INDUSTRY CLUSTERS AND INDUSTRY TARGETING

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IINTRODUCTION

The US economy is undergoing a well-documented structural change as a result of market globalization, revolutionary technological changes, and advances in production practices. Innovation, adaptability, and entrepreneurship are recognized as keys to the sustainable development of companies and regions in the New Economy where product life cycles are short and competition is intense (Acs, 2002). A popular public policy response to the new competitive environment is to create "regional production systems" within which existing businesses become more productive and new business start-ups are encouraged.

Porter (2001) argues that a firm's productivity will be enhanced if it operates in a regional business environment characterized by a concentration of competing and cooperating firms, high quality and specialized inputs, supporting industries and institutions, and sophisticated and demanding local customers. Many state and local programs designed to foster these regional production systems focus on the promotion of existing or emerging industry clusters (NGA, 2002). Porter et al. (2004, p. 63) even propose that “viewing regional economies in terms of clusters is central to understanding the competitiveness of rural areas and how it can be improved.” Chapter 6 by Woodward and Guimarães contains a more detailed discussion and critique of Porter’s influential work.

In this chapter we provide an overview of the industry cluster strategy for regional economic development and the role of industry targeting in helping regions and states identify innovative clusters and design policies for cluster growth. Our discussion first defines industry clusters and provides a summary of the advantages and disadvantages to a clustering strategy. Next, we introduce the concept of industry targeting, and the applications of industry targeting to industry cluster development. Our discussion of industry clusters and targeting focuses on their role in the economic growth of smaller regions. This is an important distinction as smaller cities and rural areas may not have sophisticated the inter-industry networking opportunities (urbanization economies) available in larger metropolitan areas. Thus, access to cluster-related benefits takes on added importance to micropolitan businesses and regions.

Although the term “cluster” has entered the vernacular relatively recently, the notion of targeting industries as an economic development strategy for small regions is not new (see, e.g., Chapter 3, this volume). Indeed, rural areas have long emphasized business recruitment as an important component of their development efforts. One important question, then, is how does a targeted industry cluster strategy differ from previous efforts, if at all? We discuss this question in detail in our concluding comments.

Why Industry Clusters?

Industry Clusters Identified

Porter (2001, p. 7) defines clusters as “geographically close groups of interconnected companies and associated institutions in a particular field linked by common technologies and skills.” An important aspect is that spatial concentration enhances national and global competitive advantages across firms. These advantages arise from a variety of inter-firm spillovers of factors such as technology, knowledge, as well as region-level agglomeration effects, such as shared input suppliers.

Although industry clusters are common in smaller regions, each cluster is unique because of differences in sizes, core industries, and inter-firm relationships. For example, a cluster may consist of firms engaged in producing similar products such as log homes (Montana) or houseboats (Kentucky). Establishments in these "horizontally" organized clusters benefit from the availability of a pool of skilled and specialized labor (Kim, Barkley, and Henry, 2000). Clusters also may comprise establishments in value chains (auto assembly plants and suppliers) or firms linked by their reliance on similar specialized services (e.g., research and development facilities or education and training services). Finally, McCann (1995) suggests that some industry clusters result from establishments independently selecting the same location because that location provides proximity to a shared resource or market. In this case, the establishments may have little interaction and experience few benefits from locating near one another.

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Markusen (1996) also proposes that industry clusters may be categorized into four general types according to their industrial structure: Marshallian, hub-and-spoke, satellite platforms, and state-anchored clusters (table 2.1). Marshallian clusters are composed primarily of locally-owned, small- and medium-sized businesses in the more information and technology intensive industries. The information technology cluster in New York is one example.

Hub-and-spoke clusters are dominated by one or several large firms surrounded by related input suppliers and service providers. Here, the Toyota Motor Manufacturing plant in rural Georgetown, Kentucky is a notable example. After the plant opened in 1988, the region witnessed a significant increase in local suppliers related to the automotive giant. Satellite platforms consist primarily of the branches of large multi-plant companies. These differ from hub-and-spoke clusters in that the branch plants tend to be relatively large and independent. Thus, the availability of local input suppliers is not as critical.

Finally, in the case of state-anchored industry clusters the local regional economy is dominated by a large public activity (e.g., university, military base, or government office) and the supplier and service sectors that develop around them. Notable small communities include Corvallis, Oregon and State College, Pennsylvania, where large state universities serve as the economy's lifeblood, both through direct impacts and technology related spin-offs.

As we show in table 1, each of the above cluster types offers different inter-firm interdependencies and prospects for growth. Each cluster type also requires a different policy focus for improving the competitiveness of the cluster.

Industry Cluster Advantages and Shortcomings

Targeted industrial development programs at the industry cluster level are founded on the perception or belief that cluster growth will provide greater local economic development benefits than less focused efforts (Barkley and Henry, 1997). Three principal advantages accrue to establishments in clusters and their host regions that enhance the competitiveness of both the firms and regions.

- Industry clusters provide production and marketing cost savings (localization economies) to member firms. Sources of potential cost savings include access to specialized input and service providers; a larger pool of trained, specialized workers (for example, software engineers in the Silicon Valley); and public infrastructure investments and financial markets geared to the needs of the industry.
- Industry clustering provides establishments with a greater ability to focus on their core activities and to adopt new production technologies and organizations (NGA, 2002). Highly competitive product markets mandate rapid adaptability to market changes, and clusters provide a more conducive environment for change.

- Industry clustering facilitates the development of linkages, cooperation, and collaboration among area firms. Inter-firm networking enhances information sharing in marketing, new product development, and technological upgrading. Rosenfeld (2002, p. 7) argues that “Innovation, imitation, and entrepreneurship are what propel virtually all competitive clusters.” Intra-cluster networking helps provide the knowledge spillovers critical to product development and new firm spin-offs. The importance of clusters to new firm start-ups is supported by Gabe’s (2003) findings that new business activity in an industry is positively associated with the region’s industry cluster size.

The potential benefits from cluster development have encouraged many states and regions to structure their industrial development programs around clusters. For example, Pennsylvania has identified nine industry clusters that are the focus of the Commonwealth’s workforce development programs. This strategy however, has three potential pitfalls and shortcomings.

First, regions will have difficulty “picking winners,” i.e., identifying industry clusters that best fit their local economies. The successful development of a competitive industry cluster is most probable if a regional competitive advantage exists, often the result of past industry location patterns. Yet, potential problems facing smaller regions are summed up by Porter et al. (2004, p. 61), who acknowledge that "There is still no rich understanding of the composition and evolution of rural economies at the industry cluster level . . ." A further complication to "picking winners" is that the political process will be "too inclusive" rather than "too selective" when selecting industries for cluster promotion (Peck and McGuinness, 2003). The consequence is a dilution of resources available for cluster development programs. For example, Pennsylvania's targeted industries encompass nearly 69 percent of the Commonwealth's total employment.

The second shortcoming is that many regions, especially smaller ones, have clusters in declining industries or no clusters at all. For such regions, it may not be prudent, or even possible, to pursue cluster strategies. In these situations, Rosenfeld (2002, p. 13) suggests that development practitioners look for local connections to clusters in adjacent regions or "re-orienting the central theme of the cluster from some commonality of the production process to a commonality related to knowledge, innovation or entrepreneurship."

The third shortcoming is that a focus on cluster development may lead to imbalanced economic development across the region or within segments of the population. Martin and Sunley (2003, p.28) argue that “[t]he danger of a cluster-based approach to policy is that it detracts from the need to take a more holistic view of regional development.” In their simplest formulations, cluster policies fail to account for other sources of economic prosperity as identified in the literature, such as innovation (Acs, 2002); entrepreneurship (Acs and Armington, 2003); human capital (Mathur, 1999); local quality of life (Deller et al., 2001; Florida, 2002); and social capital (Sobel, 2002; Rupasingha et al., 2005). As such, Feldman and Francis (2004, p. 135) recommend that “[r]ather than target specific industries or technologies, effective state policy might focus on creating conditions that would allow firms to grow and prosper.” DeBreschi and Malerba (2001) are more specific and argue that cluster development policies should focus on improving local education and labor quality, infrastructure improvements, and small business development.

In summary, the benefits provided by a successful cluster development strategy will be realized only if the strategy addresses the above shortcomings. A well-designed industry targeting program can increase the likelihood of cluster development by helping regions identify (1) existing or potential innovative clusters;

(2) industries linked to the selected clusters through value chains, labor pools, and technologies; and (3) programs to enhance innovation and entrepreneurship within the clusters. Next we provide an overview of targeting methods that regions may adopt to better position themselves to take advantage of cluster-based growth.

Cluster Targeting and Policy

Over the past ten years or so, the cluster concept has taken hold among both economic development policy makers and practitioners. Responding to the 2001 national economic downturn and increased worker insecurity as a result of globalization, it appears that these long-known ideas are moving beyond political rhetoric. Nowadays, key phrases of the cluster vernacular--such as value-chains and agglomeration effects—roll off the tongue of governors, economic development agency heads and local leaders. Indeed, numerous states and regions have identified key industry clusters to serve as cornerstones of their economic development efforts. For example, like Pennsylvania, Iowa has identified clusters to serve as the basis of its economic development strategy, focusing on BioScience, Advanced Manufacturing and Information Solutions.

Alongside theoretical advances, the cluster concept has enjoyed myriad practical innovations--primarily identification methods. From the resurgence of interest in location quotients to the emergence of neural network analysis, researchers and consultants implement both tested and new techniques in order to help regions recognize local sectors with competitive advantages that can serve as growth engines. In practice, these sectors can range from traditional resource extractive industries to high-tech manufacturing, from financial services to retail trade.

From a policy perspective, the driving force behind cluster analysis is the desire to identify the sectors, industries, and processes that propel a regional economy. Here, the focus is as much on the cluster's competitive structure (such as inter-firm relationships and local capacity) as it is on the products themselves. Once identified, cluster-specific economic policies can be designed to strengthen their performance or tap their potential. For example, a region promoting a food manufacturing cluster might use its workforce development funds to put together a food safety training curriculum for incumbent workers. Or, an industrial development corporation trying to lure a new business might focus their efforts on firms with business service needs similar to those already in place. Here, the goal is to enhance the efficiency of existing resources and processes.

Consequently, one outcome of the rise of cluster-based economic development is a renewed interest in economic targeting. In its modern variant, targeting is the process of identifying the sectors or clusters that are most likely to prosper in a region, given the region's characteristics. While methods vary, most targeting programs generally have two components. The first is a means to identify clusters that have a high potential for locating or expanding in the area. In this respect, analysts assess detailed sector trends, particularly with an eye towards how clusters line up with regional characteristics.

The second component is more subjective, and involves narrowing candidates to sectors that provide attractive local economic development impacts, such as future job growth, high wages, contributions to the local tax base, and minimal negative environmental impacts. After assessing potential sectors, regions decide which of these characteristics are most important and target clusters accordingly. In the end, targeting efforts aim to identify a small set of clusters that are the best match given a region's specific capabilities and preferences. These can include both existing and new industries.

Although often derided as “smokestack chasing,” a well-defined targeting strategy enables regions to focus their economic development activities. Such efforts usually include recruitment, but also may rely on local business retention and expansion activities, and entrepreneurship, incubation and small business development programs. Thus, targeting permits a more efficient use of limited economic development resources.

As already noted, the fact that it is very difficult to “pick winners” is well-known. Still, thousands of economic development practitioners and state and local policymakers work everyday on exactly that. While regional economists tend to look unfavorably upon these efforts, there is no reason to expect that this long-standing practice will disappear anytime soon. Accordingly, analysts interested in having a “real world” impact may need to accept a less than optimal outcome. While perhaps a disheartening result for purists seeking an ideal solution, policy relevance is an important virtue as well. And, fundamentally, working in this context is not that much of a compromise. Because efficiency remains one of the pillars of economics, regional economists still have much to contribute. For example, they can bring their quantitative skills to bear in helping regions pare down the seemingly infinite list of potential candidates into a more manageable set; call it “conditional efficiency” (i.e., the best outcome in an imperfect world). In the remainder of this chapter we describe some of the key components of such efforts. More detail is given in the chapters that follow.

Using Location Quotients in Cluster Targeting Analysis

The location quotient (LQ) is, perhaps, the most prevalent method in use today for identifying existing and potential clusters. A common application of LQs is identifying a region's importing and exporting industries. An exporting industry not only meets the local demand for its products, but also produces enough so as to sell outside of the region. An importing industry is one in which local production levels are insufficient to meet local demand.

The LQ approach is appealing in that it is both intuitive and easy to calculate from readily available data. In practice, this analysis is most informative when using the most disaggregated employment data available for the region (NAICS 3- or 4-digit). The basic formula for the location quotient is:

LQ = (%LEi / %NEi) = percent of Local Employment in Industry i divided by the percent of National Employment in Industry i.

Simply put, the LQ identifies how local industries stack up against national averages.

When interpreting the data, an LQ greater than 1.0 indicates that the economy is self-sufficient, and may even be exporting the good or service of that particular industry. Any exporting industry might be a strong candidate for further development. Used in conjunction with local expertise, the LQ can help identify industry clusters. Strategies centered on LQ analysis tend to complement their identification methods with qualitative techniques, such as focus groups and interviews with industry experts. This process can help policy-makers interpret aspects of the quantitative research, develop a better picture of the relationships among local industries, and identify similar workforce or infrastructure needs.

Despite their popularity, LQ analysis has several drawbacks in both application and concept. From a practical standpoint, comprehensive LQ analysis relies on data that may not be available for small regions. For example, disclosure rules may mean employment data are not available in sufficient detail to conduct meaningful cluster analysis. Specifically, government regulations prohibit disclosing employment data when individual firms might be identified. As an example, if there are only one or two firms operating in a particular industry in a given region, the government will not disclose this data through published sources. As this is fairly common in small and rural regions, potential clusters may be missed if analysts lack in-depth knowledge about the economy under scrutiny.

But conceptual problems may be of greater concern. By construction, LQs focus on single industries. Thus, while LQ analysis might help identify industries that are regional strengths, they do not necessarily identify clusters. This is an important distinction in that the cluster development concept is much broader than the industry development concept. The latter tends to focus on the needs of individual firms, whereas the former considers the entire value chain, the competitive structure within the region, and various local information networks.

Recognizing these shortcomings, analysts weave the LQ approach into more sophisticated cluster identification efforts. For example, David Barkley and Mark Henry's approach at Clemson University (Chapter x) follows three main steps.

1. Use the LQ to identify industry concentrations within which the region has experienced recent employment growth.

2. Construct value chains for the industry clusters selected in Step 1. Using input-output models, identify industries in the value chains with the greatest linkages to the local industry concentrations.
3. Rank the selected industries from Steps 1 and 2 by expected economic and fiscal impacts on the local economy. Methods for estimating and evaluating impacts are detailed in a recent book on Community Impact Simulation Models (Otto, Johnson and Deller (2006)).

One key component of their analysis is the use of relative local employment growth rates as a way to identify "promising" industries. An industry with a comparatively high growth rate may indicate an area of competitive advantage.

Fostering Serendipity

Despite recent advances in cluster identification methods, the fact remains that most techniques in use today classify, at best, historical and current strengths of the local economy. For example, a typical application of the location quotient method might identify an industry cluster as having an LQ greater than 1.2. By this criterion, in order for any cluster to reveal itself, it must already have a relatively strong presence.

Such an analysis, though useful, can be incomplete or (misleading) for a number of reasons. First, like a mutual fund, past performance is no guarantee of future success--a lesson confirmed by many long-lost rural manufacturing industries. Consequently, relying solely on established industries can be a limiting, or even wrong-headed, strategy.

A related effect of requiring a strong historical presence is that most cluster identification methods are incapable of identifying emerging or potential industries. In today's economy, being first matters. Because most cluster identification algorithms depend on detailed published government employment data, which is often released one year or more after it is collected, it may take several years to recognize important trends.

As a result, cluster analysts often arrive "too late." Rather than helping regions build advantages, the analysts' role is generally one of trying to explain why the cluster emerged. Often unable to do so, we commonly attribute cluster emergence to 'serendipity,' a wholly unsatisfactory concept.

Furthermore, cluster methods are not predictive. While analysts have developed a comprehensive set of tools for identifying existing clusters, they offer precious few methods for identifying nascent clusters. In particular, few current approaches look at existing fundamentals of the regional economy with an eye toward identifying hitherto non-existent clusters. In the dynamic global economy, however, it is likely that economic growth in small regions will be driven by emerging industries at least as much as by existing ones. As a result, the practice of economic development also requires methods for identifying potential. Simply put, regions can no longer count on "getting lucky."

Shields and Vivanco (2003) confront this issue in their 'back-of-the-envelope' method for identifying new opportunities for aggregate employment growth in Pennsylvania. They compare employment trends in rural Pennsylvania with rural counties in "similar" states to identify the local industries that are not doing as well as their peers. In pinpointing the industries, three criteria had to be satisfied:

1. The industry needed to exhibit positive employment growth at the US level from 1990-2000.

2. The aggregate industry employment growth rate in the rural counties of the comparison states had to exceed the US average.
3. The aggregate industry employment growth rate for the US had to exceed the aggregate growth rate for rural Pennsylvania counties.

In a nutshell, this analysis identifies Pennsylvania industries that are being greatly outperformed by both comparison places and the US. While a methodological cousin of the Barkley and Henry approach, the Shields and Vivanco (2003) model focuses on new targets rather than existing strengths, in essence asking “why not here?”

For more sophisticated efforts, econometric models offer a promising method for identifying emerging or potential industries. For example, Goode and Hastings (1989) and Leatherman et al. (2002) modeled business location decisions taking into account most of the variables identified as important in business growth. Goode and Hasting’s Northeast Industrial Targeting system modeled the require-ments of 69 aggregate regional manufacturing sectors, using 730 non-metropolitan communities in the northeast United States. Leatherman et al’s Plains Economic Targeting System (PETS, see Chapter x) matches industry requirements of 78 industry sectors to the characteristics of 414 counties in the six Great Plains states. In both models, results were used to identify the industries that offer the highest probability of success for each region, with subsequent development efforts focused on those industries.

Typically, economic development professionals apply these results to industrial attraction strategies. Today the challenge many small cites and regions face requires developing strategies to help existing business use these results to expand existing markets or products. In such cases the resources that go into attending conventions and making calls now go into taking time to visit local firms and creating coaching relationships that help them be more resourceful in understanding and using the results of the analysis.

CONCLUDING COMMENTS AND A REALITY CHECK

Are clusters simply “old wine in new bottles”? In other words, what is it that distinguishes cluster development from its failed predecessors? This is a valid question. Prima facie, the cluster targeting strategy can be characterized as an effort to identify the sectors that are the sources of local competitive advantage. Once identified, limited local economic development dollars are spent to grow these sectors. This appears to be analogous to historical rural development initiatives aimed at attracting branch manufacturing plants.

But the cluster approach is much richer. In Chapter 4 Woodward and Guimarães introduce the ‘Porter Diamond,’ a diagram that captures the key relationships among firms, suppliers and institutions that characterize economic clusters. The cluster approach to economic development policy recognizes all of these actors, and builds appropriate strategies for each of their interactions. For example, it sets the stage for active dialogue between local businesses and government organizations, such as workforce development centers; between supplier networks and regional universities. Overall, then, a cluster effort is much more holistic than policies built around individual firms.

In the remainder of this book other authors introduce various methods for identifying and evaluating the efficacy of clusters. But it is important to recognize that choosing the targeted industries is as much a political decision as an economic one. Comprehensive industry targeting programs are likely to involve business, labor, environmental organizations, and government, each with their own goals, interests and stakeholders. And these may often be at odds. For example, commercial and residential real estate developers may favor large scale business attraction efforts, because such growth will likely push up the value of land as new people and businesses move into the region. Municipal officials in smaller regions, however, might feel political pressure from current residents to “maintain the local quality of life,” which often translates into opposition to growth.

Thus, analysts need to be mindful that analysis is just one component of efforts to identify clusters that may succeed locally and in the national or global market place. Achieving consensus among interested parties, or at least enough agreement to enact and carry out expensive public programs, remains a major challenge. Accordingly, an important part of any targeted regional cluster initiative is an inclusive strategic plan.

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Table 2.1. Markusen's Typology of Industry Clusters

Cluster Type	Characteristics of Member Firms	Intracluster Interdependencies	Employment Growth Prospects
Marshallian	Small and medium locally owned firms	Substantial inter-firm trade, collabo-ration, strong insti-tutional support	Dependent on synergies, economies pro-vided by cluster
Hub-and-spoke	One or several large firms with numerous smaller suppliers and ser-vice firms	Cooperation be-tween large firms, smaller suppliers on terms of large firms	Dependent on growth prospects of large (hub) firms
Satellite plat-forms	Medium and large branch plants	Minimum interfirm trade, networking	Dependent on re-gion's ability to recruit, retain branch plants
State-anchored	Large public or non-profit entity and related, sup-plying service firms	Restricted to buy-sell relationships between public en-tity, suppliers	Dependent on re-gion's ability to expand political support for public facility

Source: Markusen 1996.