

Influencing Factors of Product Diversification and Innovation: An Exploration of Geographic Clustering and Product Breadth

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Numerous scholars have considered the effects of the geographical clustering or agglomeration of firms. However, the debate over the relationship between firm clustering and firm outcomes has yet to be resolved. Based on our analysis, we propose that firms that are located in clusters benefit from a broader product offering or diversification. However, we also predict that increases in cluster size, beyond a certain point, yields a reduction in product breadth. Our aim in this article is to propose a roadmap for future research on product diversification, to more fully explicate the previous mixed cluster-performance results and strategic marketing implications.

INTRODUCTION

“Clustering includes both the phenomenon of a critical mass of one sector of an industry developing in one place such that other firms in that sector are attracted to that location, and the force of attraction that a core sector of an industry has on auxiliary sectors of that same industry to that location.”

Prevezer, 1997

The term “firm cluster” may be defined as a group of organizations located in close geographic proximity or as a geographic concentration of interconnected businesses in a particular region (Porter, 1990). Although research in the area of the geography of economic activities dates back to the work of Marshall (1920), the concept of clusters has attracted much attention more recently (Gordon and McCann, 2000). Interest has come from a variety of disciplines including economics, geography, sociological and management. Clustering research typically addresses questions of why clusters form, how they form and what benefits they offer (Maskell and Kebir, 2005). Numerous case studies have considered the relationship between agglomeration and performance and have resulted in important, yet conflicting findings. Some studies have concluded that firm clusters result in economies of agglomeration and others suggest diseconomies. Therefore, further research is needed to properly characterize the nature of the outcomes of agglomeration. In addition, a richer set of firm characteristics and conditions that impact the cluster structure and outcomes are yet to be analyzed. This study attempts to fill an important gap in the strategy, agglomeration and product development literature by focusing on product diversification outcomes and influencing factors.

Geographic proximity has been studied by a number of economists (e.g., Krugman 1991; Marshall 1920). For example, the concept of “agglomerative economies” suggests that geographically concentrated firms in the same industry benefit from access to skilled labor, existing channels of distribution, and

knowledge spillovers (e.g., Ciccone and Hall 1996; Goldstein and Gronberg 1984). This view has led to the concept of industry clusters (also known as “industrial districts”) among researchers in economic geography, regional development, and business strategy (e.g., Porter 1990, 1998a, b; Rosenfeld 1997; Saxenian 1994; Sternberg 1991). A considerable number of scholars in economic geography address the spatial concentration of industry. Much of the recent work among scholars in economic geography has focused on agglomeration economies—benefits to regions containing clusters or spatial concentrations of the same type of firms (e.g. Marshall, 1920; Arthur, 1990; Krugman, 1991).

According to Porter (1998b), clusters are “a geographically proximate group of interconnected companies and associated institutions in a particular field”. Thus, cluster theory points to the important role of external players, such as nearby suppliers, distributors, competitors, and researchers. Members of these industry clusters are said to enjoy a common set of external resources as well as close relational ties that foster knowledge exchange (Harrison 1992; Rosenfeld 1997). Cluster-based knowledge sharing largely reflects informal mechanisms rather than formalized cooperative arrangements (Enright, 1991). Cluster theorists argue that clusters offer a new way to view competitiveness and business strategy (e.g., Porter 1990, 1998a, b). A firm’s relationships (both geographic and social) with these broader constituents are believed to play a key role in its learning ability, innovation outcomes, and ultimate success (Porter 1998a, b; Saxenian 1994). Therefore, cluster theory may offer a unique perspective on marketing strategy by suggesting that individual firm-level outcomes are influenced by a manufacturer’s location in a geographically concentrated enterprise community.

For scholars, the issue of location is viewed as part of the broader study of the optimal relationship between the firm, its customers and suppliers (Piore and Sabel, 1984; Porter, 1990). The recent consideration of spatial issues involves a reconsideration of the relationship between the nature of the firm and transactions costs (Williamson and Winter, 1993; Pitelis, 1993). The primary reason for this refocus is said to have resulted from a growing awareness of the changes in the spatial organization of manufacturing and distribution activities (Shonberger, 1982; Best, 1990; Nishiguchi, 1994) and the growing communication possibilities.

Although the precise nature and outcome of clusters have yet to be settled by scholars, research findings across all disciplines are clear that local geographic distribution of firms is not random. Numerous empirical studies have confirmed that firms have a strong tendency to locate in close proximity, both within and between industries, however, an important question of how this phenomena is associated with performance has yet to be resolved. Although there are some studies that have considered the link between clustering and the performance of firms, there is no consensus on its effect thus far. Firms could reap a number of benefits from clustering with other firms, including the ability to share infrastructure and inputs, draw on a larger pool of labor, and take advantage of knowledge or demand spillovers (Marshall, 1920). However, in many industries, clustering also raises the prospect of heightened competition in product markets (Freedman, Kosova, 2010).

Thus, while the benefits of clustering have been well articulated, the possibility that there may be diseconomies of agglomeration is compelling. Empirical evidence has indicated a negative as well as positive relationship between cluster size and firm outcome. It is this tension that we seek to explore. Although some empirical work has begun, cluster research primarily concentrates on either developing theoretical framework or demonstrating industry clusters in practice through case studies of high-profile clusters (Ganesan, Malter & Rindfleisch, 2005). As far as we are aware, this is the first empirical study to consider the impact of a cluster of complementary organizations (or supply chain) within the same high-tech industry, as opposed to simply the competing manufacturers. This study attempts to offer a tentative step toward addressing a gap in the literature in terms of understanding how cluster characteristics impact firm product strategy, which has important implications for firm location decisions, as well as the development of local, state and national government policies (Folta et al., 2006). Conceptually, we explore the following questions:

- (1) How does geographical proximity relate to firms’ performance in terms of product breadth?
- (2) What is the relationship between cluster size and firm product breadth?

This study is in part a call for further research to more fully explicate the previous mixed cluster-performance results and marketing strategy implications. Such pursuits would significantly inform research related to geographical clustering or agglomeration and product breadth. The first section of the paper briefly describes the theoretical underpinnings and summarizes prior empirical studies on the effect of firm geographic clusters on the firm outcomes, all of which form the basis for the propositions. The paper concludes with a discussion and recommendations for future research.

LITERATURE REVIEW

Frequently purported across various disciplines (i.e. economic, geography, management) is the notion that clusters benefit the firm because of economies of agglomeration – the net benefits to being in a location together with other firms increase with the number of firms in the location (Arthur, 1990). This rationale suggests that the performance of geographically clustered firms improves with cluster size. However, this same phenomenon also raises the prospect of heightened competition in local product markets. Thus recent work has argued that larger clusters may expose firms to higher costs due to congestion (Pouder and St. John, 1996; Prevezer, 1997), which for high technology firms may come in the form of increased competition for valuable inputs, such as scientists (Zucker et al., 1999), or an increased risk of having their knowledge expropriated by geographically proximate rivals (Shaver and Flyer, 2000). Such congestion costs raise the possibility that there may be diseconomies of agglomeration.

In line with both cluster theory and research on new product development, our theory of how clustering influences product breadth hinges on the firm's acquisition and utilization of product-related knowledge and resources that promote successful breadth of products. Knowledge has previously been defined in the literature as technical information and know-how that is directly relevant to product development and/or offering (Rindfleisch and Moorman, 2001). Expansion of product offerings presents potential challenges and potential benefits to the firm (Grant, 1991). A large variety of product categories allow a firm to better meet the needs of customers and may ultimately attract a larger customer base. Product Mix refers to product baskets that may contain products that vary based on function, appearance and/or range of applications. The product mix decision involves knowledge of the firm's target market, project prioritization, resource allocation and technology selection (Chen, Lee and Tong, 2006). These factors have been demonstrated to have an impact on the firm's economic success (Mansfield and Wagner, 1975).

While some have argued the economic pros and cons of the product diversification strategy (Hotelling, 1929), our intent is to examine the product line characteristics simply from the viewpoint of a firm's ability to expand its product category offering, through knowledge acquisition in relation to its proximity to other firms in the same industry. The indicator of product mix or line structure examined in our paper is breadth, the number of different product categories offered by a company.

Economies of Agglomeration

Marshall (1920) theorized that three primary benefits occur to firms locating in clusters: access to a pool of specialized labor, access to a pool of specialized input providers (or suppliers), and technology spillovers among competitors. These externalities are thought to increase with the number of firms in a location due to economies of agglomeration. Many scholars since, have accepted the notion of "knowledge spillover" as a major factor for the clustering of innovative firms. The argument is based on the belief that the most efficient transfer of knowledge and innovativeness occurs among actors in proximity. In addition, when the firms in a cluster represent the same business sector, benefits are said to result from the fact that the cluster may attract more suppliers and customers than a single firm could alone, resulting in economies of agglomeration. Numerous empirical works have demonstrated that innovative manufacturers tend to cluster in locations where key knowledge resources are available (Audretsch and Feldman, 1996) that knowledge tends to spill over locally and diffuses more slowly across geographical distance (Jaffe et al., 1993). Regional clusters are a potential way through which location-based complementarities are realized (Delgado Porter, Stern, 2010).

One of the most important benefits of locating in a cluster is access to information and to people who have the tacit knowledge and the contacts which enable them to understand and contribute to newly developing technologies. For this, geographic location makes a difference. Social networks develop where information, expertise, and contracts can be easily exchanged, facilitating the transfer of knowledge across firms (Almeida and Kogut, 1997; Jaffe et al., 1993; Saxenian, 1994). These knowledge transfers seem to be particularly important for new and small firms (Acs et al., 1994). Larger clusters may also provide enhanced legitimacy, enabling members to better overcome the liability of newness (Pouder and St. John, 1996). The implication is that in the presence of economies of agglomeration, there should be clear performance benefits to firms locating in geographic clusters.

The knowledge base provided by the particular firm cluster is therefore available to the participating firms through knowledge spillover. Product diversification requires market, resource and technology knowledge (Chen, Lee and Tong, 2006). Such absorbed knowledge should be reflected in participating firms' business strategies, including product breadth. Thus,

Proposition 1: *The product breadth of firms will be positively related to the average product breadth of the geographic cluster in which they are located.*

There are several potential sources of the economies associated with agglomeration. As a location gains firms, it also gains useful infrastructure and a deepening labor market. Search costs for qualified employees may decrease. It may not simply be the concentration of skilled labor that distinguishes a region, but also the availability of suppliers and a variety of regional institutions—including distributors, specialized consulting, market research, testing services, angel investors, and venture capitalists—that provide technical, strategic, financial, and networking advice and services which the regions' firms often cannot afford individually. Agglomeration has a great potential to serve both entrepreneurs and supplier organizations. Firms can work closely with suppliers and customers in testing new technology. Spare parts and out-of-stock items may become locally available, which would reduce inventory costs for firms in large clusters. In contrast to non-clustered firms, suppliers in clusters may have lower search costs in finding suppliers and buyers. In this way, the beneficial effects of clusters multiply as the infrastructure develops and the greater number of participants provides additional knowledge, skills and know-how. Therefore,

Proposition 2: *The product breadth of firms will be positively related to the size of the geographic cluster in which they are located.*

However, the down-side of clustering is said to be the overcrowding that can result in the shortage of vital resources necessary for firm viability—diseconomies of agglomeration. Although the previous section speaks to certain benefits and characteristics of agglomeration, it is also important to weigh the costs against the benefits. Diseconomies of agglomeration may take the form of congestion costs, which increase with the size of a cluster (Prevezer, 1997). These costs associated with very large clusters may actually impede the firm's knowledge absorption and the product diversification process. Almeida and Kogut (1997) also make reference to these costs when they argue that only when there is sufficient technological opportunity relative to the number of firms in the cluster do the benefits outweigh the costs.

The organizational boundaries of firms in clusters may be permeable, with knowledge flowing out, as well as in. This reasoning led Shaver and Flyer (2000) to hypothesize that the strongest firms have the most to lose by participating in a cluster, so will prefer to avoid them. This may lead to adverse selection (Akerlof, 1970), where weak firms locate in larger clusters, while the best firms locate outside of clusters so they do not lose their advantage to geographically proximate rivals. Therefore, a negative relationship between cluster size and firm performance may develop. In an entrepreneurial environment, some of the best employees may start their own firms, thus taking the knowledge and relationships they have developed, away with them.

Costs on the supply side include congestion costs and competition, which may drive up the prices of labor and land. Indeed reports of Silicon Valley stress soaring real estate prices, high wages, shortages of housing, length of commuting times, all of which may deter companies from settling in a high cluster

community (Larsen and Rogers, 1984). On the demand side, there might also be saturation costs and costs from competition in output markets. Competition between firms within a sector in producing the same product may reduce firm-level profits. Therefore, a greater number of competitors may effectively decrease access to potentially scarce resources (Prevezar, 1997).

According to Pouder and St. John (1996), clusters in early stages of development experience rapid growth and the opportunity space should exceed the number of firms in the cluster. This suggests that firms participating in early-stage clusters should not yet be exposed to congestion costs and the diseconomies of agglomeration should be minor. As a result, a positive relationship should exist between cluster size and performance in the early stages of cluster development. However, as clusters grow beyond some point, the benefits to being in a cluster may decline. At some point, the costs may outweigh the benefits. Cluster size will positively influence technology firm performance when cluster size is small, and this effect may very well diminish.

The benefits of clusters are expected to dissipate as the number of the participating firms increase, thus:

Proposition 3: *There is a non-linear relationship between Geographic cluster size of high-tech firms and the product breadth of the firm in the cluster*

The proposed model is depicted in the Appendix (Figure 1)

DISCUSSION AND CONCLUSION

A debate ensues regarding whether the effect of clustering is positive or negative. Firms could reap a number of benefits from clustering with other firms, including the ability to share infrastructure and inputs, draw on a larger pool of labor, and take advantage of knowledge or demand spillovers (Marshall, 1920). However, in many industries, clustering also raises the prospect of heightened competition in product markets (Freedman, Kosova, 2010). Researchers have noted declining and even negative effects of firm concentration on new product development (Deeds et. al., 1999; Folta, Cooper, and Baik, 2006). This research suggests that competition for resources within highly concentrated geographic areas may decrease a firm's ability to create new products. This study provides a roadmap for future investigations, given our conclusion that the relationship is more complex than perhaps previously considered.

Based on our proposition, a non-linear relationship between cluster size and firm product breadth may help explain the previous mixed cluster-performance results. Thus, firms that are located in clusters may benefit from a more complete product portfolio. However increases in cluster size, beyond a certain point, may yield a reduction in product breadth. Firms within very large clusters may not benefit from knowledge spillover due to the eventual negative effects of congestion. Thus, this supports the view that saturation costs and costs from competition in output markets may, under certain scenarios, outweigh the benefits of agglomeration (Larsen and Rogers, 1984).

In sum, the model introduced in this paper has the potential to highlight the positive effect of clustering and may help shed light on the relationship between cluster characteristics and product breadth. We call for future research to empirically test our model, based on a specified sample and measurement formulation. Such research would be critical to answer the questions:

How does geographical proximity relate to firms' performance in terms of product breadth? What is the relationship cluster size and firm product breadth? Future research might also consider the impact of firm industry, age and length of time a firm is physically located in a cluster on product strategy. Although our purpose was not to examine the causal mechanisms underlying the relationship between firm clusters and firm product breadth, such analysis might present an interesting contribution to the literature.

Further study of the clustering-product mix relationships may offer a unique perspective on marketing strategy. Understanding how cluster characteristics impact firm product strategy has important implications for firm location decisions, as well as the development of local, state and national government policies (Folta et al., 2006). Manager may also find value in this study as they strive to understand how clustering with other firms in the same industry may influence product offerings.

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APPENDIX

FIGURE 1
PROPOSED MODEL

