

LOGISTICS INTENSIVE CLUSTERS

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ABSTRACT

Logistics-intensive clusters are agglomerations of three types of firms: (i) firms providing logistics services, (ii) firms that service logistics companies (such as truck maintenance operations, software providers, specialized law firms, international financial services providers, etc.), and (iii) firms that require significant logistics services (including manufacturers, distributors, retail logistics operations, etc.). The last category includes firms that are the customers of logistics services. This paper looks at the competitive advantage that industry clusters, in general, provide for participant firms and then it focuses specifically on the advantages for logistics cluster participants.

Keywords

Logistics, industrial clusters, co-location.

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INDUSTRIAL CLUSTERS

It has long been observed that industries tend to be geographically “clustered”. Well-known examples of clusters include the concentration of information technology firms in Silicon Valley and their counterparts along Route 128 in Massachusetts, film studios in Hollywood, wineries in the Napa and Sonoma valleys in California, biotechnology firms in Cambridge Massachusetts, finance and banking in Manhattan, newspapers on Fleet Street in the City of London, fashion and design in Northern Italy, computer products in Taipei, life science companies in Medicon Valley (spanning Eastern Denmark and Western Sweden), and countless others.

Agglomerations of firms that draw economic advantage from their geographic proximity to others in the same industry or stage of value addition is a phenomenon that was originally observed and advanced by the British economist Alfred Marshall in his classic work “Principles of Economics” (1920). Marshall hypothesized that the development of industrial complexes implies the existence of positive externalities of co-location. He attributed such externalities to three main forces: (i) knowledge sharing and spillover among the co-located firms; (ii) development of specialized and efficient supplier base, and (iii) development of local labor pools with specialized skills (see also Peneder, 1997). Michael Porter expanded on this hypothesis in a landmark paper in 1998, providing a detailed framework for cluster

analysis, as well as many more examples of clusters in various industries. His paper is focused on the competitive advantages and the increased innovation offered by clusters. He suggests that clusters affect competition by (i) increasing the productivity of the co-located companies, (ii) increasing the pace of innovation, and (iii) stimulating the formation of new businesses. In his words “a cluster allows each member to benefit as if it had greater scale or as if it had joined with others formally – without requiring it to sacrifice its flexibility” (Porter, 1998).

The two major types of inter-firm relationships which contribute to the success of clusters can be defined as being vertical and horizontal. Vertical relationships are links between trading partners. All firms today rely on suppliers of various types and, after adding their own value, they sell their product or service to customers. Thus, on the procurement side they interact with a network of material and parts suppliers and an array of service providers. On the sales side they interact with distributors, customers, and other service providers. The management of these relationships is of prime importance, especially as firms have moved away from vertical integration and, increasingly, outsource a number of functions and stages of production. Thus, being close to one’s customers is one of the major forces pushing firms to co-locate next to their customers, while their suppliers co-locate with them. The ultimate examples of such vertical clusters may be those created by a single “channel master,” such as “Toyota City,” or the cluster of aviation suppliers servicing Boeing in

Everett, Washington. The BMW plant in Greer, South Carolina, employs 5,000 workers, yet it supports over 23,000 jobs in the state, as many suppliers decided to co locate around Greer (Shain, 2009).

Horizontal relationships are between firms at the same stage of production, such as automobile manufacturing plants in Detroit, Michigan, or film studios in Hollywood, California. Such firms both compete with each other and cooperate along dimensions that benefit them. Thus, they may create joint ventures to attack difficult markets or to explore basic knowledge that is still removed from application. They can also collaborate on lobbying the government regarding regulations that affect the entire cluster or for the provision of basic infrastructure. Examples of such competition/cooperation regimes include the industrial districts with historic craft traditions in Northern Italy, that are made up of multiple small firms specializing in design and manufacturing of fashion goods including footwear, leather goods, clothing and accessories. Such districts thrived especially in the 1970s and 1980s. Other instances of clusters consisting mainly of horizontal relationships include the mutual fund industry in Boston and the advertising industry in New York City. In the “horizontal clustering” model, economic advantage is driven by bonds of trust and association, which help firms learn from each other and trade knowledge – either explicitly or through the flow of human resources.

Naturally, most clusters include both vertical and horizontal type of relationships. Thus, Detroit and its vicinity is composed of not only many automotive plants but also legions of suppliers and sub-suppliers’ plants. And Hollywood hosts major studios but also a myriad of technical and artistic suppliers, as well as the professional human resources necessary to bring films to life.

The focus of this paper is on industrial clusters that are involved in the production and handling of physical goods. Unlike information technology, advertising or financial services clusters, our interest is in clusters that are focused on the movement, storage and convergence of “things.” The reason is that, in addition to generic cluster advantages, the participants in these clusters enjoy significant operational logistics advantages which we explore here.

WHY CLUSTERS?

The clustering phenomenon defies simple economic explanations. In some sense, why would firms want to be close to their competitors, losing advantages that distinct locations can provide? This is especially true in this day and age where communications are instantaneous across the globe and modern transportation links provide fast, reliable and inexpensive services.

In some cases, the answer is relatively clear. For example, the wine industry is concentrated in areas where the soil type, terrain, climate conditions, and water availability are conducive to growing grapes. Napa and Sonoma valleys alone include more than 1,000 commercial wineries between them. As Porter (1998) describes, around these wineries, these clusters attract an extensive array of suppliers supporting direct production (such as barrels, grape stock, labels, etc.), capital goods (such as specialized agricultural sprayers for water and chemicals; mower and slashers to keep rows clean of weeds; mechanized pruning systems, etc.), as well as an array of service providers for marketing, advertising and public relations.

The answers are also obvious when clustering reduces the search costs for consumers. Thus, as Utterback (2006) notes, expensive retailers congregate on Fifth Avenue in New York, while discounters are concentrated around Fourteenth Street.

Finally, the answer is also clear when one is dealing with a “channel master”. In this case, the lead firm, be it Toyota or Dell, requires suppliers, either explicitly or implicitly through service standards prerequisites, to locate close to the channel master, which is typically a large original equipment manufacturer (OEM).

In most cases, however, the reason for clustering is less clear. Recall that there are many well-documented examples of clusters in ancient times (consider, for example, Incense Route along the Horn of Africa, carpet-weaving in North-West Persia, glass-blowing in Phoenicia, the obsidian industry of Teotihuacán, Mexico), all of which created economic growth by clustering. It is not intuitive, however, to associate clusters with economic success in today’s global economy with its far-reaching and efficient supply chains, instant communications and the free flow of money and knowledge across borders. To counter this argument, economists have reasoned that as the advantages of specific locations and co-location diminish in terms of traditional factors of production (capital and labor), other factors increase

in importance. These include the exchange of tacit knowledge, which cannot be codified in an email attachment sent to a supplier; the trust among employees of different organizations, based on their multiple relationships outside the work environment; the ability to take advantage of physical infrastructure knowledge infrastructure (such as universities and research laboratories), legal infrastructure (in terms of reduced government bureaucracy and other regulatory hurdles) and information technology infrastructure. Another conundrum regarding clusters, from an economic stand point, is why firms in a cluster don't end up acquiring one another to create larger enterprises if closeness is so advantageous. Of course, to some extent this takes place in an active merger and acquisition environment. Yet, in many ways a cluster may be an optimal balance between the complexity and bureaucracy that hamper innovation in large enterprises, and the lack of scale that holds back smaller firms. In a dynamic environment, when innovation and fast market response are keys to competitive advantage, the tacit communication and trust-building between smaller firms (and between their employees, who share culture and extensive personal contact) allow for joint learning and adoption of best practices (Gertler, 2007). Yet the separate and independent decision making of the firms in the cluster may avoid "groupthink," allowing the cluster to adopt new technologies and process innovation, thus renewing itself and remaining competitive.

LOGISTICS-INTENSIVE CLUSTERS

The focus of this paper is a particular type of cluster – a cluster of firms with logistics-intensive operations. This includes mainly two types of companies: (i) logistics services companies, such as transportation carriers, warehousemen, forwarders, third party logistics providers (3PLs), customs brokers, and specialized consulting and IT providers, and (ii) companies with logistics-intensive operations, such as distributors, light manufacturing and kitting companies, as well as other companies who compete based on their logistics prowess.¹ Companies located in these communities benefit from both general cluster advantages and advantages specific to logistics-intensive companies. Naturally, many logistics clusters develop around transportation hubs, such as ports and airports. The main activities

around such transportation hubs include either transshipment or mode change (from vessel to rail, rail to truck, air to truck, etc.). Thus, for example, Singapore, Hong Kong, Shanghai, Rotterdam, Antwerp, Dubai, Los Angeles/Long Beach and the New York/New Jersey area have developed into significant logistics clusters around the large ports there. Similarly, several large cargo airports have developed into logistics clusters specializing in time-sensitive international trade. Examples include Memphis, Hong Kong's Chep Lap Kok, Shanghai's Pudong, Seoul's Incheon, Anchorage, Dubai, Frankfurt, London's Heathrow and Los Angeles. Note that many of the logistics clusters are agglomerated around locations with both a significant port and a large airport, allowing firms supporting international trade, such as forwarders, customs brokers, and legal service providers to serve both. Naturally, the "last mile" is invariably served by trucks so all logistics clusters include access to highway infrastructure and significant presence of trucking companies. By the same token, many of the port locations are served by railroads. Railroad hubs are often not in proximity to ports but rather in central geographical locations, such as Chicago and Kansas City in the US. Logistics clusters include many firms offering logistics services, such as transportation, warehousing, custom brokerage, forwarding, etc. Such firms routinely share capabilities in order to maximize utilization and offer superior service to their customers. Geographical proximity is central to these advantages which include the following: – Matching backhaul and head haul freight flows for transportation conveyances, allowing carriers to serve the logistics-intensive cluster with high equipment utilization and therefore lower costs. – Using each other's conveyances when capacity is tight on one and available at others. Thus, for example, DHL and UPS, despite being direct competitors, will use each other's airplane capacity when needed. – Allowing firms to trade warehouse capacity in real time. Similar to the use of competitors' transportation conveyances, competitors will lease, on a short term basis, warehouse capacity to each other, thereby serving the customers and reducing long term costs. – Having many warehouses in the same location means that the freight volumes in and out of the cluster location will be high and therefore the transportation service frequency will be high – a crucial service parameter for many shippers. – Co-location of logistics companies allows them to effectively handle the change of service providers. When a customer decides to use, say, UPS instead of FedEx at a certain location, the change involves many details which can be handled very effectively when the logistics providers are located next to each

¹ *The third type of companies in a logistics cluster – those who serve logistics Companies – are similar in the relationships to the logistics companies to any set of suppliers locating next to their customers, and enjoy no specific logistics advantages.*

other. Again, the customer benefits. As a testament to the significant and growing role of information technology and other specific knowledge-based human resources requirements in the logistics field, many logistics clusters support specialized advanced education. Thus, for example, the PLAZA in Zaragoza includes the Zaragoza Logistics Center with the MIT-Zaragoza Program in its midst, Singapore has established The Logistics Institute, a cooperation between Georgia Tech and the National University of Singapore, and the logistics cluster stretching from Rotterdam to the German border, is home to the newly established Dinalog, the Dutch Institute of Advanced Logistics.

CONCLUSIONS

Industrial clusters enjoy location advantages stemming from the power of the cooperation between cluster members. Clusters allow each member company to operate independently, yet enjoy many scale advantages of larger firms. Thus, companies in clusters may innovate and move with the speed of small firms, yet have access to resources at the scale of large firms. In many ways, a cluster may be the optimal arrangement between small, isolated firms and large, slow industrial behemoths. Logistics-intensive clusters offer additional specific benefits to cluster members in addition to the benefits available to members of any industrial clusters. These include efficient transportation and warehousing based on the ability to share resources and therefore deal effectively with demand variability. In many cases, when governments (either local or national) look to develop clusters, they fix their sight on the “sexy,” knowledge-intensive ones – envisioning a “Silicon Valley” in Europe, developing a bio-technology cluster, or a nano-technology industry in the Iberian peninsula, or even a film industry in Alaska.² Yet logistics clusters provide just as many advantages, and in many cases even more benefits to the local economy. The regional economic returns from logistics clusters are rooted in the typically large number of jobs created, in the surprising (to the uninitiated) sophistication of the industry in terms of use of information technology, as well as global financial services.

REFERENCES

- MARSHALL, A. (1920): *Principles of Economics*, London: Macmillan.
- PENEDER, M. (1997): “Creating a Coherent Design for Cluster Analysis and Related Policies”, Paper presented at the *OECD Workshop on Cluster Analysis and Cluster Based Policies*, pp. 10-11, Amsterdam.
- PORTER (1998): “Clusters and the New Economics of Competition”, *Harvard Business Review*, Nov-Dec.
- SHAIN, A. (2009): “Boeing Jobs: Suppliers Likely to Relocate”, *The Post and Courier*, Nov 1, 2009.
- UTTERBACK, J. *et al.* (2006): *Design Inspired Innovation*, World Scientific Publishing Co. Pte. Ltd., Singapore, 2006.
- GERTLER, M. (2007): *Tacit Knowledge in Production Systems: How Important is Geography?* In Karen Polenske (ed) *The Economic Geography of Innovation*, Cambridge University Press.

² See <http://nosubsidy.org/Home.html>

