

What Was New About the Cluster Theory?

What Could It Answer and What Could It Not Answer?

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Michael Porter's cluster theory became popular at both the academic and policy levels as well as received a series of critiques. This article provides a synthetic view of those critiques. In addition, it reveals two new fundamental limitations of the theory. First, the descriptive and static nature of the theory limits the ability to replicate a successful cluster in practice. In other words, the current theory is more focused on describing how a cluster is organized today rather than how a cluster emerged. Incorporating historical process can strengthen the practical application. Second, the interconnectedness of a cluster is hard to measure empirically, and moreover, the theory does not explain how exactly the public sector can strengthen this aspect. A dialogue with networking theories can potentially improve the application.

Keywords: *economic development; cluster; competitiveness; regional economy*

Michael Porter's cluster theory has become extremely popular at both the academic and policy levels. Yet the theory has several major limitations. Martin and Sunley (2003) and Kitson, Martin, and Tyler (2004) provided strong critiques, as did Harrison and Glasmeier (1997) in a friendlier way, though the latter was more concerned with Porter's argument on inner-city development than with the cluster theory. This article is indebted to those works. One objective of this article is to provide a synthetic overview of the debates about the cluster theory and to categorize them into three points.

The second objective is to analyze the theory further and to provide two new critiques. These critiques are essential because they get to the fundamentals of the theory, yet the past literature has not discussed them before. Highlighting these analytical weaknesses provides the potential to replicate successful clusters at the policy level. First, at the theoretical level, the theory is descriptive and static in nature despite Porter's insistence that a cluster is dynamic. The theory will be more powerful and useful if it can incorporate dynamic analysis into the historical development of clusters. Second, the theory has limitations in identifying and promoting the interconnected aspect of the cluster. More dialogue with the theory of networks can strengthen the application of the cluster theory.

The third objective of this article is to highlight some questions that the cluster theory has not answered and to identify areas for new research in the future. Here, the

purpose is not to maximize the damage to the theory or to claim that the cluster theory is meaningless. Some of those problems are not only with Porter's theory but also with many economic development theories in general. Rather, this exercise should help them in the development of the cluster theory as well as provide potential bridges between the theory and practice.

The organization of the article is as follows: First, the cluster theory is introduced and its new and old components are assessed. At the same time, the popularity of the theory, along with why it has won so much popularity, is analyzed. Next, the article describes three major limitations identified by the past literature. Then, it points out two new shortcomings, which are fundamentals of the theory and necessitate further improvement.

Popularity of the Cluster Approach

Michael Porter's cluster theory has called for debate in a wide range of academic fields: urban planning, geography, public administration, and economic development.

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Porter has promoted this theory not only as an analytical concept but also as a key policy tool (Martin & Sunley, 2003, p. 6). State and local governments, along with private sector consultants, have identified and developed clusters (Waits, 2000, p. 37). Cluster development has been espoused by national governments of the industrialized countries, such as the United States, the United Kingdom, France, Germany, the Netherlands, Portugal, New Zealand, and Japan, to name a few, and has been applied to developing countries (Doeringer & Terkla, 1996; Schmitz & Nadvi, 1999). Furthermore, this quest for clusters has even reached international organizations: the Organization for Economic Cooperation and Development (1999, 2007), the European Union (European Commission, 2003), and the World Bank (2000, 2006). The next section will examine what exactly the cluster theory is, why it became so popular, and how exactly it is different from other economic development theories.

What Exactly Is the Cluster Theory?

Throughout his writings, Porter (2000) has been consistent in his definition of a cluster, which is “a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities” (p. 16). This is only a highly synthesized version of the definition. What a cluster includes and how it functions can be summarized in the following two points: (a) elements that make up a cluster and (b) interconnectedness to produce growth, innovation, and competitiveness.

First, Porter (1998b) often provides a list of elements in a cluster. Beyond single industries, these include, for example,

suppliers of specialized inputs, providers of specialized infrastructure, customers, companies in industries related by skills, technologies, or common inputs. Finally, many clusters include governmental and other institutions—such as universities, standards-setting agencies, think tanks, vocational training providers, and trade associations—that provide specialized training, education, information, research, and technical support. (p. 78)

This extended list can be condensed into four factors based on his famous diamond framework (Porter, 2000, p. 20; also see Figure 1): (a) firms of a similar industry, its strategy and rivalry; (b) supply conditions (such as

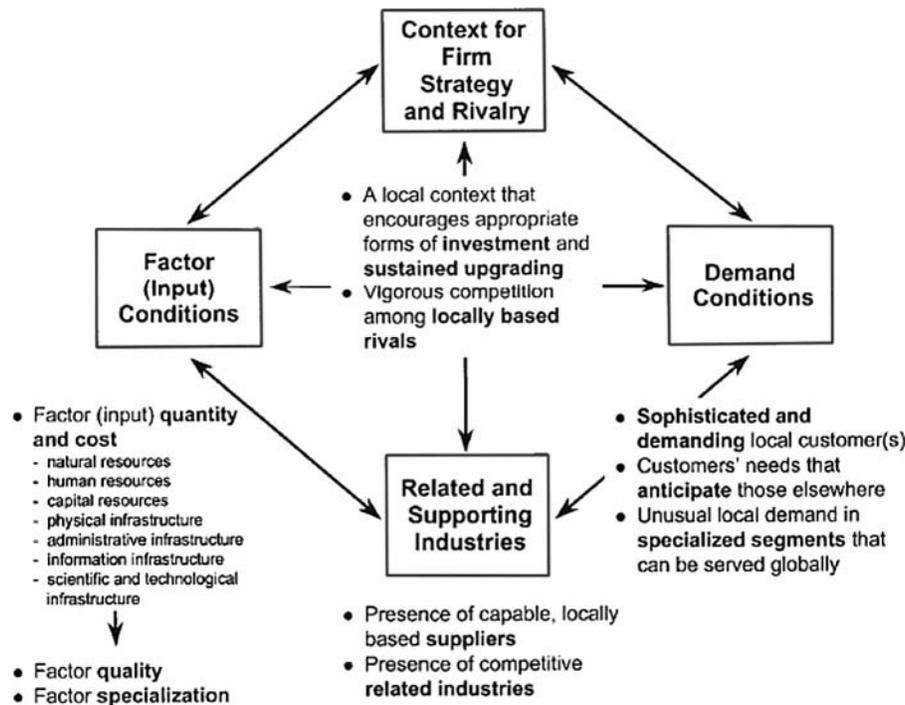
suppliers and extending to legal, technological, and consulting services); (c) demand conditions (such as core customers); and (d) related and supporting industries. The last condition essentially includes the rest of the list—from governments and universities to trade associations and experienced capital (i.e., venture capital).

The second aspect of the cluster is its interconnectedness, the linkage among these elements. Porter (1998b) emphasizes that collaboration and competition among them can promote growth, innovation, and competitiveness. He further explains that this happens in three broad ways: (a) by increasing the productivity of companies, (b) by driving the direction and pace of innovation, and (c) by stimulating the formation of new businesses (p. 80).

Then, it is important to ask a question: Is this explanation of the elements of a cluster substantially different from that in the previous economic development literature? First, in terms of the coverage of the constituting elements, the list provided by Marshall (1890) was clearly shorter: skilled labour, supporting and ancillary trades, and specialized suppliers. Later works, descended from agglomeration theory, extended this list. For example, the innovative milieu theory already provided essentially the same list by the late 1980s: universities, government research labs, business associations, venture capitals, and sophisticated core customers (Castells, 1989, pp. 82-89; Castells & Hall, 1994; Herbig & Golden, 1993). Thus, together with classic agglomeration elements, this effectively covers all the four conditions in Porter’s framework. Porter additionally and explicitly included standards-setting agencies, think tanks, and vocational training providers, but these may be a minor addition.

Second, Porter (1994, 1998b) asserts that the interconnectedness through collaboration and competition among these cluster elements is the source for growth, innovation, and competitiveness. Perhaps this aspect was not emphasized sufficiently by Marshall’s (1890) externalities. Nonetheless, essentially the same concept was discussed in a classic work by Chinitz (1961) a long time ago: “a network of interdependence between sectors within the region” (p. 279). Chinitz explained the growth of the New York region by uncovering the role of intermediate goods and services (such as legal, accounting, and duplicating services) as well as the competition among small enterprises, which promoted entrepreneurship (p. 288). The focus of industrial district literature was specifically on interfirm relationships (Brusco, 1982, pp. 170-171; Piore & Sabel, 1984). Therefore, this second aspect of the cluster theory, interconnectedness, does not seem to be an innovative concept in the field.

Figure 1
Sources of Locational Competitive Advantage Based on Diamond Framework



Source: Porter (2000, p. 20).

In Porter's (1994) first paper specifically related to the cluster, or the role of location, he related his theory to the context of the economic development field on one point: that the benefits of agglomeration identified by Marshall (1890), Weber (1929), and Lösch (1954) were based on static efficiency, such as the lowest input costs or the greatest economies of scale (p. 36). In contrast, Porter called for an emergence of a new paradigm in which competitive advantage would be based on "the rate of dynamic improvement. It is not the inputs or scale the firm possesses today but its ability to relentlessly innovate and upgrade its skill and technology (largely intangible assets) in competing" (p. 37). It is true that Marshall and other founding fathers of the field did not explicitly discuss the capacity to continuously innovate. The concept of innovation was developed by Schumpeter (1934, 1954) a few decades later and was not explicitly applied to regional economic development literature until the 1980s, when scholars started to analyze the rise of high-tech industries (Castells, 1989; Saxenian, 1985). However, it is too early to dismiss the entire economic development literature because Porter underestimated the implications of the agglomeration theory and missed the whole development of literature throughout the latter

half of the 20th century. In a series of debates on the learning capability of regions (Florida, 1995; Maskell, Eskelinen, Hannibalsson, Malmberg, & Vatne, 1998; Morgan, 1997; Saxenian, 1994), the arguments were quite similar to the dynamic capability of a cluster proposed by Porter.

Facing mounting criticism, Porter (1998c) later cited other literature related to the field and somewhat accepted that his cluster theory was not entirely new:

A variety of bodies of literature have in some respects recognized and shed light on the phenomenon of clusters, including those on growth poles and backward and forward linkages, agglomeration economies, economic geography, urban and regional economics, national innovation systems, regional science, industrial districts and social networks. (p. 207)

Porter cited more literature in his 2000 article, such as Glasmeier (1991) and Harrison, Kelley, and Gant (1996), as well as economists such as Jaffe, Trajtenberg, and Henderson (1993), Audretsch and Feldman (1996), and Krugman (1986, 1993).

Porter (1998c) emphasizes the comprehensiveness or the potential linkage to other major theories in social sciences:

Cluster theory also provides a way to connect theories of networks, social capital, and civic engagements more tightly to business competition and economic prosperity. . . . Cluster theory helps to isolate the most beneficial forms of networks . . . [and] may reveal how network relationships form and how social capital is acquired. (p. 227)

He additionally claims that his theory is embedded “in a broader and dynamic theory of competition . . . and [that] recognizes a world of global factor and product markets” (p. 208). Although there is certainly potential in linking the cluster theory to other grand theories in social sciences, Porter has not explicitly made this connection.

Nor is it clear that the industrial coverage and application of the theory is as new and broad as Porter (2000) claims: “Clusters occur in many types of industries, in smaller fields, and even in some local industries such as restaurants, car dealers, and antique shops” (p. 18). Although many renowned studies in economic development paid primary attention to high-tech industries (Castells, 1989; Markusen, 1984; Markusen, Hall, & Glasmeier, 1986; Saxenian, 1994), there have been plenty of studies of other types of industries, such as apparel and ceramics (Brusco, 1982), women’s apparel (Scott, 1984), watches (Glasmeier, 1991), and the furniture industry (Maskell, 1998).

Then, if the theory is not really new or different, why is it so popular in practice? There are potentially three reasons: an easy explanation, a clear direction, and a political justification. The first may be Porter’s easy and friendly writing style as well as his ability to effectively convey his ideas to business people and policy makers (Martin & Sunley, 2003, pp. 8-9). Porter, a Harvard business professor, is more shrewd in marketing. Whereas traditional economic development scholars may dismiss it as a simplistic explanation, Porter’s theory may make more sense to policy makers than do obscure concepts like flexible specialization, modes of regulation, a new industrial space, or regional institutions.

The popularity of the cluster theory may be based on more than cosmetics. More substantially and rather politically, Porter’s (1998c) orientation toward competitiveness plays a key role. Porter promotes the competitiveness of a cluster through two possibilities: by providing a lower production cost or by differentiating. Although the application of this concept to a region has problems, which the next section of this article will assess, his differentiation

strategy is almost always associated with regional specialization. With a trend toward decentralization and a focus on the indigenous potential (Temple, 1998), this specialization can provide a clear direction for politicians and policy makers, a promotion of a specific industrial cluster.

Furthermore, Porter (2000) promotes the competitiveness of a cluster in a global economy. Politicians find it more attractive to call for a new policy initiative to ensure survival in global competition than to expand neighborhood markets in Nebraska, just as a random example. The theory may not guarantee such success, but it certainly works better as a justification to mobilize political support.

It is perhaps the combination of these three reasons that made the cluster theory popular, and scholars in economic development as well as in social science in general should learn from this lesson. However sophisticated in its explanation, a scholarly theory may not be bought by politicians or policy makers if its meaning is not effectively translated. In addition, analysis of a phenomenon is not sufficient; practitioners look for a theory with a clear policy direction. It will be a plus if it can provide justification for political support. In his writings and consulting works, Porter provided all three of these.

As stated earlier, the cluster theory provided no substantial theoretical advancement. However, because of its popularity, the impact of Porter’s theory on policy practice should not be neglected. Harrison and Glasmeier (1997) noted that Porter’s contribution “lies in the extension of his influential advocacy of planning for interdependent ‘clusters’ or sectors, rather than focusing on individual companies or occupations” (p. 31). They are referring to the major shift in policy focus in the 1980s to a firm-level attraction and retention strategy, by increasing investment capital or developing incubators. Throughout the 1990s, there was a new group-level support strategy to promote public-private partnerships or networks of strategically linked firms (Bradshaw & Blakeley, 1999, p. 230). This emphasis on the linkage coincides with the second element of the cluster theory, the interconnectedness among firms and other players. Porter deserves credit for this catalytic role.

Limitations of the Cluster Theory Presented in Previous Studies

This section will present limitations of the cluster theory and assess questions the theory cannot answer. These are questions that are highly relevant to the application of the theory and the implementation of the policy and are therefore important for both academics

and practitioners. Essentially, the past literature identified three of them: (a) the notion of regional competitiveness and specialization, (b) geographical and industrial ambiguity, and (c) universalism.

The first major limitation of the cluster theory is its notion of regional competitiveness and specialization. It is not yet clear how regions compete or gain competitiveness. Porter's (1987, 1990) concept of competitiveness originally started with nations and was essentially defined as the ability to maintain exports (Kitson et al., 2004, p. 992). As Porter (1992) advanced this concept with firms, his main focus on this term became "a function of dynamic progressiveness, innovation, and an ability to change and improve" (p. 40). At the level of business practice, he further argues that firms may achieve competitiveness by differentiating (with products or services) or by producing at a lower cost (Porter, 1998c).

We must approach this argument of competitiveness carefully. First, there are strong disagreements over Porter's strategies to achieve competitiveness in the fields of business economics, industrial organization, and management studies (D. Jacobs & De Jong, 1992; Krugman, 1996; O'Malley & Vanegeraat, 2000). Second, it may be easier to apply this concept to firms, which are micro-units and can deliberately choose their products and business plan. Finding a niche product is plausible. In contrast, regions are aggregated units and do not have their own will; therefore, they do not choose or pursue a differentiation strategy as firms. Or is it possible for a region, as a collective unit, including firms, governments, and universities, to form a differentiation strategy? Is there such a thing as regionally differentiated products? A niche market for 20 companies? This is not clear. Note that a vague setting of goals such as a promotion of regional competitiveness or even of a specific industry is not a differentiation strategy.

Porter's competitiveness is different from the traditional sense of place competitiveness in economic development, such as that defined by Storper (1997): "The ability of an economy to attract and maintain firms with stable or rising market shares in an activity while maintaining or increasing standards of living for those who participate in it" (p. 20). Here, Storper uses it in a passive context and sees it as a description of a region. Thus, he does not attempt to explain the causal mechanism of the growth of the region. On the other hand, Porter (2000) argues that this is an active strategy and something people, firms, or regions can achieve.

In this somewhat confusing analogy between firms and regions, Porter (2000) interchangeably uses competitiveness and productivity and makes statements such as

"productivity, then, defines competitiveness" (p. 19). This is tautological. According to Porter, successful firms have the intention and capability to achieve higher productivity and profitability. If Porter argues that firms with higher productivity have competitiveness, it does not explain any cause. With this ambiguity, several scholars question (Gardiner, Martin, & Tyler, 2004; Turner, 2001), "What precisely is the differentiation or competitiveness of regions?"

This analytical weakness leads to the limitation of regional specialization. Let's suppose regional differentiation is possible, as Porter claims. Although Porter (1998c) strongly discourages competition by doing the same thing, there are quite a few disagreements about whether this specialization is good for the region over the long term or good at all. Back in the 1960s, Chinitz (1961) and J. Jacobs (1969, 1984) discussed the diversity of economy as a source of growth. There is little evidence to suggest that regions based on specialization consistently have a higher rate of innovation and economic growth (Best, 2001; Martin & Sunley, 2003; Rodriguez-Pose, 2001; Steiner, 1998). Recently, Perry (1999), Cortright and Mayer (2004), and Chapple, Markusen, Schrock, Yamamoto, and Yu (2004) have pointed out that the boom-and-bust cycles of many high-tech sectors, which are often based on specialization, bring risks. Instead, a regional portfolio strategy may be preferred. That is, in the short term, a region may promote a specialized industrial cluster, as Porter would suggest. However, in the long term, a region must develop a handful of clusters to avoid an overreliance on a specific sector. At the same time, we have to be cautious because we do not know yet which industrial clusters may have synergistic effects and how the development of a cluster in a beginning stage may benefit the development of another cluster in the next stage. These are the issues that the cluster theory has not addressed, and future research is needed.

Just like competitiveness, this concept of specialization may be underdeveloped at this moment and interchangeably used at different levels. Specialization can take place with a firm (different products or services), an industry (specific segments of an industry; e.g., computer chip design), and a region (selected industries). With the current cluster theory, all these levels are mixed, and policy makers choose whichever level is convenient for their purpose.

The second limitation is at the empirical level—that is, concerning geographical boundaries and industrial ambiguities. It is a practical challenge to identify the geographical boundary of a cluster. Porter (1998b) has provided only a weak analytical definition: "A cluster's boundaries are defined by the linkages and complementarities across industries and institutions that are most

important to competition” (p. 79). As a result, the definition of a cluster is not standardized (Martin & Sunley, 2003, p. 25; Swann, 2006, pp. 1-3), and people use clusters, cities, and regions interchangeably (Baptista & Swann, 1998; May, Mason, & Pinch, 2001), just as we discussed when looking at regional differentiation. Indeed, Porter (1998b) himself uses a variety of scales in his U.S. cluster map, and it ranges from cities (such as New York City or Boston), metropolitan areas (Silicon Valley or Los Angeles area), and substate units (southern Florida or western Michigan) to states (Colorado, Oregon) (p. 82). There are quite vague territorial compounds such as Louisville–Cleveland (which are located about 350 miles apart) and again Louisville–Nashville (175 miles apart). In southern Portugal, there are three tourism clusters within a 120-mile radius (p. 87).

This leads to enormous ambiguities at the policy-making level. For instance, being in Silicon Valley, should the cities of San Jose and South San Francisco create a strategic plan together or separately? Are they within the same cluster? Should they pursue the same specialization or differentiation? More important, how? At the current moment, it is hard for the cluster theory to generate answers for these practical applications.

Although the inconsistency in the geographical boundaries is a reasonable critique, that may not be a problem created by Porter alone. True, Porter did not (and could not) provide a clear geographical scale of clusters. However, this weakness should not doom the whole meaning of the theory because such variation in scale is simply the nature of economy. Economic geographers have known that the scale of an economic region varies by place and by industry given its historical development and topographical limitations. People know that Manhattan has strong media, advertisement, and financial clusters, whereas Silicon Valley is a stretched yet connected area for the semiconductor and Internet industries. On the other hand, recent studies with a Geographic Information Systems (or GIS) analysis indicate that clustering occurs at a substantially smaller intraregional scale, such as within 5 miles (Currid & Connolly, 2008; Funderburg & Boarnet, 2008; Rosenthal & Strange, 2003). Why are there such differences in scale? There is no grand theory to explain this issue in the entire field of economic geography, but after all, we do not have nor do we need to have a single definition of what a scale of a region is. The answer varies by context and purposes. Expecting the cluster theory to solve this puzzle may be overcriticizing or expecting too much. In the meantime, we have to be careful when analyzing clusters especially at the policy level because this affects at which scale to intervene and what to promote.

There is another dimension to this empirical ambiguity—at the industrial level. Porter (1998b) argues that the clusters cut across the industries defined by the Standard Industrial Classification (or SIC) codes, but what he explained as strong and weak linkages is unclear. Often, the rules used to distinguish clusters are highly arbitrary and highly impressionistic (Martin & Sunley, 2003, p. 21). Moreover, clusters identified as showing superior performance are anecdotal and based on success stories about particular locations (Malmberg, 1996). There are few studies that examine whether clustering within particular industries is beneficial (Malmberg & Maskell, 1997).

The conventional method to identify a cluster is to use a location quotient taking into account industry, employment and growth rate, and export activities (Austrian, 2000, p. 98). It is easy to identify some elements of a cluster: firms; labor; some suppliers, such as legal and consulting services; and core customers. It is possible, though not easy, to quantify the related and supporting industries, such as government, universities, standards-setting agencies, think tanks, vocational training providers, trade associations, and venture capital. However, these elements must be carefully selected because not all branches of those organizations deal with a particular cluster and its industrial activities. We have to keep in mind that this selection process becomes somewhat arbitrary.

More trouble comes when analyzing the core of the theory, the interconnectedness within a cluster. Input–output tables are one of the few tools, but determining the threshold for a decent or high level of interconnectedness among identified subindustrial sectors is a subjective process. Virtually all industrial sectors have some form of transactions with one another; having a transaction is merely a satisfactory condition to identify a strong linkage. Furthermore, input–output tables capture only monetary transactions, not the critical part of interconnectedness: firm rivalry and collaboration, Marshallian externalities, and knowledge spillovers (Hanson, 2000, p. 481; Swann, 2006). Scholars in the field frequently argue that such externalities and spillovers are the key to promoting the growth of a region (Saxenian, 1994; Storper, 1997), which means that the cluster theory, as it stands today, does not measure this integral part of regional development. Given these difficulties in empirical identification, most efforts to quantify clusters end up as a regrouping exercise with industrial codes.

There have been several serious methodological attempts to identify clusters. Held (1996) and Austrian (2000) combined both quantitative and qualitative data. There are manuals to identify clusters for practitioners (Economic Competitiveness Group, 1996; Rosenfeld,

1995). Moreover, Hill and Brennan (2000) and Funderburg and Boarnet (2008) used the statistical cluster method or the principal component analysis which can identify common elements to identify industrial clusters. Each attempt tends to improve the sophistication in identifying clusters. However, it does not completely solve the problem because of the two issues stated earlier: the theoretical vagueness between strong and weak linkages and difficulty in measuring interconnectedness. Thus, these are more theoretical hurdles to clear than methodological ones. In the meantime, we have to keep in mind one reality. Scholars, policy makers, and business leaders often use the cluster theory with whatever geographical boundary and industrial category is convenient—without questioning it and sometimes even without identifying it (Held, 1996, p. 249).

The third problem, highlighted by Kitson et al. (2004, pp. 996-997), is universalism. It is natural to expect that the types of cluster elements, intraregional connections, and development differ depending on the industry. For example, the role played by a university will be substantially more important for the biochemical and pharmaceutical industries than for the apparel industry. This variation among industries affects how a new business is formed, what kind of support is needed, who the customers will be, and other issues. Yet the current cluster theory does not fully consider this variation, which consequently means the development pattern is taken to be universal and the same strategy is applied to different industries. The theory should pay attention to industry-specific conditions and incorporate them into policy.

In the course of promoting clusters, many regional governments end up with targeting so-called “hot” industries, such as biotech, information technology, creative media, and nanotech in the last decade. This happens partly because politicians seek sexy high-tech sectors that will mobilize resources and because local governments follow funding from the higher level national government (Martin & Sunley, 2003, p. 25). Whereas Porter emphasized regional differentiation and specialization, ironically a certain sameness is developing with clusters of similar industries.

This story teaches a few lessons. The decision of which cluster to promote must be decentralized at the local government because local government should know the strengths of the local economy and specialization best. At the same time, selection must require caution. Naively identifying what sounds the best for the local economy and adapting the cluster initiative is hardly a panacea. In addition to the speciality and potential of the

local economy, local policy makers have to analyze what other regions are pursuing and what seems more feasible in comparison.

Further Assessment of the Cluster Theory: Two New Critiques

Past literature has suggested three limitations of the cluster theory. Whereas these are major shortcomings, this article raises two more critical limitations of the theory. These are (a) the descriptive and static nature of the theory and (b) the practical application of enhancing the interconnectedness of the cluster.

On the bottom line, the cluster theory is a general description of how a regional industrial complex is usually organized. Porter himself acknowledges this general nature: “Clusters are a striking feature of virtually every national, regional, state, and every metropolitan economy” (Porter, 1998a, p. 78). Implications from this inductively produced conclusion should not be considered lightly. That is, most industrial complexes on a regional scale have the elements described by the cluster theory anyway; the formation of a cluster per se does not necessarily produce growth, innovation, or competitiveness vis-à-vis other regions. The existence of an industrial Cluster X in Region A hardly means anything. It is first important to realize that the Cluster X also exists in Regions B, C, and so on and perhaps all the way to Z if you look at the global scale. It is more important for policy makers to ask how and why Cluster X in Region D grew more in comparison with other regions and how that might apply to Region A.

Take, for example, a comparative case of Boston and Silicon Valley, two famous computer and electronics clusters. Needless to say, both regions satisfy all the elements described in the cluster theory: firms, suppliers, customers, and even strong research universities. At the second level, these elements have some level of interaction: rivalry between firms, procurements from suppliers, and industry–university relationships. But why did Silicon Valley outgrow Boston? The cluster theory cannot answer this. A highly generic statement about competition and collaboration captures little of the dynamics of the regions. On the other hand, Saxenian (1994) would argue that the key was specifics in how the interconnection was developed and organized at each region. Silicon Valley’s flexible labor market, horizontal inter-firm relationships, and less hierarchical intraorganizational structure promoted more information flow and hence the creation of innovation (pp. 1-9). The current

analytical framework of the cluster theory does not provide this insight into why a region grows more than others. At the moment, the focus of the cluster theory is whether a cluster grows. One critical question that policy makers should always keep in mind is whether the policies of one particular industrial cluster will be more effective in comparison with others.

The descriptive nature of the theory is highly correlated with its static nature. The framework provided by the cluster theory shows how a successful industrial complex and regional economy is organized *today*, not how a successful regional economy emerges. For policy makers, the focus should be on achieving the development of a cluster, which is, by definition, a process issue. Most likely, finding a solution will require historical analysis. A cluster at each stage must come with specific development conditions. Ignoring history is counterproductive because each region, according to the cluster theory, is supposed to develop an industrial cluster that specializes according to its unique indigenous capability. Imitating today's most successful industrial complex, such as Silicon Valley, is hardly a solution; instead, that would be almost the same as replacing a child's arms and legs with adult ones and assuming that he or she can be a top-level fashion model immediately.

As Porter emphasizes, development of an industrial cluster goes through a dynamic process. However, Porter's analysis is not dynamic or, more precisely, not longitudinal, because he presents only the developed and successful clusters and provides no historical analysis of cluster development. His California wine cluster in Figure 2 is the prime example.

This diagram clearly and succinctly presents what cluster elements there are and how they are interconnected in California today. It would be more insightful if he could present the wine cluster in the 1970s or before. Suppose the tourism cluster, public relations and advertising, and the Culinary Institute were not incorporated into the wine cluster at that time. Then, we would be able to draw a few more conclusions. Adding or connecting those elements is a critical process. More important, historical analysis may reveal how to add them—how they emerged, which key player made the connection, and so on. Policy makers could then replicate the process stage by stage and in more detail.

So far, Porter (1994) has referred to this historical process only once: The historical "attributes are interacting and are enhanced (or atrophy) in a mutually reinforcing, cumulative process in which causality becomes difficult to disentangle" (p. 37). Moreover, in a footnote, he acknowledged that "there is a role for chance or historical accident. Contrary to much recent research, however,

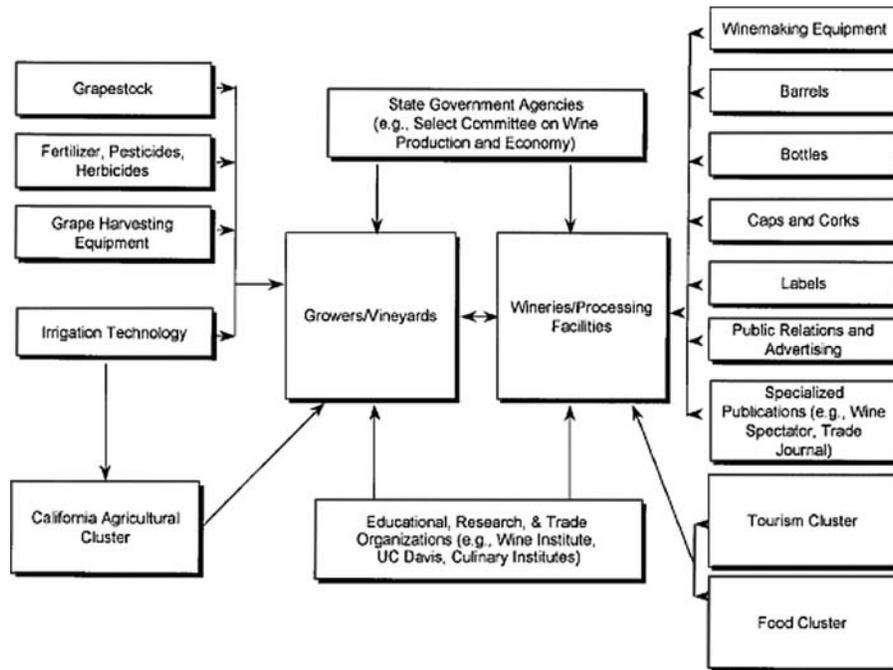
many events that look accidental are endogenous, determined by the local environment" (p. 38). However, Porter provides no further explanation but instead leaves it paradoxical. If historical attributes and chances endogenously determine the cluster development, as he claims, replication of a cluster would be impossible. We have to analyze what part of development was accidental and what could be applicable to other regions.

Although Porter himself has not done so, a few other scholars have conducted analysis on the development of clusters (Feldman & Francis, 2004; Hallencreutz & Lundequist, 2003; Lundequist & Power, 2002). Each pursued rich, in-depth, historical studies and analyzed their data at the case level. At this moment, generalization is not possible, just as Porter explained, and there are many things unanswered with regard to this issue. Both scholars and practitioners should pay more attention to the historical development process.

The last limitation of the theory is its feasibility and whether and how government can effectively fill in the missing components of the cluster. For example, if a specific element in a cluster is missing, such as the suppliers, a logical policy consequence would be for the government to provide grants to attract or nurture them. However, in reality, there is hardly such a case unless the government plans to form a cluster from scratch. The private sector is not blind and has usually looked for business opportunities. Even if there is a gap, how and how well government can promote the missing components is questionable. The more difficult part is to promote the interconnectedness of a cluster. If firms in a cluster do not have sufficient spillover or synergistic effects, what can government do? The current cluster theory may point out that government should do something about it but does not explain how.

To this end, the cluster theory should establish a dialogue with the network-related studies in the economic development literature that discuss the connections between firms and the promotion of information sharing (Bradshaw, 1993; Bradshaw & Blakeley, 1999; Cooke & Morgan, 1998; Doeringer & Terkla, 1995; Ross & Friedman, 1990). These studies, incidentally, also showed that the interconnectedness of the cluster theory was not theoretically new. In any case, what happened because of the limited budget constraint at the policy level was a dichotomous divide between the cluster and network approaches. Previously, network-promoting policies were often replaced by a new political initiative aimed at cluster formation. Instead, there should be a bridge between the two approaches with a special focus on how to promote the linkage between cluster elements.

Figure 2
Porter's Diagram Showing California's Wine Cluster



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Conclusion and Implications

This article reviewed the weaknesses of the cluster theory in its theoretical, empirical, and policy aspects. The new critiques raised in this article represent critical limitations of the theory for the analytical framework and from the policy perspective. Most important, we found that the theory's descriptive and static nature necessitates a dynamic analysis. This requires analysis of not only how a successful cluster is organized today but also how it emerged, what kind of challenges it faced and resolved, and who played a major catalyst role. Such analysis must be longitudinal, case specific, and in depth.

Although it was one of the core arguments, the cluster theory has been shown to be weak in explaining how to develop the interconnectedness or network aspect within a region. Whereas we have known that externalities and knowledge spillovers are critical for innovation and regional growth, we still know little about how exactly that happens. At this stage, the cluster theory lacks any analysis of the internal organization of a business enterprise (Best & Forrant, 1996). Perhaps one possibility is to incorporate the work on tacit knowledge by Nonaka and Takeuchi (1995) and more applied work in economic geography by Gertler (2003), in which they argue that

formation and sharing of tacit knowledge, critical for creating innovation, often takes place within a firm because it is embedded in organizational routines. Scholars who support the cluster theory, as well as those who study economic development in general, need to analyze how such insight can be applied at the interfirm, regional scale.

Although it provided several critiques, this article did not intend to denounce the whole cluster theory. The theory is extremely popular and potentially powerful. However, as with any other theory in economic development, the analysis of the weaknesses of the theory will help in its theoretical and empirical development. Because the role of scholars in economic development is to identify those holes in any theory and seek potential bridges with policies, I hope the analysis of this article will be helpful in that development.

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