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**Sustainability of Clusters and Regions at Austria's
Accession Edge**

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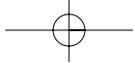
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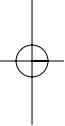
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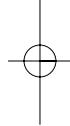


SUSTAINABILITY OF CLUSTERS AND REGIONS AT AUSTRIA'S ACCESSION EDGE"

Edward M. Bergman



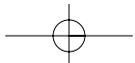
Introduction



The terms “cluster” and “sustainability” are two of the most provocatively ambiguous in their respective literatures. It may therefore be a risky enterprise to link them in a paper, particularly one that draws attention to development issues already loaded with normative overtones.

However, it seems this is not the first attempt. In proposing a sustainable energy industry cluster for Mesa Del Sol, Serchuk and Singh (1999) ask and then answer “What is sustainability?” After referring to the 1987 Brundtland report of the World Commission on Environment (where sustainability was defined as development by which societies today meet their needs without compromising the ability of future generations also to meet their own needs), they conclude:

Too often, people interpret this definition exclusively in biophysical terms, and thus concentrate on conservation of physical resources, the protection of human health, the maintenance of stable ecosystems, and so on. We prefer a broader interpretation. Achieving sustainability entails balancing the environment, the economy and social equity. To endure on a sustained basis, a society needs fair access to good jobs and economic resources, and it must factor into its economic accounting the consumption and destruction of environmental resources—especially those that are irreplaceable. *An industry cluster aims to incubate the development of innovative—and therefore robustly competitive—firms* [italics added].¹



For others, “sustainable development of regions” or “of nations” are equally contested terms: Holmén (2001) considers sustainable development de facto to be an inherently contradictory concept, since “development” itself implies structural change of certain “sustaining” territorial elements, therefore placing initial sustenance at risk.²

In expanding the concept beyond biophysical to economic components, innovation and competition receive prominent mention as elements of cluster sustainability. Similar sentiments are reflected in comments by Greene (2001): “The sustainability of the ICT [Information and Communication Technologies] cluster will derive from constant innovation, which in turn must be based on leading-edge research and research training.”³ De Vol (2001) proposes it is worthwhile to consider “what makes some clusters stick while others fall apart? The factors that allowed them to form may not be as important in sustaining them. Especially when many believe that randomness and historical accidents are integral components of how a high-tech cluster starts.”⁴

Sustainability Assumed?

Unlike the case of cluster definitions, which are debated at length and with considerable energy,⁵ one gets the impression from most published literature sources that cluster sustainability hasn’t been considered much of an issue, perhaps because sustainability is an obvious side benefit simply of *having* a successful cluster. The two terms join at the hip in many promotional materials, implying that clients should expect sustainability from clusters, and that attaining the latter virtually ensures the former. Much of the language issued by proud cluster officials during the U.S. business expansion therefore appears celebratory in nature rather than cautiously prudent or forward-looking. Because of these assumptions, the question of sustainability is seldom raised seriously.

To the degree sustainability does receive explicit consideration, ideas seem to revolve more around ensuring “retainability” of *specific cluster incumbents* (firms, institutions, officials) than about sustaining the underlying premises that originally permitted incumbent success. I will return to these underlying premises in later passages.

What I see as a misperception can in part be traced to the predominance of successful clusters among the case studies in the literature. These offer a misleading impression that one need only emulate the set of “best practices,” institutions, etc. characteristic of these clusters to achieve success and with it a sustainable future. Researchers tend to overlook cases of stillborn clusters that never succeeded at all (by definition, inherently difficult to identify) or those that succeeded for a time but then failed (easier to find, but just as easily avoided). Tichy (1998) reminds us of many failed clusters available for study, including former precision work clusters (the machine-tool cluster of Baden-Württemberg and Swiss watch cluster), natural resource clusters (coal and minerals, iron, petroleum), and mass

production (Detroit auto clusters).⁶ Each was in its day a world-class success story, and each suffered massive failure. A few later managed to recapture markedly different or refocused cluster activities.

An article in a recent issue of *Economic Development Quarterly* chronicles the experiences of thirty small U.S. cities that went through similar economic failures and have since recovered to varying degrees.⁷ Numerous first-hand accounts taken from different observers attest that local officials were least able to grasp the risks to sustainability during the very period of greatest economic success:

Everyone was fat and sassy ... everyone was employed ... they frowned upon lower paying jobs[...]The fact that there's always been so many jobs—people could come out of high school and make top wages.... Nobody wanted to change that.

Because of the integration between politics and influential individuals nothing could really happen of a progressive or constructive kind in the city. Any time any one group, like the chamber of commerce, wanted to do something, another group, like the county commission would get their people together and oppose it.

It wasn't until the mid-70s that there was a perception that we had a problem ... big shift in elected officials ... People got very proactive community-wide ... From that point on, it [economic revitalization] has been the number one issue for the entire community.⁸

As we shall see later, the best time to consider questions of cluster sustainability is during their period of greatest success. However, it is at precisely these moments that human nature and local institutions seem least capable of attending to issues more comfortably delayed or relegated to one's successors.

Cluster and Regional Prosperity: Some Common Factors

As has been repeatedly mentioned, the basic ideas behind industrial districts originated at the end of the nineteenth century with Alfred Marshall and Friedrich List, who assessed the significance of such developments for the industrial success of England and Germany, respectively. Subsequent theorists of the early twentieth century such as Weber considered industrial districts to be special cases of economic spillovers—called “localization economies”—that could arise in many regions where firms within a specific industry segment concentrated and prospered.

In both countries, attention was focused on how localities within national economies gain developmental advantages by workforce development and pooling, the reduction of costs associated with agglomerated inputs, adoption of *implicit cluster knowledge*, and the transmission of *tacit craft technologies* developed by and among proximate firms and industries. These were logical extensions of craft-based traditions that preceded industrial revolutions and were carefully nurtured for use within the industrial district.

Many craft-based industrial districts thrive today, mainly in Third Italy⁹ firms that continue to rely on the design and craft singularities that ensure market niches

among the world's growing middle-class consumers. To the degree clusters resemble these industrial districts, sustainability hinges heavily on successfully following or shaping market tastes and ensuring the exceptionally high design standards and craftsmanship characteristic of niched luxury and discretionary goods. It is in these kinds of districts and using these kinds of skills that proximity, interfirm trust, and cooperation count most. Trust-based cooperation among nominally competing agents is a hallmark of cluster thinking and policy, at least in these kinds of clusters and new industrial districts.

However, harmonious interaction or trust among other types of clusters and firms is seen by Maskell as strictly optional: "The *only* requirement is many firms with similar bodies of knowledge be placed in circumstances where they can monitor each other constantly, closely and almost without effort or costs."¹⁰ Rosenfeld (2001) documents this type of minimal—even hostile—interaction among furniture manufacturers in a northern Mississippi cluster that "steal each others' designs and attempt to produce them at lower cost ... recruit each other's employees for small increases in wages,"¹¹ or among a cluster of houseboat builders in south-central Kentucky where "competition is so fierce that some companies are not willing even to be present in the same room with others ... [which] stems primarily from owners of new startups who ... left established companies ... and took with them either employees, customer contracts or both."¹² Maskell's underappreciated point is that even in exceptionally competitive—virtually combative—circumstances, beneficial knowledge and innovation spillovers can arise without need for agreements, cooperation or much trust among cluster firms. This is yet another way to understand how both cooperation and competition can coexist among firms in differing cluster formations, and it also suggests why some interdependent firms strongly resist formal organization or governance even as they enjoy the benefits of voluntary clustering.

Traditional localization economies and pecuniary externalities found in industrial districts described above work well for firms and industries facing stable technologies and traditional best practices. However, global markets and widely spread production or distribution facilities alter our understanding of how other clusters are exposed to technological possibilities that affect globally originating risks and opportunities of many kinds. According to Maskell, "It was, however, only towards the turn of the [twentieth] century that the advantages stemming from knowledge creation and knowledge spillovers occupied centre stage in the conversation on the cluster..."¹³ In the mid 1990s, these factors led OECD to consider the innovative role industrial clusters play in major work programs concerning national innovation systems,¹⁴ which culminated in two published volumes, the first of which "accomplished the valuable and vital task of broadly informing OECD readers about value-chain concepts and the potential of clusters that function as reduced-form national innovation systems."¹⁵

The reasons for broadening original industrial district ideas to clusters of national and international dimensions are by now the stuff of everyday news: emergent communication technologies, explosion of Internet effects, lowered

transportation costs (mass air travel, inexpensive air freight, transport deregulation), international intellectual property rights protections, emergence of NAFTA, EU, and WTO trading regimes. These and all other increasingly familiar technologies and institutions permit rapid and effective diffusion of formal, novel, and commercially applicable technologies through various corporate channels, global supplier-chains, licensing and patent agreements, and business-to-business technical services.

Localities that remain insulated from these high-energy channels of knowledge transfer and commercial contact risk losing touch with the next generation of competitive technologies. At the same time, firms in localities or clusters that are not subject to global competition will remain unaware of changing customer demands that firms in more competitive surroundings are fully prepared to meet. These are among the reasons another OECD-led initiative argues that: “Clusters have attracted widespread attention as potential motors of economic growth and social innovation, allowing SMEs [Small and Medium size Enterprises] to compete on a global scale. This is why the topic of clusters is of great importance in the context of transition economies where a productivity gap persists and where SME growth remains feeble at best.”¹⁶

Simultaneously, new competitive technologies also support effective global deployment of facilities owned by multinational firms seeking strategic location advantage. It is perhaps here that the broad scope of Michael Porter’s work during the last decade assumes its greatest importance: he argues that corporate strategic planning should be relatively less concerned about operational efficiencies of individual units and rather more focused on capturing strategic competitive advantage. This is best accomplished by locating corporate units in the most hospitable clusters and regions of the world. The difference between operational efficiency and strategic advantage mirrors a similar difference between what are called static and dynamic externalities, where the latter, according to Henderson et al., deal “with the role of prior information accumulations in the local area on current productivity and hence employment.”¹⁷

In his widely respected business publications on how to evaluate regions that meet strategic business needs, Porter coopted (with surprisingly scant acknowledgement) much of the existing cluster and facility location literature written originally from the perspective of regional strategists. He further adapted it to corporate settings through (perhaps incessant) use of the famous “diamond” of corporate success factors. It is often the case that indigenous startups or spinoffs of independent firms are initially responsible for putting hospitable regions on the maps made available to the corporate strategists Porter advises. One highly desired spillover sought when making facility location decisions is entrepreneurial energies, which frequently accelerate following corporate investment in promising regions.

In my view, the greatest value Porter adds to cluster concepts is his *linking* of globally driven competition (and supporting technologies, often new and disruptive) and the strategic corporate search for existing industrial districts that offer

highly differentiated localization economies of unique benefit to subsets of international firms and functions. It is this combination that most properly bears the label “Porterian clusters.” Moreover, his linking has also helped expand the concept of clusters well beyond locally bounded industrial districts. It is now common to speak of national and supranational or mega and macro clusters, all of which reflect the highly elastic, nested relationships characteristic of global trade and communication technologies.¹⁸ Sustainability of clusters formed by Porterian (and Marshallian) forces depends heavily upon access to global sources of formal knowledge and explicit technologies—often embodied in capital goods or knowledge workers’ human capital—and their timely diffusion to local clusters and districts.

Cluster Life Cycles

The risks to cluster sustainability consist of life-cycle rigidities, which have been studied to determine their effects on development paths or the life-cycle of regional economies¹⁹ and clusters.²⁰

Two interesting life-cycle perspectives are worth exploring further. Tichy argues that cluster sustainability is a matter most properly considered over a fairly long developmental wave, during which a cluster first forms, then grows rapidly and reaches maturity or perhaps terminal petrification. He models this process closely on a product cycle theory analog, where formative clusters are at their most technologically dynamic phase, acquiring and upgrading skilled workers, deploying and refining new techniques or commercializing new products, and seeking new markets and customers. Developmental histories of clusters resemble those of their host regions in several but not all respects, since one can be relatively strong while the other is relatively weak.

In contrast to the abundance of studies on firms, surprisingly little has been written about a cluster’s formative phase,²¹ perhaps because clusters are seldom recognizable sufficiently early to outside observers, although an identification of deliberate actions leading to formative stages has been advanced elsewhere.²² Therefore, we are not entirely sure about processes of early spillovers, the emergence of trust and reciprocity, and the formation of lasting networks, infrastructure, and so on, a process that mirrors Maskell and Malmberg’s view of how regional capacities emerge: “The localised capabilities are all moulded by historical processes.”²³

Tichy considers it possible to create clusters in the presence of existing network strengths (three are identified as key: labor, input-output, and technology networks). Policy-created clusters are said to be more likely to succeed when they are *network-based* (with cooperative production of range of services, similar stocks of knowledge, different supply chains or customer branches) rather than *star-clustered* (with a dominant firm and its linear/dedicated supplier chain, similar to growth-poles), although the latter are faster and their startup costs much lower.

The possibility of deliberate cluster creation contrasts with the views of many who see the emergence of “organic” or “evolutionary” clusters as serendipitous accidents of historical accumulation wherein regional resource endowments, assorted “Porterian” corporate strategists, entrepreneurs, and innovators, or simply felicitous coincidence, could feature prominently. Organic clusters contrast rather sharply with consciously deliberate regional efforts to design and launch the necessary networks. There are smatterings of evidence to support both views, with European experience more interventionist and American experience driven more by markets, chance, and economic history.

Maskell and Malmberg argue that isolating mechanisms are at work in innovative regions, sustaining them by protecting them from external regional competitors.²⁴ First, *asset mass efficiency* is the idea that historically agglomerated research and development (R&D) and related innovation assets are not easily or readily duplicated in competing regions. Second, *time compression diseconomies* are the costly but necessary lags a competing region must overcome while trying to master and replicate the capacities of a superior region, which can busily continue to build upon its strengths through increasing returns processes. Last, an externally inscrutable *interconnectedness of asset stocks* implies that simply replicating each asset stock produces no sense of how they are deployed effectively, which is another way of saying that accumulated assets develop DNA-like usage patterns not visible or apparent to outsiders or even those who daily draw upon this embedded DNA.

Returning to Tichy’s view of the development wave or life-cycle concept, the growth phase of a cluster

appears to be the best of all worlds to participants. It is the phase, nevertheless, which may generate the first deviations [that] cause later troubles. Success is easy in this phase, so that little pressure exists to search for further development of the cluster’s strengths, for other applications of its knowledge, etc. It is tempting to concentrate on the best-selling product(s) and to produce it (them) in ever-increasing quantity, utilising economies of scale. As a consequence economic policy must stand against concentration, try to avoid overspecialization, and protect the region’s information density.²⁵

The structural risks any region faces during periods of rapid growth are in such moments too bothersome or confidence-challenging to deal with, yet it is during precisely such times that decisions that could place cluster sustainability at risk are inadvertently made.

To avoid structural risks during the growth and maturation stages, Tichy argues that regional officials should stop promoting R&D dedicated to a cluster’s main specialities, encourage other related uses of a cluster’s dominant skills and products, promote regional spinoffs and related research capacity, encourage multiple producers while discouraging single producers of given cluster products, and build foundations that encourage expansion of new clusters to broaden a region’s overall cluster portfolio.

Maskell and Malmberg's regional version of processes associated with maturation considers *asset erosion* first, which in their view takes place as "hitherto important institutions in a region are no longer reproduced at the same pace or to the same degree."²⁶ A second factor, *substitution*, is a special form of technological erosion that arises when "new technology rapidly devalues former investments in, for instance, skills, education and infrastructure, thus undermining the region's capabilities." Others term these innovations "disruptive technologies," which first find acceptance only in marginal market niches but then, through design/production refinements and shifts in customer demand, eventually displace the originally "sustaining technology." Last, *regional lock-in* can develop when initially important institutions and practices—often social and cultural in origin—focus on self-preservation or aggrandizement and become a sclerotic risk to²⁷—rather than the lifeblood of—regional progress.

The mature phase, which is critical in Tichy's view, arises when a cluster's potential to react to market demand and develop new offers is nearly exhausted. This means all three underlying networks have lost the capacity to adapt, collapsing instead upon a highly specialized set of redundant skills, obsolescent process and design technologies, and mass-produced output lines attractive to ever fewer customers and supply chains. The Swiss pharmaceutical cluster is said to have fallen into this state, now producing only very traditional products, even though parent Swiss pharmaceutical *firms* have managed to keep up with the demanding medical product cycle by conducting their most critical operations—Porter-style—in various U.S. and other advanced-economy regions. The remaining shards of network competence in a mature cluster that has become unfavorably positioned might still be redirected to regional emerging clusters where their contributions could be beneficially deployed, but otherwise the older cluster is headed for terminal "petrification," the endgame Wilbur Thompson once termed an "industrial hospice."

A final petrification phase arrives when all remaining cluster activity is conducted by a single failing entity, perhaps an endangered branch or nationalized firm, which operates with the certain knowledge it cannot long survive, even for routine political purposes of providing subsidized or regulated employment for its remaining workers. So much effort and resource expenditure may have been required to retain maturing and petrifying cluster remnants and resuscitate exhausted cluster networks that the region will have placed its final bets on the wrong cluster and paid very high opportunity costs in the bargain. In such a case, the possibility of sustainability has long since passed and the host region could be placed at considerable risk, absent outside beneficial forces.

Sustainability Lessons: Innovate Constantly, Learn by Competing

The literature makes clear just how dependent clusters and regions are on processes that expose them to competition in demanding global markets and to sources

of innovative practices. This may not be news to many, but still one might ask: Are firms' capabilities to "innovate constantly, learn by competing" enhanced more in clusters or in regions?

Relying mainly on the typical cluster literature discussed earlier, one cannot avoid the indelible impression that clusters *per se* are automatically innovative and therefore sustainable, although the literature on regions is considerably less optimistic, with regions known to be in dire situations far outnumbering permanently prosperous regions that enjoy innovation-based success. One is therefore quite logically led to a naive hypothesis: sustainability is more likely in the average cluster than the average region.

The remaining sections of this chapter attempt to explore this hypothesis in the context of Austria and its CEE neighbours, starting with a description of how the relative strength of Austria's clusters and regions is determined. The rest of the chapter then presents a stylized set of innovation and competition indicators for clusters vs. regions of varying strength ratings, ending with a short summary of the major findings and possible implications. The findings are of considerable conceptual interest, but are also important to accession countries and regions now considering alternative development concepts that compete directly for scarce material resources and time, which if misallocated in periods of "path dependency" could exact high opportunity costs.

Cluster and Region Strength

A fair comparison of innovation and competition in regions vs. clusters should account for varying degrees of cluster or regional strength. Ideally, we should also seek systematically recorded evidence of such practices and perspectives, rather than piece together the usual patchwork of often conflicting, contradictory, or incommensurable case-study results.

Accordingly, this section will report on a survey of Austrian firms conducted in 2001 to assess their innovative capacities and competitive instincts; all of the firms are located in areas that adjoin one of Austria's four EU accession-country borders.²⁸ A key feature of the survey includes a self-assessment by each firm of the cluster *and* region within which the firm operates. Distinctions between cluster and region make little sense in case studies of monocluster regions—such as the Third Italy industrial districts—and the fact that regions and clusters could vary considerably in their practices is routinely ignored in other case studies of both clusters and regions.

Moreover, when cluster and regional concepts are collapsed for analytic convenience, evidence concerning essentially different processes that may account for variations in cluster vs. regional development becomes confused or overlooked. To avoid further propagation of these and similar problems, each firm reported in this study was asked to rate the strength of its region on a five-point scale: poor-to-excellent regional innovation and investment environment; clusters were also

rated on a five-point strength scale from emergent to developed cluster firms and institutions.²⁹ A firm could rate both cluster and region as high- or low-strength, meaning there is no practical difference between their strength levels (i.e., they are highly rank correlated), or it could rank them independently (no rank correlation), implying wholly distinct strengths for the two environments experienced by a given firm. The Spearman rho correlation of .203 reveals some similarity of rankings, but the similarity is not convincingly robust.³⁰

A cautious reader might note that firms are inclined to report their clusters and regions to be of similar strength somewhat more frequently than they report differing strengths. If strength similarities are overreported by Austrian firms, then the weakly correlated strengths of clusters and regions become weaker still, which calls into serious question the convenient assumption, held by many scholars and analysts, that clusters and regions function as close substitutes or proxies.

Sources and Uses of Innovation

It is widely agreed that firms are best able to survive and prosper in competitive economies such as the EU and NAFTA when they draw upon various sources of proven technological and commercial knowledge that permit them to innovate successfully. The innovation systems literature points in particular to various stages of innovation where firms might logically deploy knowledge and identifies typical sources of such knowledge. Early stages include (1) the generation of potentially valuable ideas and (2) the subsequent development of such ideas prior to their commercialization.

The sources of potentially valuable knowledge within an innovation system are usually associated with basic knowledge institutions, such as universities, plus intermediary organizations that transfer knowledge to members, or with the accumulated commercial knowledge embedded within the local-to-international communities of firms, particularly other firms in the same industry, customer firms, and supplier firms.

Based upon innovative the inputs that our respondent firms report deriving from each of these sources, we are able to detect some useful distinctions between strong regions and clusters at the two product innovation stages.³¹ The sources of innovative inputs are grouped in rows of Table 4.1 according to the following categories: *supportive institutions* (business incubators and industry or cluster associations), *same sector firms* (associated with horizontal clusters or localization economies), *regional firms* (value-chain suppliers or customers), *venture capitalists*, and *universities*. The columns of this table indicate whether the innovative services benefited firms at the *idea generation* or *idea development* stages, where generation of innovative ideas implies a head start. What we are looking for is evidence that certain sources or stages of innovation become more important for stronger clusters or stronger regions. This will be indicated by rank order correlations (Φ) between cluster (C) or regional (R) strengths and a particular source or stage.

Table 1 Sources of Innovative Inputs

Innovation Sources/Stages	Supportive Institutions*	Same Sector Firms	Regional Firms*	Venture Capitalists	Universities
Idea Generation	————	R Φ = .00 C Φ = .28	R Φ = .24/.28 C Φ = .18/.20	R Φ = .22 C Φ = .00	R Φ = .38 C Φ = .18
Idea Development	R Φ = .00/.00 C Φ = .32/.52	R Φ = .00 C Φ = .35	R Φ = .21 C Φ = .36	R Φ = .18 C Φ = .22	R Φ = .34 C Φ = .34

* indicates more than one source of innovation and associated correlation in the category

One notes immediately that as cluster strength grows, firms show generally higher tendencies to rely upon all sources for idea development; regional strength associations with nearly every idea development source are much weaker or absent, the exception being universities, which are equally important for both regions and clusters. Conversely, idea generation gains importance more for rising regional than cluster strengths, the exception being same-sector firms, which are often considered *de facto* evidence of a cluster.

Whereas innovation sources, supportive institutions (incubators and cluster organizations), and same-sector firms provide greater innovation assistance at both stages to stronger clusters, venture capitalists and universities provide more assistance to the strongest regions. Regional firms (value-chain partners) provide stronger regions with idea generation services and stronger clusters with idea development services, which captures wholly the preceding paragraph's principal observation.

Taken together, stronger clusters depend decisively upon institutional, same-sector firms and regional firms for idea development support, while stronger regions depend more upon regional firms, universities, and venture capitalists for their idea generation assistance. Perhaps strong cluster firms are simply able better to absorb and exploit organizational inputs for idea development services. Or, perhaps, strong cluster firms have become so dependent upon organized and shared innovation sources that they are less able to tap innovative generation potentials in their regional community of firms, venture capitalists, and universities.

One is tempted to interpret these patterns as partially refuting our working hypothesis and appearing more consistent with the alternative view that strong regions have greater sustainability prospects than strong clusters, which are heavily reliant on closely associated institutional or cooperative arrangements rather than on the market or knowledge-based sources that characterize strong regions. The consequences for sustainability hinge on the answer to this question: Are stronger cluster firms likelier to engage in sustainable activities when innovation is increasingly drawn from supportive institutions and same-sector firms, or are firms in stronger regions more likely to engage in sustainable practices? The evidence of competition, markets, and cluster advantages will be examined to help sort these matters out a bit.

Cluster Advantage vs. Competitive Markets

Part of the answer we seek can be found in the degrees to which strong clusters and strong regions are able to capitalize upon a series of advantages that often characterize industry clusters. These are examined in Table 4.2, whose rows represent a series of potential advantages and whose columns contain the rank correlation (Φ) for strong regions (R) and clusters (C).

Strong regional and clustered firms alike acknowledge these advantages, but clusters clearly identify more strongly with more of the potential advantages: the weakest cluster correlation exceeds the strongest region correlation. This imbalance is the direct result of rapidly diminishing advantages to regions at their highest strength levels, because early strength increases account for all the observed correlation. In contrast, every cluster advantage rises in importance among firms across the full weak-to-strong cluster strength pattern, some quite markedly. The attenuated regional strength pattern contrasts clearly with the steadily increasing advantages of the cluster strength pattern, which consequently enjoys measurably stronger correlations.

This implies that firms attached to clusters of highest-rated strength somehow draw more heavily upon potential cluster advantages, no matter the strength of their region. The strong connections offer indirect confirmation of the conceptual consistency between cluster strength rankings and known attributes of clusters.

The earlier reviews of sustainability remarked that any cluster or region could risk losing its competitive edge over time due to many factors that will not be rehearsed again here. However, the many factors can be boiled down to two: (1) innovative practices (e.g., idea generation and development) that permit renewal of capacities and options, as evaluated previously, and (2) competitive pressures on firms to differentiate themselves, which usually stimulates the pursuit of innovation, thereby reducing the risk of complacency and sclerotic closure, a discussion of which now follows.

To get at the possibilities of competitive differentiation, we focus attention on how successfully respondent firms are able to position themselves within various market regimes and where they obtain knowledge that permits such positioning. In Table 4.3, five groups of responses are used to demonstrate contrasts among clusters and regions in their orientation toward competition and differentiation.

Table 2 Strong Cluster and Strong Region Advantages

Cluster Advantages	Strong Regions	Strong Clusters
Member relationships support R&D efforts	R Φ = .26	C Φ = .60
Associations/institutions promote success	R Φ = .34	C Φ = .53
Regional firms prefer to work together	R Φ = .25	C Φ = .31
Knowledge is gained from cluster firm contacts	R Φ = .24	C Φ = .46
Firms participate in cluster-wide programs	R Φ = .00	C Φ = .33
Firms/institutions are open to entry of new firms	R Φ = .00	C Φ = .49

Table 3 Orientation of Clusters and Regions toward Competition and Differentiation

Positioning Tendencies of Firms	Strong Regions	Strong Clusters
International Market Positioning		
—Demanding international customers	RΦ= .17	CΦ= .00
—ISO certification	RΦ= .19	CΦ= .00
—Proportion of production exported	RΦ= .23	CΦ= .00
Regional Market Positioning		
—Demanding regional customers	RΦ= .18	CΦ= .00
—Regional customer feedback	RΦ= .28	CΦ= .00
—Regional supplier quality	RΦ= .29	CΦ= .00
Specialized Differentiation		
—Specialized supplier assistance	RΦ= .19	CΦ= .19
—Degree of product difference with strongest competitor	RΦ= .17	CΦ= .22
Buyer trends gained as cluster member	RΦ= .21	CΦ= .41
Competition costs outweigh benefits	RΦ= .00	CΦ= .24

Here again, we are looking for evidence of how firms position themselves as the region or cluster of which they are part varies from weak to strong. This is important, since we want to know if firms are either better able or more willing to position themselves competitively as their regions and clusters become more fully developed and stronger.

Starting first with *international market positioning*, firms may position themselves in response to sophisticated and demanding customers who raise the competitive bar through their willingness to buy, thereby pressuring firms to innovate more. Alternatively, the need to obtain ISO certification (International Organization for Standardization) of products and processes to compete effectively in global markets calls forth innovative responses. Finally, a higher percentage of total production exported to international markets (e.g., Latin America) demonstrates an ability to meet international competition in the globalizing economy. As we can see, firms find these positioning elements important as the strength of their host regions rises, but the same firms show indifference to such positioning factors over the full range of observed cluster strengths.

Next, we look at *regional market positioning*, where firms are locally subject to sophisticated customer demands, receive regional customer feedback regularly, and are able to deploy the specialized inputs of high-quality regional suppliers. These are often considered some of the most significant factors behind the success of both regions and clusters, but only those firms in regions of increasing strength show any relationship. In other words, firms hosted by stronger regions enjoy greater degrees of these features, but the same firms in stronger clusters report no such relationship.

Another positioning technique is the firms' *specialized differentiation* of their products from their competitors', thereby ensuring some temporary protection

and pricing advantage as well. In the effort to differentiate products or services, firms often collaborate with key suppliers to develop new offers. Firms tend to seek identical degrees of assistance from specialized suppliers to differentiate product lines as their host regions *or* clusters become stronger. Together with other innovative practices discussed in earlier sections, firms assemble their product portfolios, which differ from their strongest competitors' to various degrees, as reported here. Firms appear to have slightly more differentiated product lines in strong clusters vs. strong regions.

The ability to differentiate product lines and to anticipate new market opportunities often depends upon collective information on the *buyer trends* that are developing. Membership in a cluster provides access to such collective information, which may help firms anticipate new markets earlier and more effectively. Although firms in strong regions and strong markets appear to benefit from information concerning new buyer trends, the degree of association is nearly twice as high for firms in strong clusters than strong markets, which helps confirm the relative advantage of collective product market information.

Finally, local competition is often said to stimulate firms to become more efficient, innovative, and successful in both local and international markets. The question is, do firms in local markets see the advantages of local competition, thereby encouraging more competitive behavior, or do they see the *costs of competition* outweighing the benefits? This is a key factor in the development of clusters and regions, since competition appears to be an important component of sustainability. The evidence here is quite striking: firms in regions of all strengths hold no systematic view, i.e., responses were essentially random, but firms in stronger clusters systematically find that the costs of competition outweigh the benefits. Perhaps competition is seen as harmful to good relations within "cooperative" clusters, or perhaps firms become steadily more averse to competition as cluster strength and services grow; whatever the cause, efforts to avoid competition in strong clusters may lead to serious sustainability problems.

A consistent and revealing portrait of differences between strong region and strong cluster firms gradually becomes clearer: strong region firms are far more likely to rely on market contacts and regional economic strengths to remain competitive. On the other hand, strong cluster firms are much likelier to rely on organizational services and membership benefits to become competitive. Strong region firms would therefore have a natural competitive advantage, since they rely most heavily upon market processes.

Conclusions

This chapter started with an inquiry into the sustainability of clusters and regions, where it was argued that sustainability depends upon innovative sources of renewal and upon competitive pressures that stimulate or provoke firms to innovate valuable new products or processes.

Drawing upon recently collected evidence from Austrian manufacturing firms that self-assessed the strength of both clusters and regions to which they belonged, some important differences emerged. First, cluster and region strength is somewhat similar, though not identical, for firms. Cluster features and advantages rose steadily for firms as their clusters' strength increased, but the region features and advantages peaked early and did not rise further for firms as their regions' strength increased. A cluster "advantage plateau" was clearly reached early in the development phase of regions.

Second, innovative sources differ for cluster vs. regional strengths, where strong cluster firms draw their most important innovative inputs from organizations and strong region firms rely far more on other regional firms. Third, competitive markets and production processes, combined with strong customer- and supplier-based product development assistance, clearly distinguish firms in strong regions. Strong cluster firms were highly dependent on cluster and industry organizations to remain competitive and expressed less competitive concern as cluster strength rose.

One is, therefore, led to the tentative conclusion that strong regions are probably more sustainable than strong clusters. Regions may in fact have been evaluated as strong by a respondent firm if they promote sustaining practices, i.e., they are places where innovation and competition are embedded in the very economic fabric. On the other hand, cluster firms' heavy dependence on formal organizations could make them more vulnerable to the sclerosis that creeps into unchallenged bureaucracies and self-perpetuating structures. Equally suspect is the growing aversion of strong cluster firms to local competition, which reveals a development mechanism prone to serious sustainability risks. (These findings are summarized in Appendix II.)

These comments do not imply that cluster development should be avoided, but they do suggest that clusters may be of more limited usefulness than presently thought.³² For example, the known advantages firms enjoy as their clusters gain strength seem to flatten out early in regional strength rankings. This seems to imply that clusters might play key *supplemental* roles in weak regions, providing important services, effects of scale, and synergy found lacking in the region. However, the value of cluster supplementation to firms may diminish as regions develop, advance, and agglomerate "naturally" so that adherence to a cluster may inhibit firms from becoming valuable members of a complex and sustainable region.

This view appears to be broadly consistent with recent research in the U.S., which found that urbanization externalities (complex "Jacobs" regional effects) promoted sustained growth, unlike localization externalities ("MAR" [Marshall-Arrow-Romer] industrial concentrations/clusters).³³ If so, one might be led to consider how to promote simultaneously the development of clusters *and* regions, refocusing attention gradually away from clusters as they become fully integrated into sustainable regional economies.

The experience of Austrian firms may prove instructive to neighboring accession countries and regions as the many development options available in the lit-

erature or presented for consideration by EU, OECD, and other officials come under serious review.

Appendix I

Representative Definitions

- An *industrial district* is “a socio-territorial entity, characterized by the active presence of both a community of people and a population of firms in one naturally and historically bounded area.”³⁴
- A *cluster* is a “geographically-bounded concentration of interdependent businesses with active channels for business transactions, dialogue and communications, and that collectively shares common opportunities and threats.”³⁵
- “A *cluster* is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities. The geographic scope of a cluster can range from a single city or state to a country or even a network of neighboring countries.”³⁶
- “*Clusters* can be characterized as networks of production of strongly interdependent firms linked to each other in a value-adding production chain ... [with particular reference to the] concept of *economic clusters* as a reduced scale model of innovation system approach.”³⁷

Appendix II

Sustainability Findings and Conclusions

1.
Strong *Clusters* → member advantages gain steadily
Strong *Regions* → member advantages plateau early
2.
Strong *Clusters* → organizations support innovation
Strong *Regions* → regional firms support innovation
3.
Strong *Clusters* → membership aids competitive position
Strong *Regions* → market exposure drives competition
4.
Strong *Clusters* → costs seen as greater than benefits of competition/rivalry
Strong *Regions* → indifferent to local competition/ rivalry
5.
Strong *Regions* more sustainable than Strong *Clusters*
Strong *Clusters* potentially important in Weak *Regions*

Notes

1. Adam Serchuk and Virinder Singh, "Sustainable Energy Industry Cluster for Mesa Del Sol," Renewable Energy Policy Project, 1999. http://www.repp.org/repp_pubs/articles/mesaDSol/index.htm
2. Hans Holmén, "The Unsustainability of Development," *International Journal of Economic Development* 3, no. 1 (2001): 1–26.
3. Roy Greene, "Ireland's winning industrial formula protects economy against effects of US downturn," University of Galway Press Release, 15 May 2001.
4. Ross de Vol, "Talents are attracted by the quality of Place: Connected Clusters Stick," *BrainHeart Magazine* (March 2001): 8.
5. See Appendix I for representative definitions and sources.
6. G. Tichy, "Clusters: Less Dispensable and More Risky than Ever," in *Clusters and Regional Specialization*, ed. M. Steiner (London: Pion, 1998), 211–25.
7. H. J. Mayer and M. R. Greenberg, "Coming back from Economic Despair: Case Studies of Small- and Medium-Size American Cities," *Economic Development Quarterly* 15, no. 3 (2001): 203–16.
8. Mayer and Greenberg, "Coming back from Economic Despair," 208–9, 213.
9. "Third Italy" denotes northeast central Italy, a region of scattered industrial districts that prospered economically because of the vitality of its small, clustered firms, in stark contrast with southern Italy and the major industrial centers of Italy.
10. P. Maskell, "Towards a learning-based theory of the cluster" (paper presented at the World Conference on Economic Geography, 4–7 December 2000, Singapore), 14.
11. S. Rosenfeld, "Advancing the Understanding of Clusters and Their Opportunities for Less Favored Regions, Less Advantaged Populations, and Small and Mid-Sized Enterprises" (Carrboro, NC: Regional Technology Strategies, Inc., 2001), 8.
12. Rosenfeld, "Advancing the Understanding of Clusters and their Opportunities," 10.
13. Maskell, "Towards a learning-based theory of the cluster," 8.
14. "National innovation systems" or NIS is a concept or framework that sets forth the institutional and organizational features of how a nation or a region systematically generates, uses, and replicates its knowledge and innovation base.
15. P. den Hertog, E. M. Bergman, and D. Charles, eds., *Innovative Clusters: Drivers of National Innovation Systems* (Paris: OECD Proceedings, 2001), 7, referring to T. J. A. Roelandt and P. den Hertog, eds., *Boosting Innovation: The Cluster Approach* (Paris: OECD Proceedings, 1999).
16. Local Economic and Employment Development (LEED), *Clusters in Transition Economies—Progress Report*, DT/LEED/DC(2002)8, p. 2. The OECD report continues: "It needs to be said at the outset that to date, no clusters—defined as spontaneously occurring agglomerations of vertically and/or horizontally integrated firms operating in related lines of business—have yet been identified in [Slovenia, Slovakia, Czech Republic, Poland, and Hungary]," p. 3. The report is available at <http://www.oecd.org/dataoecd/49/22/2089148.pdf>
17. V. Henderson, A. Kuncoro, and M. Turner, "Industrial Development in Cities," *Journal of Political Economy* 103, no. 5 (1995): 1067–90.
18. P. den Hertog, E. M. Bergman, and D. Charles, "In Pursuit of Innovative Clusters" (paper presented at International Conference on Measuring and Evaluating Industrial R&D and Innovation in the Knowledge Economy, 23–24 August 2001, Taipei, R.O.C.), 6–9.
19. Bergman, E. M., and Harvey Goldstein, "Urban Innovation and Technological Advance in the Research Triangle Region," in *Sustainability of Urban Systems: A Cross-National Evolutionary Analysis of Urban Innovation*, ed. P. Nijkamp (London: Gower, 1990); P. Maskell and A. Malmberg, "Localized Learning and Industrial Competitiveness," *Cambridge Journal of Economics* 23 (1999): 167–85.
20. Tichy, "Clusters: Less Dispensable and More Risky than Ever."

21. "Formative phase" refers to the actual emergence of firms and supporting institutions that enjoy cluster benefits à la Marshall, not the issuance of nomenclature, labels, and websites favored in recent years by many a newly established institutional presence that wishes to stake formal claims of existence.
22. M. Peneder, "Dynamics of Initial Cluster Formation: The Case of Multimedia and Cultural Content," in *Innovative Clusters: Drivers of National Innovation Systems*, ed. P. den Hertog, E. M. Bergman, and D. Charles (Paris: OECD Proceedings, 2001), 303–12.
23. Maskell and Malmberg, "Localized Learning and Industrial Competitiveness," 173. Continuing: "The present built environment and infrastructure can often be traced back through at least a century, while the natural resources typically are from pre-historic origins. It should, furthermore, be noted that the resources available in the region comprise the region's own resources and the ones available through import from other parts of the world."
24. Maskell and Malmberg, "Localized Learning and Industrial Competitiveness," 176–78.
25. Tichy, "Clusters: Less Dispensable and More Risky than Ever," 233.
26. Maskell and Malmberg, "Localized Learning and Industrial Competitiveness," 178–9.
27. M. Olson, *The Rise and Decline of Nations: Economic Growth, Stagflation and Social Rigidities* (New Haven: Yale University Press, 1982).
28. The survey includes seventy-eight usable responses from a sample of industrial firms stratified by four value chains (vehicle producers, electronics producers, chemical and pharmaceutical producers, and metalworking and machine producers) and four major production regions (Vienna, Graz-Villach, Klagenfurt, and Linz-Wels) in 2001. The same sampling frame was earlier used to assess the contingent valuations of transportation and logistics services by a similar sample of firms in the same value chains and regions; G. Maier, E. M. Bergman, and P. Lehner, "Conjoint Analysis of Transport Options in Austrian Regions and Industrial Clusters," in *Freight Transport Demand and Stated Preference Experiments*, ed. R. Danielis (Milan: Franco Angeli, 2002). The questionnaire was developed and refined by the author, in conjunction with ongoing OECD cluster studies, drawing upon other instruments that have been used to examine clusters and innovation. Parts of it have also been used in more focused studies of U.S. and Slovak regions.
29. The Austrian firms were asked to respond to the following questions:

Figure 1 Survey Form for Austrian Firms (2001)

Considering all the significant factors, including government, industry and social factors, how good a location is your region as a place to innovate in your business?		
Very poor location in which to innovate or invest further	1 2 3 4 5	Excellent location in which to innovate or invest further
Your industrial cluster...		
Is still emerging, with a narrow range of firms and institutions	1 2 3 4 5	Is well developed with a broad range of firms and institutions

30. The two-tailed test of this correlation remains insignificant at the 5% level, while the one-tailed test passes the 5% but not the 1% confidence level. Readers should use their own judgment in assessing these exploratory results, some of which are of marginal significance (indicated by "-").
31. In all comparisons, we are principally interested in detecting whether respondent firms are more likely to engage in or support a variety of sustainable practices as the strength of their association with (1) regions or (2) clusters rises. In other words, do stronger regional or cluster contexts improve chances of sustainability equally? Unless otherwise stated, significance is measured with one-tailed tests, where the majority of tests are significant at 0.05 or better ("-") indicates significance at 0.10 or better).

32. These results could also indicate that Austrian firms ranked their *efforts* to stimulate clusters, rather than the actual functional effectiveness or performance level of clusters of industries. If so, the difference may also reflect similar differences concerning EU-favored cluster launching efforts vs. U.S.-favored *ex post facto* support of market-based agglomeration clusters, which are relatively understudied but quite interesting issues.
33. E. L. Glaeser, H. D. Kallal, J. A. Sheinkman, and A. Scheifler, "Growth in Cities," *Journal of Political Economy* 100 (1992): 1126–52.
34. Becattini, G., "The Marshallian ID as a socio-economic notion," in *Industrial Districts and Inter-firm Co-operation in Italy*, ed. F. Pyke, G. Becattini, and W. Sengenberger (Geneva: International Institute for Labour Studies, 1991), 37–51.
35. S. A. Rosenfeld, "Bringing Business Clusters into the Mainstream of Economic Development," *European Planning Studies* 5, no. 1 (1997): 3–23.
36. M. E. Porter, "Competitive Advantage, Agglomeration Economies and Regional Policy," *International Regional Science Review* 19, no. 1 (1996): 85–94.
37. Roelandt and den Hertog, *Boosting Innovation*, 9.



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