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Clusters, Innovation and Entrepreneurship
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Chapter 1

Policy Issues in Clusters, Innovation and Entrepreneurship

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This chapter sets out the key policy issues examined in the book on supporting entrepreneurship and innovation through clusters. It discusses the nature and importance of clusters, how clusters function, and the role of policy. Clusters stimulate entrepreneurship and innovation because they are sites of localised positive externalities in labour market pooling, input-output linkages and knowledge spillovers. Policy has a role to play in facilitating the emergence and growth of clusters and addressing some potential problems of clustering.

Introduction

Major localised clusters of firms and research and training institutions in closely related activities play an important role in increasing innovation, entrepreneurship and growth in the local economies that host them, generating both local and national economic benefits. This book looks at how selected successful clusters operate, how they are supported by policy and the lessons for other areas. We use a local lens to understand these clusters and cluster policies because each cluster is situated in particular local conditions and the relevant policy interventions must therefore be tailored to their distinct needs.

Clusters support economic growth by providing an environment conducive to innovation and entrepreneurship in given activities, which enables productivity growth through increases in efficiency and the quality and differentiation of goods and services. Many of the benefits occur naturally, without any need for public intervention: knowledge spillovers happen when workers change firms and entrepreneurs spin-off ideas from large firms or research institutes; labour search and training costs are reduced when there are large local pools of specialised labour; and firms capture internal economies of scale when selling specialised inputs to large local markets. But public policy can also play an important role in the emergence and development of successful clusters, for example by supporting pre-competitive research collaborations, providing basic and specialised infrastructure, brokering network creation, funding generic education and training and helping to co-ordinate and mobilise key stakeholders behind a vision for the development of the cluster.

This book provides seven case studies of the recent evolution of major, successful clusters in OECD member countries, the challenges they face and the role that policy is playing there. Each cluster is crucial to its local economy and of real significance to its national economy. Their development is complex and context specific, but examining their stories raises important issues for cluster development elsewhere. The story of the Grenoble cluster in France is illustrative.

The economy of the Grenoble city-region has grown strongly in recent years, driven by an internationally competitive cluster of activities in research, development and product design for microelectronics, nanotechnologies and related software. It counted in 2007 some 40 000 direct jobs in 300 enterprises,

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of which the majority were less than 10 years old, and included many spin-off enterprises. Cluster output and employment has grown strongly in the last few years, especially within SMEs, and its firms undertake a high level of innovation, with over 80 per cent bringing new products to market in a 3-year period. In 2005, the cluster was recognised by the French government as one of seven "global competitiveness clusters" in France, or "pôles de compétitivité mondial", bringing considerable financial support for research and development activities and a cluster management organisation, Minalogic, with the job of brokering research and other collaborations between research, education and industry.

The development of the Grenoble cluster has nonetheless unfolded over a long period of time. The development of electronics and microelectronics activities in the area can be traced back for at least 50 years to the development of hydroelectric power in the surrounding Alps and the location of a branch of the government's atomic energy agency undertaking industrially relevant research in the city. Following these largely informal and fortuitous origins, it is interesting how the cluster then gathered strength and grew over time, successfully updating its technologies by combining and recombining a number of technology staples, from the era of hydro-electric power, electrochemistry and electrometallurgy in the 1950s to the present era of nanotechnology.

What has been behind this success? Views differ on the details and precise order of importance, but certain elements stick out. Grenoble has built on a very strong education sector, comprising four universities and a management school delivering a large inflow of high-skilled labour in relevant fields. It has eight major national or international research institutes in related fields. Strong local social capital at leader level and an entrepreneurial and pro-cluster local public sector has helped to drive research-industry co-operation and public-private investment projects. Some major firms have located their research and development facilities locally, which despite subsequent changes of ownership have remained locally embedded and strong sources of spin-off enterprises. And there have been some important flagship projects in the last ten years, including the Alliance Crolles 2 initiative, an agreement amongst three major firms to pool some of their pre-competitive research efforts, the Minatec project, a centre for joint education, training and research for the cluster, and the recent "pôle de compétitivité" initiative, each driving the cluster forward. So in a strong sense the growth of the Grenoble cluster has been supported and accompanied by cluster-oriented public sector activity and investment and strong local leadership.

But there are new challenges for the cluster, which potentially threaten its continued growth. One major issue is the need to respond to intense and increased international competition. Major investments in platform

technologies were made in the past, but a new scale of investment is now implied for a new generation of microelectronics products, and the cluster is seeking to compete with others abroad that are benefiting from substantial public investments. A second challenge is to reverse a worrying, if small, recent decline in the number of researchers in the cluster and a shortage of technicians. And there is a continued "invisible barrier" between industry and public research and education institutions that constrains the labour mobility that promotes knowledge transfer and collaborations. SMEs have also been kept too far away from formal cluster governance arrangements, limiting their potential role in contributing to and disseminating innovations and spreading job creation benefits through subcontracting. Then there is a major question concerning the future trajectory of the cluster, with the key industry, research and government players needing to strike the right balance between specialisation and diversity in the cluster, seeking on the one hand to minimise the risk of becoming a single specialisation cluster vulnerable to shocks and on the other to avoid a fragmentation of research and training efforts that would reduce critical mass. This challenge is epitomised by a recent local debate about whether public research funding for the cluster should move into new areas such as sophisticated textiles that share a common competence and skills base with the traditional cluster specialisation but are not strictly in the fields for which the cluster is best known. Furthermore, success itself has generated new challenges and threats in terms of managing congestion in transport and housing, limiting the risk of social divide by ensuring that growth benefits are spread widely in the city and not limited to an elite group of high-tech employees and responding to ethical objections to nanotechnology research in the cluster, for example by sharing information and developing ethics policies.

There are clearly some potentially important lessons from this story for other clusters. The case of Grenoble demonstrates the potential of a local cluster to drive growth through generating and supporting innovative enterprises able to compete on a world stage. It underlines the critical role that public policy often plays in supporting the development of clusters. It shows the role that leadership, social capital, public investment and collaborations have played in supporting development. It also shows that clusters need to evolve over time through adaptation to changes in technologies and markets. And it suggests that clusters should not be seen as assured successes, able to look after themselves and spread benefits more widely, but that their growth and evolution are likely to bring with them new challenges often requiring further co-ordination amongst stakeholders and targeted policy support.

Cluster policies are still relatively new in many places and substantial policy experimentation is taking place. There is much to learn from these experiments about the role of policy and its methods and approaches. This book takes up this

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learning challenge by seeking answers to the following questions for each of seven internationally important clusters (Grenoble, France; Vienna, Austria; Waterloo, Canada; Madison, Wisconsin, United States; Dunedin, New Zealand; Oxfordshire, United Kingdom; Medicon Valley, Sweden/Denmark):

- What is the nature of the cluster and how has it evolved over the last ten years?
- What are the key drivers of competitiveness of the cluster and the factors behind its success?
- What is the impact of the cluster on entrepreneurship and new and small firm development?
- What are the obstacles to further development of the cluster?
- What is the role of public policy at national, regional and local levels in supporting the cluster?
- What are the future policy challenges for the cluster?
- What are the lessons of the experience for clusters elsewhere?

By reviewing these experiences, the book aims to point to the most promising directions for policy development in other clusters.

But first this introduction addresses some key preliminary issues that should be understood before deciding on policies for clusters, namely: What are clusters? Why focus on clusters? What are the limits to cluster approaches? How do clusters function? What is the role of policy in clusters?

What are clusters?

Clusters are geographic concentrations of firms and organisations working in related activities. They have been defined by Porter (1998) as geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries and associated institutions in particular fields that compete but also co-operate. They are often rooted in a single locality, but their boundaries will not always correspond to local administrative areas, as illustrated by the Medicon Valley case in this book. They exist across the full array of tradable sectors although they often do not correspond to a single manufacturing or service sector as recorded by standard industrial classifications.

The feature of tradability of cluster output across local and national boundaries is an important one. First, it highlights the fact that clusters of locally-concentrated activity can only emerge when it is possible to trade their output, since otherwise the scale of the activity is limited by the local population which it serves. Second it highlights how the size and specialisation of clusters have been able to grow given globalisation and increased international market integration. The potential impacts of clusters are therefore

much greater now than in an era of stronger national trade barriers and higher transport costs. Third, because they are tradable and grow into international markets clusters are of course subject to strong competition from other places.

From a national or international perspective, the economic benefit of clusters comes from the specialisation of places in activities within which firms can gain higher productivity through accessing external economies of scale or other comparative advantages and the trading of this higher quality and lower cost output with other places. From the perspective of local governments, the benefit comes from the strong competitiveness of the clusters they host, their generation of higher wages and profits, their attraction of new investment and the spread of benefits to the rest of the local economy.

Clusters may be supported by a specific cluster initiative or programme, for example a network broker or manager, but this is not always the case. Indeed, a frequent mistake made by policy makers and analysts is to think that clusters are synonymous with deliberate policies or deliberate co-operations in formal networks. Although this type of action is common and can be important, clusters may also arise and sustain themselves simply through market processes as new actors move into a cluster to gain the benefits of greater productivity and existing actors grow through their greater competitiveness. Thus the role of policy has to be carefully assessed.

It is also important to recognise that there are different types of clusters with different methods of functioning. Iammarino and McCann (2009) identify three types of clusters: "pure agglomerations" such as a competitive urban economy with fragmented and hard-to-identify relations among firms, "industrial complexes" such as steel dominated clusters with strong vertical linkages in local supply chains, and "social networks" such as new industrial districts with strong social capital based relationships. A classic article by Markusen (1996) distinguished between "new industrial districts", "hub and spoke districts", "satellite industrial platforms", and "state-centered districts". Panniccia (2006) provides another useful typology. The point is that the nature of clusters and the processes that make them competitive differ, and these differences must be understood if appropriate policy responses are to be developed.

Why focus on clusters?

Economic benefits

For those involved in policy development, the fundamental motivation to understand clusters is to explore what policy might do to facilitate their emergence and growth and hence realise the potential economic benefits associated with them. The picture is clearest when the lens is placed on those places that host clusters. Within these places cluster development may be associated with productivity increases resulting from a range of localised

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external economic benefits discussed further below. These productivity increases allow increases in the wages and profits or price competitiveness of local enterprises. Furthermore, they can create a virtuous circle of growth as the higher productivity environment generates new firm entrants and firm expansions, increasing the size of the cluster and strengthening the productivity benefits. Local growth may therefore be expected in terms of income per head increases and job creation.

From the national perspective, the picture is more complex because the external economic benefits in the locations where clustering occurs may be accompanied by external economic costs from losses of activity in other locations. If the productivity gains within the cluster outweigh the productivity losses in other places, then national rather than just local gains can be expected. Whether such net national gains exist is a difficult empirical question to answer. Nonetheless, theory suggests that if a range of cluster specialisations emerge across a country then national benefits might be expected from the increased division of labour. In addition, major clusters compete internationally and as such may generate benefits without necessarily displacing other national companies from their product markets. But critically, because of increasing returns more innovation may be generated from location in clusters, thus stimulating growth. Furthermore, the growth of major clusters may also spread more widely within a country through mechanisms including purchasing from suppliers outside of the cluster, transfer of knowledge to other areas, and redistribution of tax revenues.

Political interest

Growing understanding of the potential for realising these types of economic benefits has also raised political interest in clusters in recent years. The French competitiveness clusters ("pôles de compétitivité") programme has already been highlighted in the case of the Grenoble cluster. It is an initiative that aims to promote innovation, exports and growth in French strategic industry sectors by building critical mass in 71 clusters, with a greater weight of spending going towards the 7 global competitiveness clusters. Important national cluster initiatives can also be found in other OECD countries, such as the Technology Cluster Initiatives in Canada, the Czech Clusters Programme and the Japanese Industrial Cluster Programme (OECD, 2005; OECD, 2007). Regional and local governments and agencies are also frequently involved in cluster development (Sölvell *et al.*, 2003; Observatory of European SMEs, 2002). The sum of these national and local initiatives represents a significant overall policy effort and it is important to respond to and guide this political interest and the initiatives it is spawning.

Potential threats to cluster performance

Despite the success of many clusters, their continued contribution to economic growth cannot be taken for granted. There are many examples of previously strong clusters that have been unable to reposition themselves and have declined severely in the face of strong international competition or technological and market change, such as the shipbuilding industry in Glasgow, UK, or the New England golf equipment cluster in the USA (OECD, 2001; Porter, 1998).

The market and competitive threats are intense today with the economic crisis. A number of authors refer to a cluster life cycle, with clusters being born, growing, moving to maturity and declining (Bergman, 2008; Maggioni and Riggi, 2008; Huggins, 2008). As with the product life cycle, it is nonetheless possible for clusters to escape this destiny with appropriate renewal strategies and adaptation to change. Rabelloti *et al.* (2009) show how many of the famous Italian industrial districts are adapting to changes in competitive pressures by evolving in their sectoral specialisations, developing new internationalisation and innovation strategies and developing new forms of enterprise organisation. Nonetheless other case study evidence and the experience of clusters that declined or collapsed in the past suggest that clusters can sometimes become locked into their core technologies, reinforced by infrastructures such as social capital and research and training activities that fit those core technologies, leading to decline as outside technologies and markets change over time. Policy makers should therefore be aware of the potential competitive weaknesses of clusters and have some understanding of how lock-in may occur and what facilitates diversification. The speed of reaction to such problems needs to accelerate in current conditions.

Costs of clusters

The economic benefits of clusters are commonly highlighted. However, there are also potential economic and social costs that should be taken into account in considering whether and how to support clusters. One of the most obvious costs is increasing congestion as clusters grow, in the form of busy roads, queuing and rationing of public services and infrastructure such as schools, hospitals and leisure facilities, rising house prices and encroachment of buildings on green spaces. This has led some local government authorities, such as those involved in the planning of the Oxford and Cambridge clusters, to constrain growth or disperse activities to other areas. Another potential cost is that cluster growth may increase social inequalities in host localities as a core group of workers emerges with high pay whilst another segment of society is excluded from core jobs. Whilst all residents suffer from the increased congestion, residents benefit to different degrees from the increased incomes generated by cluster growth. Policy makers are therefore called on to find ways of managing

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congestion and spreading benefits. Some very interesting local initiatives have emerged to help manage these problems. For example, the OECD identified a series of social innovations in the Silicon Valley and San Francisco Bay area that have emerged in response to rapid growth pressures, including PolicyLink's "Equitable Development Zone" in the City of Richmond and California Futures Network's promotion of planning policies focused on developing existing, underutilised urban centres rather than encouraging urban sprawl (OECD, 2004).

Learning from policy experimentation

In recent years, the number of cluster promotion initiatives has increased, leading to a situation today where many types of policy approach coexist, varying in their precise goals, activities and intensities. Approaches range from leaving the clustering process to the market, building critical mass through inward investment and infrastructure initiatives, supporting science-industry linkages and creating formal networks among cluster enterprises for joint sales and purchasing and other types of co-operation. The co-existence of many approaches presents an opportunity for the policy maker to learn about policy options.

At the same time, the fact that cluster policies have often arisen in a bottom-up way from local initiatives suggests scope for identifying and spreading the most effective approaches. At present, robust evaluations of the economic impact of cluster initiatives are rare, reflecting the complexity and multifaceted nature of cluster policies relative to single policy instruments, and this evaluation gap needs to be addressed. The scope to learn from other places nonetheless exists in a more qualitative way, with the proviso that the initiatives implemented as a result of such exchange of good practices should be properly evaluated and adjusted in line with the results.

One of the most important lessons from cluster experience to date is that policy should not seek to build clusters in places where the necessary critical mass and conditions do not exist, corresponding to the "wishful thinking" clusters of Enright (2003) (policy driven clusters that lack not only a critical mass, but also any particular source of advantage that might promote organic development). This is much less likely to be a problem in the case of major clusters with significant history but caution should be applied when seeking to apply the lessons to very small clusters.

A framework for policy co-ordination

A further reason for focusing on clusters is because they offer potentially useful frameworks for co-ordinating the range of different actors involved in delivering economic policies relevant to cluster development on the ground and better fitting them to real local needs. Taking a cluster perspective allows the policy maker to consider together and at the same time all the aspects of the local

environment and firm capacities that influence the competitiveness of key export sectors. This lends itself very well to the development of integrated strategies that bring together a range of approaches and measures – such as inward investment, entrepreneurship, training, innovation and infrastructure – around key local goals, hence increasing the potential for achieving synergies, reaching real priorities and mobilising local stakeholders. Within clusters, the potential is very strong for bringing together policy activities more productively by analysing systemic needs and developing collaborations between stakeholders.

Clusters and the economic crisis

Recent years provided very favourable conditions for cluster development, reflecting strong global economic growth. From 2008, however, a global economic crisis has provided radically different conditions. The crisis is destroying firms and jobs, making finance difficult to obtain for investment and stifling appetites for risk. As concentrations of entrepreneurship and innovation, clusters are likely to be hard hit. At the same time, however, the cost and productivity advantages that clusters have built up over time are likely to provide firms in clusters with an important advantage in surviving the crisis relative to isolated firms. Thus clusters and cluster policies can be seen to be important in both times of growth and recession. Furthermore, if policy makers can make the right decisions about investments to be made now, those that will improve the competitive environment in clusters rather than simply seeking to subsidise everyday firm operations, they are likely to lay the foundations for future economic and employment growth.

How do clusters function?

It is critical to understand how clusters function in order to assess the appropriate role for policy. In one sense, this is not straightforward because there are several competing explanations of the cluster phenomenon (Asheim, Cooke and Martin, 2006) whilst it has already been highlighted that the specific nature and functioning of clusters varies. At the same time, however, there is considerable overlap between explanations and fairly wide agreement about the fundamental foundations of cluster performance.

The core argument goes back to Marshall's assertion that there is a triad of external economies in operation within clusters, namely "thick" labour markets, specialised input suppliers and knowledge spillovers (Marshall, 1920; Belussi and Caldari, 2009). Following Marshall, clusters are widely seen to generate innovation and productivity benefits because they facilitate:

- A division of labour in the labour market, enabling firms to obtain specialised labour with lower search and training costs and higher productivity and workers to obtain higher wages and increased opportunities to specialise and move firms.

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- A division of labour in intermediate supplier industries, providing customer firms with local access to specialised suppliers of materials and components, finance, marketing and business services and so on, enabling specialised input providers to exploit greater internal economies of scale, reducing search and monitoring costs for both parties, and reducing transport costs.
- Knowledge spillovers, such as transfers of knowledge of market opportunities and technologies among agents in the various firms and research organisations located within clusters through a range of formal and informal links.

Duranton and Puga (2004) give a more differentiated account of the types of externalities that are likely to explain the locational advantages of clusters. However, the key feature of both accounts is that the important externalities are favoured by geographical proximity, thus explaining the phenomen on of clustering. There is certainly evidence of a significant localisation of knowledge spillovers, reflecting the tacit nature of some parts of knowledge (Jaffe *et al.*, 1993; Audretsch and Feldman, 1996; Anselin *et al.*, 1997) and the greater division of labour in the product and labour markets of clusters is also clear to see.

These externalities drive productivity growth, permitting profit and wage growth on the one hand or price reductions and output and employment growth on the other. This may set into motion a positive cumulative causation process. Thus the higher rewards to firms, entrepreneurs and workers that the higher productivity of the cluster offers may attract new factors and activities in terms of new firm starts, growth of existing firms, inward investment, in-migration of labour, growth of research and training centres and so on, thus increasing cluster mass and productivity in a cycle of growth that is likely to come to an end only when increased cluster productivity advantages are matched by greater cluster costs as wages, land prices and other factor costs rise and congestion arises.

Clearly, the case for clusters rests on the idea that they offer favourable environments for high innovation and productivity and there is significant empirical evidence pointing to the existence of such benefits. Aharonson *et al.* (2004), for example, show how clustering affects biotechnology firms' innovativeness, taking firms with similar characteristics and contrasting the performance of those located in clusters with those not located in clusters. They found that clustered firms are eight times more innovative than geographically remote firms, with the largest effects for firms located in clusters that are strong in their own specialisation. Biotechnology may be a sector for which clustering has particular benefits because it relies heavily on the transfer of tacit knowledge. Nonetheless, other studies taking a range of technology specialisations show that cluster firms tend to be more productive in innovation than other firms (Audretsch and Feldman, 1996; Baptista and

Swann, 1998; Breschi, 2008; Lublinski, 2003; Porter, 2003; Wallsten, 2001; Weterings and Boschma, 2006). There is also empirical evidence linking clusters to other economic benefits including increased firm productivity (Madsen *et al*., 2003; Szforzi, 1990), entrepreneurship (Feldman, 2001; Guiso and Schivardi, 2007; Rocha and Sternberg, 2005; Rosenthal and Strange, 2005), local employment growth (Audretsch and Dohse, 2004; Fingleton *et al*., 2008; Wennberg and Lindqvist, 2008) and local wages (Brenner and Gildner, 2006; Porter, 2003; Wheaton and Lewis, 2002).

A debate that has not yet been fully resolved, however, concerns whether the important externalities in a cluster occur within particular industries, and are therefore favoured by sector specialisation (*i.e.* localisation economies or Marshall-Arrow-Romer externalities) or whether they occur across industries and are favoured by sector diversity (*i.e.* urbanisation economies or Jacobsien externalities). If they are the latter then it is simply city size that matters. If they are the former then it is the concentration of firms in the same sector that counts, corresponding better to the conception of clusters usually applied in the policy world. There may also be a middle road, in the form of related variety, referring to externalities among activities in different industries but which share competence and knowledge-bases (Boschma, 2009; Asheim, 2008). Empirically, the relative importance of localisation as compared with urbanisation economies has not yet been pinned down (Glaeser, 2000; de Groot *et al*., 2008), but clearly an important element of localisation economies is required for traditional cluster thinking to hold.

There are other views of cluster functioning and how economic benefits are generated that go beyond the Marshallian externality view outlined above. Particularly influential is the work of Porter (1998) on the competitive advantage of nations, regions and cities. Porter's analysis focuses on four inter-related cluster advantages in his famous "diamond", namely: specialised factor inputs (such as human resources, capital resources, physical infrastructure and university research institutes), related and supporting industries (such as capable suppliers and related industries), sophisticated and demanding customers (that press firms to improve and provide insights on future market needs) and a favourable investment climate and vigorous local rivalry. This represents a broader view of the driving forces of cluster competitiveness than the Marshall story, in particular in its emphasis on the benefits of a competitive spur to productivity. Others have focused on notions of innovative milieu (Ratti *et al*., 1997; Camagni, 1991), local innovation systems (Asheim and Gertler, 2005; Cooke, 2001, Cooke *et al*., 2004) and other sources of localised increasing returns. Nonetheless, externalities are usually at the centre of theoretical explanations of cluster performance.

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A difficult issue within all this, and one with important potential policy implications, is whether formal networks and collaborations are required to achieve the anticipated benefits of clusters, or whether the benefits can be achieved simply through co-location and normal business transactions. For example, studies of high-technology European clusters found that knowledge transfer largely occurs through labour mobility amongst enterprises, company spin-offs and acquisitions of enterprises by others in the cluster rather than by formal exchanges (Keeble and Wilkinson, 2000). This might suggest that cluster policy should focus mainly on building cluster size rather than interactions. Others place much stronger emphasis on the role of social capital in clusters and suggest that governments may be able to create environments that favour the emergence of social capital and co-operations among firms and other agents in clusters (Storper, 1997; Putnam, 2000).

Furthermore, entrepreneurship is clearly a critical, if under studied, process in cluster development and one that is tightly linked to innovation. A large part of cluster success is usually attributed to relatively strong innovation performance. However, innovation requires entrepreneurs to carry new ideas into exploitation. Thus successful innovation in clusters is likely to be accompanied by new firm formation, spin-outs and small firm growth. To favour this, clusters need to provide appropriate conditions for successful new business development, such as an entrepreneurial culture, access to clients, access to capital, and access to exploitable knowledge in existing firms and research organisations (Mills *et al.*, 2008).

What is the role of policy in clusters?

The fundamental rationale for policy intervention in clusters is to facilitate the exploitation by firms and workers of potential local external economic benefits from input-output linkages and knowledge spillovers and hence increase productivity and generate growth.

One mechanism through which policy may facilitate exploitation of positive externalities in clusters is by stimulating growth in cluster mass, for example by providing information to potentially mobile firms and workers on cluster locations and specialisations, offering incentives for investment in clusters and supporting the provision of housing, business premises and other infrastructure in clusters. This approach creates the conditions for the potential realisation of positive externalities by increasing the co-location of agents. If firms and workers are encouraged to locate in clusters then productivity within the cluster may be expected to increase. There is a national benefit if that increase outweighs reductions in productivity in the places that agents relocate from.

A second mechanism is intervention to encourage collaborations among agents in clusters, for example through incentives for joint research projects, commercialisation of public research, creation of spin-off companies, development of science and innovation parks, creation of local knowledge exchange networks and upgrading of suppliers to assist them in gaining contracts with larger firms. This type of approach assumes that co-location on its own is not enough and that explicit local collaborations are required to realise the potential benefits of clusters. In principle it does not reduce productivity outside the cluster. In fact increased innovation would be expected to spill over to other places.

If the market itself were to generate optimal clustering and cluster interactions then such policy intervention would be counterproductive. However, there are a number of reasons for thinking that the market will produce suboptimal outcomes.

1. *Non-appropriability of externalities*. Clusters are argued to be the sites of positive externalities. However, whilst firms and workers may be attracted to clusters to gain from externalities generated by others, they are not compensated for the positive externalities they generate themselves. For example, if a firm trains skilled labour which then moves on to another cluster firm or imparts tacit knowledge about market opportunities to other firms, it is not directly compensated. It may therefore be expected that firms and workers will engage in too little clustering without some form of public intervention to help clusters emerge and grow.
2. *Lack of location information*. Firms and workers may lack information on existing or potential cluster locations in which their productivity could be enhanced. If this is the case then agents may choose suboptimal locations unless policy makers can find a way to transmit information on the location and specialisation of high productivity local clusters.
3. *Lack of co-ordination of agents*. Although firms benefit from co-location in a cluster, market mechanisms may not be sufficient to co-ordinate the co-location process. Even if agents are aware of the potential benefits of locating near to others, it may not be clear where they should locate to realise these benefits since the eventual outcome depends on a set of decentralised decisions. Thus eventually perhaps no cluster will emerge, or a cluster may emerge in one place and not another. Since the outcome is difficult to predict and agents face costs in relocating there can therefore be a blockage on cluster emergence. A lack of trust among agents may also act as a barrier to the development of potentially beneficial collaborations within clusters such as research and development collaborations and joint purchasing or marketing initiatives. The general difficulty is that no individual agent is likely to be sufficiently recompensed for the costs of co-

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ordinating the establishment of a cluster and the interactions within it. If an agent undertakes promotion work to enhance the visibility of a cluster and attract new agents, all present and future players in the cluster are likely to benefit, whether or not they contribute to the promotion work and there is usually no private sector mechanism available to ensure that all beneficiaries contribute to the costs. This suggests that the public sector can have an important role to play in "seeding" the emergence of clusters and as an "honest broker" of collaborations.

4. *Restrictions on mobility*. Barriers to the geographical mobility of firms and workers are also likely to impede the emergence of clusters. It might be expected that firms and workers will be drawn to locate in clusters because of the greater profitability and real wages expected, at least up to a size where the effects of an increasing number of competitors or congestion start to force firms to disperse (Krugman, 1991, Baldwin *et al.*, 2003). However, barriers to the mobility of agents, for example in housing, land and labour markets, may prevent the optimum level of clustering from emerging without public action to address mobility problems.
5. *Generic market failures*. A number of well-known market failures affect entrepreneurship and innovation in general and are also likely to affect clusters. Typical problems include financing for new and growing firms, development of science and technology infrastructure, research and training. As with any market failures, appropriate public intervention is called for as long as the public sector can achieve better outcomes than the market. In the case of cluster policy, the key point is that there are likely to be certain failures that are specific to particular clusters in their scale or nature, and hinder the emergence of potential cluster specialisations. For example, finance, skills, research and infrastructure might be required for a particular activity such as biotechnology or information technologies, suggesting the need for policy solutions that are adapted to the needs of each cluster.
6. *Negative externalities and distributional problems*. Another type of policy problem that may occur in clusters is the possibility that cluster growth may lead to significant congestion costs because agents do not take into account the negative externalities of their activities for others. Policy should therefore price the congestion or take second-best measures to disperse activity or improve infrastructure in the cluster to remove the congestion. Furthermore, the market is not good at addressing potential distributional problems in clusters in the form of the inequalities that may emerge between rich and poor residents. Policy intervention of some kind may be needed to address these distributional questions, whether at national or local level.

There has been strong debate about the role of policy in clusters (Asheim, Cooke and Martin, 2006; Caniels and Romijn, 2005; Cooke, 2002; Hospers *et al.*,

2008; Peck and Lloyd, 2008). However, arguments based on the need for policy intervention to address the types of market failures identified above have strong theoretical and empirical foundations. It could be argued that once clusters are operating successfully the public sector should withdraw since firms should then have internalised the location advantages started through the policy stimulus to co-location and collaboration. In practice, however, continued public sector support may be required for activities that are subject to continued market failures such as the provision of education, training, seed and venture finance and pre-commercial research appropriate to the needs of the cluster.

There is also an emerging school of thought that focuses on evolutionary aspects of cluster development and the adaptability of clusters and their firms to technological, competitive and market demand shocks (Bathelt *et al.*, 2004; Bergman, 2008; Boschma, 2009; Cooke, 2009; Hassink, 2005; Martin and Sunley, 2006; Zucchella, 2006). A key message from this thinking is that clusters must avoid over-specialisation and lock-in by branching from time to time into new directions involving the reorientation of existing activities to new technologies and markets, creating new combinations of activities and exploiting related variety opportunities. It is often argued that policy also has a role to play here in facilitating access to new knowledge via "global knowledge pipelines", or alliances with global technology and market partners, the attraction of foreign direct investment and highly skilled labour and the promotion of innovation and entrepreneurship to support the emergence of more variety within clusters.

However, the potential problems with cluster policies should also be recognised and taken into account in decisions about whether and how to support clusters. Firstly, new theory from spatial economics suggests that policy assessments need to look wider than clusters themselves if they are to establish the full economic impacts of cluster policies, since whilst there may be positive impacts on the competitiveness of the clusters receiving policy support, they may be accompanied by negative impacts on the competitiveness of other areas (Potter, 2009). Indeed, cumulative causation processes are likely to be involved in which the strongest clusters grow at the expense of others. Therefore, whilst local governments and development agencies will wish to capture the maximum cluster activity to their area, at national level it must be recognised that there can be only a small number of major clusters. This suggests an important governance issue requiring co-ordination between national and local policies.

Secondly, cluster policies are essentially a type of "picking winner" approach. In addition to market distortion concerns, they are therefore associated with the usual problem of lack of information on current and future conditions to support governments in the choice of sectors that will grow successfully. There are a number of examples of past cluster policy

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interventions that have failed because of changes in markets, technologies or competition or because the nature of the intervention was not appropriate. Hospers *et al.* (2008) refer to this problem as one of "backing losers" rather than "picking winners". A related problem is the potential for "institutional capture", whereby public authorities become too close to cluster stakeholders and start to follow their agenda too closely risking high policy deadweight and distortion.

Thirdly, supporting clusters increases the degree to which host economies are specialised in cluster activities. If those clusters then decline, and if it takes time for other industries to grow up locally and for workers to shift to the new industries, then the host locality will suffer from out-migration and reduced incomes and increased unemployment for those who remain.

Finally, clustering clearly should not be seen as the sole economic development solution for innovation and growth. There is a wide range of evidence pointing to the major importance of many other factors such as research and development, human capital formation, entrepreneurship, public infrastructure and so on (OECD, 2003, 2009). The major priority is to strengthen these factors nationally and not solely in a few concentrations, notwithstanding the national importance of certain clusters.

There are therefore some important reasons for policy intervention but also some potential pitfalls. The best policy advice then is to ensure that cluster policies meet real needs on the ground. The following chapters examine cluster development processes in selected major clusters, the policy challenges they face and how policy is responding. The case studies provide important insights for all those involved in developing clusters.

References

Aharonson, B., J. Baum and M. Feldmann (2004), "Industrial Clustering and the Returns to Inventive Activity: Canadian Biotechnology Firms", 1991-2000, Working Paper 04-03, Danish Research Unit for Industrial Dynamics.

Anselin, L., A. Varga and Z. Acs (1997), "Local Geographic Spillovers between University Research and High Technology Innovations", *Journal of Urban Economics*, Vol. 42, pp. 422-448.

Asheim, B. (2008), "Regional Environment for Innovation and Entrepreneurship", in *OECD LEED Entrepreneurship and Local Innovation System Reviews: The Case of Cantabria*, OECD LEED Programme, Paris, pp. 155-187.

Asheim, B. and M. Gertler (2005), "The Geography of Innovation: Regional Innovation Systems", in J. Fagerberg, D. Mowery and R. Nelson (eds.), *The Oxford Handbook of Innovation*, Oxford University Press, Oxford, pp. 291-317.

Asheim, B., P. Cooke and R. Martin (2006), "The Rise of the Cluster Concept in Regional Analysis and Policy: A Critical Assessment", in B. Asheim, P. Cooke and R. Martin

(eds.), *Clusters and Regional Development: Critical Reflections and Explorations*, Routledge, London, pp. 1-29.

Audretsch, D. and D. Dohse (2004), "The Impact of Location on Firm Growth", CEPR Discussion Paper 4332, Centre for Economic Policy Research, London.

Audretsch, D. and M. Feldman (1996), "R&D Spillovers and the Geography of Innovation and Production", *American Economic Review*, Vol. 86, No. 3, pp. 630-640.

Baldwin, R., R. Forslid, P. Martin, G. Ottaviano and F. Robert-Nicoud (2003), *Economic Geography and Public Policy*, Princeton University Press, Princeton.

Baptista, R. and P. Swann (1998), "Do Firms in Clusters Innovate More?", *Research Policy*, Vol. 27, pp. 525-40.

Bathelt, H., A. Malmberg and P. Maskell (2004), "Clusters and Knowledge: Local Buzz, Global Pipelines and the Process of Knowledge Creation", *Progress in Human Geography*, Vol. 28, No. 1, pp. 31-56.

Belussi, F. and K. Caldari (2009), "At the Origin of the Industrial District: Alfred Marshall and the Cambridge School", *Cambridge Journal of Economics*, Vol. 33, pp. 335-355.

Bergman, E. (2008), "Cluster Life Cycles: An Emerging Synthesis", in C. Karlsson (ed.), *Handbook of Research on Cluster Theory*, Edward Elgar, Cheltenham, pp. 114-132.

Boschma, R. (2009), "Evolutionary Economic Geography and its Implications for Regional Innovation Policy", OECD LEED Programme mimeo, OECD, Paris.

Brenner, T. and A. Gildner (2006), "The Long-Term Implications of Local Industrial Clusters", *European Planning Studies*, Vol. 14, No. 9, pp. 1315-1328.

Breschi, S. (2008), "Innovation-specific Agglomeration Economies and the Spatial Clustering of Innovative Firms", in C. Karlsson (ed.), *Handbook of Research on Innovation and Clusters*, Edward Elgar, Cheltenham, pp. 167-192.

Camagni, R. (1991), *Innovation Networks: Spatial Perspectives*, Belhaven Press, London.

Caniels, M. and H. Romijn (2005), "What Drives Innovativeness in Industrial Clusters? Transcending the Debate", *Cambridge Journal of Economics*, Vol. 29, pp. 497-515.

Cooke, P. (2001), "Regional Innovation Systems, Clusters and the Knowledge Economy", *Industrial and Corporate Change*, Vol. 10, No. 4, pp. 945-74.

Cooke, P. (2002), *Knowledge Economies: Clusters, Learning and Co-operative Advantage*, Routledge, London.

Cooke, P. (2009), "Economic Development Policy as an Evolutionary Envisioning Process", OECD LEED Programme mimeo, OECD, Paris.

Cooke, P., M. Heidenreich and H.-J. Braczyk (2004), *Regional Innovation Systems: The Role of Governance in a Globalized World,* Second Edition, Routledge, London.

De Groot, H., J. Poot and M. Smit (2008), "Agglomeration Externalities, Innovation and Regional Growth: Theoretical Perspectives and Meta Analysis", University of Waikato, Working Paper in Economics 01/08, Waikato, New Zealand.

Duranton, G. and D. Puga (2004), "Micro-foundations of Urban Agglomeration Economies", in J. V. Henderson and J.-F. Thisse (eds.), *Handbook of Regional and Urban Economics: Cities and Geography*, Elsevier, Amsterdam, Vol. 4, pp. 2063-2117.

Enright, M. (2003), "Regional Clusters: What We Know and What We Should Know", in J. Bröcker, D. Dohse and R. Soltwedel (eds.), *Innovation Clusters and Interregional Competition*, Springer Verlag, Heidelberg, pp. 99-129.

Feldman, M. (2001), "The Entrepreneurial Event Revisited: An Examination of New Firm Formation in the Regional Context", *Industrial and Corporate Change*, Vol. 10, pp. 861-891.

Fingleton, B., D. Igliori and B. Moore (2008), "Employment Growth in ICT Clusters: New Evidence from Great Britain", in C. Karlsson (ed.), *Handbook of Research on Innovation and Clusters*, Edward Elgar, Cheltenham, pp. 79-106.

Glaeser, E. (2000), "The New Economics of Urban and Regional Growth", in G. Clark, M. Feldman and M. Gertler (eds.), *The Oxford Handbook of Economic Geography*, Oxford University Press, Oxford, pp. 83-98.

Guiso, L. and F. Schivardi (2007), "What Determines Entrepreneurial Clusters?", EUI Working Paper, ECO, 2007/48, European University Institute, Florence.

Hassink, R. (2005), "How to Unlock Regional Economies from Path Dependency? From Learning Region to Learning Cluster", *European Planning Studies*, Vol. 13, No. 4, pp. 521-535.

Hospers, G.-J., F. Suatet and Desrochers (2008), "Silicon Somewhere: Is there a Need for Cluster Policy?", in C. Karlsson (ed.), *Handbook of Research on Innovation and Clusters: Cases and Policies*, Edward Elgar, Cheltenham, pp. 430-446.

Huggins, R. (2008), "The Evolution of Knowledge Clusters: Progress and Policy", *Economic Development Quarterly*, Vol. 22, No. 4, pp. 277-289.

Iammarino, S. and P. McCann (2009), "Local Innovation Systems: Identification and Policy Analysis", paper prepared for the OECD LEED Programme, OECD, Paris.

Jaffe, A., M. Trajtenberg, and A. Henderson (1993), "Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citation", *Quarterly Journal of Economics*, Vol. 108, pp. 557-98.

Keeble, D. and F. Wilkinson (2000), *High-Technology Clusters, Networking and Collective Learning in Europe*, Ashgate, Aldershot.

Krugman, P. (1991), "Increasing Returns and Economic Geography", *Journal of Political Economy*, Vol. 99, No. 3, pp. 483-499.

Lublinski, A. (2003), "Does Geographic Proximity Matter? Evidence from Clustered and Non-Clustered Aeronautic Firms in Germany", *Regional Studies*, Vol. 37, No. 6 and 7, pp. 453-467.

Madsen, E., V. Smith and M. Dilling-Hansen (2003), "Industrial Clusters, Firm Location and Productivity: Some Empirical Evidence for Danish Firms, Aarhus School of Business", Working Paper 03-26.

Maggioni, M. and M. Riggi (2008), "High-Tech Firms and the Dynamics of Innovative Industrial Clusters", in C. Karlsson (ed.), *Handbook of Research on Innovation and Clusters: Cases and Policies,* Edward Elgar, Cheltenham, pp. 54-78.

Markusen, A. (1996), "Sticky Places in Slippery Space: A Typology of Industrial Districts", *Economic Geography*, Vol. 72, No. 3, pp. 293-313.

Marshall, A. (1920), *Principles of Economics*, 8th edition, Macmillan, London.

Martin, R. and P. Sunley (2006), "Path Dependence and Regional Economic Evolution", *Journal of Economic Geography*, Vol. 3, No. 1, pp. 395-437.

Mills, K., E. Reynolds and A. Reamer (2008), "Clusters and Competitiveness: A New Federal Role for Stimulating Regional Economies", paper from the Metropolitan Policy Program at Brookings, Brookings Institution, Washington DC.

Observatory of European SMEs (2002), *Regional Clusters in Europe*, Luxembourg: Office for Official Publications of the European Union.

OECD (2001), *Devolution and Globalisation: Implications for Local Decision-Makers*, OECD, Paris.

OECD (2003), *OECD Growth Study*, OECD, Paris.

OECD (2009), *Going for Growth 2009*, OECD, Paris.

OECD (2004), "Social Innovation and the New Economy: Evidence from the Silicon Valley and the San Francisco Bay Area", OECD Local Economic and Employment Development Programme mimeo prepared by Karen Chappel, OECD, Paris.

OECD (2005), *Business Clusters: Promoting Enterprise in Central and Eastern Europe*, OECD, Paris.

OECD (2007), *Competitive Regional Clusters: National Policy Approaches,* OECD, Paris.

Paniccia, I. (2006), "Cutting through the Chaos: Towards a New Typology of Industrial Districts and Clusters", in B. Ahseim, P. Cooke and R. Martin (eds.), *Clusters and Regional Development Critical Reflections and Explorations,* Routledge, London, pp. 90-114.

Peck, F. and C. Lloyd (2008), "Cluster Policies and Cluster Strategies", in C. Karlsson (ed.), *Handbook of Research on Innovation and Clusters: Cases and Policies,* Edward Elgar, Cheltenham, pp. 393-410.

Porter, M. (1998), *On Competition*, Harvard Business School Publishing, Boston, Massachusetts.

Porter, M. (2003), "The Economic Performance of Regions", *Regional Studies*, Vol. 37, No. 6 and 7, pp. 549-578.

Potter, J. (2009), "Evaluating Regional Competitiveness Policies: Insights from the New Economic Geography", *Regional Studies*, Vol. 43.

Putnam, R. (2000), *Bowling Alone: The Collapse and Revival of American Community,* Simon and Shuchter, New York.

Rabellotti, R., A. Carabelli and G. Hirsch (2009), "Italian Industrial Districts on the Move: Where are they Going?", *European Planning Studies*, Vol. 17, No. 1, pp. 19-41.

Ratti,R., A. Bramanti and R. Gordon (1997), *The Dynamics of Innovative Regions: The GREMI Approach,* Ashgate, Aldershot.

Rocha, H. and R. Sternberg (2005), "Entrepreneurship: The Role of Clusters. Theoretical Perspectives and Empirical Evidence from Germany", *Small Business Economics*, Vol. 24, pp. 267-292.

Rosenthal, S. and W. Strange (2005), "The Geography of Entrepreneurship in the New York Metropolitan Area", *Federal Reserve Bank of New York Economic Policy Review*, Dec. 2005, pp. 29-53.

Sölvell, Ö., G. Lindqvist and C. Ketels (2003), *The Cluster Initiative Green Book*, Ivory Tower, Stockholm.

Storper, M. (1997), *The Regional World. Territorial Development in a Global Economy*, Guildford Press, New York.

CLUSTERS, INNOVATION AND ENTREPRENEURSHIP – ISBN 978-92-64-04442-5 – © OECD 2009

Szforzi, F. (1990), "The Quantitative Importance of Marshallian Industrial Districts in the Italian Economy", in F. Pyke, G. Beccatini and W. Sengenberger (eds.), *Industrial Districts and Inter-firm Co-operation in Italy*, International Institute of Labour Studies, Geneva, pp. 75-107.

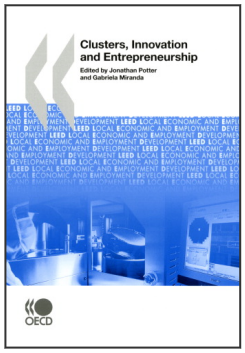
Wallsten, S. (2001), "An Empirical Test of Geographic Knowledge Spillovers using Geographic Information Systems and Firm-Level Data", *Regional Science and Urban Economics*, Vol. 31, No. 5, pp. 571-599.

Wennberg, K. and G. Lindqvist (2008), "How do Entrepreneurs in Clusters Contribute to Economic Growth?", Stockholm School of Economics Working Paper Series in Business Administration, 3, Stockholm School of Economics, Stockholm.

Weterings, A. and R. Boschma (2006), "The Impact of Geography on the Innovative Productivity of Software Firms in the Netherlands", in P. Cooke and A. Piccaluga (eds.), *Regional Development in the Knowledge Economy*, Routledge, London, pp. 63-83.

Wheaton, W. and M. Lewis (2002), "Urban Wages and Labour Market Agglomeration", *Journal of Urban Economics*, Vol. 51, pp. 542-562.

Zucchella, A. (2006), "Local Cluster Dynamics: Trajectories of Mature Industrial Districts between Decline and Multiple Embeddedness", *Journal of Institutional Economics*, Vol. 2, No. 1, pp. 21-44.



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