

SPACES online

Spatial Aspects Concerning Economic Structures

Peng-Fei Li

Horizontal vs. vertical learning: Divergence
and diversification of lead firms in the Hangji
toothbrush cluster, China



UNIVERSITY OF
TORONTO



RUPRECHT-KARLS-
UNIVERSITÄT
HEIDELBERG
EXZELLENZUNIVERSITÄT

Issue 2011-01 | Volume 9
www.spaces-online.com

Please quote as Li, P.-F. (2011): Horizontal vs. vertical learning: Divergence and diversification of lead firms in the Hangji toothbrush cluster, China. SPACES online, Vol. 9, Issue 2011-01. Toronto and Heidelberg: www.spaces-online.com.

Author Peng-Fei Li, Department of Political Science, University of Toronto, Sidney Smith Hall, 100 St. George Street, Toronto ON M5S 3G3, Canada; and Peking University, Department of Urban and Economic Geography, 5 Yiheyuan Road, Beijing 100871, P.R. China, Email: mrlipengfei@gmail.com

Keywords competitor networks, vertical linkages, lead firm, toothbrush cluster

JEL codes D83, L26, R11

Abstract

Horizontal interaction and networking between competitors as opposed to vertical value-chain-based linkages has long been under-conceptualized in the literature on the internal and external structure of clusters. Combining labor mobility/spill-offs, friendship ties among competitors, the role of trade fairs/professional conferences, and competitive interaction, a framework of clusters is developed that focuses on the horizontal dimension as an alternative way to interpret local and external learning. This model is applied to investigate divergent strategies and learning activities of three lead firms in the Hangji toothbrush industry, China, drawing on both vertical linkages in global value chains and horizontal interaction in competitive networks. Although both frameworks can explain differences in strategies among the lead firms in the cluster, the notion of competitive networks is particularly significant as horizontal interaction may provide additional explanations beyond producer-buyer linkages and learning.

Editors: Harald Bathelt, Johannes Glückler

External Advisor: Heiner Depner

ISSN: 1612-8974

© 2011 SPACES online. The authors maintain full copyright of the papers.

Horizontal vs. vertical learning: Divergence and diversification of lead firms in the Hangji toothbrush cluster, China

1 Introduction

The role of horizontal linkages has been underemphasized in the cluster literature to date (Malmberg and Maskell 2002; Lorenzen and Maskell 2004), although it is widely accepted that clusters exhibit both vertical and horizontal dimensions (Porter 1998). The domination of vertical networks in regional approaches appears natural in the context of the resurgence of regional economies (Storper 1995). The distinctive feature of both traditional industrial districts and new economic clusters is a locally disintegrated production system that is specialized enough to ensure efficiency and flexible enough to meet uncertain market conditions (Piore and Sabel 1984). From a historical point of view, flexible specialization of clusters is regarded as a possible substitute for the traditional mode of mass production. By specifying specialization vs. a deepening social division of labor as a hallmark of the local industrial structure, clusters are implicitly defined through their vertical dimension. Other cluster approaches that rely on transaction costs, knowledge, institutions and social perspectives (Scott 1993; Maskell 2001; Amin 1999; Storper 1995) often also focus on the vertical linkages. This tendency can also be observed in the discussion of clusters' external linkages. Vertical relations with global buyers are assumed to be the dominant, although not the only, way of connecting clusters with global economies (Humphrey and Schmitz 2000). This paper does not question the significance of the vertical dimension for clusters, but rather doubts that scholars have concentrated so much on producer-user relations, while deemphasizing systematic analyses of the knowledge flows through horizontal network and their relationship to economic development and especially, to local and trans-local technological learning.

The goal of this article is to develop a horizontal learning framework of cluster firms that synthesizes the relevant informal learning mechanisms from local and non-local competitors. Compared to interactive learning between producers and users, competitor interaction exhibits different characteristics. This leads to new insights to understand and solve contemporary puzzles of regional development, related, for instance, to the duality of local vs. global relationships and the limitations of cluster upgrading in global value chains. To illustrate the usefulness of this horizontal framework, I investigate a heterogeneous industry cluster, the case of the Hangji toothbrush industry in China. Here, I try to explain the diverse learning practices and strategic choices of the three lead firms by analyzing both the vertical and horizontal cluster dimensions. By comparing the two cluster dimensions in explaining strategic differences of three lead firms in the cluster, advantages of a horizontal framework become very clear.

This article is organized as follows: Section 2 sketches out the development of cluster approaches from including vertical to horizontal and social dimensions and from dealing with local to trans-local scales. Here, the limitations of vertical interpretations of clusters in global value chains are pointed out. In Section 3, a horizontal framework is put forward that integrates four learning mechanisms with respect to competitors in a cluster context. After a brief introduction of the research practice in Section 4, Section 5 outlines the global shift of the toothbrush industry and describes different strategies of the three local lead firms in Hangji. Section 6 explains the strategic choices of these lead firms from a perspective of vertical and horizontal interaction and networking. Section 7 concludes and discusses policy implications of this research.

2 Cluster conceptualizations: From vertical to horizontal and social interaction, from local to trans-local linkages

Inter-firm linkages in cluster theories have evolved from vertical to horizontal and social dimensions. At the early stages of cluster research, industrial clusters were explained from a transaction-cost perspective suggesting that spatial proximity between partners in input-output linkages minimizes transaction costs (Scott 1993). Related explanations did not consider the horizontal dimension and related linkages. The focus on traded dependencies, however, did not leave room for investigating and understanding processes of knowledge generation and local learning of cluster firms. It became clear that an encompassing cluster theory cannot focus on aspects of cost reduction alone. As a consequence, theoretical constructs of the regional economy needed to shift from an analysis of static advantages associated with the proximity of suppliers and users toward the notion of dynamic competitiveness of localized industries. In responding to this shift, two strands of cluster approaches developed based on the learning region and social embeddedness arguments, respectively, although some ideas of the two arguments are interrelated.

The learning region argument builds on the idea that innovation is an interactive process between producers and users (Lundvall 1992; Morgan 1997). It is argued that space particularly matters for producer-user interaction in dynamic technology context (Lundvall 1992, 57-59). At the time, however, a drawback of the interactive-learning argument at the regional level is that Lundvall's (1992) innovations that result as a collision of the producers' technological opportunities and the users' needs mainly refer to incremental product innovation. This focus of interactive learning is neglected in some of the accounts on learning regions, and it is one of the main reasons why clusters from a learning perspective could be constructed with dynamic innovations, yet, in reality, may fall into the trap of incremental changes (Asheim 1996).

Instead of mainly relying on interactive learning, a similar argument of localized learning draws inspirations from the communicability of different kinds of knowledge geographically. Tacit knowledge which can be effectively shared through face-to-face communication may lead to a situation where specialized industry clusters gain a sustainable competitive advantage, especially if globalization makes codified knowledge ubiquitous (Maskell and Malmberg 1999). Localized learning, in this perspective, opens room for cluster theorizations that go beyond vertical linkages. From this, a broad localized-learning perspective has led to the formulation of a knowledge-based theory of clusters, which includes both horizontal and vertical relations (Malmberg and Maskell 2002, 2006).

In the knowledge-based theory of clusters, institutions and social context which affect the interaction of local actors are also emphasized (Bathelt 2005; Malmberg and Maskell 2006). It is here where this approach shares common ideas with the social embeddedness argument of regions (Gertler 2003). The social and institutional construction of clusters develops in a similar way as the learning-region approach: the argument is initially built around vertical linkages and then widens and becomes more comprehensive. According to Grabher (1993), regions can even become over-socialized if they are characterized by rigid vertical linkages and corresponding ossified institutions as in the context of old industrial districts. To generalize the social argument in spatial settings, Storper (1995) reframes an economic region as a nexus of untraded interdependencies, deviating from – but also being closely related to – local input-output linkages. Untraded interdependencies differ from input-output linkages as they encompass “labor market, and ‘conventions’, or common languages and rules for developing, communicating and interpreting knowledge (though direct input-output relations may also play a role here)” (p. 206). Untraded linkages are highly related to traded dependencies because “in some cases, these non-traded connections overlap with traded input-output relations” (p. 204). According to Storper (1995), it is not the tacit knowledge, but “the territorial agglomeration of certain untraded interdependencies and spillovers ... [that] can confer on ... [regional actors] absolute advantages” (p. 206).

Some strains of the embeddedness argument go beyond social relations. If the shift from traded to untraded interdependencies can be interpreted as a shift from economic to social relations, developments of cluster approaches that draw on institutions and contexts may be understood as a way to find the order behind social relations (Amin and Thrift 1994; Amin 1999; Storper 1997, 2009). Despite the new emphasis in institutional and contextual perspectives, arguments focused on vertical linkages can still be found at prominent places in these discussions. In the concept of context, for instance, vertical linkages are implicitly important since “the structural component of context is defined by the division of labor and the networks in which the actor finds herself or himself” (Storper 2009, 13). In institutional accounts, both vertical and horizontal relations are included since cluster policies include “initiatives to encourage interfirm exchange and reciprocity through buyer-supplier linkage programmes” and “sector-specific organizations (e.g. trade associations, sectorally-based service centres)” (Amin 1999, 371).

This development of regional cluster approaches involves a shift from a vertical interpretation to an emphasis of the horizontal and social dimensions of clusters (Bathelt 2005). A dilemma in cluster approaches that focus on the vertical dimension is that empirical evidence tends to counter theoretical suggestions: studies show that most vertical linkages are outside the region (Malmberg and Power 2005). Because of this, the global-value chain literature has emphasized the role of external linkages of cluster firms (Humphrey and Schmitz 2002). To combine global value chains with the cluster perspective appears relatively easy when focusing on vertical linkages through which cluster firms could be integrated into networks of global buyers in an organic fashion. As such, this framework provides a good, though not the only, conception within which clusters could insert into networks of global relationships. The central question for clusters in the context of global value chains becomes how to coordinate the role of global chain-drivers with local agency of cluster firms. Humphrey and Schmitz (2000) argue that bottom-up initiatives of local clusters can hardly break the dominant power relations of global buyers, just as the Monkey King could not escape from the Buddha’s palm. The potential for clusters to upgrade their position within global chains depends on the dominant type of governance of this chain. In a quasi-hierarchical chain, cluster firms can more easily upgrade in manufacturing with the assistance of the global buyers, but are not supported in functional upgrading as this may encroach on the core competence of buyers. In a market-based chain, process upgrading may be slow but potential for further upgrading exists. A relational value chain requires a more symmetric distribution of competencies and power which is unlikely to be found in the case of cluster firms in developing countries. These three propositions provide an important framework to understand how clusters can upgrade in the context of global value chains; yet, recent reflections and advances in value-chain research call for new understandings about the possibility of cluster firms to learn from within as well as across or from the outside of value chains:

First, recent studies question that whole value chains are characterized by a single governance type (Bair 2005; Ponte and Gibbon 2005). Even though the typology of value chain governance modes has been greatly extended compared to the early buyer vs. producer-driven dualism (Gereffi 1999; Gereffi et al. 2005), empirical studies display an even greater complexity and dynamic of value-chain governance in different segments of an industry (Talbot 2009), in different locations/countries of an industry (Sturgeon et al. 2008), and at different points in time (Oro and Pritchard 2010). Therefore, it is best to accept that a single type of governance is not able to describe a whole value chain. It may only be able to describe the features of a subset of inter-firm linkage within a value chain, although this, of course, influences the overall structure of the chain (Sturgeon 2009). From a cluster perspective, multiple governance modes within single value chains imply that it may not be suitable to use the cluster as the unit in the analysis of regional insertion into global value chains because firms in a specific cluster might be part of different value chains. Therefore, the question of what kind of value chains a cluster is inserted to may have more than one answer.

Second, the concept of upgrading in global value chains presumes a static interpretation of innovation. Even if new industrialized nations follow a development path from OEMs (original equipment manufacturers) to

OEMs (original brand manufacturers), as in the apparel industry (Gereffi 1999), it is questionable whether firms in every cluster in a less-developed context would (or should) follow the same process. Although the different types of upgrading describe different characteristics of firms' strategies, it should be emphasized that, in reality, the distinctions of different kinds of upgrading are blurred. It is normative to assume that cluster firms should upgrade in the form of a linear process (Ponte and Ewert 2009). The rise of contract manufacturers provides counter-evidence of firms that are innovative and profitable although being in a "low value-added" segment of a global value chain (Sturgeon 2002). What has been assumed behind the upgrading imperative is that there is a limit of innovation in different economic context and that this predefines cluster firms to upgrade to "high value-added" activities. Dynamic technological innovation, which is very important for clusters in developing countries, does not play a role in the upgrading imperative. This might be the reason why studies of clusters in global value chains are restricted to technological stable industries, such as apparel and shoes.

Third, in global value chains, clusters are primarily connected through vertical relationships. Though many clusters in developing countries have transactions with global buyers (Schmitz and Knorringa 2000), supplier-buyer relationships are certainly not the only way for cluster firms to learn externally. Strategic alliances, competitor interaction and peer observation in trade fairs and professional conferences also are important mechanisms for cluster firms to learn from outside (Maskell et al. 2006). Humphrey and Schmitz's (2000) earlier conceptualization of an externalized cluster inherits a vertical understanding of clusters. As illustrated above, following the trend from a vertical to a horizontal and social interpretation of clusters, the next section synthesizes possible mechanisms of informal learning for cluster firms through horizontal linkages.

3 How clusters create knowledge from competitors: A horizontal framework

Previous cluster theories interpret competitor relations in different ways. In Porter's (1998) understanding, for instance, clusters of industry bundles are the national articulation of his diamond model, where fierce competition forces national firms to innovate. In a knowledge-based theory of clusters, firms do not interact directly with local competitors, but learn from them through monitoring as knowledge-creating organizations (Malmberg and Maskell 2006). In an institutional view, local firms do not only compete against one another, they also collaborate with each other in business associations or lobbies to protect mutual interest and provide public goods. In a global buzz environment, global competitors come together in a temporary fashion and learn from one another through face-to-face interaction and observations (Bathelt and Schuldt 2010). By combining all these interactions with competitors in a learning perspective, a horizontal knowledge-creating framework of clusters can be developed (Table 1).

Labor Mobility/Spill-offs. Since experience and knowledge are to a great extent embodied in individuals, tacit, inter-firm mobility of labor and new firm creation by previous employees naturally becomes an important mechanism for establishing dynamic learning processes from competitors. One feature of labor mobility and spin-off or spill-off processes is that they cannot be controlled by single individuals or organizations. They depend more on local culture and business spirit than on rules and regulations. Another feature related to labor mobility and spin-off processes is that they are mainly, albeit not exclusively, local in nature. Empirical studies and reviews on spin-offs (Longhi 1999) and regional labor mobility (Almeida and Kogut 1999; Power and Lundmark 2004) show that they frequently occur locally and, through this, facilitate knowledge diffusion within a cluster. The non-organized and mainly local character of these processes serves to provide new learning channels rather than conduits in the cluster (Owen-Smith and Powell 2004). These processes lead to a situation where firms do not need to specifically invest into learning opportunities, by just 'being there', they almost automatically benefit from such learning processes (Bathelt et al. 2004). However, this does not mean

that local firms equally participate in benefiting from or contributing to labor mobility and spin-offs. With their heterogeneous internal structures, clusters, especially at the early stages, benefit most from labor flows and spin-offs processes related to some key firms, as the cases of Fairchild in Silicon Valley or DEC in Boston demonstrate. The fact that some key firms play a major role in local labor mobility and spin-off processes is an important aspect of cluster evolution. In a horizontal framework of clusters, this aspect is also crucial to understand local knowledge creation and diffusion.

Table 1: *A horizontal learning framework for cluster firms*

Horizontal learning mechanisms	Conditions	Attitudes of agents	Spatial dimension
Labor mobility/ Spin-offs	Being there	Automatically	Local
Competitor interaction	Being enemy	Intentionally, passively	Local or global
Friendship tie	Being friends	Intentionally, actively	Local or global
Trade fair /Professional meeting	Temporary being there or being friends	Automatically, intentionally	Global

Friendship Ties among Competitors. If labor mobility and spin-off processes involve networks between managers, employees and/or new entrepreneurs, friendship ties between entrepreneurs and leading managers in competing firms should also be included in a horizontal framework. By peer friendships, we do not refer to collusion or other illegal collaboration between competitors. Assumptions about their rarity and their potential illegal nature may be the reason that competitor networks have not been emphasized in previous cluster approaches, even though recent studies adopt the view of economic actors as social individuals. In rational accounts of economic interaction in a competitive market, there is no room for friendship among competitors, but as social actors in differentiated markets, friendships are more than likely among entrepreneurs in the same industry. By sharing similar industrial experience and a common knowledge structure, in fact, entrepreneurs that are active in the same business are actually more likely than others to be friends, as they have a natural interest to communicate with each other and exchange experiences. From an economic view, there may be substantial potential benefits that derive from friendship networks of competitors as they likely stimulate ongoing exchanges through factory visits and personal communication, through which knowledge about technologies, products, management forms and markets are circulated. The significance of competitor networks is supported by an investigation of hotels in Sydney that found that friendship ties with competitors lead to drastic performance increases and that such ties are also more likely among competitors (Ingram and Roberts 2000). Similarly, empirical studies of clusters in developing countries point out that friendships among local family enterprises occur more often than not, especially in the early stages of a cluster (Nadvi 1999). Although related transactions among family firms and internal control by family members can do more harm than good to clusters if they dominate, kinship networks of firms that are engaged in similar activities may provide an important mechanism for local learning in regions with a poor knowledge pool.

Although individuals know each other very well when they are neighbors, proximity is neither a sufficient nor necessary condition for friendship networks of competitors. The fact that spatial proximity is not sufficient implies that friendships between competitors are selective, and the fact that geography is not necessary means friendship ties can also be trans-local. Two features distinguish informal learning within a friendship network from that through labor mobility and spin-off processes. First, since friendship networks of competitors are selectively cohesive, informal learning is not open to all local firms – just ‘being there’ is thus not sufficient. It requires time and efforts to be a member of a friendship network, and the more connected a

person is within friendship networks, the more learning opportunities they derive from competitors. Second, the potential non-local character of friendship networks enables learning from foreign competitors. Entrepreneurs in clusters may learn from peers in other countries through factory visits and regular talks.

Competitive Interaction. The elusiveness of understanding learning from competitors is that peers can learn from each other when they are friends, but can also learn when they are enemies or rivals. In contrast to collaborative learning through friendship ties, rivalry relationships involve competitive interaction. Competitive interaction is important for cluster firms because it provides incentives and information for learning. In global competition, radical innovations by firms can quickly encroach on their competitor's profits. The persistent pressure from global competitors drives cluster firms to invest in local research and development. In a localized context, the advancement of competitors can be even more pressing (Maskell 2001). Besides being forced to follow their peers' moves, firms could also get valuable information from their competitors when they are located near-by. In close proximity, peers automatically observe what others are doing as a process which is referred to as learning by monitoring (Malmberg and Maskell 2006). Learning by monitoring is due not only because of physical proximity, but also because the firms have common knowledge backgrounds for efficient comparisons. Little variations that are neglected by outsiders may be interpreted as significant information by local peers. The high sensibility of competitors makes learning from global competition possible. For example, strategies of global lead firms provide an important reference point for other firms in the industry to direct their future investments. Products of lead firms also become objects of reverse engineering for competitors.

Trade Fairs/Professional Conferences. In contrast to the above three permanent learning mechanisms from competitors, trade fairs and professional conferences are temporary and periodic clusters where firms can learn from each other (Maskell et al. 2006). Knowledge diffusion in trade fairs and professional conferences comes from both horizontal and vertical linkages. Here, we only focus on the former. What makes a temporary cluster different from a permanent one is the existence of global buzz that saturated with updated global information in an industry or technology field (Bathelt and Schuldt 2010). The ways competitors interact in permanent clusters, such as observation, competitive interaction, face-to-face communication, and social networking, are replicated in the few days during a trade fair. In temporary clusters, firms can observe the innovations and new directions of their competitors, and may reframe their competitive strategies later on. As competitors, the participating managers at trade fairs compete for customers through their new product offerings. As social actors, the same attendees may be acquaintances, former classmates or 'buddies' sharing a similar passion. Social linkages among competitors enable them to talk with each other during and after such meetings. As a result of formal meetings during these events, competitors that have never met before become familiar with one another, through which new friendships could develop later on. The social networking during trade fairs and professional conferences thus provides a basis for competitors to make contact and collaborate in the future.

Although these four learning mechanisms have been sketched separately, in reality, they operate as overlapping and reinforcing mechanisms. Labor mobility/spin-offs and trade fairs/professional conferences can, for instance, provide opportunities for the formation of friendship ties among competitors. Labor mobility/spin-offs may also drag firms into new competitive interaction. Conversely, competitive interaction also works in trade fairs and professional conferences. Overall, there are many ways how relations of cluster firms can be articulated differently in various settings and how these different modes of networks interact with each other to produce and reproduce inter-firm relations. It is important to note that the horizontal framework described above concentrates on informal learning processes. Formal networks of competitors, such as strategic alliances, technology licensing, and research joint ventures, have not been discussed here. This does not mean that formal networks of competitors are less important for learning processes of cluster firms. An interesting question is whether and under which conditions formal networks may be complementary to or in conflict with

informal learning channels for cluster firms. Before being able to answer this question, we need to have more in-depth empirical studies on formal and informal learning networks of cluster firms.

The horizontal networks discussed above exhibit different characteristics from vertical ones: From a perspective of vertical relationships, firms in clusters succeed if their relationships with suppliers/buyers can be maintained; in a horizontal framework, the success of cluster firms is dependent on whether they can learn as fast as or even faster than their competitors. Perhaps the most fundamental difference between the two dimensions is that a vertical view of clusters presumes firms to learn via transactions, while a horizontal framework argues that learning is possible without transactions and that this kind of learning is quite common. To illustrate how learning activities of cluster firms and particularly the horizontal dimension and competitive interaction drive dynamic changes in clusters, the divergent strategies of three lead firms in the heterogeneous toothbrush cluster of Hangji, China are investigated below.

4 Case selection and research practice

To investigate different types of learning processes, a convenient way is to compare how vertical and horizontal linkages can explain different behaviors of cluster firms. Since there are many types of value chains and different mechanisms of informal learning in the horizontal framework, an ideal case for such a study is a heterogeneous cluster that includes lead firms that are part of value chains with different governance modes and which interact with their competitors in different ways. The Hangji toothbrush cluster, located in China's Jiangsu province in the Yangtze River Delta region meet these criteria. Through the fieldwork in this cluster, I gradually recognized the theoretical relevance of this case and correspondingly adjusted the methodology of whom to be contacted and what to be discussed in interviews with local firms. In this perspective, the case of Hangji can be characterized as a theoretical sample and the research practice as a grounded theory construction process (Glaser and Strauss 1967).

The study of the Hangji toothbrush industry was originally initiated as a collaborative research project with a global lead firm in toothbrush industry. I and two managers in the global lead firm worked together to write a report on this cluster. The fieldwork, conducted in July 2007, included 13 interviews with entrepreneurs as well as interviews with the secretary general of the local business association and with government officials. Following a close-dialogue approach (Clark 1998), most of these interviews took more than two hours, and those with key informants, such as with two lead entrepreneurs and the association and government representatives, lasted for half a day. We first contacted the local government and the business association, which enabled us to explore and characterize the general structure of the local toothbrush industry. Following this, a group discussion with local toothbrush entrepreneurs was organized with the help of the local government and the business association. At this stage, I recognized that the different strategies of the three lead firms in the cluster would provide perfect basis for a comparative study of vertical and horizontal learning processes. After this, we conducted interviews with the founders of lead firms and with other local firms in the cluster and visited their factories, sometimes jointly with the secretary general of the local business association and one government official. The following analysis of the three lead firms in the cluster draws from this research practice.

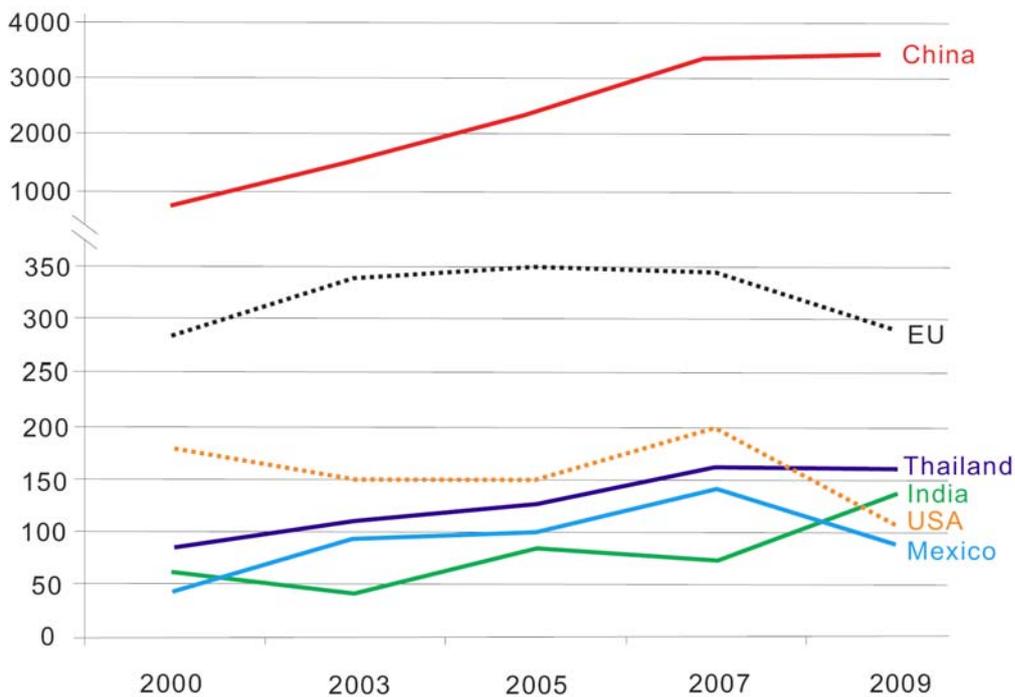
5 Diversification and divergence of three lead firms in the Hangji toothbrush cluster

With the rise of the manufacturing sector in Asia, the geography of the toothbrush industry followed a trend that is similar to that of other consumer-product industries, shifting from the U.S. and Europe to Asia (Figure 1). While toothbrush industry has been shrinking in the past ten years with fluctuations in the U.S. and the

EU and stagnation in Latin America, Asian countries, especially China, have become new centers of toothbrush manufacturing. Although already the world's largest exporter before 2000, China has gained more momentum since then, compared to other Asian countries. In fact, the global shift of toothbrush industry to China could be another narrative to study the expanding toothbrush cluster in Hangji, where 400 toothbrush and related firms agglomerate in a relatively small area of about 36 square kilometers producing 70 % of all toothbrushes in the country (Wang 2009).

The rise of the Hangji toothbrush industry can be explained by both the restructuring and integration of manufacturing facilities in multinational corporations and the explosive growth of local firms. First, in an industry that is characterized by products that are easy and cheap to transport and stable mature technologies, two business models are commonly adopted by global lead firms: One strategy is that of concentrated mass production where economies of scale can be realized. For example, since the 1990s, Colgate has increasingly reduced the number of toothbrush facilities in Latin America from nine to three locations and concentrated production. In 2006, it closed its toothbrush factory in Puerto Rico and expanded production in Hangji (Colgate-Palmolive 1998, 2006, 2009). Another strategy is outsourcing. In the case of Hangji, most orders are taken by local toothbrush firms generating a local production system of toothbrushes with a distinct social division of labor. Second, the rise of toothbrush firms in the cluster also benefits from a huge growing domestic market in China since the early 1990s when many toothbrush firms in Hangji were established.

Figure 1: Exports of major toothbrush producing countries, 2000-2009 (million units)



Source: United Nations Statistics Division (2010)

Among the 400 toothbrush and related firms, three lead firms can be isolated and distinguished due to their large size as well as their unique strategies (Table 2). The three lead firms were originally established in the early 1990s by local entrepreneurs, but have diverged in their later development.

Table 2: Comparison of three lead firms in the Hangji toothbrush cluster, 2007

Indicator	Lead firm		
	Colgate-Sanxiao	5A	Mingxing
Business mode	OBM	OBM	OEM (OBM)
Year of establishment	1989	1993	1991
Employees (number)	7000	2000	800
Annual production(million units)	900	600	360
Technology-related patents (number)	40	0	0
Design-related patents(number)	127	167	78
Organizational Status	Multiple sites	Single site	Single site
Ownership Status	U.S.	Chinese	Chinese
Export/domestic sales ratio	-	6/4	5/5
Main competitive advantage	Global brand	Quick design	High quality

Notes: OEM = original equipment manufacturer, OBM = original brand manufacturer

Source: Patents are retrieved from the website of China Intellectual Property

(<http://www.cnipr.com.cn>, accessed 5 December 2007); others are from author's fieldwork.

Employees, annual production and patents refer to 2006, and export/domestic ratio 2009.

Sanxiao used to be the largest toothbrush producer in Hangji and in the country. Traced back to a town-owned enterprise, Sanxiao was a pioneering model of privatization in China's transition to a market economy. After its transition to a family firm in 1989, the strong incentive of being a private firm and the founder's decision to focus on the rising rural market gave Sanxiao a competitive advantage over state-owned toothbrush enterprises at that time. Sanxiao quickly became a market leader with control of over half the domestic market. As multinational corporations are gradually involved in many clusters in China (Zhou and Xin 2003), Sanxiao was acquired by Colgate as its main global production base of toothbrushes in 2001. The integration of Sanxiao's high-efficiency-at-low-cost structure with Colgate's global high-price lead brand makes the combined activities of Colgate-Sanxiao the most profitable firm in the cluster.

The second lead firm in local community is 5A. Although incorporated as a private firm like Sanxiao in 1993, 5A dates back to a town-owned enterprise earlier in the 1980s. Starting from being an OEM, 5A now produces toothbrushes with its own brand name that are distributed in both domestic and international markets. As illustrated by a comparison of patents in Table 2, 5A is still weak in technological innovation, but builds up its strength in toothbrush design (State Intellectual Property Office 2006). The founder of 5A describes its strategy in comparison to a foreign market leader:

I could talk with our design team, and we may develop a new toothbrush in half an hour. But for P&G [Procter and Gamble], new product development begins from the choice and confirmation of design styles. That may take six months. After that, P&G has to check the new design not infringing any patent of global competitors. Then a prototype is made, and after that market potential research will be conducted in global branches of P&G. If the market research of a new product proves to be good, it moves to the next step of claiming patents in the U.S. and in EU. If the potential market is not good, then the development will end. For us, if we had such a long process, our new product would have been dead. For product quality, there are still gaps between us and Colgate or P&G because of the difference in equipment, machine operation and management, but for design speed, we have out-competed them. (5A founder, translated from Chinese)

The third local lead firm Mingxing, like 5A, also started from supplying global brand firms. The firm has become an important OEM in the worldwide industry although it produces relatively few toothbrushes under its own brand name. Mingxing is not remarkable in technical innovation or product design, but earns its reputation for producing high-quality toothbrushes. This has been achieved partly by two strategic actions, which have not been taken on by other toothbrush firms in Hangji: The first action is to buy all main equipment from abroad as machines produced by domestic firms are not stable and precise enough. Equipment from Germany is better but expensive. Most local firms use a mixture of both types of machines in their factories to meet different orders. With the intention to supply global brand firms and large retailers, Mingxing purposefully only uses equipment from abroad. Mingxing's second action was to build the only mold factory needed for the production of plastic toothbrush handles in Hangji. In toothbrush production, defects in the metal molds may not become apparent until after thousands of toothbrushes have been made. Because of the complexity of mold production, most toothbrush firms in Hangji are supplied by molds from Zhejiang province. The distance of 550 kilometers between the toothbrush firms in Hangji and the mold producers to some extent restricts quality improvements of toothbrushes in Hangji, as it is difficult to accurately articulate specific requirements of molds and swiftly make adjustment to different settings if mold producers are not on the spot. Mingxing's own mold factory guarantees high quality and thus contributes substantially to its competitive advantage in production. High product quality enables Mingxing to maintain its position as a key toothbrush supplier for global brand firms and large retailers, such as Wal-mart, Carrefour, TESCO and others (author's interview).

The above description of different strategies of the three lead firms poses the question of why and how this divergence and diversification occurs. Differences in equipment and molds may partly explain Mingxing's advantage in high-quality production, but it does not say much about practices of learning and knowledge creation that are key to the use of materials and tools and the successful integration of market opportunities. A more comprehensive explanation of diversified strategies of the three lead firms requires an investigation of their networking, interacting and learning processes. In the next section, inter-firm interacting and learning practices are explored that result from both vertical and horizontal relationships.

6 Horizontal and vertical dimensions of the divergence and diversification of lead firms

An explanation of the strategic choices of Mingxing and 5A based on vertical linkages could be drawn from Humphrey and Schmitz's (2000) framework of cluster upgrading in global value chains. Since 5A exports toothbrushes under its own brand name, the firm's relationships with global buyers resemble those of a market-based value chain. In such a value chain characterized by market-based governance, global buyers neither assist nor hinder the activities of cluster firms, for instance related upgrading attempts. Therefore cluster firms, such as 5A, that have a particular competence in product design, could, under this kind of value-chain governance, have more opportunities for functional upgrading than under a more hierarchical governance form. In our fieldwork, however, we do not find much evidence of 5A's learning from or confrontation with global buyers.

Mingxing, an OEM for global lead firms and large retailers, would likely be subject to an asymmetrical power distribution and operate in a quasi-hierarchical value chain. Based on Humphrey and Schmitz's (2000) framework, Mingxing's weakness in branding and strength in production can be explained by the proposition that a quasi-hierarchical chain favors process and product upgrading but hinders functional upgrading, as global buyers would assist partner firms in product manufacturing but would also prohibit them from developing their own brands to avoid new competition. In the fieldwork, there is no evidence that global buyers restrict the development of Mingxing's own brands. However, the argument of getting assistance from global buyers has been confirmed by the founder of Mingxing:

At that time, by supplying multinational corporations, we had effectively improved our management. One buyer even sent a technician from a toothbrush producer in their country to assist us. The technician lived in Yangzhou [the city which Hangji is subordinate to] for one and a half years. He came to our factory every day. To be honest, he provided some reasonable advice on technology and other issues. (Mingxing founder, translated from Chinese)

This value-chain-based explanation reveals a certain logic behind the divergence of local lead firms, but leaves many open questions. First, in the global value-chain framework, there is little discussion of hierarchal structure within multinational corporations, except indirectly treating it as one kind of value-chain governance. But this leaves important issues unanswered: Why, for instance, is Sanxiao integrated into the hierarchal structure of Colgate? How does the new venture Colgate-Sanxiao affect the local community and its linkage and power structures? Such questions cannot be easily answered when conceptualizing a cluster's vertical insertion into global value chains. Second, for the case of 5A, the vertical linkage structure does not provide a valid explanation. The fact that global buyers neither helped and nor hindered 5A's activities in a market-like value-chain environment provides evidence that the firm's advantage in design is not related to its vertical linkages with global buyers. Third, the vertical-learning explanation is most convincing in the case of Mingxing; but is this the whole story? Is there any evidence of horizontal learning dynamics that could equally, if not more, contribute to the firm's manufacturing advantage? To clarify these questions, we now turn to an exploration of the horizontal linkages of the three lead firms to offer an alternative explanation.

Competitive Interaction and the Colgate-Sanxiao acquisition. Sanxiao's acquisition by Colgate can be explained from a perspective of interacting competitors. Since its market entrance in China in 1992, Colgate has aimed to become the market leader similar to its position in other countries. However, Sanxiao already controlled more than 50 % of China's toothbrush market. If we take the global restructuring processes of toothbrush industry into consideration, the acquisition of Sanxiao was important for Colgate for at least three reasons. First, this acquisition enabled Colgate to absorb Sanxiao's manufacturing facilities and proceed with its strategy to concentrate toothbrush production in Asia. Second, Colgate was thus able to access Sanxiao's marketing channels across the country, compensating for its previous underinvestment in this field. Third, through the acquisition, a challenging competitor was eliminated. After the acquisition, advertisements of Sanxiao have gradually decreased and Colgate gradually took over Sanxiao's place as the leading toothbrush brand in China. For Sanxiao, the acquisition also makes much sense given its problems with family-style management structures, challenges of transforming retail outlets and increasing competition from local firms (Liu 2004; Wei et al. 2007). Like many local entrepreneurs in the cluster, the founder of Sanxiao was socialized under traditional Chinese society norms and thus managed and controlled the firm through family members. As it grew larger, this type of family-style management increasingly restricted the firm's activities, although it greatly contributed to the early development of Sanxiao. Second, the success of Sanxiao in the 1990s is due in part to the rise of rural markets. With the dynamic process of urbanization, the main retail outlets for toothbrush sales have changed. A transformation of sales outlets from independent convenient stores to chains stores and supermarkets has taken place – a process, which Sanxiao has not quickly adjusted to. Third, intensive competition of local firms also encroaches on Sanxiao's market shares. This competitive-interaction analysis of Sanxiao and Colgate explains why the acquisition was a win-win solution for both partners.

With the 45.6 million US-Dollars acquisition price from Colgate, the founder of Sanxiao has entered into new businesses producing mosquito coils and sanitary napkins – a market segment unrelated to the toothbrush business. Although smaller than his previous company, the new firm, also called Sanxiao, is also successful in the new market segment. The transition of Sanxiao from producing toothbrushes to mosquito coil and sanitary napkins can hardly be classified as inter-sectoral upgrading. Instead, it is competitive interaction that explains the acquisition of Sanxiao, and also sheds light on the learning processes between Colgate and other local firms in Hangji. Although Colgate has not joined the local toothbrush association and does not allow

other firms to visit its factory, local toothbrush firms still learn from formal management structures through monitoring their new neighbor and are forced to improve the working conditions and welfare situation in competing with Colgate for skilled workers. As one interviewee explained:

Colgate brings formal management experience to Hangji. Formality vs. informality refers to Colgate vs. us. Or, frankly speaking, Colgate provides employees holiday premium pays. We could not do that. We learn a lot from multinational corporations. They treat employees well. If you do not follow their way, you will have a big problem. (a local toothbrush entrepreneur, translated from Chinese)

The monitoring and interaction of competitors benefits both the local toothbrush firms as well as Colgate. By being located in Hangji, Colgate gets real-time information about technological progresses and new product launches of local toothbrush competitors. Such information is quite valuable for supporting Colgate's strategy formation and product development in the world market. The development of Colgate 360o toothbrushes in 2004, a worldwide success, basically imitates a design of 5A. The founder of 5A described this vividly as follows:

In the past, we would have used toothbrushes to clean our tongues, but that's not comfortable. For oral hygiene, tongue cleaning is very important since saliva with many bacteria sits on it. Thinking this, in 2003, we designed a toothbrush with a tongue cleaner on the back. That toothbrush could clean and massage your tongue when you brush your teeth. After that, Colgate imitated our design. Have you seen the advertisement of Colgate 360o toothbrushes on TV? It would infringe our patent to add a tongue cleaner of 10 centimeters on the back. So they [Colgate] did it with a little change. Toothbrush in the front, tongue cleaner in the back, that's called 360o. (5A founder, translated from Chinese)

Role of Trade Fairs and Competitive Interaction for 5A. The 360o toothbrush further illustrates 5A's advantage in developing new product designs quickly. Why does 5A, as opposed to other local firms, adopt such a strategy and emphasize its own brand? The development of a private enterprise like 5A is steered by its founder. Therefore, the answers to 5A's strategy center around its founder's decisions. The founder of 5A is an entrepreneur with a strong spirit of patriotism. 5A's strategy as an OBM has been formed by a patriotic entrepreneur within a specific historical context. Before the establishment of 5A, the founder was a manager of a local town-owned toothbrush enterprise which exported all products without having its own brand until the event at Tiananmen Square in 1989. After the event, the U.S. and Europe did not allow toothbrush imports from China. This experience inspired the founder's patriotism. He established his own firm in 1993 with the name of 5A, which means "love our party, country, firm, people and job", and transformed 5A from an OEM to an OBM.

If 5A's transition to an OBM is viewed within the historical context, the firm's focus on design may also be explained from a specific event at a trade fair. In the early stages of the cluster, toothbrush styles were shared by the local community as common goods. The importance of patents and property rights was recognized by the founder of 5A during the 2000 Canton Fair. The Canton Fair, the biggest trade fair in China (Xin and Weber 2009), is a great opportunity for export-oriented firms like 5A to receive international orders (Sandberg 2009). Besides the vertical linkages with buyers during trade fairs, horizontal interaction with competitors turned out to be significant for 5A's strategic rearrangements:

At that time, Colgate and P&G, with officials of State Intellectual Office, accused our products of infringing on their patents and forced us to take our products away from the trade fair. When we came back, I established the rule that any toothbrush must be claimed before selling it. After that, we showed our patent documents at the Canton Fair, and they [Colgate and P&G] had nothing to say but go away. (5A founder, translated from Chinese)

Friendship Ties Between Mingxing and Global Competitors. If competitive interaction helps understand the rationales behind the Colgate-Sanxiao acquisition and 5A's choice of a design strategy, Mingxing's focus on production may also be explained through horizontal networks and related learning processes, rather than through vertical assistance from global buyers. In the narrative of Mingxing's founder discussed above, assistance of global buyers has, in fact, been realized through a technician from a peer factory. What the global buyer did in this case was to connect two competitors through its powerful position in the toothbrush value chain. Besides this role in networking, the relationship with the global buyer is primarily focused on product specifications and less on technology progress and innovation. As both are specialized in different activities, there are limited possibilities for technological collaboration. In contrast, horizontal interaction appears to be more significant for the technological advances of Mingxing. For Mingxing to outperform local competitors in production, local horizontal friendship ties are neither required nor necessary. Mingxing is not involved in (and not interested in) systematic learning from local competitors because the firms in the local community are not as technologically advanced. Learning processes through labor mobility and observation of nearby firms in the field are enough to get to know what local competitors have achieved and how they have done this. What makes Mingxing superior in production compared to other Hangji firms is its learning from global competitors, based on weak-tie networks of entrepreneurs. The founder of Mingxin remembers his journey to visit factories in other countries and describes how the firm became so competitive:

There are not many opportunities to learn abroad, but I have visited most of the big toothbrush factories in the world: one in the U.S., three in Germany, one in Switzerland, one in Italy and one in Latin America. For example, the linkage to the one German toothbrush firm was first initiated by the German entrepreneur. He asked us whether he could visit our factory, and we said no problem. At the end of his visit, I said that in the future, if there were chances, we might also visit his factory. So I visited his factory last year. By visiting our factory, he may learn how we could produce toothbrushes at such a low cost. By visiting his factory, I could learn difference on management styles and many other issues. (Mingxing founder, translated from Chinese)

Labor Mobility in the Local Community. The three informal horizontal learning mechanisms discussed above provide alternative explanations for the divergence and diversification of three lead firms. As mentioned in the theoretical discussion, labor mobility and spin-offs are channels that may have a positive effect for the entire local community in an informal way. Because of this paper's focus on three individual firms, the effects of local labor mobility and spin-offs are somewhat obscured. In our interviews with local entrepreneurs, especially with the founders of Mingxing and 5A, however, the high mobility of labor has been widely recognized. Although the entrepreneurs regarded labor mobility or job hopping as a "problem" that has to be solved, there is little they were able to do. From a wider perspective, labor mobility facilitates knowledge diffusion in the local community and provides a passive learning mechanism for toothbrush firms, including the three lead firms. Being in a public position, the secretary general of the local toothbrush association recognizes the significance of local labor mobility:

In Hangji, resources are shared, not in a formal way. Labor flows and information flows. What Colgate has, other firms will also know. Also Colgate is 'stealing' information from other firms [and vice versa]. What Mingxing has, Colgate will know quickly. Thousands of workers are on the move. That is information flow. You cannot keep something as a secret [hidden from others]. (secretary general of the local business association, translated from Chinese)

7 Conclusion and Discussion

The horizontal dimension of economic clusters, that links peers and competing firms with each other, has rarely been systematically investigated in conceptual or empirical studies of clusters. In the context of cluster theory, a shift has taken place from vertical linkage argument to explanations that include the horizontal dimension and social networks. In parallel, conceptualizations have moved from internal relationships to systematically include external linkages of clusters. Related to this development, a horizontal learning framework for cluster firms has been formulated in this paper by integrating four mechanisms of informal learning discussed in the literature. Labor mobility and spin-offs are passive learning channels without single organizations taking charge. From these processes, firms can benefit by 'just being there' without dedicated extra-costs. By contrast, learning from friendship ties with competitors requires that firms are members of a social and economic network. To build weak ties with global competitors requires that entrepreneurs are open-minded and that networking efforts are made. Another common relationship among peers is competitive interaction, which can provide cluster firms with valuable information and drive competitors into certain strategies. All these types of horizontal learning can also be accomplished during international trade fairs and professional conferences. Though vertical interaction is very important, global competitors being together in the temporary global buzz during these events enable firms to learn about industry dynamics and innovation at a global level through face-to-face communication and observation (Bathelt and Schuldt 2010). In reality, the four horizontal mechanisms are, of course, overlapping, complementary and reinforce with each other.

To illustrate the importance of horizontal networks, the heterogeneous cluster of the Hangji toothbrush industry was chosen for an empirical study. Three lead firms in the cluster were established in the same time period, but their strategies quickly diverged. Sanxiao has been acquired by Colgate; as an OEM, Mingxing earned its reputation by producing high-quality toothbrushes; and 5A owns its own brand name and builds competence based on quickly changing product designs. From vertical linkages in global value chains, the different choices of Mingxing and 5A may be partly explained through quasi-hierarchical or market relationships with global buyers. A horizontal framework, however, provides a more comprehensive understanding of these processes: competitive interaction best explains the win-win situation associated with the Colgate-Sanxiao acquisition; the peer observation at the Canton trade fair has been significant for 5A's strategic rearrangement and focusing on product design; and friendship ties provided many opportunities for Mingxing to learn about better practices in manufacturing from global competitors. In addition, labor mobility has also been recognized as an important informal learning mechanism for the local community.

As discussed, the horizontal framework primarily focuses on informal learning processes of cluster firms. This paper paid less attention to the formal methods of knowledge diffusion, such as strategic alliances, technology licensing and joint R&D. This is due to the fact that the case of Hangji does not provide opportunities of observations on such formal learning mechanisms. It should also be recognized that horizontal linkages encompass more than mechanisms of learning. Governance connections of local competitors are also significant for the cluster development. In Hangji, for instance, the local business association, a formal self-organized institution, has initiated many well-accepted projects and performed important tasks for the local toothbrush industry to ensure cohesiveness. These include regional brand promotion, the construction of a patent database for cross-referencing and the coordination of local conflicts. The horizontal framework presented here is constructed from a knowledge and learning perspective.

Aside from theoretical aspects, the investigation of the three lead firms in the Hangji toothbrush cluster also raises some issues related to regional industrial policies. Many regional studies have, at least implicitly, been dominated by a normative orientation. Cluster research, for instance, implicitly argues for the reproduction of similar structures in almost every instance, initiated by the outstanding performance of some success regions. For a long time, common features of successful clusters have been presumed rather than studied thoroughly in

empirical investigations. Similarly, the upgrading narrative assumes a linear process to success for peripheral regions in the context of developing countries. While these studies may differ in what successful regions would be or which road clusters should follow, but they share the view that a regionally-based strategy exists and is pursuable.

A broader heterogeneous view of clusters, as illustrated by the divergence and diversification of three lead firms in the Hangji toothbrush industry, casts doubt on the fundamental assumption of conventional cluster studies: is there really a common strategy for all clusters or regions? As discussed above, the lead firms in Hangji all chose different strategies. They have all been more or less successful, and it is hard to evaluate which is better. This clearly speaks against the ideal that best-practice solutions pointing at a general path toward upgrading exist— be it at the firm or regional level. In the case of Sanxiao, some local entrepreneurs regard its development as a failure since the founder left the toothbrush industry; but using the financial resources acquired from the acquisition through Colgate, the original entrepreneur has become successful in new industries (a development that can hardly be characterized as inter-sectoral upgrading). For Mingxing and 5A, the upgrading narrative may prefer 5A's choice as it based on the successful development on its own brands; but from an economic point of view, 5A – although being larger – it is not as profitable as Mingxing. It may be contested whether profitability is a good criterion to evaluate success; in a long-run the strategy of 5A will likely be more profitable, but it is too early to tell. Overall, the case of Hangji suggests exercising care rather than over-interpreting developments in the short-term. It calls for reflections rather than provides solutions to the fundamental question of economic development. The obvious fact that there are different possible avenues to successful economic development, although not “all roads [may] lead to Rome”, has also been recognized by the local business association as expressed by the secretary general in a conversation:

Mingxing does OEM for Wal-Mart and TESCO. It is also big, produces mold by itself and does well. Now Mingxing is more profitable than 5A. It's hard to say whether joint-venture or OEM should be encouraged. (secretary general of the local business association, translated from Chinese)

This points at a challenging puzzle for regional industrial policy makers. While conventional approaches are normative and suggest a single best way to success, in light of the above research what is needed is a relational, open, multi-path framework for economic development that stimulates different learning and innovation processes rather than prescribes best-practice solutions.

References

- Almeida, P., Kogut, B. (1999) Localization of knowledge and the mobility of engineers in regional networks. *Management Science*, 45: 905-917.
- Amin, A., Thrift, N. (1994) Living in the global. In A. Amin, N. Thrift, (eds) *Globalization, Institutions and Regional Development in Europe*. Oxford: Oxford University Press, 1-22.
- Amin, A. (1999) An institutionalist perspective on regional economic development. *International Journal of Urban and Regional Research*, 23: 365-378.
- Asheim, B.T. (1996) Industrial districts as 'learning regions': A condition for prosperity? *European Planning Studies*, 4: 379-400.
- Bair, J. (2005) Global capitalism and commodity chains: Looking back, going forward. *Competition and Change*, 9: 153-180.
- Bathelt, H. (2005) Geographies of production: Growth regimes in spatial perspective (II) – knowledge creation and growth in clusters. *Progress in Human Geography*, 29: 204-216.
- Bathelt, H., Malmberg, A., Maskell, P. (2004) Clusters and knowledge: Local buzz, global pipelines and the process of knowledge creation. *Progress in Human Geography*, 28: 31-56.
- Bathelt, H., Schuldt, N. (2010) International trade fairs and global buzz, part I: Ecology of global buzz. *European Planning Studies*, 18: 1957-1974.
- Clark, G. (1998) Stylized facts and close dialogue: methodology in economic geography. *Annals of the Association of American Geographers*, 88: 73-87.
- Colgate-Palmolive Company (1998) *Annual Report*, Retrieved January 20, 2011 from <http://investor.colgate.com/annual.cfm?archive=yes>.
- Colgate-Palmolive Company (2006) *Annual Report*, Retrieved January 20, 2011 from <http://investor.colgate.com/annual.cfm>.
- Colgate-Palmolive Company (2009) *Annual Report*, Retrieved January 20, 2011 from <http://investor.colgate.com/annual.cfm>.
- Coe, N.M., Hess, M., Yeung, H.W-C., Dicken, P., Henderson, J. (2004) 'Globalizing' regional development: A global production networks perspective. *Transactions of the Institute of British Geographers*, 29: 468-484.
- Gereffi, G. (1999) International trade and industrial upgrading in the apparel commodity chain. *Journal of International Economics*, 48: 37-70.
- Gereffi, G., Humphrey, J., Sturgeon, T. (2005) The governance of global value chains. *Review of International Political Economy*, 12: 78-104.
- Gertler, M.S. (2003) Tacit knowledge and the economic geography of context, or the undefinable tacitness of being (there). *Journal of Economic Geography*, 3: 75-99.

- Glaser, B.G., Strauss, A.L. (1967) *The Discovery of Grounded Theory: Strategies for Qualitative Research*. New Brunswick: Aldine Transaction.
- Humphrey, J., Schmitz, H. (2000) *Governance and upgrading: Linking industrial cluster and global value chain research*, IDS Working Paper No. 120, Institute of Development Studies, University of Sussex, Brighton.
- Humphrey, J., Schmitz, H. (2002) How does insertion in global value chains affect upgrading in industrial clusters? *Regional Studies*, 36: 1017-1027.
- Ingram, P., Roberts, P.W. (2000) Friendships among competitors in the Sydney hotel industry. *American Journal of Sociology*, 106: 387-423.
- Liu, X-M. (2004) I sell Sanxiao to Colgate, *World of IT Managers*, April, 5. URL: <http://bbs.brandmanager.com.cn/archiver/showtopic-2843-1.aspx>, accessed 16 January, 2011.
- Longhi, C. (1999) Networks, collective learning and technology development in innovative high technology regions: The case of Sophia-Antipolis. *Regional Studies*, 33: 333-342.
- Lorenzen, M., Maskell, P. (2004) The cluster as a nexus of knowledge creation. In P. Cooke, A. Piccaluga (eds) *Regional Economies as Knowledge Laboratories*. London: Edward Elgar, 77-92.
- Lundvall, B-Å. (1992) User-producer relationships, national systems of innovation and internationalization. In B-Å, Lundvall (ed) *National Systems of Innovation: Toward a Theory of Innovation and Interactive Learning*. London: Pinter, 45-67.
- Malmberg, A., Maskell, P. (2002) The elusive concept of localization economies: Towards a knowledge-based theory of spatial clustering. *Environment and Planning A*, 34: 429-449.
- Malmberg, A., Maskell, P. (2006) Localized learning revisited. *Growth and Change*, 37: 1-18.
- Malmberg, A., Power, D. (2005) (How) do (firms in) clusters create knowledge? *Industry & Innovation*, 12: 409-431.
- Maskell, P. (2001) Towards a knowledge-based theory of the geographical cluster. *Industrial and Corporate Change*, 10: 921-943.
- Maskell, P. Bathelt, H., Malmberg, A. (2006) Building global knowledge pipelines: The role of temporary clusters. *European Planning Studies*, 14: 997-1013.
- Meyer, D. (1998) Formation of advanced technology districts: New England textile machinery and firearms, 1790-1820. *Economic Geography*, 74: 31-45.
- Morgan, K. (1997) The learning region: Institutions, innovation and regional renewal. *Regional Studies*, 31: 491-503.
- Nadvi, K. (1999) Shifting ties: Social networks in the surgical instrument cluster of Sialkot, Pakistan. *Development and Change*, 30: 141-175.

- Oro, K., Pritchard, B. (2010) The evolution of global value chains: Displacement of captive upstream investment in the Australia-Japan beef trade, *Journal of Economic Geography*, doi: 10.1093/jeg/lbq008.
- Owen-Smith, J., Powell, W.W. (2004) Knowledge networks as channels and conduits: The effects of spillovers in the Boston biotechnology community. *Organization Science*, 15: 5-21.
- Piore, M.J., Sabel, C.F. (1984) *The Second Industrial Divide*. New York: Basic Books.
- Ponte, S., Gibbon, P. (2005) Quality standards, conventions and the governance of global value chain. *Economy and Society*, 34: 1-31.
- Ponte, S., Ewert, J. (2009) Which way is "up" in upgrading? Trajectories of change in the value chain for South African wine. *World Development*, 37: 1637-1650.
- Porter, M. (1998) *The Competitive Advantages of Nations*. New York: Free Press.
- Power, D., Lundmark, M. (2004) Working through knowledge pools: Labor market dynamics, the transference of knowledge and ideas, and industrial clusters. *Urban Studies*, 41: 1025-1044.
- Sandberg, S. (2009) Internationalization patterns of Chinese private-owned SMEs: Initial stages of internationalization and cluster as take-off node. *Progress in International Business Research*, 4: 89-114.
- Saxenian, A. (1994) *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*. Cambridge: Harvard University Press.
- Saxenian, A. (2006) *The New Argonauts: Regional Advantage in a Global Economy*. Cambridge: Harvard University Press.
- Schmitz, H., Knorringa, P. (2000) Learning from global buyers. *Journal of Development Studies*, 37: 177-205.
- Scott, A.J. (1993) *Technopolis: High Technology Industry and Regional Development in Southern California*. Berkeley and Los Angeles: University of California Press.
- State Intellectual Property Office of China (2006) *Report of Design-related Patents in Toothbrush Industry*, Retrieved October 15, 2010 from <http://www.sipo.gov.cn/sipo2008/zxft/hjqysxh/>.
- Storper, M. (1995) The resurgence of regional economies, ten years later: the region as a nexus of untraded interdependencies. *European Urban and Regional Studies*, 2: 191-221.
- Storper, M. (1997) *The Regional World: Territorial Development in a Global Economy*. New York: The Guilford Press.
- Storper, M. (2009) Regional context and global trade. *Economic Geography*, 85: 1-21.
- Sturgeon, T. (2002) Modular production networks: A new American model of industrial organization. *Industrial and Corporate Change*, 11: 451-496.
- Sturgeon, T., Van Biesebroeck, J., Gereffi, G. (2008) Value chains, networks and clusters: Reframing the global automotive industry. *Journal of Economic Geography*, 8: 297-321.

- Sturgeon, T. (2009) From commodity chains to value chains: Interdisciplinary theory building in an age of globalization. In J.Bair (ed) *Frontiers of Commodity Chain Research*. Stanford: Stanford University Press, 110-135.
- Talbot, J.M. (2009) The comparative advantages of tropical commodity chain analysis. In J.Bair (ed) *Frontiers of Commodity Chain Research*. Stanford: Stanford University Press, 93-109.
- United Nations Statistics Division (2010) *The United Nations Commodity Trade Statistics Database*, Retrieved January 17, 2011 from http://data.un.org/Data.aspx?q=tooth+brush&d=ComTrade&f=_l1Code%3a96%3bcmdCode%3a960321.
- Wang, J-C. (2009) New phenomena and challenges of clusters in China in the new era of globalization. In B. Ganne, Y. Lecler (eds) *Asian Industrial Clusters, Global Competitiveness and New Policy Initiatives*. Singapore: World Scientific Publishing, 195-212.
- Wei, D.Y.-H., Li, W., Wang, C. (2007) Restructuring industrial districts, scaling up regional development: A study of the Wenzhou model, China. *Economic Geography*, 83: 421-444.
- Xin, J., Weber, K. (2008) The China Import and Export (Canton) Fair: Past, present and future. *Journal of Conventions & Event Tourism*, 9: 221-234.
- Zhou, Y., Xin, T. (2003) An innovative region in China: interaction between multinational corporations and local firms in a high-tech cluster in Beijing. *Economic Geography*, 79: 129-152.