the fifth one referring to organizational innovation. Further, Nelson argued that technological innovation involves not only the first time introduction of new technology, but also the diffusion of technology, and such diffusing process depends greatly on the accumulation and
development of all kinds of knowledge\cite{2}. In this paper, the analysis of innovation in SMEs covers both technological innovation (e.g. generation of new technology, and its use and diffusive process) and organizational innovation (e.g. reconstruction of clustering elements or resources, or a new organizational configuration, and achieving re-selection and optimization of strategic goals through the sharing of knowledge, networking and collaboration).

On the other hand, the significance of the spillovers of knowledge from external sources has been increasingly recognized in the process of innovation and economic development. A number of literatures suggest that knowledge spillovers are centered on spatial proximity such as industrial clusters, and that a wider and faster diffusion of knowledge spillovers can be achieved by actively stimulating cooperative relationships or motivated by several economic actors including local government, intermediary networks, etc. (Feldman 1999\cite{3}, Krugman 1999\cite{4}, Breschi and Lissoni 2001\cite{5}). In essence, enterprises within industry clusters have been expected to possess performance advantages due to superior access to knowledge spillovers, and in turn to develop the knowledge absorptive capacity within the spillover pool.

In addition, this paper introduces a perspective of co-governance, and the main actors in innovation have been defined as follows: as an institutional arrangement, cluster governance is a ‘game-playing’ dynamic process of working together with joined efforts of entrepreneurs, local government, intermediary organizations, as well as external market. Accordingly, these forces play different roles and place different impacts upon the innovation of SMEs. Therefore, this kind of co-governance perspective is expected to focus more on the innovative interaction between the internal and external network and thus towards a better understanding and practice of innovation mechanism for SMEs in clusters.

2. Case Study: Empirical Experience from Xiqiao Textile Industrial cluster

2.1 Brief overview
This paper employs case study as the main research method, including (1) in-depth interviews, (2) fieldwork observation and, (3) questionnaire. Based on the continuous investigation into Xiqiao textile cluster during a period of March – October 2007, this paper has developed the following possible findings on innovation in the SMEs within Xiqiao textile clusters:

Xiqiao textile cluster of enterprises is one of the largest Chinese industrial clusters. There are about 1300 small and medium enterprises within the textile cluster, employing 62900 workers in total. According to the recent report, nine enterprises boast their output value over 100 million yuan, and fifty enterprises achieve the production value over 5 million yuan. The production capacity achieves 1 billion meters of different kinds of fabrics, and the total assets of the textile enterprises have accounted for over 8.15 billion yuan, with an annual output value of 7.32 billion yuan. Xiqiao textile cluster was once dominated by woven fabrics, and later developed into a complete industrial chain ranging from the raw materials, woven fabrics, dyeing and textile finishing.

2.2 Experience from Xiqiao: mechanism to nurture and promote innovation in industrial clusters
One of the highlighted characteristics in Xiqiao textile cluster is its innovation centre, which is believed to be effective and most of the SMEs within the cluster have benefited from it. The Xiqiao innovation centre covers an area of 2218 hectares, with a total investment of 90 million yuan and last year’s expenses of 1.2 million yuan. The basic function of this innovation centre is to offer technology and innovation related services to enterprises, by providing new design or patterns for new products, offering professional services of production analysis and quality tests, promoting cooperation activities between SMEs and technological associations, helping building up the platform for E-business, and offering financial and managerial services to SMEs, etc.. The following is the structured function map of Xiqiao innovation centre:
In effect, the innovation centre has realized many positive outcomes: (1) promoted the introduction of high-skilled technician, (2) enhanced the capability of R&D, with over 8000 new designed varieties and 80% of market shoot straight, (3) accelerated the pace of technical equipment transformation, (4) optimized the structure of products, with 30%-40% new textile fabrics designed by the innovation centre and thus significantly improved the product qualities, (5) upgraded the status of Xiqiao textile cluster and became a good example for researching and developing new textile products thanks to the innovation centre, and (6) realized the innovation of marketing, embodied by offering important information of supply and demand within the clustered SMEs, building up the platform of e-business and online transaction, and accelerating the process of R&D within SMEs. All of these evidences from Xiqiao have served as an empirical base for the following analysis framework.

3. Analysis Framework: Mechanism of Industrial cluster Innovation

3.1 Description of framework

The above findings drawn from the case of Textile industrial clusters have shed light on the research of innovation mechanism for SMEs in clustering. First, the logic of innovation mechanism in the practice of SMEs can be testified through the following four supporting mechanism, namely, the driving mechanism, the learning mechanism, the incentive mechanism and the constraint mechanism. In specific, the driving mechanism determines the efficiency of the initial innovation activities; the learning mechanism enables the enterprise to continuously secure the capability for innovation; the incentive mechanism and the constraint mechanism, on the other hand, both guarantee the proper and effective functioning of the innovation mechanism, in a positive or passive manner respectively. Second, based on the evidence from the case of Xiqiao, this paper first examines some relevant economic actors in innovation, then explores the view of co-governance, as a rationale of interaction for those innovation actors, and finally deduces a framework for innovation mechanism, involving the four function-supporting mechanisms, in which such relevant innovation actors with a perspective of co-governance can fit (Figure 2).
3.2 Driving mechanism based on market-oriented governance and internal governance

Market demand is the driving force for innovation in SMEs, in that market both sets the starting point for innovative activities and turns out to be the end of innovation-value-transition. The notion of market-oriented governance (Hancher et al. 2004) suggests its possibility of being one kind of effective mechanism for guiding and promoting innovation in clustering as an external driving force. It should be noted that the ever-changing market demand and competition may promote enterprises to sharpen technical skills and to reconstruct and optimize the production process, so as to meet the needs of market and further secure the core competence for development. In essence, market-oriented governance is not to resist the unseen hand of market, but to guide it and modify the price mechanism in a proper manner.

Within the innovation mechanism based on market-oriented governance, enterprises are expected to not only act as rationalists, but also to keep away from the pitfalls of symmetric information and thus achieve flexible innovation in high efficiency.

In contrast to market-oriented governance, internal governance is pre-dominated by training and management of the innovative driving force internally. This driving force can be embodied by two aspects, namely, the accumulation of innovative resources and the level of information exchange, which can be further characterized as specific organization scale, R&D level, human resources, the number of patent applications, and the outcome of innovative activities. There is one key element within the innovation mechanism, called tacit knowledge, which was first introduced by British researcher Polanyi. ‘Tacit Knowledge’ believes that industrial clusters are favorable for the diffusion and dissemination of non-coding knowledge. Since then, Storper (1995) examined four kinds of production systems, namely, small scaled customized, high-tech, large scaled production, and mass lean production, and concluded that each production system involves certain factor driving for innovation, but unanimously tacit knowledge accounts as the key factor. Through informal information exchange, tacit knowledge can be diffused and spillovered within SMEs in the clustering, and thus form region tacit knowledge. Because of embeddedness and common social background, those enterprises out of the cluster cannot easily imitate the core techniques and production. At the same time, thanks to the mechanism of knowledge spillover, SMEs within the clustering can realize an effect of knowledge integration, and thus stimulate the highly dense and efficient innovative activities.

3.3 Learning mechanism based on value chain governance and network governance

In the age of knowledge economy and globalization, industrial clusters embodied by industrial agglomeration and geographic proximity have gradually embedded in the global value chain (Schmitz 1995; Humphrey & Schmitz 2002). Clustering environment is regarded as ‘innovative space’ thanks to its favorable milieu for innovation activities. Also, the interaction of SMEs between the upstream and downstream of value chain makes it possible to get access to the innovative information...
and knowledge. According to Gereffi, the function of value chain governance is to balance all segments throughout the value chain and to coordinate among different value activities and interest groups. The learning mechanism based on value chain governance enables SMEs throughout the value chain to obtain sustainable competitiveness, through the dynamic process of accumulation, sharing and inventing new knowledge and technology. There are also lots of game-play interactions for SMEs among different segments of the value chain, and SMEs can continuously develop their innovation capability and core competence through these interactions.

On the other hand, it cannot be denied that SMEs within clustering is inseparable from the strong support of their surrounding social network. Intermediary network is expected to be an important node in the social network, and is the significant third party for cluster governance including technical service organization, trade associations, etc. While lacking of funds and technology support, traditional SMEs within the cluster are not easy to realize positive innovation effect on their own. However, these enterprises can still rely on the external network to secure enough information and knowledge (especially those tacit knowledge through close interactions), and achieve innovation finally. Professor Wang has designed an interactive model to describe the innovative process based on the effective interaction between the intermediary networks and SMEs within clustering. Such conclusion has shed light on the practice of learning mechanism based on network governance.

3.4 Incentive mechanism based on entrepreneur governance

Recently, entrepreneurship has been regarded as one of the utmost important influential factors in the process of innovation. And the role of Entrepreneurs will become even more prominent when SMEs are struggling in a high-risk and fierce competition setting. Lee (2000) has quoted Marshall and Krugman’s Element Reinforcement Theory to analysis the economic effects of entrepreneurship in clusters, suggesting that the inspiration of entrepreneurship and innovation, and the entrepreneurs’ relationship in competition and collaboration makes the SMEs in clusters become highly flexible and competent. Further, to guarantee entrepreneurship works decently, it is necessary to introduce incentive mechanism here, in that such incentive mechanism will enable entrepreneurs to bear in mind that once breakthrough in technical and organizational innovation, it is possible to secure the high rewards in return, so that it makes the entrepreneurs maintain high inspirations and incentives to endeavor on innovation and achieve high efficiency. Therefore, the issue up to the top agenda is how to design an effective system measuring the innovation effectiveness and the payment for entrepreneur, with both material and spiritual incentives, to provide a flexible and highly efficient environment, so that entrepreneurs can maintain a highly active aspiration and potential for innovation.

3.5 Constraint mechanism based on government governance

As innovation in SMEs is often alongside with high uncertainty and risks, there should be an effective constraint mechanism of risk to complement not only the incentive but also the constraint aspects of the mechanism of innovation. As Friedman suggested, government plays duo-roles, one as a competition rule maker, and the other as an arbitrator that makes sure the set rules work. This paper introduces government governance, expecting to offer some experience for the practice of set up a constraint mechanism for innovation. For instance, it is possible for local government to design a set of stringent assessment and screening measures for innovation projects, by which all the SMEs within the cluster should strictly abide, so as to lower the probability of innovative risks. Meanwhile, local government should set up and sharpen the monitoring mechanism towards innovation, setting all the SMEs under control, and guiding them towards those innovative programs with low risk and high values, and thus effectively lower the risks and heighten its innovation efficiency.

4 Conclusion

In theory, the traditional innovation theory has two ways of research preferences: one is to examine the knowledge spillovers and sharing of information within the whole industrial cluster from a macro-economic perspective; the other is to focus on the innovation activities of single enterprise from a
rather micro perspective. This paper, on the other hand, has developed a view of co-governance, which is believed to be a mezzo perspective, to look into the issue of innovation mechanism for SMEs in clusters.

In practice, based on the empirical evidence and analysis from the case of Xiqiao textile industrial clusters, this paper has explored an analysis framework for innovation mechanism, which is embodied by the four supporting mechanisms, namely, the driving mechanism, the learning mechanism, the incentive mechanism and the constraint mechanism, and within which, different interest groups of co-governance, namely, actors from both external market and internal, from both value chain and intermediary networks, and from local government and entrepreneurs, are playing their roles respectively in such game-play interactions. Therefore, it is believed that this kind of mezzo perspective to research on innovation mechanism will emphasize more on the learning and interaction between the internal and external network, improving the channels for information and technology, and thus towards a better understanding and practice of innovation mechanism for SMEs in clusters.

References