Chapter 13
Cluster Policy: A Guide to the State of the Debate

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Interest in the role of economic geography in explaining differences in prosperity levels across locations is growing (Spence et al. 2009; World Bank 2009). Contrasting strands of the academic literature are contributing to this debate. Researchers representing the New Economic Geography approach apply models that incorporate increasing returns and mobile factors to explain the emergence of regions having different densities of economic activity (Royal Swedish Academy of Science 2008). The work on clusters—regional agglomerations of companies, research institutions, government agencies, and other organizations in a specific area of business activity related through various knowledge and economic linkages (Porter 2008; see also Ketels 2011)—breaks this analysis down to the level of density in specific activities. Scholars have also used related approaches to look at regional innovation systems (Cooke 1992; Gertler and Asheim 2006), industrial districts (Becattini 1990; Porter and Ketels 2009), and locations that are home to a "creative class" (Florida 2002).

Although there is widespread agreement that geography matters for the patterns of economic activities and outcomes to be observed, there is little consensus on whether there is a case for policy intervention. Arguments are made for (Porter 2007, 2008) and against (Duranton 2011). Others acknowledge the theoretical case for intervention (Norman and Venables 2004) but point out the complex implementation issues that render practical success unlikely (Venables 2008). In the meantime, practitioners in the economic development community have made their choice, and especially cluster-based economic policies and programs have become widely used (Borras and Tsagdis 2008; Davies 2006; Freser 2005; Oxford Research 2008; Pietrobelli and Rabelotti 2006; Yusuf et al. 2008; Zeng 2008).

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In this chapter I explore the current state of the academic debate on cluster policy, a term that, for lack of a broadly accepted definition, I propose to understand inclusively. In the following pages I therefore use it to mean all efforts by government—alone or in collaboration with companies, universities, and other agents—that are aimed at enhancing the competitiveness of clusters. This definition excludes efforts by other entities acting alone, such as purely private cluster initiatives, and general governmental policies that are not directed at clusters (but that might affect them). In this broad, but by no means exhaustive, review of the quickly growing literature, I first summarize the key findings on the existence and impact of clusters. I then review the work on the emergence and evolution of clusters, a topic particularly relevant for policy that is ultimately intended to change the trajectory of such paths. The second part of the article addresses the topic of cluster policy. It sets out by presenting the basic theoretical argument for cluster policy. I discuss two opposing understandings of how cluster policy should be conducted, arguing that their different underlying definitions of what cluster policy is lie at the heart of the widely diverging opinions on the use of cluster policy. Most of the actual cluster policies discussed in the section thereafter are found to be very unlike those that the critics have in mind when arguing against cluster policies. Lastly, I examine matters of implementation that have a crucial bearing on whether and when cluster policy is beneficial and how large these benefits might become.

Clusters as Building Blocks of a Modern Economy

Clusters and Economic Performance

Economic activity is distributed unequally across space, and these differences in density have significant implications for productivity and prosperity across locations (Porter 2004; World Bank 2009). Activity in some industries, for example, is distributed across regions in overall patterns that are consistent with the distribution of aggregate economic activity, whereas activity in other industries concentrates heavily in a few locations, deviating greatly from those overall patterns (Porter 2003). Among this latter group, there are specific groups of industries that tend to collocate, building clusters (Porter 2003). Regional economies end up with distinct specialization profiles reflecting the presence of the clusters that have located there.

Marshall (1890) was the first economist to argue that clusters arise because of specific benefits that firms can enjoy from locating close to others engaged in related activities. The conceptual and empirical research on these benefits that drive divergence across regions has focused on three main mechanisms: (a) the local market demand to attract more specialized suppliers and interact with them more efficiently (Amiti and Cameron 2007), (b) a deeper labor market to provide access to more specialized skills (Eriksson and Lindgren 2009; Huber 2010), and (c) concentrated innovation activity to create local knowledge spillovers that support the emergence

of new ideas and better practices (Aharonson et al. 2007; Audretsch and Feldman 2003; Thompson 2006). There is significant empirical evidence that each of these sources matters (Dauth 2010; Ellison et al. 2010), with their relative weights driven by cluster-specific factors.

The unfettered push toward collocation in clusters is held in check by countervailing effects that drive convergence across regions. Competition for specialized labor and other inputs among companies in the same industry raises the cost levels within clusters. The intense rivalry with direct competitors in a cluster cuts into the margins that companies can charge. There is clear evidence that these factors matter as well, especially at the level of narrow industries (Braunerhjelm and Thulin 2009; Delgado et al. 2010b). The tendency of economic activities to be collocated depends on the balance between these opposing forces. Clusters emerge where the forces for divergence dominate. Activities remain local when the forces for convergence dominate. Clusters typically account for about a third of total employment (Porter 2003).

The size of the cluster sector is to a large degree a reflection of broad patterns in economic composition, especially the degree of service-orientation the economy has reached. The pattern of specialization within the cluster sector, however, turns out to be a major driver of economic performance. Regions with strong clusters (high levels of specialization in groups of related industries) excel in terms of wages, attraction of foreign direct investment, productivity, and prosperity (Bobonis and Shatz 2007; Porter 2003). Figure 13.1 shows the relationship between cluster portfolio strength and regional prosperity for European regions. These studies do not prove causality, but they do indicate the close relationship between clusters and economic outcomes. Differences in cluster specialization could explain around one third of the difference between the U.S. and the European levels of GDP per capita (European Commission 2007).

Clusters are obviously not the only drivers of regional prosperity. A substantial body of literature argues that a broad range of fundamental factors, including the nature of institutions, the quality of factor conditions, the openness of markets, and the geographic location itself, are critical (Gallup et al. 1999; Hall and Jones 1999; Sachs and Warner 1995). The competitiveness approach (Porter 1990) integrates clusters into a comprehensive framework building on these ideas. Clusters amplify the strengths that these fundamentals provide but depend on them and cannot eliminate their weaknesses.

In the literature on economic geography, the sheer scale of economic activity in a region is discussed as another possible explanation of prosperity differences across regions. This argument comes in two varieties. In one, it is argued that cross-cluster spillovers are more important than within-cluster spillovers, meaning that absolute size and density matter most, not relative specialization (Brülhart and Sbergami 2008). In another approach it is argued that heterogeneity—the absence of specialization—in high-density urban regions is central to "creativity" (Florida 2002; Jacobs 1961/1992). Both of these models predict a very unequal world of a few prosperous large regions (core, or urban) and many poor small regions (periphery, or rural) as a result of larger substantial mobility across regions. By contrast, the cluster model predicts that regions of similar fundamentals can reach similar sizes and levels of prosperity if they each develop their own patterns of specialization.

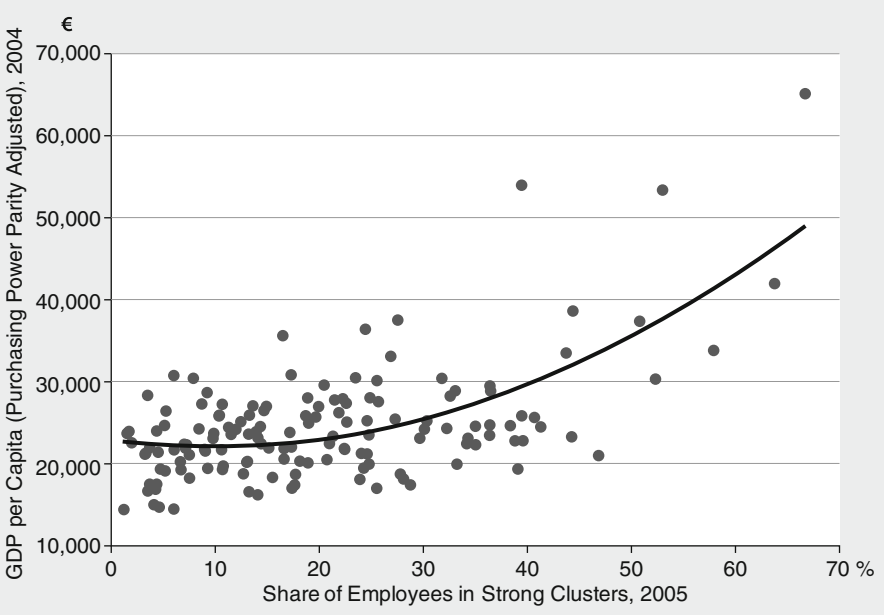

Fig. 13.1 Cluster portfolio strength and regional prosperity in European countries, Nomenclature of Units for Territorial Statistics (NUTS), Level 2. Strong clusters are defined by $LQ > 2$. Shown are NUTS regions in the EU-15, excluding Portugal and Greece. Data are from European Cluster Observatory ISC/CSC cluster codes 1.0, data set 20070510 (Copyright 2008 by Christian Ketels. Adapted with permission)

A number of empirical studies test the impact of all three dimensions: cluster specialization, the quality of economic fundamentals, and the degree of urbanization (e.g., Brülhart and Mathys 2007; Carlino and Hunt 2007; De Groot et al. 2008; Fritsch and Slavtchev 2008; Lall and Mengistae 2005; McDonald et al. 2007). There is no clear consensus across these studies, but the overall evidence suggests that each of the dimensions plays an independent role. Looking at the two related to geography, one finds evidence that cross-cluster agglomeration remains the dominant force in developing economies and is losing power in advanced economies, where instead cluster specialization is figuring more and more (Brülhart 2009; Krugman 2008; World Bank 2009). Cluster specialization explains a significant share of the prosperity differences among the European Union's first 15 member states (EU-15), a group of countries broadly similar in competitiveness. But cluster specialization explains far fewer of the prosperity differences across the EU-25 countries, where disparities in competitiveness are much more pronounced.

Recent studies indicate that specialization and diversification do not necessarily conflict with each other. The advantage of large metropolitan areas seems to be that they can combine these two characteristics. In other words, the size of such areas enables them to create critical mass in individual clusters while supporting an overall

portfolio of clusters that provides a breadth of knowledge and capabilities. And the advantage of diversification seems to be greatest when it happens in "related clusters," that is, in activities that share common aspects of knowledge or capabilities. High specialization in a narrow industry supports high levels and growth of productivity. Employment growth, however, is likely to occur in related industries within the cluster, not in the already highly present industry itself, where competition for input factors drives up costs (Delgado et al. 2010a).

The positive impact of cluster strength on economic performance works through several distinct channels (Porter 2008). Companies within clusters achieve higher levels of productivity (Boasson and MacPherson 2001; Greenstone et al. 2010). They are able to do so because the presence of specialized suppliers and service providers shortens reaction times and the need to maintain comparatively high levels of working capital. Indeed, companies within clusters *must* achieve superior levels of productivity because the intense competition on input and end markets requires both constant improvement of efficiency and the adoption of best practices. The effect of intensified competition is felt not only by companies but also by employees, who reportedly work longer hours in strong clusters (Rosenthal and Strange 2008). Companies within clusters attain superior levels of innovation (Audretsch and Feldman 2003; Fornahl et al. 2010; Moreno et al. 2004). The cluster environment leads to higher pressure to innovate, a richer source of relevant ideas, and lower costs of turning ideas into new products and services. There is accumulating evidence that clusters have an especially notable impact on the commercial use of knowledge, not just on the creation of knowledge itself (Sölvell and Protsiv 2008). Lastly, clusters promote an environment conducive to entrepreneurship. New companies rely more on external assets and capabilities than incumbents do. Clusters provide access to them, which elevates the levels of entry in cluster environments (Freser et al. 2008; Glaeser and Kerr 2009; Guiso and Schivardi 2007). More important, survival rates and firm growth are higher in clusters as well (Audretsch and Dohse 2007; Delgado et al. 2010a; Wennberg and Lindqvist 2010).

Cluster Evolution

The literature reviewed up to this point indicates that clusters exist and have an important impact on economic outcomes. But how do clusters arise? On the whole, the knowledge about the processes of cluster evolution is still largely based on case studies. This literature suggests that clusters emerge where economic transactions across locations are feasible *and* where there are location-specific factors that forge a nucleus for cluster development. The first condition is crucial for cluster dynamics to become relevant but is often neglected in policy discussions. Where trade across locations is inhibited, the productivity benefits of clusters are irrelevant and the seeds of cluster evolution have no opportunity to come to fruition. Deep market integration has a much longer history in the United States than in Europe, a fact that very likely accounts for the stronger cluster profile of many U.S. regions.

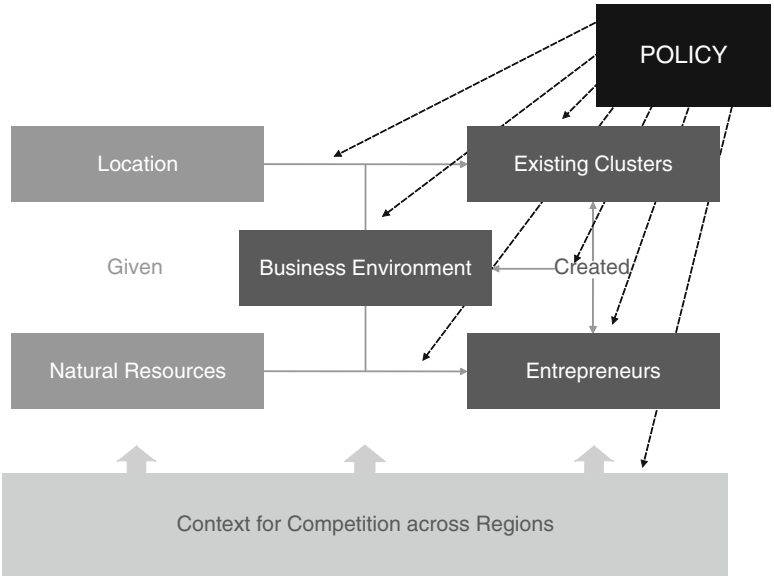

Fig. 13.2 The emergence of clusters (Copyright 2008 by Christian Ketels. Adapted with permission)

This example also suggests that the reduction of trade barriers because of globalization will boost the role of clusters, even though individual clusters have experienced everything from explosive growth to fast decline (Rabelotti 2001). Well-established incumbent clusters with strong inherent position prosper because they can serve a growing international market. But incumbent clusters that have resulted from trade barriers and have had only a relative advantage when serving a limited geographic market come under mounting pressure. New clusters grow where rising competitiveness and advantageous cost positions provide a platform to serve global markets. Quite tellingly, the outsourcing of economic activities to emerging economies has again taken place in clusters (Enright et al. 2005).

As for the second condition, researchers have found that various types of nuclei are involved. Figure 13.2 provides an overview of the most significant of these nuclei. Endowments of natural resources and a geographic location close to trading routes are frequently important. Specific elements of the business environment, such as the presence of a prominent university or of unique local demand, can trigger the development of a cluster (Braunerhjelm and Feldman 2006; Bresnahan and Gambardella 2002). Individual companies, be they local entrepreneurial start-ups or investments from outside firms (Manning 2008), can, through spin-offs and the attraction of other companies, "anchor" clusters that may develop sufficient independent strength to survive the demise of the initial anchor (Treado and Giarratani 2008). A factor that has gained increasing attention is the function of existing clusters as a breeding ground for new clusters. There is compelling evidence that

new clusters register much more vigorous employment growth if they are related to clusters already strong in a region (Delgado et al. 2010a). Consistent with these findings, the specialization profile of regions has been shown to develop in a path-dependent process of related diversification (Neffke et al. 2009).

Literature on the life cycle of clusters is expanding (Bergman 2006). Many clusters seem to follow an S-shaped development path. After what is often a long phase of gestation, a cluster achieves a size where cluster effects set in and growth accelerates. This growth then becomes self-reinforcing; cluster effects culminate, and growth explodes. Over time, growth moderates as the cluster reaches its market potential and congestion effects become more relevant. Some clusters then manage to reinvent themselves, finding a new market or technology to ignite a next phase of cluster dynamisms. Others, however, get locked into existing technologies and gradually shrink as their markets disappear or other clusters develop more dynamism (Maskell and Malmberg 2007; Saxenian 1994). This thinking finds its reflection in the work on regional economies (Audretsch et al. 2008).

These existing life-cycle studies have a drawback, however. They work well retrospectively tracking the path of successful clusters but have only limited predictive power. They do not lend themselves particularly well to the early identification of clusters that will ultimately blossom. Many case studies suggest that the process of cluster development is complex and fragile (Feldman and Francis 2004). Chance events might be seminal, especially in the early stages of cluster evolution (Storper and Walker 1989). The literature has identified a number of factors that spur cluster development, but there is no comprehensive model that integrates them. And there are virtually no robust empirical studies on their relative significance (Van der Linde 2003, is an exception) or their sufficiency in triggering the growth of successful clusters. This gap in the literature poses a significant challenge for policy-makers hoping to influence the emergence and development of clusters.

Cluster Policy

Cluster research over the last 20 years has to a large degree focused on identifying what clusters contribute to the market success of companies and the performance of regions. Not surprisingly, the evidence that clusters are important for economic success has attracted the interest of policy-makers. But although there is an emerging consensus on the usefulness of clusters as an analytical tool, such accord is still a long way off in the academic discussion on cluster policy.

Governments, meanwhile, have over the last few years launched an impressive array of cluster policy programs. This revival, after a first wave of interest in the wake of *The Competitive Advantage of Nations* (Porter 1990; see Aranguren et al. 2006, on the experience of the Basque country, one of the early adopters of cluster policy), has been driven chiefly by policy-makers' escalating frustration with traditional approaches at a time when pressure to improve competitiveness has been building (Davies 2006; Freser 2005).

The Theoretical Motivation for Cluster Policy

Economists regard policy interventions as justified when specific conditions restrict the ability of the normal market process to lead to optimal outcomes from an overall welfare perspective. Such "market failures" underlie the traditional motivation for economic policy. The local externalities that give rise to clusters constitute market failures such as—

- coordination failures, because individual companies take account only of the impact that their decisions have on themselves, not on others, be it about whether to locate in a cluster or what investments to undertake there.
- information asymmetries, for even if companies wanted to consider the impact their actions have on others, the knowledge necessary to make the right "social" decision is dispersed among the cluster's many participants.
- path dependency, for decisions of cluster participants today affect the cluster's possible evolutionary path in the future. Coordination failures and information asymmetries in making these decisions thus have a dynamic dimension as well. Moreover, social and private discount rates might differ—an additional source of market failure.

If cluster policy addresses such market failures, it does not diminish global welfare. Under some assumptions, the free competition between rational governments in supporting clusters even leads to the best possible outcome, not a race to the bottom (Norman and Venables 2004). Although these arguments do not prescribe specific policy interventions, they do indicate the direction that cluster policy should take. Policy intervention should always target the market failure at its source. Policy can subsidize activities that are underprovided because of coordination failures or differences in discount factors. And policy can facilitate platforms for collective action to overcome coordination failures and information asymmetries. Figure 13.3 depicts this argument graphically.

Policy approaches can be compared for both their actual impact (in addressing the problem or market failure) and their potential costs (in leading to distortions or government failure). Figure 13.4 shows the relative mix of impact and distortions for different policy approaches. Policies that target individual companies are highly effective but also very distortionary. Policies that target the entire economy are only slightly distortionary, if at all, but they are often also not very effective. Policies aimed at individual industries come somewhere between these two poles. Cluster policy, however, offers a superior mix of benefits and costs. It is organized around a group of industries that by definition have strong linkages. Aiming policy at them will thus not only be effective but will even trigger additional benefits from positive spillovers that are induced. The policy is neutral within the cluster where competition for factors of production is the sharpest; it is distortionary only relative to activities outside the cluster, where other skills and assets are needed by definition. Although some distortion remains, the approach promises a potentially better balance of effects.

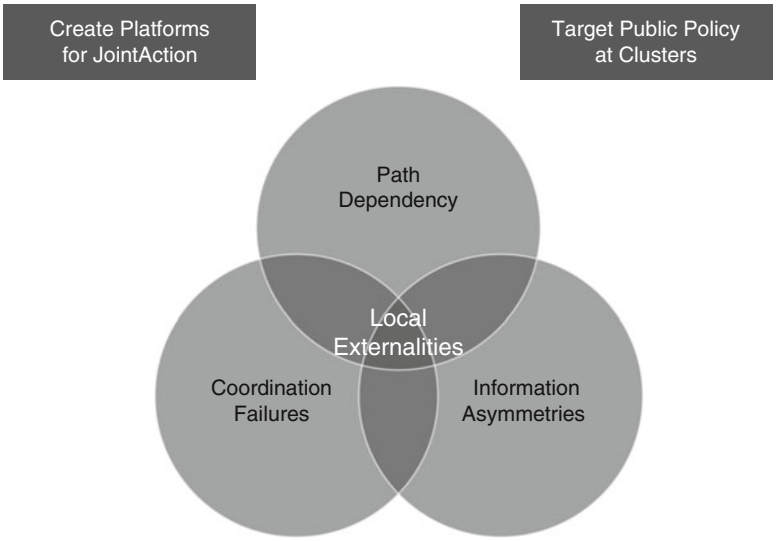

Fig. 13.3 The case for cluster policy (Copyright 2008 by Christian Ketels. Adapted with permission)

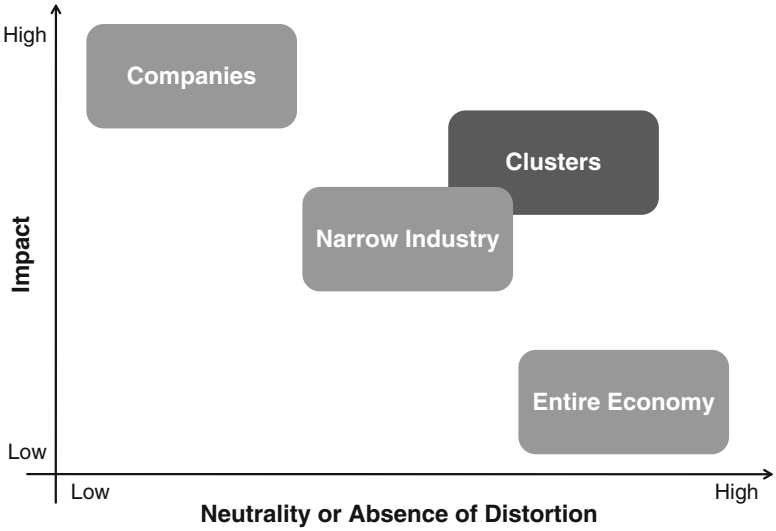

Fig. 13.4 The impact and neutrality of government policies (Copyright 2010 by Christian Ketels. Adapted with permission)

In practice, efforts to grapple with market failure are never perfect (Rodrik 2008). They suffer from government failures in implementation (some reasons for which are lack of knowledge to target the intervention, inability to provide incentive-neutral funding, and incapacity to resist political pressure by interest groups seeking

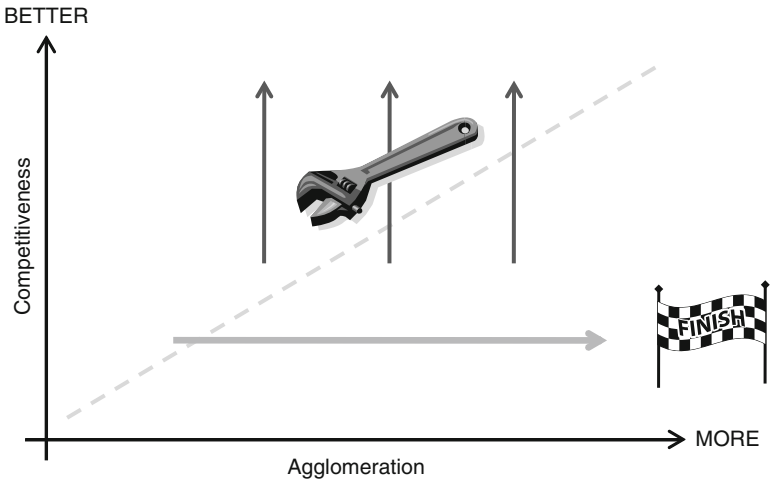

Fig. 13.5 Two perspectives on cluster development (Copyright 2008 by Christian Ketels. Adapted with permission)

beneficial treatment) and might have unintended side-effects, entailing collateral costs that outweigh the benefits. This observation is also true for cluster policy and has led to a debate on whether cluster policy is useful or harmful.

The Theoretical Debate About Cluster Policy

In the academic debate the strongest criticism of cluster policy does not come from researchers who claim that locational factors are irrelevant but rather from economic geographers and others who fully subscribe to the view that locational factors are important. Some analysts disapprove of the "fuzzy" nature of the cluster framework (Martin and Sunley 2003). Their criticism raises some pressing conceptual issues but has little relation to the practical problems policy-makers face when deciding on whether and how to implement cluster policy. It has also been challenged on more conceptual grounds (Benneworth and Henry 2004; Motoyama 2008). A more fundamental criticism of the motivation for cluster policy (Duranton 2011) turns out to be highly revealing for how the lack of a generally accepted definition of cluster policy continues to hamper the debate. To understand these different views on cluster policy, it is useful to go back to a simple diagram that relates agglomeration to competitiveness (see Fig. 13.5). The evidence discussed in the section on "Clusters and economic performance", above, points to a positive relationship between the two dimensions, a fact that is generally accepted by critics as well as advocates of cluster policy. (As discussed above, there is disagreement on how tight this relationship is relative to other factors.) But how should cluster policy

intervene to move a location from a place at the bottom left to the top right? This question is where the fundamental difference comes in.

In one approach agglomeration is the key policy lever; as agglomeration progresses, competitiveness will naturally follow as cluster effects set in. With agglomeration as the ultimate goal, efforts to attract companies through incentives—ranging from tax rebates to free infrastructure—naturally come to the forefront of the policy debate. Economic geography-based approaches, too, center on the effects of traditional tax, trade, and regional policies on agglomeration patterns (Baldwin et al. 2003). Dynamic models in "new economic geography" provide guidance on when and how these instruments should be used in order to have maximum impact (Brenner 2003, 2008): The process of agglomeration is characterized by crucial junctures at which patterns of economic geography are determined. For economic policy, this observation implies that intervention has to occur early—before the crystallization of the patterns that determine the future location of a dominant cluster. That intervention also has to be massive, meaning that it must give a boost so significant that the location acquires critical mass in order to far surpass all potential rivals. And it implies a priority on identifying a few clusters on which economic development then hinges.

If massive targeted subsidies in the early phase of cluster emergence are the policies under discussion, should they be used? Critics of cluster policy are not the only ones who counsel against resorting to them, for such policies require the policy-maker to have an abundance of information and ability and are therefore likely to fail. Furthermore, there is debate as to whether such policies could even have sufficient effect. With current economic geography being aligned with the fundamentals, some researchers find that policies encouraging a marginal company to change location have very limited impact on the productivity of other companies (Martin et al. 2008). Other analysts arrive at opposite results, with significant implications for the productivity of companies in the proximity of companies that have changed location (Greenstone et al. 2010).

In another approach competitiveness is portrayed as the vital policy lever; as competitiveness builds, agglomeration will naturally increase as the cluster becomes more attractive for new entrants (Rodriguez-Clare 2005). With competitiveness as the ultimate goal, clusters become a process tool to design and implement policies more effectively. The instruments then targeted at existing clusters are well known from innovation policy, regional policy, and enterprise policy. They are supplemented by actions that specifically favor collaboration on their use and that create platforms for collaboration within an agglomeration. The competitiveness literature, including the insights on cluster evolution, offers guidance on when and how to use these instruments. This assistance, though, is radically different from the model that critics of cluster policy have in mind. The focus should be mainly on agglomerations that have already passed the early stages of development (Rodriguez-Clare 2007). In other words, the fundamental conditions for economic success are in place, and active collaboration can become a "turbo" for the use of existing strengths. The emphasis of policy interventions should be on enabling collaboration and channeling resources in a different way, using moderate amounts of new funding. Major new

funding is not necessary and could become harmful by compounding the potential for distorting incentives. And though a selection of clusters is needed for the commitment of sufficient resources and attention to any one initiative, economic development is the result of many clusters in all regions that are flourishing, not just a few per country.

If these policies are the ones under discussion, should they be used? Even the critics of cluster policy have a slightly favorable view: Improvements in the fundamentals of competitiveness are a sensible goal, and the suggested approach mitigates their downside. But they remain skeptical about whether cluster efforts can sufficiently promote underlying competitiveness. Proponents of cluster policy, meanwhile, see enough evidence that such efforts can in fact lead to a much more meaningful implementation of policies for honing competitiveness (Cortright 2006; Mills et al. 2008; Porter 2008; Waits 2000).

There remains a fair degree of disagreement in the debate about cluster policies. This difference of opinion stems at least partly from a lack of effective communication between theoretical research and policy practice. This communication failure leads to a fundamental disconnect on what cluster policy is and how it is related to efforts to upgrade competitiveness. For many researchers, improving competitiveness is fundamentally an automatic process driven by the self-interest of companies and politicians. For most governments, improving competitiveness is a complex challenge of identifying action priorities and mobilizing allies to work on them. Cluster policy has the potential to respond to these real challenges, which the critics assume will be taken care of automatically over time.

The Practice of Cluster Policy

The number of cluster programs launched by governments around the world has soared in the last few years. There is significant heterogeneity in objectives, tools, and—as far as can be already seen—results.

Most cluster programs, especially in advanced economies, pursue traditional economic policy objectives in new ways:

- Innovation policy is the field of widest adoption for cluster programs. France (Pôle de Compétitivité), Germany (Spitzencluster), Japan (Industrial Cluster Program, METI; Knowledge Cluster Initiative, MEXT), Sweden (Vinnväxt), and, most recently, the United States (i6 Challenge program) have launched efforts in this direction, all trying to foster leading innovation clusters in the respective country. The Chilean cluster program (run by InnovaChile Corfo) is an example of a similar program in an emerging economy. Many of these endeavors are open to all types of clusters, whereas some concentrate on specific categories like biotech (German BioRegio competition) or energy (E-RIC[1] program in the United States).
- A close second is regional policy, where the main objective is to spur regional growth (with innovation a possible, but not the only, driver). Examples include

the RDA cluster efforts in the United Kingdom, the multiple cluster programs of German and Austrian states, and the Small Business Administration Regional Innovation Cluster program in the United States.

- A third, more heterogeneous group of cluster programs includes those that aim to upgrade company sophistication, mainly among small and medium-sized enterprises (SMEs). The German Competence Networks program falls broadly into this category. A range of EU-supported efforts aims at helping SMEs internationalize. Many programs funded by aid organizations in developing and emerging countries, such as the Inter-American Development Bank's cluster program in Colombia and the cluster program of the Brazilian Micro and Small Business Support Service (SEBRAE) Project in Minas Gerais (Brazil), are of a similar nature, often with a specific focus on enhancing exports (Ketels et al. 2006).
- Then there are specific programs where clusters have been used as an organizing principle in other areas, such as the U.S.'s Workforce Innovation in Regional Economic Development (WIRED) program on building workforce skills, and the cluster approach that Invest: Sweden and ProsperAr (Argentina) take to investment attraction.
- A final, quite different group of cluster programs includes those that aim to drive diversification by developing new clusters. Examples are the cluster program in Saudi Arabia; the cluster efforts in many of the Gulf countries; and many similar initiatives in Asia, from Singapore to China. There are also numerous programs in regions across the OECD to create new "high-tech" clusters, with the most popular targets having shifted from information technology to life sciences and then to "creative" and clean energy clusters.

Cluster programs differ significantly in the tools they use, not only their objectives. The contrasts to traditional policy approaches are often more pronounced in this dimension than in others.

- The vast majority of programs rely on the financing of specific activities conducted in the cluster. In advanced economies these financing structures diverge from traditional policies in two main ways. First, many of them must be structured as a cluster initiative in order to qualify for funding. There is no funding for individual companies. Second, an increasing number of programs allocate money through competitive process. There are no criteria whose fulfillment means automatic eligibility for government support. All of the previously mentioned efforts related to innovation policy follow this model. The regional programs listed also require cluster collaboration structures, but not all of the programs have a clearly competitive element. In emerging economies quite another path is often taken, with funding, directed credit, or tax incentives being granted to companies in target sectors, much as in traditional industrial policy programs. This approach has been used by many Asian countries, but also by OECD regions with ambitious plans to attract new clusters.
- Another group of programs provides or supports cluster management. Especially the Austrian and some of the German state-level programs operate in this way.

In Germany, the program for regional development was specifically changed to allow the funding of cluster management activities. The EU has recently started trying to improve cluster-management practice through training, networking, and tools for cluster managers. Many of these programs are designed to upgrade the funding schemes discussed above.

- The final group of programs gives direct support in the form of infrastructure, other input factors, and specific regulatory environments relevant to specific clusters. Such help is one of the preferred instruments in countries and regions intent on attracting new clusters. Dubai, for example, has made extensive use of free zones (e.g., finance, media, and semiconductors). Singapore's Biopolis, too, offers physical infrastructure and other incentives.

Although the understanding of cluster programs is growing, there is still painfully little systematic data on their impact. The limited quantitative evidence that does exist points to moderately positive effects (Dohse 2007; Dohse and Staehler 2008; Engel and Henrik 2004; Falck et al. 2008; Fromhold-Eisebith and Eisebith 2008). The reviews of individual programs tend to find positive returns for the participants and an expanded capacity for joint action (see, for example, the review of the Swedish Vinnväxt program by Cooke et al. 2007). Robust economic results are hard to pin down, however. Successful cluster development is mostly a function of sound economic fundamentals and significant collocation of related activities (Lindqvist, Ketels, and Sölvell 2003). Cluster programs can supplement those kinds of fundamentals and affect cluster development but are very unlikely to produce clusters on their own (Konakayama and Chen 2007; Meier zu Köcker 2008; Sölvell 2008; Wolfe 2008).

Although there is no dramatic empirical evidence of the effectiveness of cluster programs, programs that have steered free of attempts to create clusters seemed to have fared at least as well as the traditional policy programs that governments use. Measured against this real benchmark instead of the theoretical benchmark of an ideal policy, cluster programs have come out relatively well. Accordingly, the cluster policy debate among government officials has shifted its emphasis from whether to launch programs to how to organize them (see, for example, High Level Advisory Group on Clusters 2008).

Challenges in the Practice of Cluster Policy

Government officials discuss many details of how cluster programs should be designed. The effective engagement of the private sector, the combination of local with global linkages, and the measurement of impact are often mentioned as key issues. In this section I discuss three particular challenges that have rather broad conceptual importance and require a practical answer to the question of designing cluster programs appropriately.

The first challenge is how to scale up the impact of cluster programs. Simple arithmetic suggests that working with one regional cluster, even a sizeable one,

is unlikely to generate economic outcomes that are meaningful for the overall regional economy. The average regional cluster accounts for about 1 % of total employment in a region (European Cluster Observatory 2008); larger clusters, maybe up to 5 %. Upgrading one cluster will tend to have only a moderate impact on the regional economy overall. There is a range of ideas for how cluster policy can be designed to affect the regional economy (High Level Advisory Group on Clusters 2008; Ketels 2009; Pietrobelli and Rabelotti 2004). Regional officials should take a portfolio perspective on their cluster efforts, addressing the different needs of clusters at different stages of development and leveraging the linkages across clusters. They should leverage the experience of the cluster efforts for economy-wide improvements. And they should integrate their cluster efforts into a broad economic strategy that identifies the specific value the location has relative to others of similar standing.

The second challenge is how to spur the development of new clusters. The evidence discussed indicates that cluster programs work best for strong, established clusters. But the limitations of a cluster policy confined to "strengthening the existing strengths" is obvious for less advanced economies and regions in a process of structural change (Ketels and Memedovic 2008; Landabaso 2001). Some researchers suggest that diversification efforts can be based on a cluster approach when development paths are designed to leverage existing clusters for a push into related fields (Delgado et al. 2010a; Hausmann and Klinger 2007). These ideas have informed a discussion about "smart specialization" as a new concept for regional policy in Europe (Foray et al. 2009), one according to which existing cluster structures would serve as the basis for regionally specific development strategies. Identifying the potential for new economic activities is seen as something that only companies can do. The significant positive external benefits that it yields instills theoretical motivation for governments to assist this discovery process.

A third challenge in conceiving an appropriate design for a cluster program is the question of where to use cluster programs instead of more traditional policy approaches. The evidence discussed indicates that cluster programs work best if the economy's fundamentals are solid. But in emerging and developing economies these fundamentals have significant weaknesses almost by definition. Poor business environments are likely to be a far more serious obstacle than the weakness of clusters is. And with fragile political institutions the move toward cluster policies can open a Pandora's box of interventions, as noted by the European Bank for Reconstruction and Development (2008). Still, regional concentrations of related activities are prevalent even in emerging and developing countries (World Bank 2009; Zeng 2008). Under such demanding conditions, efforts to establish and develop clusters should be directed to creating the local and regional social capital required in order to upgrade competitiveness in the future. And cluster efforts should be supported with limited resources (which are often sufficient for collaboration) and managed by institutions that are outside direct political influence.

Conclusions

Cluster policy is a field undergoing dynamic development in which the clarity of the conceptual discussion has not always kept pace with the efforts of government officials. Although there is an emerging consensus on what clusters contribute to the modern economy, the discussion on a workable theory of cluster policy is still very active. The absence of a consensus on the usefulness of cluster policy is to a major degree the consequence of confusion about what cluster policy actually is. If cluster policy is understood as a tool to change the nature of economic geography artificially, there are many conceptual and practical arguments against its use. If, however, cluster policy is seen as a way to leverage existing agglomerations as platforms for collaborative enhancement of cluster dynamics and as effective channels through which to deliver economic policies, it has much potential.

Whether cluster policy can fulfill this potential is not only a matter of clarifying a conceptual debate that is too often conducted in the parallel worlds of different, isolated research traditions. It also depends on the way cluster policy is implemented in practice. The number of efforts to improve the actual practice of cluster management and cluster policy design has risen significantly over the last few years, but academic research has in great measure been too detached from the reality of the problems government officials and cluster initiative managers face to be of much help.

Further progress in the debate on cluster policy debate will have to be driven by additional data. For clusters, there is now an increasing amount of quantitative data that have facilitated a new wave of empirical research. For cluster policy, there is nothing comparable. The existing impact assessments are case-by-case analyses and tend to be focused on improving the specific policy program in place, not on broadly learning about better cluster policy. This approach for impact assessment is a start, but more has to follow.

Note

1. Regional Innovation Cluster (RIC).

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