

---

## From clusters to cluster-based economic development

---

Christian H.M. Ketels\*

Institute for Strategy and Competitiveness,  
Harvard Business School,  
Ludcke House,  
Boston, MA 02163, USA  
Fax: +1 617 384 7268 E-mail: cketels@hbs.edu  
\*Corresponding author

Olga Memedovic

United Nations Industrial Development Organizations,  
Vienna, Austria  
E-mail: o.memedovic@unido.org

**Abstract:** Over the last decades, changes in the global economy and the emergence of Global Value Chains (GVCs) have raised the interest in understanding the specific conditions and cross-company interactions within and across locations. For companies, the need to choose the right location for specific activities moved from an operational to a strategic issue. For countries, regions and cities, competition raised the stakes of understanding how to improve productivity and attract firms in specific fields beyond providing low factor costs and subsidies. Many countries, from natural-resource-rich, to transition economies, and to developed countries have launched competitiveness policies and cluster initiatives involving various stakeholders. The paper addresses how clusters can be leveraged for economic policy and what the role of different stakeholders in this process is. This paper summarises the cluster concept, focusing on the main theoretical framework and on recent empirical findings, and discusses key pillars of a cluster-based economic policy approach. The paper concludes with an application of the concept to resource-rich, oil-dependent economies.

**Keywords:** cluster concept; competitiveness; economic performance; Global Value Chains; GVCs; organised collaboration; cluster-based economic development; economic policy; economic diversification; resource-rich countries.

**Reference** to this paper should be made as follows: Ketels, C.H.M. and Memedovic, O. (2008) 'From clusters to cluster-based economic development', *Int. J. Technological Learning, Innovation and Development*, Vol. 1, No. 3, pp.375–392.

**Biographical notes:** Dr. Christian Ketels is a member of the Harvard Business School faculty at Professor Michael E. Porter's Institute for Strategy and Competitiveness. He holds a PhD (Economics) from the London School of Economics and is currently a Senior Research Fellow at the Stockholm School of Economics. Dr. Ketels has led cluster and competitiveness projects in many parts of the world and is a Director of The Competitiveness Institute, a not-for-profit global network of cluster practitioners.

Dr. Olga Memedovic is UNIDO Staff Member at Research and Statistics Branch. She holds a PhD in Economics from Erasmus University Rotterdam. Previously, she served as Project Leader at the Netherlands Economic Institute and as a Research Fellow at the Tinbergen Institute of Erasmus University Rotterdam, Free University Amsterdam and University of Amsterdam. Dr. Memedovic led various research projects, among them are the *EU-LDC Trade and Capital Relations*, *Global Value Chains and Innovation Networks: Prospects for Industrial Upgrading in Developing Countries* and *Public Goods for Economic Development*. She is the author and main editor of several books and has produced many reports and studies on the issues of globalisation of labour markets, multilateralism and regionalism, technical barriers to trade, competitiveness, theory and measurement of comparative advantages, GVCs and production networks, innovation systems, collective actions and industrial policy issues.

The views expressed herein are those of the author and do not necessarily reflect the views of the United Nations Industrial Development Organization.

---

## 1 Introduction

One of the most visible effects of changes in the economic structures of the global economy is the significant growth of linkages across locations. Global Value Chains (GVCs) are one expression of these linkages: they refer to the distribution of activities in an industry through buyer–supplier relations across different geographical locations. Previously, most industrial activities needed to generate a product or service concentrated in one location, but changes in technology and policy have made it possible to place individual activities in the location that is economically most beneficial and to reintegrate them again by connecting these locations in real time, in GVCs (Gereffi, 1994; Gereffi and Korzeniewicz, 1994; Gereffi et al. 2005) and innovation networks (Nelson and Rosenberg, 1993; Cooke, 2001; Ernst, 2000; Ernst, 2001).

GVCs reflect the combination of forces leading to dispersion and to agglomeration of economic activities. The globalisation of value chains across many locations is a sign of the first, the embeddedness of these individual activities in strongly specialised local clusters of related and supporting industries is a sign of the second. The changes in innovative activity illustrate this combination of seemingly opposing trends: Leading global players increasingly outsource some R&D tasks to specialised suppliers in different locations. A new geography of innovation is emerging with concentrated innovation networks dispersing into new and diverse innovation nodes. Global innovation networks reflect the shift in corporate strategy from closed to an open and integrated innovation model (Ernst, 2008). But, at the same time, centrifugal forces are working in the opposite direction. Innovation still remains geographically concentrated because tacit knowledge is better exchanged through locally embedded social networks where local institutions matter. In addition, the innovation process has changed in ways that raises the benefits of proximity. The ‘open innovation’ model (Chesbrough, 2003) of networks of companies, specialising in various value chain segments, including research and development, and operating in cluster environments, proves more powerful than the old model of closed in-house research labs.

Different regions and regional clusters are responding to these changes in heterogeneous ways. Many established clusters are getting stronger with barriers protecting less productive locations being removed, while others have lost position, as their activities were relocated to stronger peers or new clusters. The archetypical industrial districts in northern Italy, a type of clusters of networks of small- and medium-sized companies operating in light manufacturing, have become a symbol for the difficulties of keeping up with the intense pressure from competitors in Asia and eastern Europe (Porter and Ketels, forthcoming). Many regions and their locations have prospered and some have improved standards of living much faster than had been thought possible, especially in different parts of Asia and in central and eastern Europe. Other regions and locations were unable to match the competitive challenge from new locations entering the global economy and offering asset-specific set of advantages relative to the alternative locations.

These processes have raised the need to better understand the specific conditions and cross-company interactions in and across locations. For leading players, organisers and coordinators of GVCs, the need to choose the right location for specific activities moved from an operational to a strategic issue (Porter, 1998d). For countries, regions and other locations, competition raised the stakes of understanding how to enhance productivity and to attract foreign partners in GVCs in specific sectors, and by going beyond providing preferential market access, low factor costs and subsidies. For governments at various levels, the challenge is how to apply strategic management thinking to position themselves and specialise as a means to reach higher level of prosperity. In response, many countries, from developing, to the natural-resource-rich, to the transition economies, and also to developed countries, have launched cluster-based strategies and policies for increasing productivity and competitiveness of their economy. Many cluster development strategies and initiatives have also been assisted by international organisations like UNIDO. The attractiveness of the cluster concept stems to a significant degree from the frustration with traditional approaches: a focus on stable macroeconomic policies and open markets is seen as not sufficient by many policy makers, and interventionist industrial and innovation policies are also of the poor track record. Cluster-based policies are different from either of these two approaches. They acknowledge the important role of public policy in shaping many dimensions that are important for company success and they stress the crucial role of rivalry between companies for innovation and for growth.

Although there is little doubt about the interest in clusters and cluster-based economic policies, there is much less real agreement about what clusters are, and how to leverage them for economic policy. Also, there is concern about whether these concepts, developed based on observations in advanced economies of western Europe and North America, can be applied in countries at a different stage of economic development. The paper addresses these issues. Section 2 summarises the cluster concept, focusing on the theoretical framework and on recent empirical findings. The key underlying factors of the cluster concept, their relation to economic performance and their emergence are reviewed. Section 3 discusses the key elements of a cluster-based economic development approach. Section 4 concludes with discussion on the role of government in cluster development.

## 2 The cluster concept

Clusters are defined as ‘groups of companies and institutions co-located in a specific geographic region and linked by interdependencies in providing a related group of products and/or services’ (Porter, 1990; Porter, 1998a; Porter, 1998b). Clusters are a natural manifestation of the specialised knowledge, skills, infrastructure and supporting industries in enhancing productivity as the key determinant of sustaining high levels of prosperity in a location. A combination of supplier relations, common labour markets, rivalry, knowledge spillovers and learning effects, affect the economic environment that companies face in clusters.

The definition of clusters builds on three key pillars. The first pillar is *geography*. Clusters are driven by proximity and are often concentrated in a region within a larger nation, and sometimes in one town. The second pillar is *value creation*. Clusters include companies in different industries that are related to each other in the production of goods and services valued by customers. The third pillar is the *business environment*. Clusters are affected by cluster-specific business environment conditions resulting from individual actions as well as cooperation of companies, government agencies, universities and other institutions in the national and regional innovation system (Lundvall, 1988; Lundvall, 1993; Freeman, 1995; Edquist, 1997; Cooke and Morgan 1998; Cooke et al., 2000; Cooke, 2001). In addition, clusters are important dimensions of strong business environments.

Clusters are driven by externalities of various types, supplier relationships, the use of a common factor inputs like specialised labour markets, or knowledge spillovers. While many of these positive externalities occur naturally, their dynamics can be fostered through a mix of networking, collaboration and competition (Best, 2001).

These mechanisms work in clusters in all parts of an economy, not only in knowledge-intensive industries like life sciences or information technology, as sometimes assumed. In tourism, for example, the ability of a hotel to generate value for its customers is strongly dependent on the quality of local companies in many other related and supporting industries, from agro-industries, to restaurants, to transportation, to travel agents, to shops, and to financial and health services. Creating value in clusters incorporates manufacturing and services. In chemicals, for instance, the transportation and logistics providers explain a significant share of value-added, even though the main activity is the production of chemical substances (Ketels, 2007; European Petrochemical Association (EPCA) Think Tank, 2007).

Not all economic activities organise into clusters (Porter, 2003). For some industries, the need to be close to the market served is more important than the potential benefits of being geographically close to other companies in the same field. In these industries, companies do not compete across regions and they are not directly exposed to competitors that can draw on business environment and cluster conditions elsewhere. For other industries, the benefits of being part of a cluster are more important than the proximity to the market. Companies in these industries compete not only based on sophisticated internal strategies and operational practices but also based on the skills and assets they can leverage from the location of their own activities; they are competing with the different combinations of skills and assets that their peers have access to elsewhere.

### *2.1 Clusters and competitiveness*

Clusters are part of a broader competitiveness framework (Porter, 1990; Porter et al., 2007). The prosperity of a location, and the opportunities for its companies and clusters to reach high levels of productivity, depends on the general business environment, not just the macroeconomic, social, political and legal context, geography, and other institutional aspects generally discussed in the economic growth literature.

Clusters, as part of this business environment, can enable companies to leverage business environment quality to reach higher economic performance. Strong clusters are not a substitute for advantages in other dimensions of business environment quality, but companies in strong clusters are often better placed to turn business environment advantages into competitive advantages. Clusters are to some degree also the result of the general business environment: they are more likely to emerge and develop fully in a strong overall business environment.

The nature and depth of clusters therefore depends on the state of development of the economy. In developing countries, clusters are often less developed and their firms perform less advanced activities. There is a tendency to operate value chains that are focused on key primary activities and to provide many supporting activities in-house. The low availability of supporting services can become a barrier for foreign investors (Porter and Ketels, 2008). Firms compete mainly based on cheap labour or local natural resources, and depend heavily on imported intermediary inputs, machinery and technology. Specialised local infrastructure and institutions, e.g. educational programmes and industry associations, are absent or inefficient. As economies get more advanced, clusters usually deepen to include suppliers of specialised material and intermediary inputs, machinery and services; specialised infrastructure emerges from public and private investment; and institutions arise that provide specialised training, education, information, research and technical support.

Clusters exist in metropolitan (Porter, 1998c) and in rural regions (Porter et al., 2004). In metropolitan regions, the higher density of economic activities is beneficial for creating cluster effects, or specific types of clusters, and it enables simultaneous creation of several clusters. In rural regions, distances are a more important consideration. Specialisation tends to result in higher economic dependence on individual clusters and on the linkages to other regions, often metropolitan nearby (Porter et al., 2004).

### *2.2 Clusters and economic performance*

Clusters can create economic benefits. The economic benefits of a cluster come in three dimensions (Porter, 1998a). First, clusters enable higher productivity. Companies can operate with a higher efficiency, drawing on more specialised assets and suppliers with shorter reaction times than when working alone. Second, companies and research institutions can build connections to better learn and innovate, as tacit information and knowledge are best developed and exchanged locally (OECD, 2001; Porter, 2001).<sup>1</sup> Knowledge spillovers and the close interaction with customers, other companies, venture capitalists and knowledge-intensive service providers create more new ideas and provide intense pressure to innovate, while the cluster environment lowers the cost of experimenting. Third, business formation tends to be higher in clusters. Start-ups are more reliant on external suppliers and partners – all to be found in a cluster. Clusters can

spread the cost of failure, as entrepreneurs can fall back on local job opportunities in the many other companies in the same field (Wennberg and Lindqvist, 2008).

The combination of these potential benefits has a positive impact on the ability of companies to engage in GVCs. For leading companies in GVC, clusters are more attractive partners because they reach higher productivity that isolated companies find hard to match. For local companies, clusters can be a lever to acquire new competences and to access international markets through participation in such value chain. Border-spanning linkages can potentially make clusters more successful open innovation system (Teece et al., 1997). To draw on these opportunities, clusters also need to develop strong external linkages, not just strong internal business environments and cluster structures. Innovation-driven economies like Sweden have benefited significantly from globalisation because they combined strong domestic innovative capacity with strong global linkages through multinational companies (Ketels and Sölvell, 2006a; Porter and Ketels, 2007). Such linkages that are external to the local cluster but internal to the value chain in areas of complementary and new knowledge are of key importance to succeed in GVCs (Nadvi and Halder, 2005).

### 2.3 *Cluster mapping*

Cluster mapping, the creation of systematic datasets on cluster presence across many regions, has enabled the systematic testing of the relationship between clusters and economic performance. The literature drawing on this data strongly supports the positive impact of cluster presence on prosperity (Porter, 2003; Porter et al., 2007). This literature shows that:

- 1 the higher is the share of a region's jobs in cluster categories in which the region is strongly specialised (higher concentration of jobs in the cluster regionally than nationally), the higher are the region's average regional wages. The weaker cluster structure in Europe because of the history of barriers to trade and investment that encouraged breadth and small cluster specialisation across countries seems to be a significant factor in explaining Europe's prosperity gap with the USA (Ketels and Sölvell 2006b; Ketels et al., 2007)
- 2 the more specialised region is in a particular cluster, the higher are the regional wages in this cluster relative to the national cluster average wage
- 3 the more concentrated a region become in terms of employment by clusters over time, the higher is the region's average wage growth.

The US data allows a closer look at the effect of cluster portfolio composition on regional economic performance. Three findings are noteworthy: First, the average wages in local industries in a region are positively and significantly related to the average wages in traded clusters. This suggests that traded clusters create value in competing across regional boundaries, and that value is then dispersed into the local economy through local consumption. A reinforcing reverse relationship also seems to be present: efficient local industries, as showed by higher wages, provide a helpful environment for traded clusters to compete across regions by providing efficient inputs. Second, two-thirds of the gap between a region's average wage and the average wage across the USA is explained by differences in regional wages in individual clusters, not by the relative size of individual clusters in the regional economy. This finding runs counter to the argument that to be

economically successful a region has to have a presence of high-wage clusters. Instead, it seems more important to be productive in the cluster category in which a region has a strong position. Third, some industries act as ‘bridges’ between related clusters and can be linkages between the two. The most prosperous regions tend to have portfolios of regional clusters that are related and thus create reinforcing strengths that are hard to copy by competing locations (Delgado et al., 2007).

A region specialising in one cluster faces a trade-off between higher efficiency in that cluster and higher exposure to industry-specific shocks. A region specialising in a group of related clusters can enjoy the benefits of higher efficiency while reducing the exposure to the industry-specific shocks.

## *2.4 How clusters develop*

Clusters develop over time; they are not a phenomenon that just appears or disappears overnight. Some clusters develop from networks of small- and medium-sized companies. Others are linked to a keystone company or university. The keystone company give rise to a cluster by providing the launch pad for new companies or attracting suppliers. Spin-offs develop around university, drawing on the human capital and ideas of the key academic institution. There is no single model for clusters, but many models manifesting the circumstances of location and sector specificity.

Among the most frequent sources of cluster development are specific aspects of the location, specific business environment conditions, related clusters and the long-term impact of specific entrepreneurial decisions by private or public sector leaders. The process that leads from any of these starting conditions to the fully developed clusters with companies in all relevant related fields takes many years, often decades.

The oil and gas cluster in Houston is a good example for the long-term impact of starting conditions, oil and gas resources. Although these natural resources have by now been largely depleted, the cluster is still dynamic in terms of capability building and upgrading. The cluster capability has been built over time from selling the natural resources to selling knowledge and skills, and to the exploration and use of new skills and knowledge for development of new products and services. The cluster-specific business environment provided the conditions in which this development and co-development was possible; it helped the location to leverage the inherited wealth, natural resources, to create the new wealth.

Another root for cluster development can be successful companies or universities. They can act as an anchor for the cluster by spinning-off new businesses and attracting investment from companies outside the region. In North Carolina, the network of universities in the Research Triangle in the 1960s led to one of the leading biotech clusters in the USA rising.

Clusters often emerge not only in the fields that are entirely new for a regional economy, but also in the fields that build on present local assets or knowledge. In San Diego, the US Navy with a leading communication research facility provided the ground for the development of a dynamic telecommunication cluster around Qualcomm – an unintended side effect of the cut-downs in US military spending in the 1990s.

Most clusters have strengthened or developed without purposive public or collective actions. Government policies, or investments in universities or infrastructure, were present, but they were often not pursued with a focus on a specific cluster. Despite this absence of directive strategy, the inherent economics of proximity have, for most

clusters, been sufficient condition to attract other companies and institutions over time. This has led to a self-reinforcing cycle that was often started by a chance event. A strong business environment and trust between public and private leaders turned out to be among the strongest predictors of self-bearing cluster development across regions.

Cluster nature can change over time – a process sometimes describes as a life cycle. Emerging clusters have few separate entities and activities, limiting the potential for cluster effects to set in. As the cluster gets bigger, the potential for interaction grows exponentially and cluster performances improve dramatically. Clusters may then start to attract companies, individuals and capital from other locations, further adding to their potential. Mature clusters are then exposed to rising factor costs and face the threat of becoming tied to a certain technology or operating model, which can become obsolete through technological innovation or changes in market demand.

Although referred to as a life cycle, this process is far from automatic and only describes the stages clusters might go through. At any stage, especially in the early stages of cluster evolution, there can be shocks that move the cluster from its potential trajectory and lead to the dispersion of the economic activity.

## 2.5 *Clusters and organised collaboration*

Companies in the cluster, in general, do not require institutional underpinning for their active collaboration. Many benefits of clusters can occur purely because of co-location. But purposive collaboration can enhance the ability of clusters to drive higher economic performance and innovation. Companies in cluster with strong cooperation can better exploit the complementary skills and capabilities of local suppliers and service providers while knowledge flows between companies and knowledge organisations (research institute and universities) can be improved.

When mutually beneficial goals of the individual companies in the cluster are not sufficient to ensure strategic interaction conducive to cooperation among them, then organisational innovations of collective action to reach results desirable for all in the cluster are called for. Collective actions can also be launched when the individual initiative can result in benefits for all, but it will be too costly for an individual company to engage in, or can result in free riding. Government policies to upgrade the cluster-specific business environment can also become more focused and effective through pursuing collective actions involving public and the private sector.

Many strong clusters were able to reach higher collaboration by drawing on a new class of organisations, which are also termed Institutions for Collaboration (IFCs) (Porter and Emmons, 2003). These organisations, trade and business associations, entrepreneurs' networks, standard setting agencies, quality and cleaner production centres, technology networks, and many others, are neither government agencies, nor private for-profit firms. They are surprisingly many, and especially common in highly developed economies. They also have important roles in developing countries, where they often correct for the market and government failures. IFCs play an essential role in connecting the parts of the business environment and fostering efficient collective actions for the provision of public goods. For example, collective industry bodies, such as trade and business associations and chambers of commerce, have essential roles to play in improving infrastructure, organising training, quality certification, and opening new export markets that are often overlooked. These organisations also play important role in



linking clusters to GVC, helping to define a role that provides complimentary capabilities and activities relative to other locations.

### 3 Cluster-based economic policies

Although government is not the only player in cluster development, it clearly has an important role. The experience around the world suggests some guidelines for what policy should focus on. First, a successful cluster policy builds on sound economic policies. Governments need a sound strategy for upgrading competitiveness. Cluster development should be a part of that strategy, but it cannot substitute for missing reforms in other areas such as education, labour market regulation or competition law. Second, government should be open to support all clusters that show the willingness for cooperation and have some assets to build on. Policy should not pick winners among clusters and it should reinforce established and emerging clusters rather than try to create entirely new ones. Third, government should be engaged in cluster initiatives as a facilitator and participant, not as the leader. The most successful cluster initiatives are public-private partnerships. And fourth, government should *not* provide subsidies, protection or relaxation of competition laws to develop clusters. This is even more important in countries that have less experience with competition working on their domestic markets.

Cluster-based economic policies are sometimes confused with centralised industrial policy approaches. Both approaches recommend that policies are specific to a cluster or an industry but then take different views on what to do. Often industrial policies have targeted areas of perceived market demand or attractive technology. Then they intervened in competition (subsidies, protection and the like), at least temporarily, and favoured domestic companies in the hope that national champions facing global competition will emerge. This approach required sustained financial commitment by the public sector and was driven by the centralised decisions at the national level. It has a high failure rate; even when there was a positive short-term impact, the sustainability tended to be low.

In contrast, cluster-based policies leverage local assets, capabilities, history and geographic location, and are open to all clusters in a location. They are neutral on ownership and enable competition to be more productive and sophisticated. Their success depends on the sustained participation by all stakeholders, not just government, and at all geographic levels. Although their impact might be low at first, it can rise over time and some quick successes are often possible.

The wide variety of policy initiatives that were launched to take advantage of the economic potential of clusters can be summarised in three groups: those to leverage clusters, those to strengthen clusters and those to create clusters.

#### 3.1 Leveraging clusters for economic policy

Many government agencies have *leveraged clusters* to improve the efficiency of economic policies aimed at regional development and economic diversification. Many Foreign Direct Investment (FDI) attraction agencies have focused their efforts on specific clusters. Special economic zones, industrial parks and innovation zones were created for companies and related institutions from designated clusters. Workforce skill development

programmes were organised around cluster groups of companies and educational institutions.

By focusing policy tools on clusters, government can better focus on areas where it impacts the competitiveness of several companies simultaneously. And it can reap additional benefits from the spillovers in the cluster that were triggered through the policies. Rather than improving competitiveness company by company (with a danger of intervening in competition), a cluster-based use of economic policy instruments reaches entire groups of companies. Cluster initiatives are a way to organise economic policies in a more efficient and mutually reinforcing way. In Austria, for example, the government has created economic development agencies with a cluster focus. These agencies package the full range of available government policies, tapping into all relevant regional, national and EU programmes, for a specific cluster.

### 3.2 *Strengthening clusters*

Other cluster initiatives focused more directly on *strengthening clusters* by improving the underlying competitiveness of agglomeration economies for creating value. Cluster initiatives play a crucial role to organise such economies. A global survey of cluster initiatives launched in 2005 identified more than 1400 such initiatives globally – only the tip of the iceberg.

Cluster initiatives are collaborative actions by groups of companies, research and educational institutions, government agencies and others, to improve the competitiveness of a specific cluster. They are defined by these goals, not by any specific activity that they pursue. Companies, universities or government agencies can all launch them. The empirical research suggests that their success depends on all these groups being engaged in setting and pursuing the action agenda of the cluster initiative, not on who took the initiative (Lindqvist et al., 2003).

Cluster initiatives reach these objectives by raising the awareness of companies within a cluster and creating more effective platforms for interaction. MassMEDIC, the cluster initiative of the Massachusetts medical devices cluster, for example, was founded when it became apparent that many such companies had developed in the region but only few of them were aware of their existence or collaborated with each other.

Another approach is to use the cluster initiative as a platform for a better dialogue between the private and the public sector when making decisions about how to improve the cluster-specific business environment. Although government choices on the infrastructure, the structure and location of educational and research institutions, and many other investments and regulatory issues clearly affect the competitiveness of a cluster, government often lacks the information about what matters most for companies' success. The Automotive Cluster Styria in Austria enabled government, universities and companies to identify skill upgrading in second-tier suppliers in the automotive industry as a crucial issue defining the competitiveness of the cluster and enabled joint action to address it.

A third approach brings companies together to jointly upgrade their sophistication, for instance by making joint investments in provision of research or testing facilities, in better understanding export markets, in searching for strategic partners, and in developing more differentiated and mutually supportive strategies.

Individual companies, especially when they are small, often lack the resources to make such investments and remain trapped in competing on low costs. The coffee

growers in Colombia have used such an approach to create a branded product with much higher margins and improve their production processes. Many tourism clusters, wine clusters and flower clusters around the world have followed a similar approach.

The key question is always which clusters a region should work with. The evidence suggests that mobilising and strengthening the potential of *present clusters* that are not yet reaching their full potential (some researchers classify them as clumps rather than clusters) has the best likelihood of success. If some companies have already met the market test, the cluster-specific business environment provides at least some of the conditions that enable the cluster to succeed. Focusing only on the present clusters is, however, not a lasting strategy, especially for locations that seem to have no clusters. In such a situation, it is important to identify *emerging clusters* and their profile of business environment strengths and weaknesses. They could be the ones that use technologies, skills and assets similar to those used by the existing clusters. Or they could be the ones that develop around islands of activity present in the region, triggered by the foreign investment or by the entrepreneurial success of one company. Some initiatives to speed up such emerging clusters will witness failure, but many will succeed.

### 3.3 Creating clusters

In the 1990s, some countries and regions have tried to *create clusters* from scratch, especially in 'high-tech' sectors. Policy was pursued to stimulate significant investments in specialised infrastructure, to provide targeted financial incentives or at least temporary protection against competition from other locations. But these have failed in many cases. The most visible example is life sciences, where billions were invested but few self-sustaining clusters have emerged outside the group of dominating clusters. Many interactions within a cluster are too complicated to be designed and implemented from scratch by government.

A more appropriate conceptual approach towards entirely new clusters is a strategy to improve overall business environment conditions, by upgrading skills, access to finance and infrastructure, by streamlining government rules and regulations, by supporting sophisticated local demand, and by being open to foreign investment and competition. The conceptual framework of competitiveness suggests that in such an environment cluster development processes are much more likely to occur.

Where new clusters have taken root based on the strong government efforts, e.g. the transportation and logistics cluster in Dubai, they could draw on a favourable location and other beneficial business environment conditions. In these cases, government intervention launched or accelerated a process that could have happened naturally.

The recent research on cluster development suggest how new clusters can emerge when they build on present strengths of the business environment that can be leveraged in adjacent economic areas. One approach uses the knowledge about cluster overlaps to identify clusters in which countries or regions are likely to have proper business environment conditions (Porter and Ketels, 2008). Another empirical approach looks at the correlation of products in countries export portfolios to identify such linkages (Hausmann and Klinger, 2007). The empirical analysis of cluster initiatives supports the view that such efforts are much more likely to succeed if they operate in a supportive business environment (Lindqvist et al., 2003).

#### **4 Applying the framework: clusters as a tool for diversifying natural-resource-rich economies**

The existence and strength of clusters and the potential impact of cluster-based economic policies depend on the specific environment that companies are exposed to in a given location. Circumstances can differ from country to country and often also significantly within countries, but there are several observations that tend to describe the situation in natural-resource-rich economies.

##### *4.1 The context for cluster development in resource-rich economies*

In the general business environments, many natural-resource-rich countries face clear challenges. Key problems tend to exist in skills, and rules and regulations for business, especially for foreign companies. The access to resource wealth diminishes the incentives to acquire skills and a bloated government administration becomes the employer of choice for many citizens. In some countries, the physical infrastructure tends to be in better shape, deriving benefits from the available financial resources. But the large government role in the economy, almost inevitable since the government through its control of the natural resource deposits gets easily drawn into the centre of the economy, reduces the openness to competition and is often a hotbed for corruption. This problem is made worse by the dominance of business groups, often with strong political ties that control markets and limit entry by foreign and domestic rivals. The public sector institutions are often weak, and the power rests with individuals, not with legal systems. The situation in the private sector is similarly weak. Because of these widespread weaknesses in the general business environment, few if any clusters develop in many natural-resource-rich economies, except for indications of emerging activities in logistics and transportation and in financial services.

In oil and gas, for instance, some clustering effect can be delineated in very narrow activities and largely with a few firms, but no significant positive spillovers through the geographic proximity of activities. The situation is similar in clusters that use energy or oil as a direct input (chemical industry, plastics); the focus is here often on large capital-intensive plants, not on the interactions and knowledge spillovers among many cluster participants. In other export sectors, market positions tend to be weak because of weak business environments and ‘Dutch disease’ problems. This leads to a low diversity and exposure to high risk of industry-specific shocks. Often there is no base for clusters to emerge outside of the oil and gas sector. This high level of risk decreases the willingness of companies to invest for the long-term and raises the risk premiums that borrowers have to pay – factors that further hinder cluster development outside the natural-resource-intensive sectors.

##### *4.2 Cluster policies in oil-rich economies*

Cluster-based economic development policies in many oil-dependent countries suffer from several weaknesses that undermine their potential to transform their economy towards a more diversified industry structure. First, many government initiatives are largely focused on physical infrastructure and real estate development. Clusters are confused with large investments in fix assets of a given industry. Clusters are much more than that. Critical investments are those in soft assets such as modern logistics,

knowledge development, entrepreneurship and branding. The physical assets can make interactions easier but cannot substitute for factors such as unique skills or knowledge, which make interaction attractive and useful for cluster participants.

Second, where a specific industry focus exists, it is not always clear what specific value the regional cluster and the cluster-specific business environment will provide. With more locations competing as cluster partners in GVC, it becomes important that each location understands and communicates the specific offer it makes in a given cluster area, e.g. a focus on specific activities, on a specific geography or on a specific market segment.

Third, there are often competing or at least insufficiently coordinated cluster initiatives by different agencies. Although this might be natural for the current stage in the discussion about cluster-based economic policies in these countries, it is important that more consistency and an integrated effort are adopted as soon as a new general cluster programme is rolled out. Otherwise, the impact will be eroded by giving confusing signals to foreign and domestic investors by working against the specialisation of individual regional economies based on economic efficiency and according to political will.

Fourth, there is a weak understanding of the roles of the private and public sectors in a cluster. Too often, the dialogue is confused with a Public–Private Partnership (PPP) model for financing infrastructure investments that are needed to enable further private sector investments. This misunderstanding is not only present in the public administration. Many private sector representatives, too, have this faulty view of public–private dialogue and thus fail to engage in real collaboration to upgrade competitiveness.

Any strategy to diversify the economy through a cluster-based economic development has to start with an assessment of the relevant status quo in a country's business environment, in its present clusters and in the current profile of cluster-oriented policies. Only then can an action programme be designed that will be effective in the specific country context.

#### 4.3 *An action agenda for the design of cluster policies in resource-rich economies*

Cluster-based development approach is not a generic approach that can just be implemented; it requires many fact-driven decisions on where to focus and what to focus, and that can only be made with proper local data; in addition a country needs to define a cluster development action agenda. First, creating a sound fact and knowledge base to guide cluster-based policies is the priority. Among the concrete activities in this area, the following are important:

- *Mapping of existing clusters:* It is important to understand revealed regional patterns of specialisation, how deep they are, what profile they have, and what role they play in the regional economy. The mapping can be done using internationally validated cluster definitions and detailed regional and industry-specific data on employment, productivity and the like.
- *Evaluation of regional business environments:* Especially in a context where few clusters exist, it is critical to understand the profile of strength and weaknesses that individual regions in the country can provide. This enables the identification of

clusters that could emerge in a specific region and it makes it possible to guide targeted business environment upgrading efforts. Survey and hard-data-based methods for such business environment assessments are available and have been used in many parts of the world, including the Arab region.

- *Creation of a 'Competitiveness Observatory' to track competitiveness and cluster development over time:* Early on there should be a focus on the regular and neutral assessment of how the business environment and the clusters in the specific country are developing. Such information will provide discipline to sustain efforts, will inform about remaining or new priorities, and will be a contribution to upgrading the institutional capacity of a country.
- *Financial and technical support for cluster initiative administration (not their activities):* Funding should be made available for the provision of a cluster initiative tool box, for diagnostic and impact assessment tools, for office space and cluster initiative manager and for the training of cluster facilitators. These investments will be moderate in size but are critical to reach a high level of effectiveness in cluster efforts.

Second, a cluster development action agenda should set demanding but realistic objectives to be achieved in different parts of the economy.

- *Analyses of the present clusters:* Is strong base of activities present in the cluster and are the cluster-specific business environment conditions generally positive? The aim of cluster development in the specific area should be to raise economic returns. As an action step public-private cluster groups (national plus regional in top locations) should be launched to develop region-specific action priorities to raise productivity and enhance value-creation beyond sole export of the existing activity.
- *Emerging export-oriented clusters with existing base:* In these clusters, there is a base of activities and some cluster-specific business environment advantages. The aim is to strengthen through triggering positive cluster effects, leading to higher economic returns in the medium-term. Projects should be launched to map specific regional clusters and their cluster-specific business environments in detail to see what is missing in the cluster and which *business environment aspects can be leveraged better*.
- *Clusters serving the local market (retail, finance, construction, health):* In these clusters, there is also a base of activities serving local demand. The objective here is to raise productivity, enhance job creation and lead to new company formation. As a first step, projects should be launched to map key barriers to growth in these areas (including market power by existing business groups dominating such markets).
- *Other emerging/potential clusters:* Here the base will be small or non-existent. A realistic aim will be to launch initiatives for portfolio of regional cluster to develop that might lead to some economic results and will provide experience in private-public collaboration. A competition should be launched for potential cluster initiatives (needs to have a clear cluster focus and cover at least two of the following three groups: companies, universities, regional government agencies) so that the best (not all!) development plans get funding.

Four areas have significant potential for improving economic policy programmes through a cluster focus, and every developing country can draw on other country experience in these fields.

- *FDI attraction*: By marketing specific regional clusters to foreign investors the likelihood of success is higher. Attracting foreign investors seeking complementary clusters is especially important in the GVC context. Foreign investors can be invited into partnership programmes to develop clusters of supporting and related industries around them.
- *Economic cities/industrial zones/technology zones*: Designating specific locations for specific clusters provides these clusters with a clear profile and sets detailed demands for their business environment qualities. These qualities can then be marketed to the relevant group of companies, leading over time to the cluster being the attraction, not the specific infrastructure in the economic city or zone. Already in the conception phase, work needs to be done with companies in such clusters to identify their needs beyond a physical infrastructure.
- *Skill upgrading*: Organising cluster-specific working groups with companies and cluster-relevant educational organisations to launch targeted skill upgrading programmes has proved powerful in many locations. It should be used in a country to supplement the current policies for increasing job opportunities.
- *Small and Medium-sized Enterprises (SME) support (finance, technical assistance)*: Support programmes for companies can be focused on those that are part of a regional cluster to raise impact. Clusters can be used as a platform to reach groups of companies more efficiently. Existing anchor companies can be enlisted in programmes to develop SMEs and create better linkages towards them.

Finally, a country will only reach its ambitions of economic progress if it creates an overall business environment that is more supportive to cluster development. The following policy areas are example for the changes that need to occur over time. It will be important to sequence these reforms in line with improving institutional capabilities to implement them.

## 5 Conclusions

Clusters are increasingly recognised as an important feature of modern economies. Their presence has become more pronounced in the global economy, not less as was sometimes assumed. Complementary concepts such as the GVC point out that strong clusters benefit from strong external linkages and are well positioned to take advantage of them. Empirical data that has become available in recent years has confirmed the strong link between clusters and economic performance.

Clusters have, not surprisingly, also become an area of interest for policy makers. Although there is still less quantitative evidence on the role and impact of cluster-based economic policy, the case experience and the conceptual framework suggest some conclusions for policy makers. Clusters can improve the efficiency of economic policy tools and there are different ways to raise economic benefits from existing clusters. More complex is the question of how economies can develop new clusters; this is possible but

serious mistakes are often made that have created the misguided impression that cluster development is close to traditional industrial policy.

One of the characteristics of a cluster-based economic development approach is its concern with the specific conditions present in a location or country. Natural-resource-rich economies are an interesting case, where the need to diversify into new clusters is high but the barriers to success are considerable. The paper gives some examples of the real-world policy actions that can make progress possible even in such a challenging situation. Much more experience is needed for a full-fledged theory of cluster policy. But, already, now such policies are too beneficial to be neglected by policy makers.

## References

- Best, M. (2001) *The New Competitive Advantage*, Oxford University Press, Oxford.
- Chesbrough, H. (2003) *Open Innovation*, Harvard Business School Press, Boston.
- Cooke, P. (2001) 'Regional innovation systems, clusters, and the knowledge economy', *Industrial and Corporate Change*, Vol. 10, No. 4, pp.945–974.
- Cooke, P., Boekholt, P. and Tödtling, F. (2000) *The Governance of Innovation in Europe*, Pinter, London.
- Cooke, P. and Morgan, K. (1998) *The Associational Economy: Firms, Regions and Innovation*, Oxford University Press, Oxford.
- Delgado, M., Porter, M.E. and Stern, S. (2007) *When Do Clusters Matter for Regional Economic Performance* (mimeo), Harvard Business School.
- Edquist, C. (1997) *Systems of Innovation: Technologies, Institutions and Organizations*, Pinter, London.
- European Petrochemical Association (EPCA) Think Tank (2007) *A Paradigm Shift: Supply Chain Collaboration and Competition in and Between Europe's Chemical Clusters*, EPCA, Brussels.
- Ernst, D. (2000) *Carriers of Cross Border Knowledge Diffusion: Information Technology and Global Production Networks*, East West Center, Honolulu, HI.
- Ernst, D. (2001) 'Global production networks and the changing geography of innovation systems: implications for developing countries', *Journal of the Economics of Innovation and New Technologies* (Special issue on 'Integrating Policy Perspectives in Research on Technology and Economic Growth', by Bartzokas, A. and Teubal, M. (Eds)).
- Ernst, D. (2008) *The New Geography of Innovation: Asia's Role in Global Innovation Networks, Special USAPC Presentation on 14 February 2008, the East-West Center, Washington..*
- Freeman, C. (1995) 'The national system of innovation in historical perspective', *Cambridge Journal of Economics*, Vol. 19, No. 1, pp.5–24.
- Gereffi, G. (1994) 'The organization of buyer-driven global commodity chains: how U.S. retailers shape overseas production networks', in Gereffi, G. and Korzeniewicz, M. (Eds): *Commodity Chains and Global Capitalism*, Praeger Publishers, Westport, CT, pp.95–122.
- Gereffi, G., Humphrey, J. and Sturgeon, T. (2005) 'The governance of global value chains', *Review of International Political Economy*, Vol. 12, No. 1, pp.78–104.
- Gereffi, G. and Korzeniewicz, M. (Eds) (1994) *Commodity Chains and Global Capitalism*, Praeger Publishers, Westport, CT.
- Hausmann, R. and Klinger, B. (2007) *The Structure of the Product Space and the Evolution of Comparative Advantage*, CID Working Paper No. 146, April 2007.
- Ketels, C.H.M. (2007) *The Role of Clusters in the Chemical Industry*, EPCA, Brussels.
- Ketels, C.H.M., Lindqvist, G., Protsiv, S. and Sölvell, Ö. (2007) *Geographic Concentration in Europe and the United States* (mimeo), Stockholm School of Economics.



- Ketels, C.H.M. and Sölvell, Ö. (2006a) *State of the Region-Report 2006: The Top of Europe in Global Competition*, Baltic Development Forum, Copenhagen.
- Ketels, C.H.M. and Sölvell, Ö. (2006b) *Clusters in the EU-10 New Member Countries*, European Commission – DG Industry, Brussels.
- Lindqvist, G., Sölvell, Ö. and Ketels, C.H.M. (2003) *The Cluster Initiative Greenbook*, Ivory Tower, Stockholm.
- Lundvall, B.A. (1988) 'Innovation as an interactive process: from user-producer interaction to the national system of innovation', in Dosi, G., Freeman, C., Nelson, R., Silverberg, G. and Soete, L. (Eds): *Technological Change and Economic Theory*, Pinter Publishers, London..
- Lundvall, B.A. (1993) 'Explaining interfirm cooperation and innovation: limits of the transaction-cost approach', in Grabher, G. (Ed.): *The Embedded Firm: On the Socioeconomics of Industrial Networks*, Routledge, London, pp.52–64.
- Nadvi, K. and Halder, G. (2005) 'Local clusters in global value chains: exploring dynamic linkages between Germany and Pakistan', *Entrepreneurship and Regional Development*, Vol. 17, No. 5, pp.339–363.
- Nelson, R. and Rosenberg, N. (1993) *Technological Systems and National Innovation*, Oxford University Press, New York.
- OECD (2001) *Innovative Clusters: Drivers of National Innovation Systems*, OECD, Paris.
- Porter, M.E. (1990) *The Competitive Advantage of Nations*, The Free Press, New York. Republished with a new introduction (1998).
- Porter, M.E. (1998a) 'Clusters and competition: new agendas for companies, governments, and institutions', in: *On Competition*, Harvard Business School Press, Boston.
- Porter, M.E. (1998b) 'Clusters and the new economics of competition', in Porter, M. (Ed.): *On Competition*, Harvard Business School, Boston.
- Porter, M.E. (1998c) "The competitive advantage of the inner city," in: *On Competition*, Harvard Business School Press, Boston.
- Porter, M.E. (1998d) 'Competing across locations: enhancing competitive advantage through a global strategy, in Porter, M. (Ed.): *On Competition*, Harvard Business School, Boston.
- Porter, M.E. (2001) Council on Competitiveness, and Monitor Group, 2001, *Clusters of Innovation Initiative: Regional Foundations of U.S. Competitiveness*, Council on Competitiveness, Washington DC.
- Porter, M.E. (2003, August–October) 'The economic performance of regions', *Regional Studies*, Vol. 37, Nos. 6/7, pp.549–578.
- Porter, M.E. and Emmons, W. (2003) *Institutions for Collaboration: Overview*, Harvard Business School Note 703-436.
- Porter, M.E., Ketels, C.H.M. and Delgado, M. (2007) 'The microeconomic foundations of prosperity: findings from the business competitiveness index, in: *Global Competitiveness Report 2007-2008*, Palgrave Macmillan, London.
- Porter, M.E., Ketels, C.H.M., Miller, K. and Bryden, R. (2004) *Competitiveness in Rural U.S. Regions: Learning and Research Agenda*, Prepared for the Economic Development Administration (EDA), U.S. Department of Commerce, Washington DC.
- Porter, M.E. and Ketels, C.H.M. (2007) *Competitiveness in the Global Economy: Sweden's Position*, Presentation given to the Globalization Council of the Swedish government.
- Porter, M.E. and Ketels, C.H.M. (2008) *Russian Competitiveness at the Crossroads*, Center for Strategic Research, Moscow.
- Porter, M.E. and Ketels, C.H.M. (forthcoming) 'Clusters and industrial districts – common roots, different perspectives', in Becattini, G. (Ed.): *Handbook of Industrial Districts*.

Teece, D.J., Pisano, G. and Shuen, A. (1997) 'Dynamic capabilities and strategic management', *Strategic Management Journal*, Vol. 18, No. 7, pp.509–533.

Wennberg, K. and Lindqvist, G. (2008) *How Do Entrepreneurs in Clusters Contribute to Economic Growth*, SSE/EFI Working papers in business administration, No. 2008:3, SSE, Stockholm.

## Note

- 1 Because of the critical importance of innovation for advanced economies, 'innovation clusters' have become a particularly popular topic. See OECD (2001) and Monitor Company, Council on Competitiveness and Porter (2001).