



Observatory of European SMEs
2002 / No. 3

Regional clusters in Europe



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Regional Clusters in Europe

This report has been prepared from information provided by all partners of the European Network for SME Research ENSR (see Annex I) and was coordinated by Mr. Arne Isaksen and Ms. Elisabet Hauge from AGDER Research Foundation (Kristiansand), the Norwegian ENSR partner.

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A series of reports submitted to the Enterprise Directorate-General of the European Commission (see also Annex I to this report) by:

KPMG Special Services and EIM Business & Policy Research in the Netherlands

in co-operation with:

European Network for SME Research (ENSR), and Intomart

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The first five Annual Reports are still available and can be ordered at: EIM Business & Policy Research, PO Box 7001, 2701 AA Zoetermeer, The Netherlands. Phone: + 31 (0) 79 3413634, Fax: + 31 (0) 79 3415024, E-mail: info@eim.nl.

These are the abbreviations used in this report for the Europe-19

A	Austria	NL	Netherlands
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D	Germany	UK	United Kingdom
EL	Greece	EU	European Union
E	Spain	IS	Iceland
F	France	LI	Liechtenstein
FIN	Finland	NO	Norway
IRL	Ireland	EEA	European Economic Area
I	Italy	CH	Switzerland
L	Luxembourg	Europe-19	EEA plus Switzerland

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Preface

Enterprises are at the heart of the strategy launched by the European Council in Lisbon in March 2000. Reaching the objective of becoming the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth, more and better jobs and greater social cohesion will ultimately depend on how successful enterprises, especially small- and medium-sized ones, are.

The *Observatory of European SMEs* was established by the Commission in December 1992 in order to improve monitoring of the economic performance of SMEs in Europe. Its task is to provide information on SMEs to policy-makers at the national and European level, researchers, SME organisations and to SMEs themselves.

The reports of the Observatory provide an overview of the current situation in the SME sector in Europe through statistics on the number of enterprises, on total employment and on production by size of enterprise. In addition, the Observatory reports cover a range of thematic issues.

The *Observatory of European SMEs* covers 19 countries: the 15 countries of the EU, plus Iceland, Liechtenstein, Norway and Switzerland.

During 2002, the following reports are planned to be published:

- Highlights from the 2001 Survey
- SMEs in Europe, including a first glance at EU Candidate Countries
- Regional Clusters in Europe
- European SMEs and Social and Environmental Responsibility
- Business Demography in Europe
- High Tech SMEs in Europe
- Recruitment of Employees: Administrative Burdens on SMEs in Europe
- Taxation and SME Growth in Europe
- Highlights from the 2002 Survey

The research for the Observatory reports is carried out on behalf of the Enterprise Directorate-General of the European Commission by ENSR, the European Network for SME Research, co-ordinated by EIM Business & Policy Research from the Netherlands in a consortium led by KPMG Special Services from the Netherlands.

For a description of the activities of the Enterprise DG, see the website of the European Commission: <http://europa.eu.int/comm/dgs/enterprise>. For more information on the Observatory of European SMEs, including how to access or order the reports, see: http://europa.eu.int/comm/enterprise/enterprise_policy/analysis/observatory.htm. Information on previous reports of the Observatory may be found there as well.

Summary

- A regional cluster approach is becoming increasingly recognised as a valuable tool to foster economic development. However, there is a need for a more precise conceptualisation of what constitute regional clusters and related phenomena in order to perform 'cluster analyses' and draw policy implications. Based on such a conceptualisation the report concludes that 'underdeveloped' clusters may be upgraded by, in particular, stimulating more intense formal and informal, efficiency-enhancing co-operation between firms and strengthening links to the knowledge infrastructure.
- Statistical mapping of regional clusters only exists in relatively few Western European countries; some countries however have identified industrial or national clusters. The general picture is that the countries have numerous (potential) regional clusters, which also are of considerable relative importance, in particular in manufacturing industries. The studies also hint at the fact that regional clusters in general perform better than the national average in corresponding industries.
- Efforts to identify and map regional clusters, coupled with analyses of strengths and weaknesses in major clusters, may be a first step in designing and implementing cluster policies, following the recent approaches taken in some countries. Such a cluster approach allows focussing on areas of real opportunity within a regional economy. Thus, cluster policy should not be seen as just a way to support a few selected, strong or potentially strong, regional industries. Rather, cluster policy is an instrument to promote regional economic development and structural changes more generally, often through enhancing regional innovation capability. Cluster policy also encourages the integration of many different aspects of economic development and development policy.
- The comparative survey of 34 regional clusters (of which approximately half are 'traditional' clusters and half of them are science based) in 17 European countries¹ reveals that most of the surveyed clusters are growing in both the number of firms and employees. This result reflects a bias towards science based and young clusters in the survey. However, the survey also hints at regional clusters performing in general better than the national average in certain industries. Theoretical considerations, and several case studies point in the same direction; regional clusters often constitute fertile ground for stimulating innovation capability and competitiveness of existing firms, encourage entrepreneurship and may attract inward investments.
- The cluster survey demonstrates a mixed picture of a globalisation trend (which means that cluster firms increasingly are involved in supranational knowledge and production networks) and a regionalisation trend (which means that cluster firms still rely on regional resources and collaborators for their competitiveness), which influence the development of clusters. This observation has some policy consequences. Cluster policy must not be too regionally or locally focused, for example in only trying to stimulate regional collaboration, organisations and resources. This is particularly important if it is not at the regional level where the essential knowledge is located or where the important learning takes place. Thus, clusters policy could include encouraging more global sourcing of some components, as well as attracting branches of multinational enterprises into the clusters, if such initiatives are seen to increase the competitiveness of the cluster.
- The cluster survey also demonstrates the major importance, and to some extent the increasing importance, of regional resources and collaborators in stimulating the growth of regional clusters. Thus, policy aimed at improving the working of individual clusters is highly relevant.

¹ Iceland and Switzerland are not included in the cluster survey. Cf. Chapter 1.2.

- Principally, 'cluster policy' is seen to be of two main types: (i) to support the growth of existing or embryonic regional clusters in different ways, and (ii) to let knowledge as regards the working of regional cluster inform policy-making in general. Both types favour a focus on local/regional systems of firms (and often SMEs), on firms' value-adding environment, on indigenous growth processes, on social processes, and on the role of public authorities as broker between companies and local organisations.
- Cluster policies to support regional clustering processes should be tailored to the specific circumstances in each region and cluster. Recreating the conditions leading to success stories in other places has proved exceptionally difficult, in part because the conditions tend to have a long historical development. The need to adapt policies to specific regional circumstances means placing great awareness on the local and regional level in policy design and implementation. A degree of national co-ordination is, however, appropriate in order to prevent a waste of public money if too many regions decide to support the same type of regional clusters.
- The EU, national and regional governments have designed and implemented different types of cluster policy tools. Although the approach and the terminology differ, these policies share a number of key objectives and characteristics: (i) the policies deal with broad issues, as they are seen as an instrument to promote economic development and structural changes, (ii) they are based on improved business co-operation and networking, (iii) they emphasise the linking of firms to the (regional) technological infrastructure, (iv) the policies emphasise the role of public or semi-public organisations as mediators in encouraging inter-firm networks and joint projects, (v) they underline the need to improve innovation capability, knowledge management etc. in firms by improving the interactive learning process between firms and their environment, (vi) they focus on the need to stimulate the creation of specialised factors, and specialised knowledge in particular, and (vii) some policies stress the need to reach critical masses of firms, regional located organisations and regional co-operation.
- Based on experiences from existing instruments and theoretical considerations the report concludes that policy to support (existing or embryonic) regional clusters may generally aim to: (i) strengthen inter-firm collaboration and business networking, and (ii) build up or strengthen organisations for technology transfer corresponding to firms' needs. These two tasks basically mean to upgrade regional clusters to become regional innovation systems. The first aim often raises the need for proactive consultancy and a supervising role from an intermediate partner to encourage trust building and inter-firm collaboration. The second aim points to the importance of local and regional organisations, and in particular knowledge and training organisations, for the development of regional clusters. These organisations ideally should play a two-fold intermediary role; they keep abreast of technological improvements taking place in other areas, and have close contact with local firms in order to be aware of their problems. This also points to the importance of involving the local industry in policy design and implementation.

Chapter 1

Introduction:

Why focus on regional clusters?

Regional clusters have attracted growing interest among both academics and policy-makers during the last decades. In the 1970s and 1980s clusters established a strong position in the world market for both more traditional products (e.g. 'Third Italy'²) and high technology products (e.g. Silicon Valley). During the 1990s clusters were widely recognized as important settings in stimulating the productivity and innovativeness of companies and the formation of new businesses. The influential writing of Michael E. Porter first on industrial clusters (Porter 1990) and then on regional clusters (Porter 1998a) in particular describes the tight relationships between cluster participation and the competitiveness of firms and industries. In fact, 'the enduring competitive advantages in a global economy are often heavily local, arising from concentrations of highly specialized skills and knowledge, institutions, rivals, related businesses, and sophisticated customers' (Porter 1998a: 90). The concept of regional clusters is hence seen to catch at least parts of the mechanism's underlying dynamic industrial development in some places. The concept is also seen as a useful metaphor in designing regional development policy adapted to the new competition in the globalised economy.

Regional clusters refer to geographically bounded concentrations of *interdependent* firms (Rosenfeld 1997, OECD 2001), and may be used as a catchword for older concepts like industrial districts, specialised industrial agglomerations and local production systems. The network concept is often introduced to characterise the specific forms of governance based on social relations, trust and the sharing of complementary resources that typifies many regional clusters (Vatne and Taylor 2000). Social relations are seen as the most important channels through which information flows, and geographical proximity facilitates the formation of trustful social networks. In the second half of the 1990s, the related concept of a regional innovation system arose as a new buzzword in scholarly and policy debate. A regional innovation system (RIS) contains a specialised cluster of firms supported by a developed infrastructure of supplier firms and knowledge and technology diffusion organisations, which tailor their service to the specific needs of the dominating regional industry (Asheim and Isaksen 1997).

The increased focus on regional clusters and innovation systems reflects a (re) discovery by many academics of the importance of the regional level, and the importance of specific local and regional resources in stimulating the innovation capability and competitiveness of firms. Specific regional resources such as a stock of 'sticky' knowledge³, learning ability, entrepreneurial attitudes etc. are seen to be of great importance in firms' efforts to be at global competitive level. Building regional clusters is even perceived by some as *the* way to compete globally, as economic 'specialization is (seen as) the only way to overcome 'the globalisation trap', that is, outrunning the risk of being out competed across the board' (Lagendijk 2000:165)⁴.

The literature on regional clusters, however, has some drawbacks that may also have consequences for policy making. The drawbacks are in particular related to:

- A lack of a precise definition of regional clusters, as a lack of clear geographical cluster boundaries. Academics and policy makers apply somewhat varying definitions when studying regional clusters and designing policies to target clusters. Different types of industrial agglomerations are then grouped under the same heading, which may lead one to overrate the quantitative importance of regional clusters in the

2 The 'Third Italy' denotes the north-eastern and central parts of Italy. The area is well known for its numerous industrial districts consisting of networks of SMEs in mainly traditional manufacturing sectors. The SMEs are involved in different types of formal and informal networking.

3 Sticky' knowledge denotes knowledge embedded in a local industrial milieu, and knowledge that is difficult to transfer to or copy in other areas.

4 In this quotation, Lagendijk refers to the view of Steiner, M. (Ed.) (1997).

economy. Poorly clarified concepts also make it somewhat difficult to compare different case studies and discuss policy implications.

- Part of the literature sometimes underestimates the importance of place-specific, social and cultural factors in the creation of, and for the efficient working of, regional clusters. Our knowledge about clusters draws mostly on case studies of companies, local production systems and geographical areas, and the cases have usually been ‘success stories’, i.e. companies and areas experiencing growth. Many of the resources underpinning growth in the clusters are rather place-specific. If we do not recognise the importance of the specific local contexts for the working of clusters, we risk overrating the possibility of creating new regional clusters (and regional innovation systems), and in particular in less favoured regions.

Until now, few analyses exist on the possible impacts of the ‘new economy’ on regional industrial clustering. Among other things, the ‘new economy’ includes increasing economic globalisation facilitated by new information and communication technology. The globalisation process implies that many firms are increasingly incorporated in global value chains. Not taking this development into consideration may again lead one to overrate the quantitative importance of regional clusters in the current global economy.

This report addresses what we see as the important biases in the current research on regional clusters and regional innovation systems. The report explores four main research questions, related to theoretical, empirical and policy issues:

1. What is meant by concepts like regional clusters and regional innovation systems? What are the mechanisms underpinning dynamism, competitiveness, and stagnation in regional clusters?
2. How important are regional clusters in the economy of Europe?

Policy targeting regional clustering is often motivated by the perceived general tendency of firms to cluster geographically (Glasmeier 2000). But how important and common is the ‘fact’ of clustering?

3. What characterises regional clusters in Europe, and what are the main tendencies in the clusters?

Empirical studies of regional clusters, the ‘tests’ of cluster theories, and more generally of the theories of local economic development, very often consist of success stories (Vatne and Taylor 2000). The success often refers to specific local and historical circumstances, which makes it difficult to formulate empirical generalisations of the process of local economic development. Thus, comparative analyses of regional clusters are important to gain more general empirical knowledge of this phenomenon and to be able to examine critically, theoretical propositions of clustering and the impact of the ‘new economy’ on clusters.

4. Why and how should economic development policy and regional policy take into account the phenomenon of geographical clustering? What are good practice policies targeting (different types of) regional clusters?

There is a need to examine critically the stated reasons for public policy intervention in regional clusters, as well as to analyse what might be sound policy instruments adapted to different circumstances.

These research questions are answered via desk research and empirical investigations. The main empirical analysis consists of a survey of two regional clusters (one ‘science-based’ and one relying more on traditional, local skills) in 17 European countries⁵ to answer in particular research questions 3 and 4 above. The survey was addressed to researchers and public officials knowledgeable about clusters. The survey was carried out by the partners in the ENSR (European Network for SME Research) in the individual countries. This cluster survey focused on (i) the size and nature of the cluster, (ii) interaction inside and outside the cluster, (iii) how industrial activities in the clusters are performed, (iv) some important trends in the development of the cluster in the last ten years (to evaluate the possible importance of the ‘new economy’), (v) the activities of cluster-specific organizations, and (vi) the role played by public policies in cluster development.

The immediate question regarding this survey is to what extent the results from the comparative case studies of 34 regional clusters can be generalised to hold more common knowledge of regional clustering in Western Europe. The surveyed regional clusters derive from a wide range of industries and geographical areas, and are of different size and nature (cf. Chapter 4). Thus, the survey covers a wide range of ‘cluster types’⁶. Every cluster, however, will certainly include some place specific and industry specific features, and the survey cannot therefore

⁵ The cluster survey includes the 15 Member States of the EU plus Liechtenstein and Norway. According to available information, Iceland has no relevant regional cluster to include in the survey, whereas detailed information on regional clusters in Switzerland has not been available.

⁶ However, the surveyed clusters have been selected according to some specific sets of criteria, which are explained in Chapter 3.2.

be said to give a picture of a hypothetical 'representative' European cluster. Nevertheless, collecting comparative information about 34 regional clusters adds to the current empirical information on regional clusters, which, is hitherto almost exclusively based on case studies.

The rest of the report consists of four main parts. The next chapter clarifies the meaning of the term regional cluster and related concepts, and raises the main theoretical issues that may be relevant guides in interpreting the empirical material from, in particular, the cluster survey. Chapter 3 explores the second research questions about the quantitative importance of regional clusters, while Chapter 4 investigates the third question about the nature and development of European clusters. Chapter 5 assesses why and how regional clusters might be supported, and characterises the kind of cluster policy found at the EU, national and regional level. Finally, Chapter 6 attempts in particular to draw policy conclusions from the research. The report aims to contribute to the understanding of the process of regional clustering and the importance of regional clusters in policy formulation.

Chapter 2

Regional clusters and competitive advantage

2.1. What is a regional cluster?

The success of some regional clusters has focused attention on the creation of external economies and on the role of knowledge intensive, local environments in stimulating the competitiveness of networks of firms. Competition is increasingly seen to occur between clusters, value chains or network of firms rather than just between individual firms. It is also argued that regional clusters are the best environment for stimulating innovation and competitiveness of firms (Asheim and Isaksen 2000a).

A regional cluster may be defined as a geographically bounded concentration of *interdependent* firms. Rosenfeld (1997) underlines that clusters should have active channels for business transactions, dialogue and communication. 'Without active channels even a critical mass of related firms is not a local production or social system and therefore does not operate as a cluster' (Rosenfeld 1997: 10). This definition uncovers two main criteria for delimiting regional clusters.

Firstly, regional clusters are limited geographical areas with a relatively large number of firms and employees within a small number of related industrial sectors. Thus, the clusters are *specialised* in a small number of industries. This reflects the more general point that economic, entrepreneurial and technological activities in specific industrial sectors tend to agglomerate at certain places (Malmberg et al. 1996).

Secondly, although firms in regional clusters may co-operate with firms, R&D institutes etc. in many places, the firms are part of *local networks*, often in the form of production systems. These systems first and foremost tend to incorporate subcontractors, but may also involve horizontal co-operation between firms at the same production stage. Using a common technology or knowledge base or the same raw material source may also connect the firms in the area. The size of the geographical area constituting a regional cluster depends on where the firms in the local production system are located. Often a regional cluster covers a local labour market area or travel-to-work area.

Porter (1998a) employs a somewhat wider meaning of clusters, as 'geographic concentrations of interconnected companies and *institutions* in a particular field' (p. 78, Agder italics). On the one hand, this is a more limited definition than Porter's (1990) original cluster concept focusing on national industrial clusters, i.e. firms and industries linked through vertical (buyer/supplier) or horizontal (common customers, technology etc.) relationships, and with the main players located in a single nation/state. However, also in 1990 Porter emphasised that geographic concentration of rivals, customers and suppliers in a region will promote innovation and competitiveness in a cluster even more. Thus, 'the process of clustering (...) works best when the industries involved are geographically concentrated' (Porter 1990: 157).

On the other hand, Porter (1998a) employs a wider meaning in that he also includes institutions (formal organisations) as part of regional clusters. However, in discussing the cluster concept, Porter does not strictly define the necessary elements that constitute a cluster, but rather refers to empirical cases. Thus, Porter (1998a: 78) claims that 'many clusters include governmental and other institutions'. Then, the term regional clusters is not reserved only to denote geographical concentrations of both interconnected companies and institutions. Some clusters contain institutions, others do not.

We advocate the use of narrow and precise definitions of central analytical concepts as tools in empirical studies and as a basis for policy-making. Thus, we are in favour of restricting regional clusters to geographical concentrations of interconnected *firms*, and use the concept *regional innovation system* to denote regional clusters plus 'supporting' institutions. To constitute an innovation system firms in a regional cluster first have to form regional innovative networks involving more organised and formal co-operation between firms in innovation projects (Table 2.1). Then for example suppliers not only produce components or modules to customers' specifications but also co-operate with their customers in developing new products. The focus on innovative networks corresponds with the emphasis in OECD (2001) on how enterprise clusters stimulate firms' innovation process by the flow of ideas, information and knowledge within clusters.

A complete regional innovation system also involves co-operation in innovation activity between firms and knowledge creating and diffusing organisations, such as universities, colleges, training organisations, R&D institutes, technology transfer agencies, business associations, and finance institutions. These organisations possess important competence, train labour, and provide necessary finance etc. to support regional innovation. Thus, regional innovation systems consist of (i) firms from the industrial clusters of the region, including their support industries, and (ii) 'supporting' knowledge organisations, and (iii) the interaction between these actors⁷.

Table 2.1: A hierarchy of three concepts

Concepts	Definitions and differences
Regional cluster	A concentration of 'interdependent' firms within the same or adjacent industrial sectors in a small geographical area
Regional innovation network	More organised co-operation (agreement) between firms, stimulated by trust, norms and conventions, which encourages firms' innovation activity
Regional innovation system	Co-operation also between firms and different organisations for knowledge development and diffusion

Distinguishing between the three distinct concepts of regional clusters, regional innovation networks and regional innovation systems is especially relevant when discussing how public policy can stimulate the competitiveness of cluster firms. Regional clusters are seen mainly as a *spontaneous* phenomenon; a geographical concentration of firms often developed through local spin-offs and entrepreneurial activity. Regional innovation systems, on the other hand, have a more *planned* and systemic character. The development from a cluster to an innovation system may be *one* way to increase the innovation capability and competitiveness of cluster firms. The development requires strengthening inter-firm collaboration and the institutional infrastructure, i.e. that more knowledge organisations (both regional and national) are involved in innovation co-operation (cf. Chapter 6). Intervention between firms and knowledge organisations introduces an important role for government in 'cluster policy'.

2.2. How do clusters emerge and grow?

To some extent Table 2.1 may be a point of departure for sketching out a general, historical evolution of regional clusters. Clusters often go through a history of emergence, growth, decline or transformation. Although individual clusters develop differently, six steps in a 'model of cluster development' are outlined below.

Firstly, the birth of a cluster can often be traced to historical circumstances, such as the availability of raw materials, specific knowledge in R&D organisations or traditional know-how, the specific or sophisticated needs of a certain group of (geographically concentrated) customers or firms, and the location of firms or entrepreneurs performing some important new technological innovations that stimulate the growth of many others. Accidental reasons may also affect the growth of a cluster. However, the growth is often set off by some explicit location factors, in particular long-term development of specific knowledge that may be turned into new productive use (Pinch and Henry 1999). Emerging clusters can often be traced back to a history of events that led to the 'sudden' rise of clusters in more recent years. The first stage in cluster development often involves new firm spin-offs leading to a geographical concentration of firms in nearly the same production stage. The agglomeration is followed by local competition that is an essential driver of innovation and entrepreneurship (Porter 1998b).

⁷ This conceptualisation of regional innovation systems corresponds with the one found in Cooke et al. (2000). In their words any functioning regional innovation system consists of two sub-systems: (i) the knowledge application and exploitation sub-system, principally occupied by firms with vertical supply-chain networks; and (ii) the knowledge generation and diffusion sub-system, consisting mainly of public organisations.

Secondly, once an agglomeration of firms becomes established, progressively more external economies are created, forming a cumulative process. The first external economies often include (i) the creation of a set of specialised suppliers and service firms, frequently originating from vertical disintegration of firms, and (ii) the creation of a specialised labour market (Storper and Walker 1989). The development may lower the cost of shared inputs as savings in production costs are passed from specialised suppliers (serving numerous local firms) to client firms. The client firms will then derive a benefit not available to similar firms in less highly localised settings (Harrison et al. 1996). Cost saving also occurs through the presence of a pool of experienced and skilled workers.

A third step may be the formation of new organisations that serve several firms in the growing cluster, e.g. knowledge organisations, specialised education establishments and business associations. The organisations advance local collaboration, learning process and technological knowledge spillovers, as well as the creation of localised forms of knowledge by key personnel in the local industry. An example is the set up of centres for real services in some industrial districts in the 'Third Italy' during the 1980s. These centres hold specialised competence (on market development, technology, strategy etc.), and are able to supply the system of firms with professional competence that small firms seldom acquire themselves, but which is often necessary in accomplishing larger innovations. Brusco (1990) claims that the introduction of the centres raised the innovative capability in the local network of small producers.

Fourthly, the development of external economies and the emergence of new local organisations increase the visibility, prestige, and attractiveness of a cluster. This may result in more firms and skilled employees moving into the cluster, thus raising the attractiveness even further, as well as resulting in a fertile breeding-place for new local companies.

A fifth step relates to the creation of non-market, relational assets that foster an untraded circulation of information and knowledge, through e.g. informal collaboration, and help with coordinating economic activity. Thus, mature regional clusters may contain ensembles of specific, differentiated, and localised relations between persons and organisations that are coordinated by routines or conventions that often only work in the context of proximity (Storper 1997). Communication that contains flows of non-codified knowledge, and which is complex and uncertain, frequently involves dense human relations, which in turn are stimulated by proximity between individuals, firms, and organisations.

Lastly, although a cluster can renew its success for decades or become part of a new cluster, many regional clusters sooner or later enter a period of decline. Cluster decline is often seen to reflect a situation of technological, institutional, social and/or cultural 'lock-in' in business behaviour. Regional industrial development may become 'locked in' by the very socio-economic conditions that once made the region into a core region in a specific industry. The initial strength of a regional cluster in the past - be it a well educated or experienced workforce holding unique know-how and skill; a highly developed and specialised infrastructure of firms, knowledge organisations, and education and training institutions; close inter-firm linkages; or strong political support by regional institutions - may turn into an inflexible obstacle to innovation (Grabher 1993). Clusters may fall into a trap of 'rigid specialisation'. Cluster development sometimes tends to reinforce old behaviours and suppress new ideas, which in particular is a danger for the continued survival of a cluster when technological and global economic conditions change (Porter 1998b).

Table 2.2: Steps in the appearance and development of regional clusters; an 'ideal-typical' model

1. Formation of pioneer firms often based on specific local knowledge, followed by new firm spin-offs.
 2. Creation of a set of specialised suppliers and service firms, and a specialised labour market.
 3. Formation of new organisations that serve cluster firms.
 4. Attraction of outside firms, skilled workers, and fertile grounds for new local companies.
 5. Creation of non-market relational assets that foster local circulation of information and knowledge.
 6. A period of decline for the clusters because 'lock-in' situations may occur.
-

2.3. Different interpretations of regional clustering

Several elements of the general historical model of regional clustering are however debated, in particular the focus on social and cultural factors underpinning the growth and working of clusters. The importance of non-economic factors represents a key controversy surrounding the origin and development of regional clusters. Thus,

an interesting split is emerging in research on regional clusters and innovation systems regarding the importance of specific regional resources for the growth and working of clusters (Storper 2000).

Much of the research on regional production systems from the 1970s emphasised the close interaction of industrial organisations, performance and historical and regional specific, socio-cultural factors. *Industrial districts*, for example, contain external economies, which relate to the achievement of effective production through extensive division of labour within networks of specialised small firms. The development of industrial districts, however, is also based on a number of social and cultural factors, which are territorially specific (Asheim 1992). The existence of mutual trust and 'industrial atmosphere' are necessary ingredients in the definition of industrial districts, and these factors stimulate the development of incremental innovations in local firms (Table 2.3). Industrial districts are seen as agglomerations where 'community and firms tend to merge' (Becattini 1990:38), and where the success of the districts relies heavily on the socio-cultural context in which they are rooted.

The '*Californian school*' analysed the growth of new industrial spaces emphasising vertical disintegration of production chains in a new era of 'flexible accumulation', which leads to agglomeration of firms to reduce inter-firm transaction costs and the formation of specialised local labour markets (Scott 1988). Being at the start a mainly structural approach referring to universal causal mechanisms and circumstances the attention soon shifted to examining the role of culture, institutions and governance in the creation of new industrial spaces (Lagendijk 1997). The approach came to consider the agglomeration itself as a source of industrial dynamics, and in particular saw the region as the locus of what Michael Storper (1997) denotes as 'untraded interdependencies', which are conventions, informal rules and habits that coordinate economic players under the conditions of uncertainty.

Another example is the '*Nordic School*' of the learning economy (Lundvall and Johnson 1994) that highlights innovation as the basis for obtaining competitiveness for firms, regions and nations. Innovation is conceptualised as a complex and interactive learning process, emphasising the importance of co-operation and mutual trust that are further promoted by proximity. Learning is furthermore seen as mainly a localised process (Asheim and Isaksson 2000a). Diverging innovative capabilities between regions are the result of specific learning trajectories embedded in different institutional systems. Learning is seen as 'sticky' due to the fact that some important types of knowledge are of an informal, tacit nature⁸, and also the efficient use of formal, codified knowledge may demand some tacit knowledge. This kind of knowledge cannot easily be isolated from its individual, social and territorial context; it is a socially embedded knowledge, which is difficult to codify and transfer through formal channels of information. The fact is that while information is relatively globally mobile, (some important kind of) knowledge is remarkably spatially rooted (Cooke et al. 2000).

The three above-mentioned theoretical approaches emphasise regional and place-specific resources and institutional frameworks as important in explaining growth or decline of regional clusters. Non-market relations between firms, trust, conventions, cultural structures and non-codified knowledge are seen as factors of spatial binding, factors that promote innovation and entrepreneurship and help to lower transaction costs. The main explanations of the dynamics of regional clusters in this part of the literature have increasingly turned from 'economic' reasons, such as external economies of scale, to 'social-cultural' reasons, such as non-market forms of interaction, including trust and untraded interdependencies. These social and cultural factors are summed up by the phrase 'institutional thickness' (Amin and Thrift 1994; cf. Chapter 2.5).

Based on Porter's concept of an industrial cluster (Porter 1990) a different, and more instrumental, approach emerged. Clustering is more or less seen as an independent, aspatial process with its own laws of development, where the laws of successful clusters can be reverse-engineered in order to imitate the success stories (Storper 2000). According to Porter (1998a) companies gain competitive strength in regional clusters because of a better access to specialised and experienced employees, suppliers, specialised information and public goods, and by the motivating force of local rivalry and demanding customers. It is the case of external economies strengthened by proximity. The approach seems to contain little systematic explanation of what exactly causes the spatial binding of economic activities within clusters besides the importance of spatial proximity. The writing of Porter is extremely important, not least in making economists and policy makers aware of the phenomena of networking and clustering. However, Porter's approach (or the way it is interpreted⁹) may lead one to overrate the possibility of copying success stories in other areas in not focusing on the importance of place-specific factors. Recreating the conditions leading to 'success stories' in other places, and in particular in less favoured regions, has however

⁸ 'Tacit' knowledge may be seen as 'unarticulated' knowledge, which may be so for two reasons: (i) there is no (foreseeable) way to articulate or codify the knowledge, or (ii) although codification is possible, this has not (yet) been undertaken, possibly for economic reasons.

⁹ Porter (1998b: 225-227) refers to the embedding of economic activities in ongoing social relationships as contributing to the value creation process.

proved exceptionally difficult, in part because the conditions tend to have a long historical development (Gillespie et al. 2001).

Table 2.3: Four approaches to interpreting the process of regional clustering

'Schools of thought'	Important factors underlying the growth and working of clusters
Industrial districts	External economies + mutual trust and 'industrial atmosphere', leading to incremental innovations
'The Californian School'	Vertical disintegration, reducing transaction costs, and a specialised local labour market + conventions, informal rules and habits
'The Nordic School'	Innovation as learning, learning as a localised process, because of the importance of 'sticky', non-codified knowledge
Porter's industrial cluster	External economies strengthened by proximity (better access to input factors, local rivalry and local customers)

2.4. The importance of the 'new economy' on regional clustering

How we conceptualise and interpret the process of regional clustering may, however, change because of the perceived emergence of a new economy, related to a rapid introduction of information and communication technologies (ICT). The new technology may have great implications for existing regional clusters and for the clustering process. Two other development tendencies are in part related to the use of ICT, i.e. increasing economic globalisation and the development of more lean organisations (Harrison 1994). Taken together, these tendencies represent a more networked way of organising economic activity. The networks increasingly include transnational companies and stretch over long distances, thus potentially affecting dense local networks representing the core of regional clusters.

The development tendencies, often related to the new economy, may influence regional clustering in completely different ways. We discuss three possible, but not mutually excluding, directions of impact of the new economy with regard to clustering processes. The first refers to the new economy itself, while the second and third refer to the way ICT are used in the economy.

- (i) The growth of regional clusters in 'new economy' industrial sectors;
- (ii) The change in existing clusters due to the replacement of regional networks with more far-reaching networks rendered possible by the distance-transcending capabilities of new technologies;
- (iii) The inclusion of cluster firms in evolving global networks orchestrated by transnational corporations using ICT to co-ordinate global activities¹⁰.

i The growth of regional clusters in 'new economy' industrial sectors

One possible outcome of the new economy 'emphasises the strong clustering effect that can be witnessed in those regions most associated with the emergence of the new economy, such as Silicon Valley in California, or in the concentration of 'dot.com' start-ups in major cities such as London' (Gillespie et al. 2001: 1). This approach focuses on the conception of the new economy as newly created industrial sectors based around new technologies, and in particular that of the Internet. The clustering effects of these sectors relate to the fact that important types of knowledge are generated and transmitted more efficiently as a result of local proximity. Thus, firms in new industries based on new knowledge have a high propensity to cluster in a small number of critical localities, at least in the first part of the lifecycle of a new industry. New economy clusters often originate in metropolitan areas that contain industrial and knowledge environments able to breed firms in entirely new industries. 'The Internet economy has produced high densities of dot.com firms in San Francisco, New York, Los Angeles, and Seattle and it is following the same geographical patterns as all of its innovative forebears' (Leamer and Storper 2001: 9). The development of these US dot com clusters resembles the general model of cluster development in Chapter 2.2. The starting point is 'the establishment of a small number of core agglomerations, characterized by strong inter-firm and firm-labour market network relations, the existence of an 'industrial atmosphere', and circu-

¹⁰ The classification is inspired by Gillespie et al. (2001).

lar and cumulative advantage due to the building up of external economies in those places' (op. cit.: 9). The point is that the new industries create localised externalities, which causes new activity to cluster around it at the start of the life cycle of these industries (Storper and Walker 1989).

ii The challenge for existing clusters offered by ICT

The second approach relates to the possibilities of distributing information immediately and almost without cost over electronic networks, which has led some commentators to proclaim the 'death of distance' (Gillespie et al. 2001). The idea is then that firms are increasingly more able to use worldwide sourcing to lower input costs. Firms in regional clusters may then replace local collaborators with more far-reaching networks, possibly undermining the cluster as a place of dense local interaction and knowledge creation. These tendencies may diminish the importance of clusters in the economy as proximity constraints disappear, i.e. industrial districts interpreted as localised thickening of firm networks (Sforzi 1990) may lose ground. Research on the use of internet and e commerce in Italian industrial districts points to considerable increase in opportunities for establishing new relationships, both inside and, in particular, outside the district (Club dei Distretti 2001).

However, this argument may mix up information and codified knowledge that is mass-produced and widely distributed with the more scarce resource of non-codified knowledge. This kind of knowledge includes know-how and skills that are more or less tacit, 'sticky', and highly embedded in individual experience, human relations, communication channels and organisational routines. New knowledge in particular is often 'sticky' and includes combinations of tacit and codified knowledge. ICT may facilitate dispersal of activities that can be accomplished away from regional clusters, while activities that depend on tacit knowledge, face-to-face interaction and trustful relations tend to remain in the clusters. The Internet allows long distance 'conversations' (interactive long-distance exchanges of visual and oral information) but not 'handshakes' (information exchanges requiring persons to be in the same physical space) (Leamer and Storper 2001). This may result in 'front-end' or 'home base' activities to remain in clusters, while other activities (such as routine but mobile production and service activity) are increasingly sourced worldwide. This is the 'double-edged geography of the Internet age, with its tendencies towards specialisation and agglomeration, on the one hand, and spreading out on the other' (op. cit.: 20)

iii The inclusion of cluster firms in evolving global networks orchestrated by transnational corporations using ICT to co-ordinate global activities

The third approach examines the way in which large corporations use ICT in particular in co-ordinating their supply chains, which increasingly includes activities taking place in many parts of the world. ICT have enabled new global divisions of labour to emerge, resembling the global corporate structures of activities. The world economy is seen to develop in the direction of increasingly supranational, functional integration run by multinational companies (Dicken et al. 1997). Two parallel tendencies can be identified in the more global economy (Asheim and Isaksen 2000b). Firstly, a substitution of local systems with global systems takes place. Large numbers of firms, and also formally independent firms, are linked together in networks that are directly or indirectly controlled by the multinationals. Secondly, a transition from production systems to learning systems is occurring as a result of the increased knowledge intensity of products. This relates to the whole value chain of a product and the relevant knowledge infrastructure has to be taken into consideration when determining the knowledge intensity of a product. Taken together these tendencies represent a development from local production systems (as regional clusters) to global learning systems, often orchestrated by multinational companies.

This development may generally lead to the *reduced* significance of regional networks and clusters compared to the linking up of firms in global value chains. However, clusters may constitute what Amin and Thrift (1992: 577) denoted some years ago as 'neo-Marshallian nodes in global networks (where they) act as 'centres of excellence' in a given industry'. Corporations link up in different ways to specialised firms and knowledge organisations in dynamic and innovative clusters as they need to connect their own knowledge base with other specialised knowledge that may often be developed in innovative regional clusters. The American company Texas Instruments and the Swedish company Ericsson are for instance both established in northern Jutland, Denmark, in order to tap into the particularly well developed competence in mobile and satellite communication in this region. In such a way, the global economy may be seen as a mosaic of regional clusters linked by the flow of goods, information and knowledge (Saxenian 1994).

The important point, then, is that the approaches to interpreting the impact of the new economy require a multi-level approach to regional clusters and policy. This means that different types of knowledge must be accessed at different geographical scales. This also points to the continued importance of geographical nearness, localised

learning, dense human relations etc. in stimulating some kind of innovation activity, and for the continued importance of regional clusters in the economy, although clusters may change. The interpretations of the impact of the new economy on regional clustering also point to the importance of the three first 'schools of thought' in Table 2.3 above. The different place-specific, socio-cultural factors are seen to be of continued importance for the knowledge creation and the efficient working of regional clusters in the globalising economy.

2.5. Development tendencies in regional clusters

Two development tendencies in regional clusters will be examined in Chapter 4. Firstly, cluster firms are seen to be increasingly incorporated in national and global supply chains rather than having only regional suppliers or clients (Christensen 2000). Cluster firms more and more find their suppliers of components, modules and services outside the cluster boundary, as they carry out more worldwide sourcing of some inputs. Cluster firms are also increasingly seen to be part of global networks governed by large corporations, as cluster firms supply clients in other parts of the world or enter into strategic alliances.

Second, the degree of 'institutional thickness' in regional clusters is examined. The idea put forward by some theoretical approaches (cf. Table 2.3) is that the performance of local economies in a globalising world is critically dependent upon their institutional thickness. Only particular forms of institutional thickness, which are not universally available, are seen to be productive for growth drawing upon local resources (Amin and Thrift 1994). Some 'institutionally thick' regions are also in danger of being 'locked in', which occurs in particular when traditional technological and organisational strengths in the past turn into inflexible obstacles to innovation (Grabher 1993). Interdependencies between players in regional clusters may contribute to the elaboration of local technological trajectories that sooner or later may be out competed. Accordingly, growing or successful regional clusters are seen to develop a high degree of productive institutional thickness that stimulates a large innovative capacity as a common property of a region. However, this does not mean that local economic growth always requires local institutional thickness, as there may be several ways to stimulate economic development.

The term 'institutional thickness' can be interpreted in two main ways. The first is in the form of formal organisations with a high level of interaction which support the working of firms in various ways, 'that is a plethora of institutions of different kinds (...), all or some of which can provide a basis for the growth of particular local practices and collective representations' (Amin and Thrift 1994: 14). Secondly, institutional thickness includes social institutions that foster dense, informal collaboration between personnel in firms and organisations. The institutions 'span from firm-level or network-level routines to community-level norms and conventions, facilitating trust and economic coordination' (Lorenzen 2001: 165). The local players are aware that they are involved in a common enterprise, and they have a common industrial purpose and shared cultural norms and values. A low degree of institutional thickness denotes regional clusters that are meagre in terms of both collective, 'supporting' organisations and a productive social infrastructure. A high degree of institutional thickness, on the other hand, includes regional clusters having both numerous organisations and supportive social institutions.

Chapter 3

The quantitative importance of regional clusters

The great interest in regional clustering taken by academics and policy-makers to a large extent rests on a perceived general tendency of firms to cluster geographically. However, relatively little empirical evidence has been put forward to validate the 'fact' of regional clusters as an omnipresent phenomenon in current economies. This chapter then reviews existing studies across Europe in order to examine the quantitative importance of regional clusters. Such an exercise is important in order to 'discipline' results from case studies so that, for instance, too strong a generalisation about the importance of clusters based on the few familiar examples is avoided.

Results from national quantitative analyses to identify and characterise regional clusters are presented below (Table 3.1). The studies listed use a different terminology (such as competence clusters, local production systems, industrial districts, and regional clusters). They are based on different theoretical approaches (cf. Chapter 2.3), and use different methods and criteria to identify individual clusters. Finally the criteria are often not explicitly stated or based on qualified interpretation and knowledge of a country's economy. In most countries, the cluster mapping starts by defining some statistical thresholds (regarding regional specialisation of industrial sectors, number of employees in the sectors etc.). This inevitably leaves out some 'real' clusters. Consequently, the results from the studies concerning the relative importance of regional clusters in the national economy differ, and the results for individual countries are generally very difficult to compare.

Much of the interest in regional clustering derives from experiences and studies of industrial districts in Italy. These districts are characterised by a high concentration of firms, and very often, small enterprises in (mainly traditional) manufacturing industries, a well-developed division of work between local firms, a high level of entrepreneurship and the 'fusion' of social and economic life. Several studies have identified industrial districts in Italy, revealing different results. Sforzi (1990), being a standard reference, identified 61 so-called Marshallian industrial districts, mostly located in north-eastern and central Italy¹¹. In 1981 these districts had around 900,000 jobs, amounting to 5.4 % of all jobs in Italy, and 8.6 % of all manufacturing jobs. The districts experienced a much faster increase in employment in manufacturing and in total employment in the 1970s than the national average. Other sources also point to job creation, real wages and return on investment to be consistently higher in the industrial districts than elsewhere, also in periods of recession (OECD 2001).

A newer study based on the census from 1991 and using different criteria to classify industrial districts (Table 3.1), identifies 199 industrial districts in Italy (Fabiani et al. undated). As much as 42.5 % of the Italian manufacturing employment is found in these districts. A statistical exercise reveals that firms in industrial districts have higher profitability and higher productivity than 'non-districts firm' for identical enterprise size groups and manufacturing sectors (op. cit.).

Recently, some other countries started using the concept of regional clusters in policy design. In the United Kingdom the notion of clusters has recently become a significant strand of government policy. One important step in developing a cluster policy in the United Kingdom is a research project to map existing UK regional clusters (DTI 2001). A recent White Paper ('Opportunity for all in a world of change' February 2001) encourages Regional Development Agencies to continue developing existing and embryonic clusters in their regions building on the existing strong capabilities.

The DTI report identified a total of 154 'clusters'. The approach is comprehensive, it investigates for each national industry whether and to what extent it is regionally clustered, and to map the location of any such cluster. The

¹¹ Sforzi (1990) derives from a division of Italy in 995 local labour market areas. Marshallian industrial districts are those areas with (i) a distinct socio-economic structure (high presence of entrepreneurs and workers in small manufacturing firms, working wives, young workers etc.), and with (ii) a dominant manufacturing specialisation.

identification, however, is seen to represent a 'first assessment' only, and a starting point for detailed analyses of individual clusters. Many of the identified clusters will probably, on closer examination, tend to be concentrations of industries rather than clusters, as clusters should have inter-related firms. Interestingly enough, job creation performance in the clusters for most of the regions is no better than the regional average and in some cases significantly worse. Exceptions include London, the South East and Eastern regions where overall job creation is significantly better than the regional average. This result may be explained by the 'cluster structure' in different regions. Thus, clusters in the south tend to be service based (for example software, business services and R&D), which are generally growing sectors. Clusters in the North of the United Kingdom tend to be manufacturing-based, which are more often stagnating or declining sectors. London and the South East also include the 'thickest' clusters, i.e. those with the most industrial and institutional and other linkages, which often perform the best.

The approach to clustering in *Denmark* resembles that taken in the United Kingdom. In Denmark 13 regional and 16 national so-called 'clusters of competence' have been identified, building on the idea that the strong clusters in the future will possess very special competence and know-how (Ervervsfremme Styrelsen 2001). This identification is seen as the first task in order to design an industrial policy addressing the specific needs of Danish clusters, and so the nature and working of the individual clusters have been analysed. The regional clusters contain both traditional industries like textile/clothing, furniture and horticulture, as well as 'new' industries like mobile and satellite communication. This reflects a more common trend in which most studies identify regional clusters in both manufacturing and service industries.

In *Portugal*, regional clusters have been identified more or less as a 'by-product' from a study aiming to contribute to the development of the international competitiveness of the Portuguese industry, organised by Michael Porter (Monitor Company 1994). The study, ordered by the Portuguese authorities, distinguished industries in which Portugal has a comparatively high export rate. A characteristic of these industries in Portugal is their frequent geographic concentration. Examples indicate, however, that several of these industries hardly constitute clusters, or only make up 'underdeveloped' clusters with a low level of interaction between firms and industries. However, several changes have occurred the last years as a result of a Governmental strategy aiming to develop some of the Portuguese export industries into clusters, which includes to stimulate more co-operations between firms, create technological infrastructures, and promote the image of some products in Portugal and abroad. These efforts have created the basis for implementing a national cluster policy.

In *France* several studies attempt to map regional clusters (or local production systems). The study by Debru and Saget (1999), which was ordered by the French Space Planning Agency (DATAR), seems to be the most relevant one in this context. DATAR has also launched two projects to identify and foster the development of local productive systems in France. The study by Debru and Saget identifies 144 existing regional clusters, and in addition 82 clusters are considered as emerging or virtual. The Ile-de-France region is, however, not included in this study. The study, as well as another one (Bernard Reverdy Consultants and Michel Le Duc Consultants 2001) points to regional clusters having on average an equal or better growth than the French average.

In a few other countries there has been an identification of regional clusters, but less related to policy formulation. In *Norway*, 62 potential regional clusters were identified through the use of a statistical analysis based on figures from 1990 (Isaksen 1997, 1998). As many as 55 of the clusters were manufacturing-based, covering 63,000 jobs in the 'specialised' sectors, which accounted for 22 % of Norwegian manufacturing employment in 1990. In job growth, the regional clusters generally experienced a slightly better development than the equivalent sectors nation-wide from 1970 to 1994, and in some sectors (such as furniture, shipbuilding and electronics) the regional clusters performed markedly better. The exception for this 'rule' is the great job losses in a few centrally located regional clusters in the Oslo and Bergen area, reflecting the general trend of geographical dispersion of Norwegian manufacturing throughout the 1970s and 80s. Thus, the statistical analysis suggests that Norwegian firms in fact generally may experience competitive advantage as a result of being located in regional clusters, signifying that the well-known anecdotes reveal more general patterns.

In *Spain*, 142 so-called industrial local systems have been identified, mostly specialised in rather traditional, labour-intensive and low technology industries (EXCEL 1993). The local systems have a higher employment rate, and thus higher income per capita than the average. A study from *Austria* identifies 76 regional clusters (Gassler and Rammer 1999). These are seen to be of six main types, i.e. production clusters, distribution clusters, technology clusters, export clusters, education clusters and mixed clusters (with elements of the other cluster types). Finally, in *Germany*, studies to single out and map regional clusters could not be identified. Kremer et al. (2000) describe eleven regional clusters in North Rhine-Westphalia. These clusters, however, have the character of a pol-

icy instrument in order to promote structural change in the region. Thus, the clusters do not necessarily represent all existing regional clusters in North Rhine-Westphalia, nor are they a representative sample¹².

National studies of clusters, however, often refer to national or industrial clusters in the tradition of Porter (1990), rather than regional clusters. Industrial clusters are basically seen as an economic (and not a territorial) concept, indicating that 'a nation's successful industries are usually linked through vertical (buyer/supplier) or horizontal (common customers, technology etc.) relationships' (Porter 1990, 149). However, in particular in small countries, many clusters will have a national span, although often concentrated in one or a few regions.

Below, we describe briefly some studies that identify national clusters, focusing mainly on countries in which quantitative analyses of regional clusters do not exist. Thus, the idea of Porter (1990) has been employed amongst other places in *Austria*. In this country 16 clusters have been identified (Peneder 1994). Seven of the clusters are seen to be internationally competitive. In *Finland*, key national clusters are identified in nine industries or groups of activities by the use of input-output analyses.¹³ Also in *Ireland* 'Porter-style' clusters have been identified. O'Malley and van Egeraat (2000) identify the relatively competitive industries in Ireland and examine whether these constitute vertically or horizontally linked clusters of industries. The authors found only limited evidence of Porter-type clusters in these industries.

In *the Netherlands* a number of empirical cluster analyses of the industrial structure have been carried out since the mid 1980s. Two main approaches used are (Roeland et al. 1999): (i) monographic case studies (of in total some 60 industry groups over the years) often based on Porter's 'diamond' model, and (ii) input-output (I/O) analysis, which aims to identify inter-linkages and knowledge flows between industry groups. The I/O analyses identified 12 large conglomerates of interlinked industry groups in the Dutch production structure. In *Belgium*, the clustering phenomenon is investigated at the regional level¹⁴ in the context of a strategic development of innovation potential and technology diffusion. Flanders usually identifies 18 (accredited or de facto) clusters as groups of enterprises, research/education/training institutions, local private and public business support organisations that have an intermediary cluster organisation that links the above elements in a dense geographically and/or technologically distinct network (Capron and Cincera 1999; Larosse et al. 2001). A study using the input-output method of identifying interlinking industry groups identifies five 'mega-clusters' in Flanders¹⁵ (Peeters and Tiri 1999). In Wallonia, the 'diamond' method of Porter was used to identify three domains of excellence¹⁶ (Surlmont et al. 1998). The Walloon government's approach in the identification of cluster potential is based on the identification of 40 fields of technological competence (MRW-DGTRE, 2000). Also in *Sweden* only national clusters have been systematically identified and analysed. The most authoritative study is a book entitled 'Advantage Sweden' (Sölvell et al., 1991), which outlines the structure, growth and dynamics of six internationally competitive, national clusters¹⁷.

A complementary kind of analyses to the national mapping exercises is studies of specific industries, which among other things identify regional clusters across a number of countries. Such a study shows a process of regional clustering in the European biotechnology industry (Allansdottir et al., 2001). A relatively small number of local clusters have a large majority of European biotechnology firms, of public research organisations, and of patenting. The top 20 regions account for nearly 70 % of the biotechnology patents invented in Europe between 1987 and 1996. A majority of the clusters are found in Germany, the United Kingdom, France, Sweden and Switzerland. The clusters are mainly located in large cities and in regions containing universities and prestigious research organisations and hospitals. Some of the biotechnology clusters are well established, while others are younger and really started growing in the 1990s.

The overview in Chapter 3 reveals that statistical mapping of regional clusters only exists in a few European countries, while some countries have identified industrial or national clusters. Thus, comparable information on the quantitative importance of regional clusters as well as on cluster development is meagre. However, the studies hint at regional clusters performing in general better than the national average in respective industries. The large and growing interest in regional clusters by policy makers demands nevertheless more analyses to identify regional cluster, preferably using the same kind of methods and indicators in individual countries. Such an exercise, coupled with analyses of strengths and weaknesses in clusters, may well be a first step in designing and implementing cluster policies, following the approaches taken in the United Kingdom, Denmark and Portugal. A process of cluster identification, characterisation and selection is generally lacking in many cases of cluster policy (Enright 2000).

12 The regional clusters are found in the following industries: Wooden mechanical engineering, mechanical engineering, furniture, metalworking, textile mechanical engineering, textile industry, cement industry, paper industry, solar energy, laundry and construction.

13 The key national clusters are found in food, forest, basic metal, machine building, construction, energy, information and communication technology (ICT), business to business services and well being (Hernesniemi et al. 1996).

14 Three regions: Flanders, Wallonia and Brussels Capital Region.

15 The mega-clusters identified are agro-food, metals & building, chemical, transport & distribution, and services industries.

16 Materials (metals-materials-building), chemical, and life-technologies (pharmaceutical-health-food).

17 The Swedish competitive, national clusters are found in the following industries materials/metals, forest product, multiple business, transportation, power generation and distribution and telecommunication.

Table 3.1: Summary of results from national studies attempting to identify and map clusters*

Country	Criteria used to identify clusters	Number of clusters identified	Relative importance of clusters	Cluster development compared to national average
Austria	1) Orientation of consumer, horizontal and vertical relationships. 2) Determination of international competitiveness	16 industrial clusters		
Denmark	Qualitative interviews of 75 informants supplemented by quantitative indicators of growing firms and export specialisation	13 regional competence clusters and 16 national ones		Probably better performance
Finland	Inter-industry linkages between 68 industries, plus data on export ratios and investments	9 key national clusters		
France	Local production systems (LPS) are characterised by (i) a local concentration of SMEs, (ii) SMEs belong to one or a few industries or activities, (iii) the firms co-operate and compete, (iv) the local area includes related activities such as business services or R&D, and (v) players in the area share a common 'culture'.	144 existing LPS and 82 emerging or virtual LPS		Generally, LPS seem to have an equal or better growth than the national average
Italy	Industrial districts are local labour systems that (i) have a larger than average share of workers in manufacturing, (ii) are specialised in a manufacturing sector, and (iii) have a high concentration of workers in SMEs	199 industrial districts (in 1991)	42.5 % of the total labour force in manufacturing	In almost every manufacturing sector productivity and profitability are considerably higher for ID firms
Netherlands	Clusters of related economic activities have been identified by linking main suppliers of goods and services to main users. This is achieved by the use of (i) inter-industry linkages between 214 industry groups, and (ii) 'make & use analyses' for 650 product categories and 260 categories of economic activities.	12 large conglomerates of inter-linked industry groups	Make up nearly 30 % of the national product	
Norway	Potential regional clusters fulfil three criteria: (i) they consist of labour-market regions, (ii) the labour-market regions are specialised in at least one of 39 industrial sectors (having a location quotient equal to or higher than 3.0), and (iii) the 'specialised' sector must include at least 200 jobs and 10 firms in the region.	55 clusters in manufacturing, 62 in total	22 % of national employment in manufacturing	Slightly better employment growth in clusters
Portugal	Industrial sectors with export specialisation, seen as sectors where the country has a comparative advantage	Some key sectors have been identified, constituting 33 regional clusters		Some clusters have a high level of development, while others reveal structural weaknesses. Nonetheless, all clusters are considered to represent an important store of knowledge, upon the basis of which stronger export positions can be built.

Table 3.1: Summary of results from national studies attempting to identify and map clusters* (continued)

Country	Criteria used to identify clusters	Number of clusters identified	Relative importance of clusters	Cluster development compared to national average
Spain	Local production systems have been identified by the local/regional concentration of SMEs, belonging to one or a few industries, where firms often collaborate through close supply-chain relationships. Interestingly, and in most cases, local/regional players share a common set of business values and cultural attitudes.	142 local production systems		Analyses of local production systems indicate that firms in these systems have a higher share of 'skilled' personnel in comparison to the national average.
United Kingdom	The <i>main</i> steps are: (i) Identification of 'regional highs', i.e. 5 digit ISIC sectors which have a location quotient over 1.25 and/or over 0.2 % of the regional workforce, (ii) grouping of identified sectors into clusters, and (iii) extensive interviews with representatives of 'clusters', regional agencies, research institutes etc. to clarify to what extent the clusters of 'regional highs' may constitute clusters	154 (potential) regional clusters	Ranging from 40 % of the region's employment in London to 15 % in the North West	In general no better job creation performance than the regional average.

* The national studies involve different definitions of clusters and different approaches to identifying the clusters.

Box 3.1: Cross border regional clusters

Some examples of cross border regional clusters exist, i.e. clusters that are found in several countries. Beneath we list examples of cross border clusters and display results from studies of barriers to cross border collaboration.

Examples of cross border regional clusters:

- Glass cluster in Upper Austria (A), Bavaria (D) and Bohemia (Czech Republic).
- Textile cluster in Lower Austria (A) and Bohemia (Czech Republic).
- Technical cluster in Styria (A) and Slovenia.
- The Öresund region in Denmark and Sweden, including the Medicon Valley that consists of a significant number of pharmaceutical and biotechnological firms, university hospitals and universities (see below).
- The Twente region in the Dutch-German border region contains regional clusters and networks in the plastic technology sector, the bio-medical sector and the metal processing sector.
- Around the city of Venlo various regional clusters of suppliers, engineering agencies and knowledge institutions in Germany and the Netherlands have been formed around the multinationals Ocè and Nedcar.
- 'Dommel-valley' on the Belgian-Dutch border consists of regional clusters of high-tech firms and knowledge organisations.
- BioValley is a tri-national region located in the valley of the Upper Rhine, which extends over northwest Switzerland, South Baden and Alsace. The region aims to become a European centre for biotechnology.

Few studies seem to focus on barriers to building or strengthening cross border economic clusters. However, barriers to cross border co-operation have been analysed and identified in the Öresund region. The region stretches over Sweden and Denmark and consists of many clusters, including for example pharmaceuticals and food production. Both clusters have major, knowledge intensive firms and organisations on both sides of Öresund. The barriers to increased cross border co-operation are mostly linked to differences in legislation between Denmark and Sweden and are therefore not easily correctable in the short term. However, the Single Market will work to lower the barriers. Areas which may act as barriers to increased cross-border integration have been identified; namely the labour market, construction and housing, social services, environment and planning, tax policies, education and research, infrastructure and logistics, culture and shared identities, and industrial politics. The short-term strategy has been to establish formalised co-operations across Öresund, e.g. concerning higher education, and improved access to information concerning legislation and other critical factors.

The continuing importance of national boundaries, and thus, the barriers in creating cross-border regional clusters, is also demonstrated in an empirical analysis of firms' innovation collaboration in the two bordering regions of Alsace in France and Baden in Germany, divided by the river Rhine (Koschatzky 1999). The study includes 479 manufacturing and business service firms in Baden and 280 in Alsace. While slightly fewer than 40 % of the firms in both regions cooperate with research institutes, none of the firms in Baden has research contacts with an institute in Alsace, and only 7 % of the Alsatian firms co-operate with research and transfer institutes in Baden. Spatial distance cannot explain low cross-border co-operation in this case. However, linguistic barriers and differences in mentality and institutional distance matter. Language, laws and diverse national regulations favour innovation co-operation with partners from the firms' own region or nation. Firm managers are often familiar with regional and national R&D institutes due to earlier experience, but are unfamiliar with the institutional setting abroad. Thus, in spite of the European efforts for integration and several cross-border initiatives, national innovation systems with their regulations and institutional settings are still important for firms' innovation interactions, and firms in both regions are strongly incorporated in their respective regional and national innovation systems.

These results agree with those in a study on *Pays Basque* (APRODI/IKEI 1998). The study concluded that the physical border between France and Spain is not the main difficulty to face in attempting to form a cross-border regional cluster. The difficulty is rather seen to be 'cultural distance'.

Chapter 4

The characterisation of European regional clusters

The purpose of this chapter is to characterise the nature, working, performance as well as important development tendencies in 34 regional clusters in 17 European countries. The information about the regional clusters was gathered by partners in the ENSR network using a specially designed 'cluster survey'¹⁸. The partners were asked to answer the survey by collecting information from an expert on the relevant regional cluster for one science-based cluster and one cluster relying more on traditional, local skills (the list of clusters is presented in Table 4.1¹⁹). We wanted the survey to include both traditional and science based clusters in an attempt to ensure some comparability between the surveyed clusters from the individual countries. We did not want the survey to consist of, for example; only traditional clusters from some countries and only science based ones from other countries. We also wanted to examine whether traditional and science based clusters may have significantly different developments in some fields. Although the number of surveyed clusters is limited, the comparative information about 34 clusters is seen as an important step forward in gaining a more general overview of regional clusters and clustering processes in Europe, compared to the focus on case-studies of individual clusters that has dominated this research area.

A basic question is, to what extent the survey may give a picture that is representative for a broader number of European regional clusters. The surveyed regional clusters derive from a wide range of industries and geographical areas, and are of different size and nature. Thus, the survey covers a wide range of 'cluster types'. Every cluster, however, includes some place specific, national and industry specific features, and the survey cannot therefore be said to give a picture of how the 'representative' European cluster looks like and performs. Nevertheless, collecting comparative information of 34 regional clusters adds to the current empirical information on regional clusters.

Some large-scale, general processes of change, with regard to, for example, globalisation forces and technological changes, exist and influence industries and firms in different places. However, the particular character of individual countries, of regions, and of industrial sectors interacts with such large-scale processes to produce quite specific outcomes. The 34 surveyed regional clusters cover a wide range of cluster types regarding the kind of sector dominating in the clusters, the age and the size of the clusters (cf. Table 4.1). Thus, the cluster survey may represent sound material from which to identify different kinds of outcomes and processes, although the survey cannot give information about how representative the identified outcomes and processes are.

18 The survey draws on a questionnaire compiled by Michael Enright. However, the questionnaire has been substantially revised to suit the purpose of this report (the questionnaire is published on the CD ROM of this Observatory of European SMEs).

19 The 'expected' number of clusters would be 17 science based and 17 traditional ones. However, Portugal and Greece both submitted examples in the traditional sector resulting in a data set consisting of 19 traditional clusters and 15 science based (in which scientific knowledge inside the cluster or found outside the cluster is said to underlie innovation activity in the cluster according to the survey.).

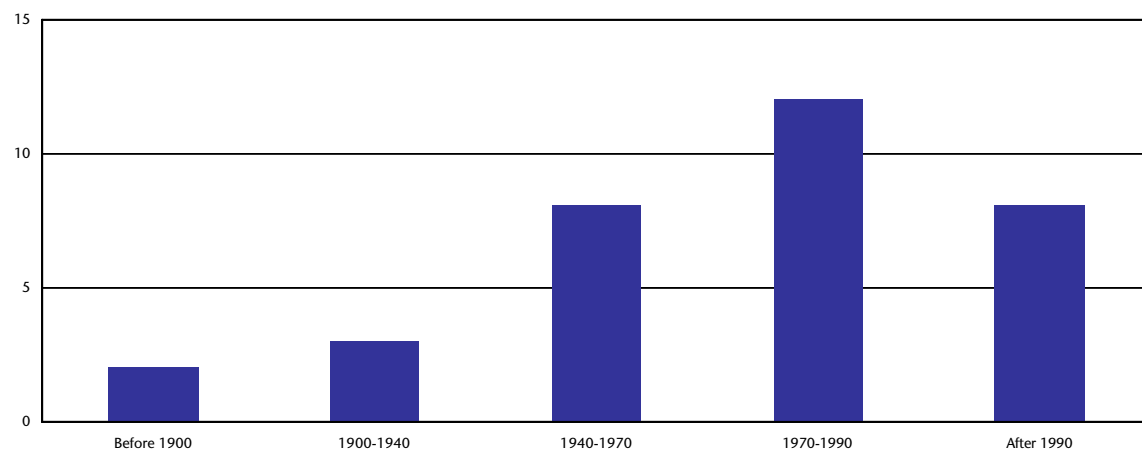
Table 4.1: List of the surveyed regional clusters (S= Science based; T= Traditional)

Country	Cluster name
Austria	Cluster Biotechnology and Molecular Medicine Science in Vienna (S); Wooden Furniture Cluster Upper Austria (T)
Belgium	Flanders Multimedia Valley (S); Flemish plastic processing (T)
Denmark	Communication cluster in northern Jutland (S); The Herning-Ikast Textiles and Clothing Industry (T)
Finland	Technology Cluster in Oulu (S); Shipbuilding in Turku (T)
France	Evry Génopôle (biotechnologies), Evry (S), Technic Valle (screw cutting and mechanics), Haute-Savoie (T)
Germany	Chemical Industry, Northern Ruhr area (S); Enterprise-information-system, Lower Saxony (S); Media Cluster; North Rhine-Westphalia (T)
Greece	Industrial District of Volos (sundry metal products and foodstuffs) (T); Industrial District of Herakleion (foodstuffs, non-metallic minerals) (T)
Ireland	The Dublin Software Cluster (S); The Dairy processing Industry (T)
Italy	Biomedical cluster in Emilia-Romagna (S), Eye-glass cluster in Belluno County (T)
Liechtenstein	Financial services (T)
Luxembourg	CASSIS (IT and e-business consultancy for SMEs) (S); Synergie (Technical facilities industries) (T)
Netherlands	Dommel Valley (ICT), Eindhoven/Helmond (S); Conoship (shipbuilding), Friesland & Groningen (T)
Norway	Electronics industry in Horten (S); Shipbuilding at Sunnmøre (T)
Portugal	Footwear cluster with several geographical concentrations in northern and central parts of the country (T); Manufacture of metallic moulds in Leiria (T)
Spain	The Cluster of Machine-Tools in the Basque Country (S); Shoe Manufacturing in the Vinapoló Valley (T)
Sweden	Biotech Valley in Strängnäs (S); The recorded music industry cluster in Stockholm (T)
United Kingdom	Cambridgeshire (High-tech) (S); British Motor Sport Industry, Oxfordshire/ Northamptonshire (T)

A dominance of young clusters

Most of the surveyed clusters are fairly young. The founding of the clusters in Figure 4.1 relates to the time when a geographical concentration of interdependent firms first appeared in the relevant sector and region. Only five clusters were established before 1940. Eight clusters were established between 1940 and 1970, while as many as 20 clusters after 1970. Chapter 2.2 argued for the fact that the emergence of clusters often can be traced back through a long history of events, and in particular events that gave rise to specific locally embedded know-how and skills. However, many of the surveyed clusters seem to have a fairly recent origin. Thus, many of the clusters were established in a period when post-Fordist production methods, characterised by flexible specialisation and local networks of SMEs, increased in importance - a development that may in itself encourage clustering processes.

Figure 4.1: Number of surveyed clusters by date of establishment



Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries.
Information from one cluster is lacking.

However, based on Figure 4.1 we cannot conclude that European clusters have often been established since the 1970s, as the survey used rather specific criteria to pick out the clusters to be analysed. More precisely, the criterion of selecting one science-based cluster in each country may lead to an overrepresentation of young clusters. The science based clusters have, thus, often been established fairly recently (Table 4.2), as the cluster firms are based on new technology and knowledge, and to some extent are spin-offs from universities and research institutes. Half of the traditional clusters were established before 1970, which still is a somewhat surprisingly low number.

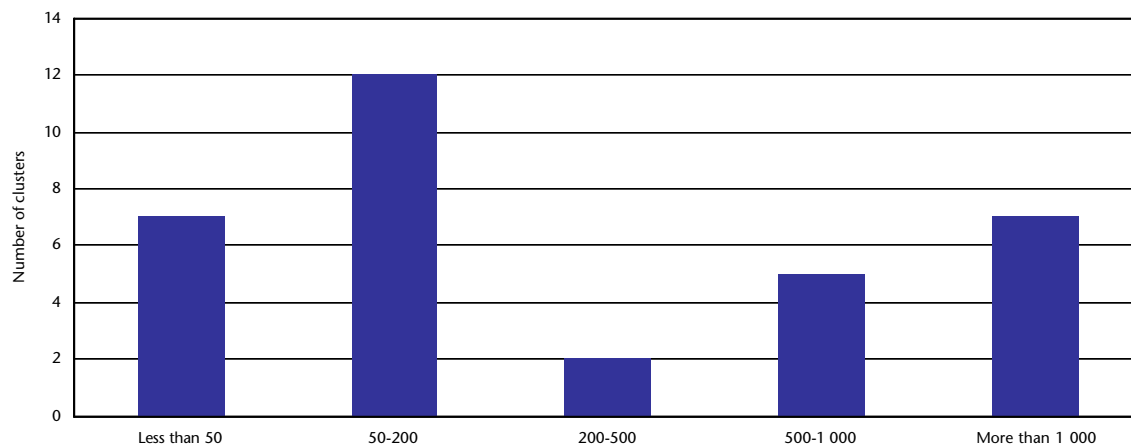
Table 4.2: Type of cluster and date of establishments. Number of clusters

	Founded before 1970	Founded after 1970
Science based clusters	4	11
Traditional clusters	9	9

Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries.
Information from one cluster is lacking.

Another important feature of regional clusters is their size in terms of number of firms and employees. Figure 4.2 demonstrates that the survey covers a wide range of size classes of clusters. About two thirds of the regional clusters are fairly small (have less than 200 firms). An examination of the number of employees reveals that most of the clusters have more than 2000 employees in the dominating sectors (including local suppliers and subcontractors), and half of the clusters employ between 2000 and 10 000 people. Thus, the main impression is that the survey contains a wide range of clusters in terms of industry, age and size, and, therefore, may illustrate quite well important development tendencies in European regional clusters.

Figure 4.2: Clusters according to the number of firms in the dominating industrial sector



Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries.

Mostly growing clusters

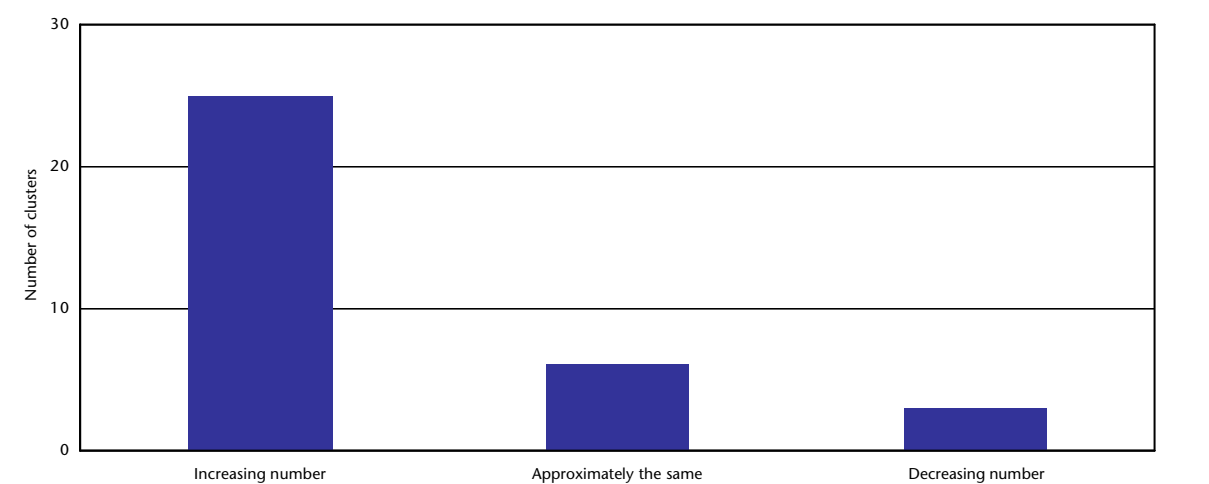
Chapter 2.2 argued that regional clusters often have a 'life cycle' consisting of birth, growth, maturity, and eventually decline or revitalisation (Porter 1998b). The cluster survey, however, seems to be biased towards growing clusters. Most of the clusters have increased their number of employees over the last ten years (Figure 4.3), while nearly 70 % of the clusters also experienced a growing number of firms over the same period of time²⁰. To some extent, the quite high number of growing clusters corresponds with results from the quantitative studies of regional clusters presented in Chapter 3. These studies hint at a somewhat better performance of regional clusters than of corresponding sectors nationwide.

The generally very good performance revealed in Figure 4.3 is still quite surprising when the low job growth or even job decline in many industries in Europe during the last ten years is taken into account. Apart from the fact that the ENSR partners may have selected 'visible' and hence often growing clusters to be surveyed, the large

20 Nearly three-quarters of the clusters with an increasing number of employees also increased in the number of firms.

number of growing clusters may also be explained by the relatively high number of science based clusters (which are in general growing industries) and the high number of young clusters (which are in an expansive phase of the life cycle) in the survey. For instance, the science based clusters, apart from one, have increased their number of employees during the last ten years. The young clusters (established after 1970), apart from one, also increased in number of employees. Thus, the results in Figure 4.3 cannot be taken as proof of a generally good performance of European regional clusters. However, theoretical considerations, some quantitative studies and several case-studies point in the same direction; regional clusters often constitute fertile ground for stimulating innovation capability and competitiveness of existing firms, encourage entrepreneurship and may attract inward investments.

Figure 4.3: Development in the number of employees in the clusters over the last ten years.
Number of clusters



Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries.

Increasing importance of SMEs

Drawing on relevant literature, Chapter 2.5 argued that regional clusters tend more to be involved in national and global supply chains rather than just relying mainly on regional collaborators. Thus, the cluster survey aimed to examine the importance of both regional resources and wider networks, as well as development tendencies regarding globalisation and regionalisation (the continued importance of place-specific resources).

A starting point, however, is to characterise the surveyed clusters in terms of dominating firm size categories. More than half of the clusters are dominated by SMEs in the sectors that ‘define’ the cluster (Table 4.3). Only three of the clusters are dominated by large-scale enterprises²¹. Table 4.3 exposes the ‘classical’ picture of regional clusters as local networks of mainly SMEs, or at least a mix of both SMEs and larger companies. A high number of SMEs in regional clusters is often explained by intense vertical disintegration by cluster firms taking place, which gives local market opportunities for specialised and often small subcontractors, as well as a high level of entrepreneurial activity in many clusters.

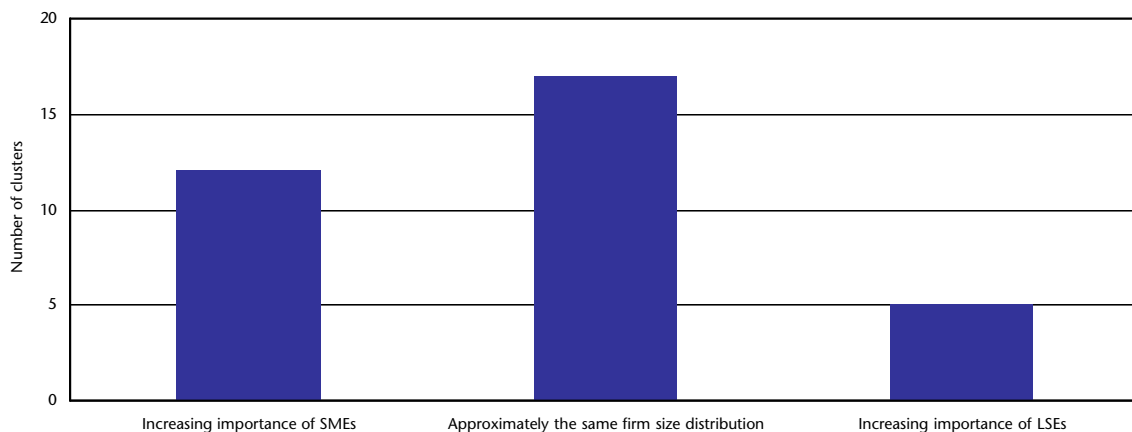
Table 4.3: Dominating firm size categories in the clusters	
	Number of clusters
Dominated by SMEs	19
Mix of sizes	12
Dominated by LSEs	3

Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries.

21 The technology cluster in Oulu (FIN), the chemical industry in the Northern Ruhr area (D) and the spectacles cluster in Belluno County (I), are all dominated by LSEs with SME suppliers.

More surprising is the fact that SMEs increased their importance in 12 of the surveyed clusters over the last ten years (Figure 4.4). Large-scale enterprises (LSEs) increased their importance in only five of the clusters²². The high and increasing importance of SMEs in many clusters implies that regional resources are important for the working of many clusters. Small firms are seen to be particularly dependent upon the local environment, as small firms seldom have resources to uphold a wide-reaching network of collaborators (Vatne and Taylor 2000). SMEs often rely on the knowledge and networks of the entrepreneur and a few business leaders, which may stretch over long distances, but are often focused upon the region where the entrepreneurs have lived and worked.

Figure 4.4: Changes in the importance of SMEs and LSEs in the clusters.
Number of clusters



Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries.

Increasing importance of multinationals in the clusters

Wider supply chains are often orchestrated by multinational enterprises (MNEs), and so the cluster survey examined the importance of MNEs in the clusters. MNEs may spread different types of activities to specific clusters. Some clusters comprise mostly factories producing standardised products or services, and making use of mainly low skilled and relatively low paid workers. Other clusters may include R&D activities and advanced production that have a higher demand for highly educated personnel, proximity to research institutions etc. The activities a cluster performs are seen to reflect the 'quality' of the local environment (in terms of e.g. the level and type of know-how and skills in the work force and the characteristics of the regional knowledge infrastructure) and may also influence the future development of the cluster. Generally, the existence of units of MNEs may encourage the spread of knowledge and technology to locally confined firms in a cluster, and may stimulate learning and innovation processes in these firms.

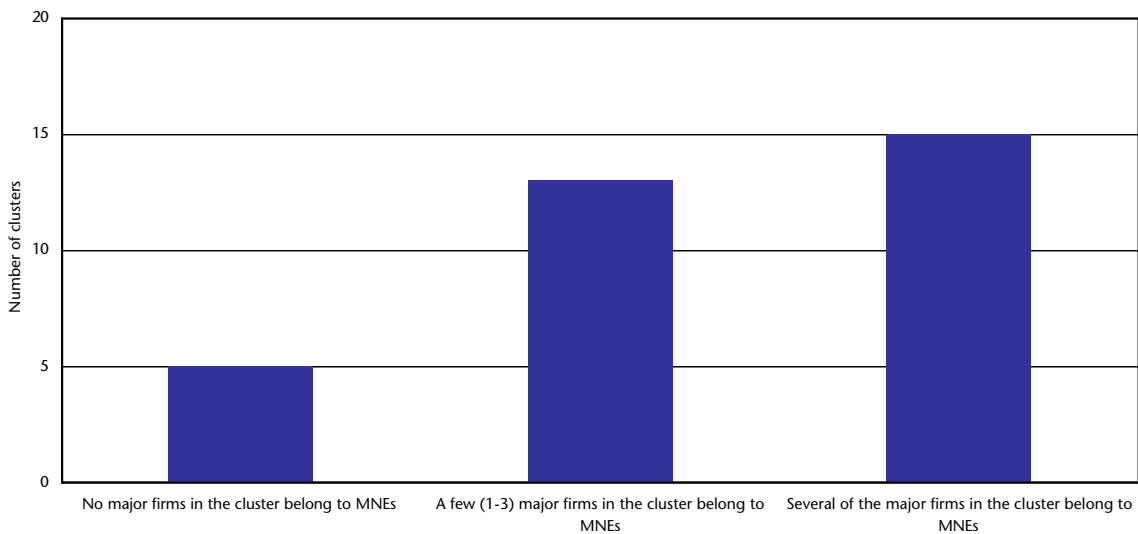
MNEs are generally of some importance in the surveyed clusters (Figure 4.5)²³. Only five clusters have no MNEs among their major firms, while in nearly half of the clusters several of the major firms belong to MNEs²⁴. This signifies that the industrial activities in many of the clusters are integrated in global networks.

²² The two Italian clusters, the 'communication' cluster at northern Jutland (DK), the Technic Valle in Haute-Savoie (F) and the electronics industry in Horten (N).

²³ In the survey MNEs are defined as enterprises having firms in at least two countries.

²⁴ The clusters with no MNEs are all traditional clusters. They consist of the two Greek clusters, Synergie (technical facilities industries) in Luxembourg, Conoship (ship-building) in Friesland & Groningen (NL), and shoe manufacturing in the Vinapolo Valley (E).

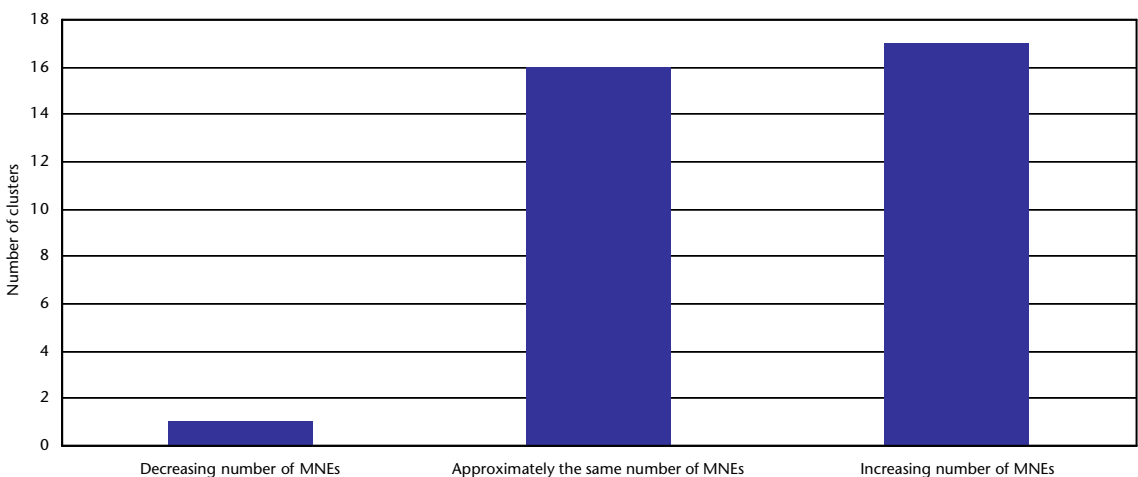
Figure 4.5: Number of clusters according to the importance of MNEs in the cluster



Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries. Information from one cluster is lacking.

The importance of MNEs has also increased in half of the clusters, while only one cluster (the Biotech Valley in Strängnäs, Sweden) has experienced a decreasing importance of MNEs (Figure 4.6). Thus, MNEs are present in most of the surveyed clusters, and MNEs are generally of increasing importance in the clusters. This occurs at the same time as many of the clusters are dominated by SMEs, and increasingly so. Actually, five of the clusters that increased the number of MNEs also revealed an increasing importance of SMEs, while seven clusters with an increasing number of MNEs had approximately the same firm size distribution²⁵.

Figure 4.6: Changes in the importance of MNEs in the surveyed clusters over the last 10 years



Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries.

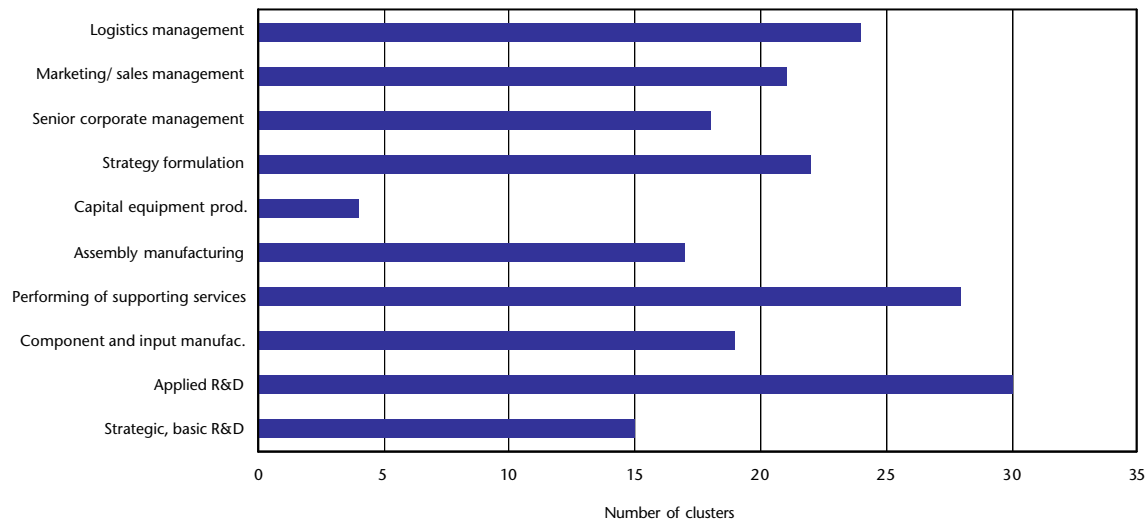
Both globalisation and regionalisation trends

Another type of indicator to interpret the importance of regionalisation and globalisation forces is a study of the activities in the value chain carried out by cluster firms. According to Figure 4.7 numerous activities generally take place inside the geographic boundaries of the clusters. Most often applied R&D and supporting services are performed inside the clusters. Administrative and strategic activities (such as strategy formulation and logistics man-

25 Thus, only five clusters had an increasing number of MNEs and increasing importance of LSEs at the same time.

agement) are also often carried out by firms in the cluster. On the other hand, capital equipment production is carried out in very few clusters²⁶. However, the main picture reveals quite 'self-contained' clusters that perform most of the main activities along the value chain of their dominating sector, except for the production of machinery.

Figure 4.7: Activities in the value chain of the principal firms that are primarily performed within the geographic boundaries of the cluster



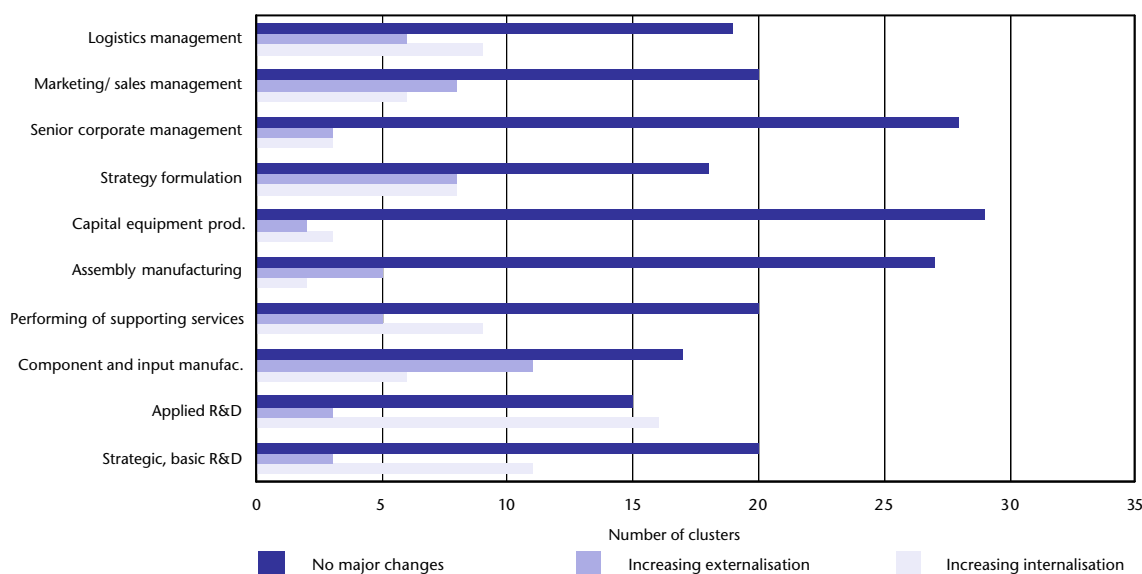
Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries.

The survey also attempted to outline the changes in the geographical distribution of activities in the value chain of the principal firms in the clusters over the last 10 years. In Figure 4.8 increasing internalisation denotes activities that were performed primarily by players outside the cluster, but which are now to a larger extent performed by players in the cluster. Somewhat surprising is the fact that both basic and applied R&D are increasingly achieved within the cluster boundaries. Case studies have concluded that firms in regional clusters may 'grow out' of their districts, when it comes to technological development due to increased globalisation and growth of MNEs (Asheim and Isaksen 2000a). As cluster firms increasingly are exposed to international competition, and some also are world leaders in their niches, they have to cooperate with the 'best' R&D milieus, which they often have to find at the national and international level, and sometimes in corporate research centres. The survey, nevertheless, points to the fact that there is more cooperation with local research milieus, or that firms increasingly perform research themselves.²⁷ The 'institutional thickness' of the clusters increases, at least as the cluster firms have easier access to both basic and applied R&D inside the clusters, and often find more supporting services nearby. Based on the fact that much of both basic and applied research takes place inside the clusters we may also advance the hypothesis that the increasing importance of MNEs in the clusters reflects an interest to tap into the knowledge bases of the clusters.

²⁶ These clusters are the two Austrian clusters, financial services in Liechtenstein, and the cluster of machine tools in the Basque country (E).

²⁷ In nine of the clusters basic R&D and applied R&D have increasingly been performed inside the cluster boundaries. The clusters are the two ones in Finland, the cluster of biotechnology and molecular medicine science in Austria, the Flemish plastic processing industry (B), the 'communication cluster' in northern Jutland (DK), biotechnology in Evry (F), the manufacture of metallic moulds in Leiria (P), shoe manufacturing in the Vinapolo Valley (E) and Cambridgeshire (UK). Five of the clusters are science based, all are growing in number of employees, and all but two have been established since 1970.

Figure 4.8: Number of clusters experiencing increasing 'internalisation' or 'externalisation' of activities over the last 10 years



Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries.

Internalisation denotes activities that are increasingly performed inside cluster boundaries, while externalisation denotes activities increasingly performed outside the cluster boundaries.

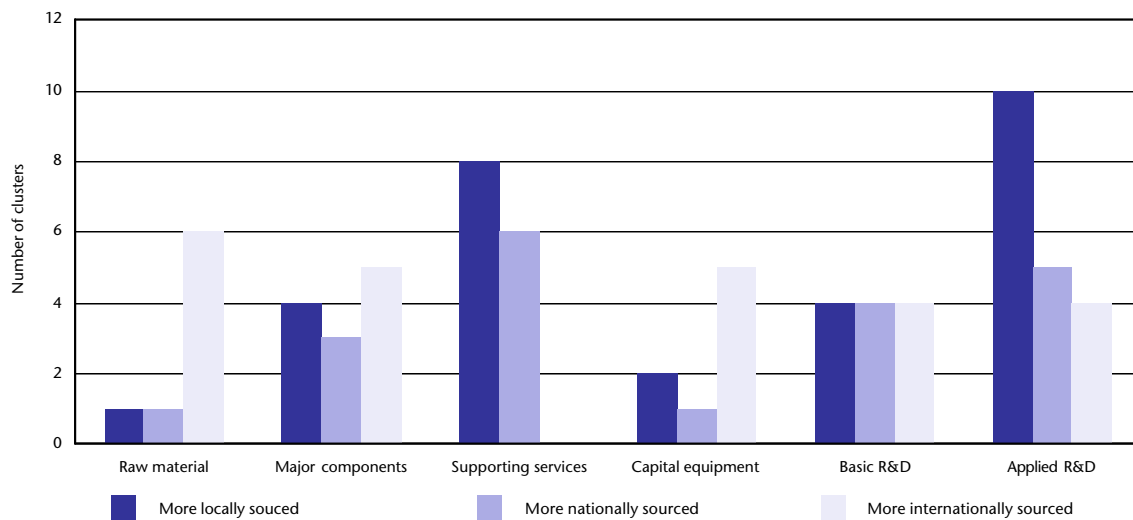
Increasing externalisation in Figure 4.8 denotes activities that formerly were performed by players inside the clusters, but are now to a larger extent carried out by players outside the cluster. Although 'no major changes' is by far the most usual answer, component and input manufacturing, in particular, are increasingly performed outside the cluster boundaries in several clusters. This may reflect more global sourcing by cluster firms. Firms in northern European clusters in particular perform component and input manufacturing outside of the cluster boundary, which may indicate a strategy to find cheaper suppliers in low cost areas²⁸. However, Figure 4.8 underlines the fact that regional clusters develop in a different way: the surveyed clusters experience somewhat different developments regarding which activities are performed increasingly inside or outside the clusters.

The survey also identified at which geographical level the major inputs into the principal industry of the cluster are sourced. The picture in Figure 4.9 resembles that in Figure 4.7²⁹. Most often there are no major changes as regards the area from which inputs are sourced. However, Figure 4.9 also demonstrates that applied R&D and supporting services are increasingly found within the cluster boundaries. Raw materials and capital equipment are increasingly sourced internationally, while there is no clear geographical trend in the case of the sourcing of major components and basic R&D.

²⁸ Increasing 'externalisation' of component and input manufacturing has occurred in the two Norwegian and Danish clusters, the Biotech Valley in Strängnäs (S), the technology cluster in Oulu (FIN), the shipbuilding industry in Friesland & Groningen (NL), the media cluster in North Rhine-Westphalia (D), the biotechnology and molecular medicine science cluster in Vienna (A), the biotechnology cluster in Evry (F) and the shoe manufacturing in the Vinapó Valley (E).

²⁹ Figure 4.8 and 4.9 report answers on two different questions in the survey. Figure 4.8 is about *activities* in the value chain of the principal firms of the cluster, while Figure 4.9 deals with *major inputs* into the principal industry of the cluster. The answers are related. Figure 4.9, however, demonstrates from which geographic level major inputs are increasingly sourced.

Figure 4.9: Number of clusters that changed the geographical sourcing of major inputs over the last 10 years



Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries.

Figures 4.6 - 4.9 demonstrate a mixed picture of regionalisation and globalisation trends. Increased globalisation is surely evident in many clusters: MNEs increase their importance in the clusters, and cluster firms increasingly find their major components outside the clusters. On the other hand, a number of activities along the value chain take place inside the clusters, and the clusters increasingly find their applied R&D (and to some extent basic research), and supporting services inside the cluster boundary. Thus, globalisation and regionalisation seem to occur simultaneously. In several clusters firms increasingly find relevant research activities and other supporting services inside the clusters, while at the same time sourcing more inputs and capital equipment from other localities³⁰.

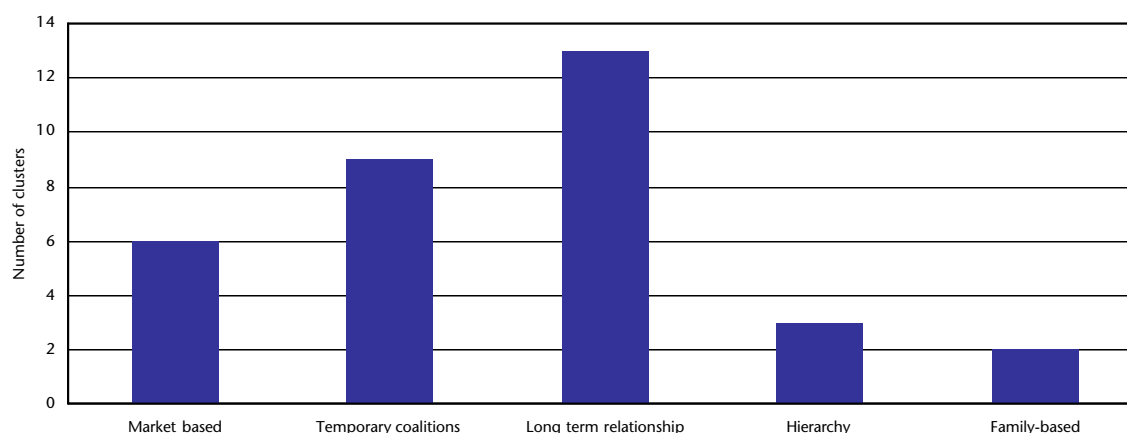
The working of the cluster

There is an emerging split in research on regional clusters as regards the importance of 'non-economic' and socio-cultural factors when interpreting the development and performance of clusters (see Chapter 2.3). The importance of social institutions that foster dense, informal collaboration between players, for the performance of local economies in a globalising world has been stressed in Chapter 2.5. What is the importance of non-economic factors for the development of the surveyed clusters?

If we only use the cluster survey we are not able to analyse such a question in detail. However, we may approach the question by examining how transactions are managed between firms within the clusters. Figure 4.10 distinguishes between five main types of transactions. Long-term relationships, in which firms tend to co-operate with each other repeatedly, are the most common type. This kind of transaction is seen to build on, and also stimulate, trust-based collaboration between firms. Temporary coalitions, in which firms come together for a single project, are the second most common type of transaction. Market based transactions, dominated by arms-length transactions and anonymous market relations are found in a few clusters, while both hierarchal (transaction inside vertically integrated firms) and family-based transactions are rare.

³⁰ In six clusters applied research is increasingly taking place inside the cluster, while components and inputs are at the same time increasingly sourced from other areas. The six clusters are the cluster of biotechnology and molecular medicine science in Vienna (A), the 'communication cluster' in northern Jutland (DK), the technology cluster in Oulu (FIN), biotechnologies in Evry (F), the media cluster in North Rhine-Westphalia (D) and shoe manufacturing in the Vinapólo Valley (E).

Figure 4.10: Number of clusters characterised by different main forms of managing transactions between firms



Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries. Information from one cluster is lacking.

Although the number are low, Table 4.4 points to the fact that different types of transactions dominate in different kinds of regional clusters. Transactions in the surveyed traditional clusters are more often based on long-term relationships and family ties. This result agrees with the picture of old clusters with its long lasting and trustful collaboration between local firms, which sometimes is strengthened by entrepreneurs and firms' managers being family members. In science based clusters the transactions are more often market based, linked to temporary coalitions and hierarchies.

An important question in this context concerns the major changes in the main forms of managing transactions in the surveyed clusters. Temporary coalition and long term relationships have become markedly more common over the last 10 years (Table 4.5)³¹. As regards temporary coalitions, the increased importance may reflect more general development tendencies. Thus, managing activities in projects and the setting up of temporary organisations are seen to becoming more common in general. Temporary organisation is seen as an emerging, entirely new type of organisation in industry, denoted as neo-industrial organising by Ekstedt et al. (1999), to stress the 'becoming' rather than the 'being' aspect of this type of organisation. This way of organising work is seen to be particularly appropriate in developing and producing customer-close, knowledge-intensive and complex products, and handling flexible markets. Thus, recent studies of innovation suggest that firms become increasingly reliant upon projects to organise complex products and systems (Gann and Salter 2000). The supposedly increasing scope of temporary coalitions is supported by the cluster survey, and the trend is evident in both science based and traditional clusters³².

Table 4.4: Number of clusters that are characterised by different main forms of managing transactions between firms

	Number of science based clusters	Number of traditional clusters
Market based	4	2
Temporary coalitions	5	4
Long-term relationships	4	9
Hierarchy	2	1
Family-based	0	2
Total	15	18

Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries. Information from one cluster is lacking.

31 Science based and traditional clusters reveal the same main trends as regards changes in transaction forms. Thus, Table 4.5 shows the figures for all the clusters jointly. A third alternative in this question was 'no substantial change'.

32 Temporary coalitions are of increasing importance in 10 of the science-based clusters and in 12 of the traditional clusters.

Managing transactions through long-term relationships is also becoming more frequent in both types of clusters. Many of the clusters are fairly young and may be evolving towards more trust-based and long-term relations between local firms as a kind of a learning process between firms and with local institutions. On the other hand, family based transactions are of diminishing importance in a number of mainly traditional clusters³³. Still, there is some evidence of increasing importance of social institutions in co-ordinating cluster based activities as long-term relationships are becoming more common.

Table 4.5: Changes in the principal form of managing transactions between firms within the clusters over the last 10 years. Number of clusters

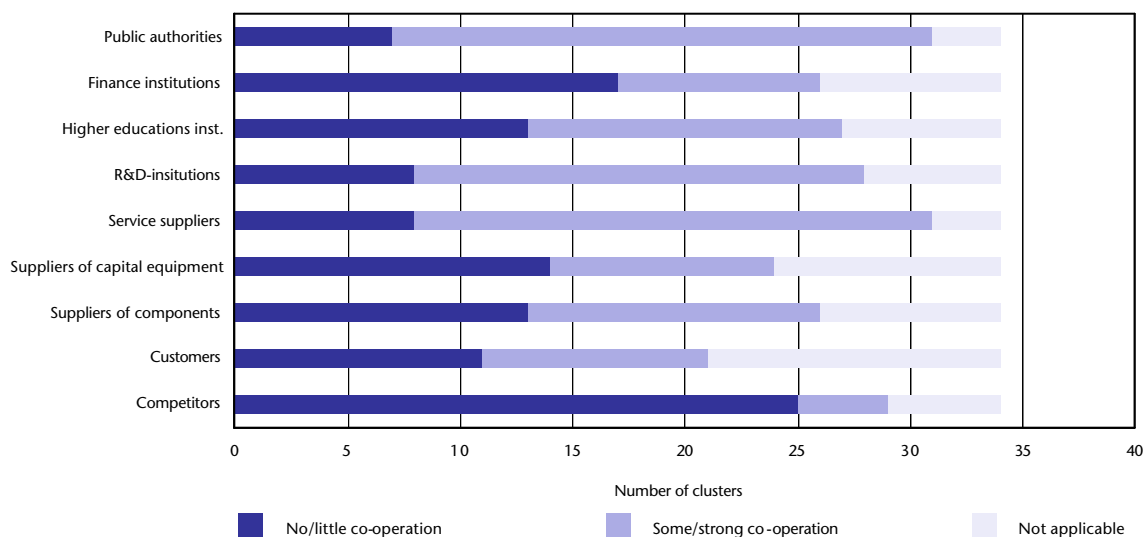
Transaction forms	Increasing importance	Decreasing importance
Market based	8	3
Temporary coalitions	22	2
Long-term relationships	18	3
Hierarchy	5	5
Family-based	4	11

Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries.

The information on forms of managing transactions is useful in interpreting the importance of institutional thickness by rating the strength of cooperation between the principal firms in the clusters and other cluster members (Figure 4.11)³⁴. Cluster firms co-operate most intensively with local service suppliers, R&D institutions and public authorities. The traditional clusters in particular reveal strong co-operation between firms and service suppliers and public authorities, while firms in science based clusters co-operate most intensively with public authorities and R&D organisations. Thus, some kinds of local, formal organisations are important collaborators for cluster firms.

Cluster firms rarely collaborate intensively with competitors³⁵. In several clusters, firms also have little or no co-operation with finance institutions, suppliers of capital equipment and components. Regarding the two last mentioned players, lack of cooperation may indicate few of these players (machine builders and component suppliers) inside the clusters, as indicated above.

Figure 4.11: Number of cluster as regards strength of cooperation between principal firms and other players inside the cluster



Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries.

33 Several of the regional clusters with decreasing importance of family based transactions are found in southern Europe. The two Italian, the two Spanish and one of the Portuguese clusters are in this category.

34 In this context cooperation demands active participation from both parties. Not applicable means that it is not relevant to answer the strength of co-operation between partners *inside the cluster* as for example when customers are not located in the cluster.

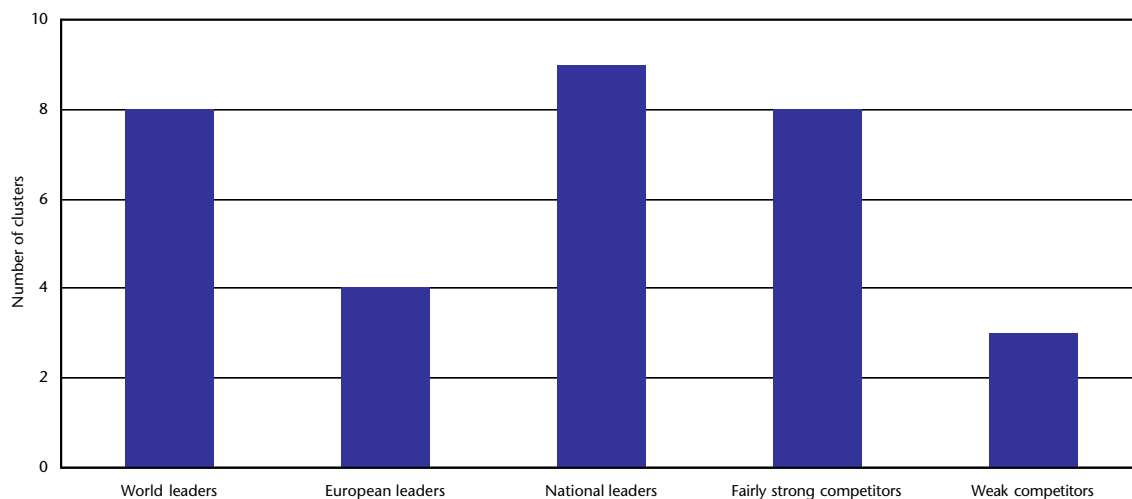
35 Only four clusters report some cooperation with competitors; in Flanders Multimedia Valley (B), financial services in Liechtenstein, the shipbuilding industry at Sunnmøre (N), and the recorded music industry in Stockholm (S).

Competitiveness and innovation activities in clusters

The increasing interest in regional clusters relates partly to the view of clusters as instruments that can stimulate firms' innovation activity and competitiveness. This view is to some extent supported by quantitative analyses (see Chapter 3). While the cluster survey cannot compare the innovativeness and competitiveness of clusters with, for example, corresponding sectors nationwide, we examine in some detail the innovation performance of the clusters.

The survey indicates that the clusters often have a fairly strong competitive position (Figure 4.12). Eight of the clusters are seen to be competitive at the world level, i.e. the firms are as competitive as the strongest in the world³⁶. Four of these are traditional clusters. However, the eight 'world leaders' have some common characteristics. Seven of them have an innovation capability on the top world or European level, seven have some major multinationals, and strategic R&D is performed within the cluster in five of them³⁷. Three clusters are categorised as weak competitors. The ICT industry in Eindhoven/Helmond in the Netherlands and the two Greece clusters are categorized as 'weak competitors' by the cluster experts.

Figure 4.12: Number of clusters categorised according to the highest competitive position of the 'average' end firms* in the cluster



* End firm denotes a firm that sells on the final market for capital goods or consumer goods, i.e. not producing components that enter into the value chain of a product.

Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries. Information from one cluster is lacking.

Competition by innovation is denoted as strong competition, as compared to weak competition via a low cost strategy (Storper and Walker 1989). What characterises innovation activities in the surveyed clusters?

Technological innovation may be separated into radical and incremental innovations. Radical innovation processes lead to totally new products or ways of producing commodities. Incremental innovation processes bring about more cautious 'step-by-step' improvements with a lower economic risk. Roughly one quarter of the surveyed clusters are characterised by radical innovation processes, or are denoted as technology generators that initiate major technological changes 'new to the world' (Table 4.5). In most of the clusters firms perform incremental innovations; 10 clusters are characterised as incremental innovators and 6 clusters are denoted as technology adapters (that significantly modify outside technology). As much as 10 clusters are 'just' technology users; they use outside technology with few modifications.

Table 4.6 reveals a somewhat surprisingly low level of innovation activity in the surveyed clusters. A large number of the cluster firms compete by other means than technological innovations 'new to the world'. The table also indicates that firms often find other advantages in the clusters than a fertile ground for performing radical innova-

36 These clusters are the 'communication cluster' in northern Jutland (DK), the technology cluster in Oulu (FIN), the Dublin software cluster (IRL), the eye-glass cluster in Belluno County (I), financial service in Liechtenstein, shipbuilding in Friesland & Groningen (NL), the electronics industry in Horten (N) and the recorded music industry cluster in Stockholm (S).

37 In a 1999-survey of 160 regional clusters from all over the world, 70 firms (44 %) were characterised as world leaders and 39 (24 %) firms as supra-national leaders (e.g. pan-Europe) (Enright 2001). The corresponding question in the ENSR cluster survey characterised 8 (24 %) firms as world leaders and 4 (12 %) as European leaders, as revealed in Figure 4.12.

tions. Access to specialised and/or cheap suppliers is not very common according to other parts of the survey (Figure 4.7 and 4.8). Access to supporting services, research activities and support by public authorities, as well as long lasting cooperation with other cluster members are among such advantages, as witnessed from other parts of the survey (Figure 4.7, Table 4.5. and Table 5.1).

The type of innovation performed varies however between different kinds of clusters. More than half of the science-based clusters are characterised as technology generators, whereas no traditional clusters have such a characterisation (Table 4.6). The traditional clusters are more often incremental innovators.

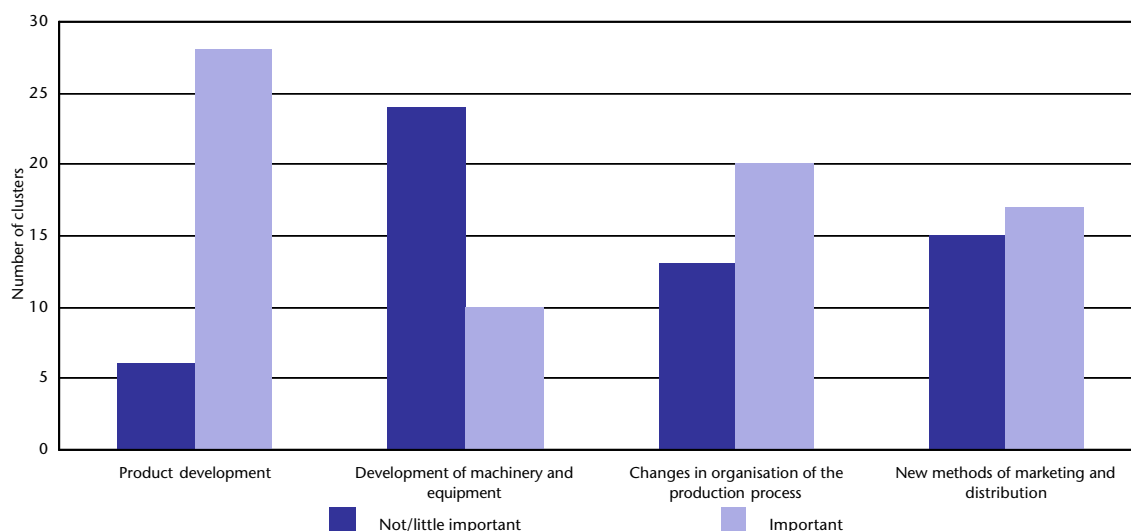
Table 4.6: Regional clusters according to level of innovation activity

	Number of clusters	Number of science based clusters	Number of traditional clusters
Technology generators	8	8	0
Incremental innovators	10	2	8
Technology adapters	6	2	4
Technology users	10	3	7
Total	34	15	19

Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries.

What types of innovations are most important in the clusters? Development of new products (and improvement of existing products) is generally the most important type of innovation in the clusters (Figure 4.13). This relates to science-based clusters in particular, but also to most of the traditional ones. Development of machinery and equipment is generally of little importance, which is consistent with the low scope of capital equipment production taking place in the clusters (according to Figure 4.7). Organisational and market innovations are, however, of importance in more than half of the clusters. Both these types of innovations are more often of importance in the traditional than in the science based clusters. This fact may point to a kind of a 'life cycle' in innovation processes in clusters. Clusters often start growing when some pioneer firms introduce new products on the market, which may lead to new firm formations via spin-offs. At a later stage product development may become less important as the original products mature, while changes in organisation processes and finding new markets become comparatively more important.

Figure 4.13: Number of regional clusters according to importance of different types of innovation activities in the clusters



Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries.

Box 4.1: Innovation activity in a science based and a traditional regional cluster

This Box illustrates some typical features as regards innovation and learning processes in two regional clusters, namely the high technology cluster in the Cambridge region and the shipbuilding cluster in Sunnmøre.

Cambridge, the United Kingdom

The Cambridge region has experienced rapid growth since the 1960s. The cluster contains both high technology manufacturing and service sectors, the latter representing the dominant growth component in the region during the 1990s. The cluster contains around 800 high tech firms with more than 27 000 employees in 1998, and has developed around the University of Cambridge with its collaborative research activity, academic spin-offs and graduate researcher recruitment.

A process of regional collective learning occurs in the Cambridge region. In the 1990s the Cambridge region was 'characterized by active processes of entrepreneur and firm spin-off, (...) of inter-firm and organization networking and linkages, and of research and management staff recruitment from the local labour market' (Keeble et al. 1999: 331). At the same time, local high technology firms take part in global and national innovation networks, research collaboration and labour market processes, which complement regional collective learning by bringing into the region supplementary technological and managerial expertise. Finally, new collective initiatives, venture capital funds and active intervention by development agencies create more institutional thickness, which are seen to be beneficial to further growth of the high technology cluster in the region.

Sunnmøre, Norway

Sunnmøre constitutes the largest ship building area in Norway, showing job growth and good performance since 1970. The ship building industry in Sunnmøre covered 4 200 jobs in 1997.

The competitiveness of the local ship building industry is to a large degree based on the innovation capability in the cluster. Local user-producer interaction has been a main driving force behind continual incremental improvements of products to satisfy new demands and needs by customers and users. Shipyards have long-term cooperation with some ship owners that often return to the yards to discuss new solutions and build new ships. Discussions with skippers, chief engineers and other crew members also give important feedback on how the firms' - and competitors' - products work, as well as suggestions for improvements.

Brief summary

Results from a survey of 34 European regional clusters have been presented in Chapter 4. The surveyed clusters are very often growing in the number of firms and employees. They are dominated by SMEs - and increasingly so, but at the same time multinational enterprises are increasing their presence. The clusters are more incorporated in global networks, as cluster firms, for example, find their major components more outside the cluster. However, a number of activities along the value chain of the principal cluster firms take place inside the geographic boundaries of the cluster, and cluster firms increasingly find their R&D and supporting services inside the cluster. The clusters are very diverse as regards competitive position and innovation activity. The survey also demonstrates some differences in the nature and working of science-based and traditional clusters.

Table 4.7: Some main characteristics of science based and traditional clusters

Science-based clusters	Traditional clusters
– Age: Young	– Age: Young and old
– Dominant forms of transaction: Market based relationships, temporary coalitions and long-term relationships	– Dominant forms of transactions: Long-term market relationship
– Important local collaborators: R&D institutions and public authorities	– Important local collaborators: Service suppliers and public authorities
– Typical innovation activity: Technology generators (mainly product development and changes in the organisation of the production process)	– Typical innovation activity: Incremental innovators (mainly product development and new methods of marketing and distributions)

Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries.

Chapter 5

Enterprise policies and clusters

At the end of the 1990s, industrial and regional policy increasingly concentrated on stimulating clusters and clustering processes (Enright 2000, Glasmeier 2000), mainly following well-known examples of affluent regions containing dynamic clusters of firms, as well as the fact that traditional policy strategies did not seem to work satisfactorily. Several theoretical approaches encouraged such initiatives (cf. Chapter 2.3). For some countries, the development of regional clusters represents a new form of industrial policy (OECD 2001). Recent initiatives of cluster mapping and policy formulation have been launched in countries like Denmark, Portugal and the United Kingdom (see Chapter 3). This chapter discusses what is meant by cluster policy, why and how public authorities at different levels should take into account regional clusters, what characterises cluster policy in the 34 surveyed regional clusters, what cluster approaches exist in individual nations and regions, and which recent EU initiatives have been taken on the issue.

5.1. What is regional cluster policy?

Principally, 'cluster policy' can be of two main types: (i) to support the growth of existing or embryonic regional clusters³⁸, and (ii) to let the knowledge of how industrial development occurs in (successful or unsuccessful) regional clusters inform policy making in general. Both approaches have some specific characteristics:

- Cluster policy entails a shift of focus from individual firms to local/regional systems of firms and firms' value adding environment.
- Cluster policy also means less reliance on large firms and more interest in local agglomerations of SMEs.
- This kind of policy also concentrates on indigenous growth processes in contrast to efforts to attract inward investments³⁹.
- The notion of regional clusters may also bring forth a policy based on the idea of 'picking the winners', as the focus is on stimulating the already strong or potentially strong parts of regional industry. The 'picking' can be organised as a bottom-up process involving local authorities, industry and experts.
- The notion of clusters also leads to stimulating social processes, e.g. encouraging trust-based interaction to increase the flow of knowledge between local players, rather than intervening, for instance, through financial incentives (Boekholt and Thureauux 1999).
- Finally, the idea of clustering points to the role of public authorities as facilitator or broker between companies, and between companies and the knowledge infrastructure.

The chapter concentrates on policies to support regional clustering processes. This type of policy *can* include stimulating clusters to upgrade to become innovative networks and innovation systems (see Chapter 2.1). Cluster policy then includes measures to strengthen business networking and to strengthen collaboration between firms and local knowledge and technology transfer organisation. This argument rests on the view that improving competitiveness is an interactive process between firms and their territorial and functional environment. Basically 'cluster policy is about stimulating the links to the local business environment through public-private dialogues,

³⁸ According to Porter (1998b), p. 247: 'Government should reinforce and build on established and emerging clusters, rather than attempt to create entirely new ones'.

³⁹ However, some strategies also attempt to build or strengthen clusters by marketing clusters and attracting outside companies that fit well with the local economic environment (Enright 2000).

defining joint research needs, co-development between contractors and suppliers and so on' (Boekholt and Thuriaux 1999: ii)⁴⁰.

According to several observers⁴¹, regional clusters may be one efficient way to achieve job creation and wealth in regions, and thus, regional clusters should form an important target group for industrial and innovation policy. Several observations underlie this argument:

- (i) Clusters are seen to be of large quantitative importance. This statement is to some extent supported by studies that attempt to identify regional clusters in different countries (Chapter 3). Of particular importance is the fact that empirical studies to a large extent confirm the view of regional clusters as generally rather successful industrial areas.
- (ii) Clustering is seen as an essential way to achieve competitiveness by regional industry, and in particular by SMEs, in the global economy. Such a view is supported by the fact that firms' innovation and learning capabilities partly rest on the quality of the local industrial milieu and on the quality of partnership and interactive learning occurring between public authorities, knowledge organisations, local companies etc. The regional level is 'an essential level at which technological synergies are generated' (Storper 1995: 896). The positive link between regional competitiveness and the working of the clusters is based on experiences from 'success stories', lessons from evaluations of policy instruments like the RIS (Regional Innovation Strategies in the EU), but is also supported by some quantitative studies (cf. Chapter 3)⁴².
- (iii) Learning-based support of 'local systems' is still seen as a rather underdeveloped policy instruments in European countries and regions, regardless of some new initiatives (Nauwelaers and Wintjes 2000). A comparative evaluation of innovation policy targeting SMEs in European countries concluded that too many policy instruments are firm-oriented and reactive, while comparatively few instruments are (regional) system-oriented and focusing on 'learning to innovate' (op. cit.). Policy aimed at regional clustering is one way to fill this gap in policy support systems.

Public policy may also aim to lower specific innovation barriers and obstacles preventing firms from forming clusters and innovation systems or preventing these from working efficiently. In principle, possible innovation barriers in regional clusters can be of three main types (Isaksen 2001). First, due to a lack of relevant local and regional players there could be an organisational 'thinness', that is an insufficient number of firms or the lack of a knowledge infrastructure in order to enable collective learning. One case is that of regions with sectors having few technological complementarities and few important user-producer relations. Such a region 'will have no specifically regional technological dynamic from which evolutionary effects could emerge' (Storper 1997: 67). A lack of collective learning may be a deficit particularly in peripheral regions with small industrial milieus and located at long distance away from relevant knowledge organisations. However, organisationally 'thin' regions also point to the fact that regions differ in their capacity to build up relevant organisations to stimulate firms innovation activity, depending on their decision-making power, financial resources and policy orientation (Tödtling and Kaufmann 1999).

Second, there could be a certain degree of fragmentation, that is the relevant players may be present, but without forming a cluster or a regional innovation system. The region may have industrial specialisations containing a number of firms as well as relevant knowledge organisations. Geographical nearness only creates a potential for interaction, without necessarily leading to dense local relations.

Finally, the third type of barriers reflects situations in which clusters exist, but the systems are too closed and the networks too rigid, resulting in a 'lock in' situation. Thus, the other side of cumulative learning and path-dependency that often characterises strong innovation systems is the institutional, social and cultural 'lock-in' of business behaviour. This may be the case if a region historically has had a strong regional innovation system based on R&D institutes and vocational training organisations with specialised activities dedicated to a declining technology. Such a regional production and innovation system, which has become technologically mature, must upgrade the knowledge base and promote product innovations in order to break path dependency (Cooke 1998).

What are relevant measures to stimulate dynamism and innovation activity in regional clusters? First, measures should be context-sensitive (as indicated by e.g. Storper and Scott 1995), and suit varying needs in individual clusters, as clusters are very different. Regions have diverse socio-cultural features, are embedded in different na-

40 This definition sets quite narrow limits to what should be understood as 'cluster policy'. We are in favour of such a narrow definition rather than (as Enright 2000) to subsume much of existing policy strategies under this heading, although many existing instruments are relevant to encourage regional clustering.

41 Porter (1998b), Boekholt and Thuriaux (1999), Landabaso (2000).

42 However, benefits for firms do not automatically arise from clustering. There can be diseconomies of regional clustering too, especially localised inflation and congestion.

tional economies, and different industries, in terms of branch, size and forms of organisation, and have their specific requirements and innovation obstacles. Then, individual and collective needs of firms in different sectors and/or regions should be targeted (cf. Chapter 4). Thus, there is no 'one-size-fits-all' cluster policy instrument or policy portfolio. Rather, 'it is precisely regional diversity that is an asset for regional innovation to build upon' (Landabaso 2000: 85).

The need to adapt policies to specific regional circumstances means placing great awareness on *the local and regional level* in policy design and implementation. According to Landabaso (2000: 90) 'the regions are the most appropriate level for action on innovation' (*ibid.*: 90). This may be the case especially for SMEs, as 'smaller firms - particularly those that lack resources and incentives to develop their own training, research or engineering departments - depend heavily on local services' (Rosenfeld 1997: 20). Regions may, however, under-invest in policy instruments where the benefits significantly spill over to other regions.

The role the public sector could play in cluster development is that of an animator of the strategic planning process. The public sector works in partnership with the private sector to co-create the framework conditions and the impulse for new economic activity, and to improve the regional innovation capacity.

5.2. Policies in the surveyed regional clusters

Based on information from the 34 surveyed regional clusters, this section analyses: (i) the most important policy tools, delivered by cluster organisations, within the individual clusters, and (ii) government policies towards the surveyed clusters perceived as most important.

The cluster experts were first asked if there existed any *specialised organisations* (e.g. associations of firms, chambers of commerce, competence or service centres, or specific cluster organisations) that perform joint activities or co-ordinate activities of firms in the cluster. If such organisations existed, the experts were then asked to rate the importance of different activities performed by the organisations.

As many as 28 of the 34 surveyed clusters contain specialised organisations. All of the science-based clusters have organisations, while five (or 30 %) of the traditional clusters lack such an organisation. The higher frequency of specialised organisations in the science-based clusters is probably explained in part by the greater importance of knowledge organisations in this type of cluster. Science based clusters are often established when knowledge-based firms spin-off from universities and research institutes in an area. The university or research organisation often continues to be important for the technology development in firms and for the education of workers and entrepreneurs.

The activities performed by the specialised cluster organisations are summarised in Table 5.1. Only activities seen to be at least of some importance for cluster firms are registered in the table. The most frequent activity carried out by the cluster organisations is government relations, i.e. to lobby government, co-ordinate public-private investments, get some special programmes, etc. These activities are more important in the science-based clusters, which also partly explains the higher frequency of organisations in these clusters. For example, Cambridgeshire (one of the UK surveyed clusters, cf. Box 4.1) has been very proactive and dynamic in promoting a cluster approach to developing its local industry, especially in the high-tech areas of software and biotechnology. Many of these initiatives have involved the establishment of new organisations, which bring industry, venture capital, researchers and the public sector together. The government-funded 'Eastern Region Biotechnology Initiative', for example, is viewed as being highly successful at promoting networking within the local cluster (Keeble et al., 1999).

The second most important activity in cluster organisations concerns training, which is also a little more frequent in science-based clusters. R&D is the third most frequent activity co-ordinated by cluster organisations, which is of equal importance in the two cluster types. Beyond that, cluster organisations co-ordinate a variety of activities among firms in the clusters, like marketing and sales, production (most important in the science based clusters), and inputs.

Table 5.1: Number of cluster organisations co-ordinating different activities. (Activities that are regarded as being of some importance or of importance for co-ordinating activities among the firms in the clusters)

		Science based clusters	Traditional clusters
R&D	Basic research	5	5
	Applied research	9	8
Production	Production	3	1
	Bundling of products and services from several firms	6	3
Inputs	Joint purchase of raw materials, components	3	0
	Joint purchase/carrying out of service functions	5	4
Training	Management training	9	8
	Other education or training	13	11
	Technological survey	7	8
Marketing and sales	Market research	5	7
	Joint branding	6	5
	Joint selling activities	2	3
Logistics	Joint warehousing	0	2
	Joint transportation	2	2
Government relations	Lobbying government	15	12
	Co-ordinating public-private investments	12	8

Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries.

Box 5.1: Example of a cluster organisation

The Technological Institutes in Valencia in Spain are described in order to illustrate the tasks and working of a cluster organisation⁴³. Currently, there are 16 Technological Institutes in the region, 13 of which are only serving a single industry (as ceramics, furniture, footwear and textiles). These industries have numerous SMEs often agglomerated in specific industrial districts in Valencia, and the Institutes are located close to these local strongholds. The idea is that the Institutes offer SMEs in these industries the technical services necessary for improving their innovation capacity. Two Technological Institutes intend to support the introduction of new technologies or activities, namely biomechanics, and optics and image. Finally, one Institute has been set up to help firms to improve their packing and transport.

The Technological Institutes were established from the mid 1980s and onwards. The most important task of the Institutes has been to assist Valencian SMEs in technological upgrading. Many firms have changed from being mostly imitators to having some internal innovation capability, albeit only incremental innovations.

A strong point of the Valencian Technological Institutes is their embedment in the regional clusters of SMEs. The Institutes co-operate closely with, and have built up detailed knowledge about, local SMEs, while at the same time being well connected to similar centres internationally. Thus, the Institutes play a two-fold intermediary role; they keep abreast of technological improvements taking place in other areas, as well as having close contact with Valencian firms in order to be aware of their problems. SMEs have to pay for services from the institutes, so enterprises only make use of what they need (or believe they need).

A weak point is still seen to be little R&D activity at the Institutes, few joint R&D projects with local firms and little contact with R&D institutes (Vázquez Barquero et al. 1999). The use of more R&D competence in innovation activity is seen as a necessary step to raise the competitiveness of local SMEs.

Another 'policy question' in the survey included characterising government policies towards the clusters. Answers to this question demonstrate that regional governments are seen by the 'cluster experts' as the most important ones as regards policy towards the surveyed regional clusters, while the EU is seen as the least important level in

⁴³ The analyses of the Valencian Technological Institutes are based upon Ors (1994), Vázquez Barquero et al. (1999) and information from IMPIVA (Instituto de la Mediana y Pequeña Industria Valenciana or Institute for the Valencian Medium and Small Firms) submitted by IKEI (the Spanish ENSR partner).

implementing policies of relevance for the clusters⁴⁴. The national and the local level are of more or less the same importance.

The observation that regional governments most often are seen having policy instruments of relevance for the surveyed clusters corresponds with the view frequently put forward in the literature stating that the regions often are the most appropriate level to design and implement cluster policy instruments (Chapter 5.1). As clusters are very different, the design of policies targeting individual clusters has to take place in close co-operation between public and private associations, and between policy bodies and local firms and labour, which is to be most efficiently organised at the local or regional level (Lorenzen 2001). However, it should be added that a degree of national co-ordination of policy to develop regional clusters is needed. It seems that many regions want to develop their own clusters, and to some extent in the same kind of industries⁴⁵. Thus, it may lead to a waste of public money if regions often support the same type of clusters.

Regional governments most often act as facilitators in support of cluster policy. This type of policy consists of attempts to bring operators (as firms and knowledge organizations) together, as well as promoting cluster-specific investments in infrastructure, education, training, or providing passive promotional support (Enright 2000). This corresponds to some extent with the establishment of specialised organisations set up in most of the clusters. Cluster firms or private organisations may initiate these organisations, however, they are quite often supported by public funds.

Table 5.2 rates the importance of different types of government policy in promoting the development of regional clusters. In this respect it is important to note that policy instruments may be relevant for the development of regional clusters, although an instrument does not focus on any specific cluster or regional clusters in general. It is also important to keep in mind that different kinds of clusters need different types of policy. A mature working cluster, for example, may only need public authorities to work in a catalytic role, ensuring co-ordination, co-operation and information dissemination. An emerging cluster, on the other hand, may need a more direct or interventionist approach with a greater emphasis on delivering infrastructure, e.g. research and incubation facilities.

The most important government policies are found in four areas: (i) financial support to individual firms' projects, (ii) support of infrastructure (both physical and knowledge infrastructure), (iii) support of education, training and research programmes, and (iv) networking and collaboration programmes. Of least importance is to provide information on different fields, to organise mobility schemes and to foster social interaction.

Table 5.2: The importance of different types of government policy for cluster development.
Number of clusters

		Not-important	Important
Firm-oriented support	Financial support of firms' projects	11	18
	Advice and consulting for individual firms	16	11
Attraction	Policies to attract outside firms to the cluster	14	15
Support infrastructure	Physical infrastructure	9	20
	Knowledge infrastructure (such as education institutions)	13	16
	Specific service or technology centres	12	18
	Other cluster organisations	12	10
Provide information	On technological fields	16	11
	On general business fields	18	8
	On market/ export fields	18	9
Support training, research, recruiting	Education and training programmes	10	19
	Research programmes	10	18
	Mobility schemes	18	6
Support collaboration	Networking and collaboration programmes	14	16
	Foster social interaction	17	7

Note: The table only counts answers that see a specific type of policy as 'important' or 'not important'. Other answers are excluded, which explains why the totals for important and not important differ between individual tools.

Source: ENSR Cluster Survey Spring 2001, covering 34 clusters in 17 European countries.

⁴⁴ However, it should be mentioned that individuals may not always realise that policy and support available to cluster firms and offered by for example regional governments or organisations like Chamber of Commerce originate from EU policies.

⁴⁵ 'It seems that more than half of the states and provinces in North America and Western Europe plan to be the world leader in the same set of clusters. Clearly all will not succeed' (Enright 2001: 17-18).

5.3. Cluster policies in European countries

The national approaches to cluster policy are very diverse. Two main reasons may explain the diversity. First, the national and regional contexts differ, and policies must be adapted to the diverse contexts (cf. Chapter 5.1). The policies have to be embedded in different business environments, cultural and institutional frameworks, as well as different governance systems. To consider such diverse contexts, the policies approaches have to differ.

Second, the cluster concept is very flexible and therefore does not provide a useful guide for policy-makers in their efforts to design and implement policies. A key weakness is a lack of clear cluster boundaries (Martin and Sunley 2001). Although Porter in recent papers defines clusters as *geographical proximate* groups of interlinked companies and associated institutions (Chapter 2.1), the spatial range or limits of clusters is not defined with any precision. Indeed, Porter suggests that clusters can be measured at almost any level of spatial aggregation⁴⁶. Following these guidelines, policies to promote cluster building or to strengthen existing clusters may target clusters at various geographical scales.

Examples of policies targeting clusters and carried out by national or federal authorities in some European countries are summarised in Table 5.3. The examples mostly include policies to support regional innovation systems, i.e. policies to strengthen local business networks and to strengthen innovation collaboration between firms and local knowledge and technology transfer organisations. Some examples also comprise the supporting of national (or federal) industrial sectors or innovations systems. These examples are included as the policies in fact often target firms and institutions in specific regions (as in the Portuguese and Scottish cases), as the relevant geographical scale of many regional clusters in small countries (as the Netherlands) may comprise the whole country, and as there is no common agreed and clear definition of the spatial range of regional clusters.

The table shows the large variety in approaches. Some countries - Denmark, France, the Netherlands, Portugal and the United Kingdom (Scotland) - have a more or less distinct national cluster policy that aims to support national and regional clusters in different ways. A national cluster programme has also been launched very recently in Sweden. In Belgium⁴⁷ and Spain the cluster policy is regionally defined. The table presents examples of a distinct cluster policy in the Flanders, and in the Basque region, although there are examples also in other regions in the two countries. Generally, in the federal states cluster policy is developed and implemented at the regional level, and therefore objectives, goals and instruments are often very different from one region to the other. This may also be the case in countries with newly created decentralised regional development institutions (such as the United Kingdom).

In other countries one can find specific regional cluster instruments, but not a fully developed cluster policy. Then, the cluster approach does not pervade enterprise or regional policy, but some specific measures that aim to support some regional clusters exist. In these cases the promotion of clustering is used as an element of, in particular, innovation and technology policy and regional policy. Austria, Finland, Germany, Italy and Norway are seen to have interesting cluster instruments. In the federal states of Austria and Germany the selected policy instruments are designed and implemented at the regional level, and not the national one.

Although the approach and the phrasing differ, national policies share a number of key objectives and characteristics:

- (i) Cluster policies are seen as a means to promote economic development and structural changes, often through enhancing (regional) innovation capacity.
- (ii) Policies are based on improved business co-operation and networking, which may demand the stimulation of social processes.
- (iii) Policies also emphasise the linking of firms to the (regional) technological infrastructure of education and R&D institutions, in which knowledge nourishes the regional economy. Policies in particular try to bring new technology to regional networks of SMEs. These policies mean fostering regional innovation systems.
- (iv) Policies emphasise the role of public or semi-public organisations having a role as mediators in encouraging inter-firm networks and joint projects. Especially in the early stage of cluster building, a third party is seen to be required to take care of the flow of information, of the building of mutual trust between cluster members, of supporting the organisation of business networks, etc.
- (v) Policies underline the need to improve innovation capability, knowledge management etc. in firms.
- (vi) Underlying the policies there is a focus on the need to stimulate the creation of specialised factors, and specialised knowledge in particular, in regional clusters.

⁴⁶ According to Porter (1998b: 199) 'the geographical scope of a cluster can range from a single city or state to a country or even a network of neighbouring countries'. Correspondingly, 'they (i.e. clusters) are present (...) at several geographical levels (for example, nations, states, metropolitan regions, and cities)' (op. cit.: 204).

⁴⁷ Flanders started a specific cluster policy in 1994. Wallonia started with pilot cluster organisations in 2001.

Table 5.3: Examples of policies targeting clusters in some European countries

Country	Objectives	Measures
Austria (Upper Austria)	Upper Austria is seen as one of the most dedicated regions in Austria to the concept of clustering. Clusters are actively supported by a cluster-oriented technology policy aimed to foster the innovation potential by strengthening the capability and willingness for co-operation.	The existing and planned instruments to achieve clustering are non-financial support measures such as strengthening the flow of information, co-operation between companies and R&D institutes, training of the labour force and the support of shared marketing and export. Existing services are primarily oriented at SMEs as they have the most severe problems with gathering external information.
Belgium (Flanders cluster policy)	The region of Flanders has carried out a specific cluster policy since 1994. Clusters are defined as enterprises or/and institutions in the region that voluntarily but actively join to create synergies in areas such as R&D, innovation, training, production, commercialisation. Policies supported such clusters through different measures. This policy has been stopped in June 2001, however, and was replaced by a new tool named 'Flemish Innovation Cooperation'*.	The policy consists of two main steps: (i) Accreditation by the Flemish Government of clusters. The operating costs of cluster organisations are then subsidised. The organisations have a coaching role in the creation and working of the 'cluster network'. That is, they help and advise partners with their application and with the building of the network. (ii) Cluster may get some 'soft' support (advice from a consultant, training), and grants and loans for R&D and innovation projects.
Denmark (Clusters of Competence)	A new cluster policy is emerging in Denmark, with the aim to upgrade existing and emerging Danish clusters (both national and regional ones). The policy stresses the need in particular to support the very specific competence of individual clusters to develop a critical mass of companies, of specialised services and infrastructure, and of organisations and channels for the spreading of knowledge.	The first step taken to construct an industrial policy addressing the Danish clusters entails identifying relevant clusters of competence. 29 clusters are singled out in a 2001 report; 16 with a national span and 13 regional ones. The second step is to tailor measures for individual clusters. Thus, critical factors of success are seen to vary from cluster to cluster. Policy instruments must then be created within the context of a dialogue between cluster firms and the political entities, either at the national or regional level.
Finland (The Centres of Expertise programme)	The aim is to pool local, regional and national resources to develop internationally competitive fields of expertise. Two important functions have been to advance networks and co-operation between different regional players, and to contribute to increased competencies in SMEs through training. The programme contributed to 8,500 new jobs and 290 new high-tech firms in the period 1994-1998.	14 regional Centres of Expertise (CoEs) and 2 national networked CoEs are in operation. The individual CoE is realized through co-operation between industry, local government, other public authorities, technology centres, universities, polytechnics and research institutes. The local technology centre generally has the responsibility for running the CoEs. The CoEs are selected by competitive tendering, the main criteria being internationally high standard, innovative approach, potential impact of proposed measures and efficient organisation.
France (Support Local Productive Systems)	The spatial planning agency DATAR carries out a policy targeting Local Productive Systems (LPS). The policy aims to encourage the co-operation of firms within LPS, further contact between firms and higher education and research institutions in the regions, and institute communication between public authorities and local players in order to develop local development policies.	The French 'LPS policy' includes two main steps: (i) Two calls for proposals (in 1998 and 1999) on LPS, in which 96 projects out of 202 proposals were selected as 'official' LPS. This selection does not pretend to be exhaustive. The projects involve firms that propose to carry out a common project or work together in an organized way. (ii) The selected projects and organisations in charge of the project may then apply for public fund to carry out their plans.

Table 5.3: Examples of policies targeting clusters in some European countries (continued)

Country	Objectives	Measures
Germany (North Rhine-Westphalia)	The REKON-Project aims to promote structural change in North Rhine-Westphalia by the use of a cluster approach. Appointed clusters share a 'cluster management' for a defined period of time, with the aim of self-sustainability afterwards. The development of new 'cluster organisations' may be one important task in that respect. The REKON example represents a new orientation of regional policy in Germany in which the development of clusters is used to promote structural change in the regions.	Measures are targeted at needs in individual clusters. The project in the construction cluster in the Ruhr area targets SMEs in construction and craft. One task is to replace the traditional way of performance in craft sector (where firms produce all by themselves) by co-operation in developing new product and entering new markets. The 'cluster managements' perform management advice, development and performance of co-operation projects
Italy	Following laws 317/1991 and 598/1994, industrial policies oriented towards local productive systems and industrial districts have been developed. Mostly, these policies have aimed at developing centres and intermediate structures for research, experimentation, pilot projects and demonstration, personnel training, production upgrading and technical consultancy in SMEs. The centres aim to increase the technological level and innovation capability in (networks of) SMEs.	Policies targeting information and technological diffusion to SMEs in local productive systems are characterised by the intertwining of national policies with regional and local initiatives, which have arisen in a decentralised and bottom-up manner. Important actions have been the creation of science parks, centres for innovation support at the regional level, and sectoral centres for technology transfer and general technical assistance aimed at the local level. In general the 'centres' are promoted and managed jointly by regions, regional financing institutions, chambers of commerce, together with private firms and entrepreneurial associations.
Netherlands (National cluster policy)	Dutch cluster policy focuses on technological co-operation aimed at improving the competitiveness and innovativeness of firms. The basic roles of the policy are (i) to create favourable framework conditions for industry and service in general, (ii) to act as broker by bringing together supply and demand and provide strategic intelligence, and (iii) by the role of the government as a demanding and sophisticated customer to provide societal needs.	The cluster policy uses two main instruments. First, creating favourable framework condition by the use of several policy fields. Second, by acting as a broker. The Ministry of Economic Affairs tries to stimulate clustering by giving information upon the opportunities and possibilities of clustering, arranging dialogue and contact between potential cluster parties, directing the cluster process, and bringing in its own contacts, networks and financial instruments. The Ministry has been involved in 12 cluster initiatives.
Norway (REGINN)	The REGINN (Regional Innovation System) - an experimental programme lasting four years - was introduced in 1998 as the first policy tool in Norway focusing on regional clusters. REGINN aims to stimulate co-operation between firms in specific sectors and regionally located research organisations and regional colleges, in order to stimulate increased innovation capability in important industries or clusters in the region.	The initiative and funds for REGINN comes from the national level. The 19 counties in Norway competed for participation in the programme through a pre-qualifying round of regional innovation analyses and proposals for concrete innovation projects. The projects were then carried out at the regional level, often organised by a regional research institute. Typical projects are the development of new process technology, organisation methods, knowledge etc., jointly between a local network of firms and a regional college or research institution.

Table 5.3: Examples of policies targeting clusters in some European countries (continued)

Country	Objectives	Measures
Portugal (PROINOV)	The Integrated Innovation Support Programme (PROINOV) has innovation and clusters as key words. An important aim is to develop innovative clusters, starting from a defined group of national clusters, which often involve the concentration of players in a specific region. Increased collaboration between firms, and with business associations, and education, innovation, R&D, financial and interface institutions should develop clusters.	Clusters are developed by attempts to construct a common vision among relevant players, identification of priorities for action, improvement of the interfaces in the innovation system in the clusters, encouragement of co-operation between cluster members, and support of the development of products and services. A main task is to improve product quality, innovation and customer contacts in traditional clusters.
Spain (Basque Cluster Policy)	The Basque country aims to stimulate the development of specific enterprise groupings (clusters) belonging to current important industrial sectors in the region, or sectors deemed to be of future importance. The clusters act as interface institutions intended to develop activities that improve the competitiveness of the sector. The instrument improves inter-firm co-operation among Basque firms in the same industrial sector.	The policy instrument started in 1991, and currently cluster institutions have been set up in 10 sectors. The public support is mainly through financial assistance to partially cover the costs for activities performed in the cluster. Each cluster is responsible for developing relevant activities for 'their' firms. Activities include training, information transfer, co-operation with technological centres etc.
Sweden (Emerging cluster programme)	A new national programme for clusters and innovation systems is about to start in Sweden in autumn 2001. A cluster programme will run in the period 2002 - 2004. The main purpose is to strengthen the policies of regional and industrial development, as the programme is meant to form a basis for other long-term actions to support the development of different innovation systems and clusters, both at the national and regional level. The cluster programme is seen to enlarge the strategy of networking in order to facilitate the industrial transformation and ability for Swedish companies to compete globally.	The cluster programme emphasises several measures: (i) the programme will be supported by analyses. (ii) the programme will work to identify threats and opportunities for industrial development as regards the efficient working of innovation systems and clusters. (iii) the programme will support the examination of quality, the performance of R&D and the creation of networks in clusters. The cluster will also be closely connected with the regional growth agreements between Swedish regions and the government.
United Kingdom (Scotland)	The Scottish Enterprise Network (SE) has given priority to supporting clusters in the Scottish economy. There are four pilot clusters in Oil and Gas, Food, Semiconductors and Biotechnology. All four clusters are in the process of developing industry action plans to upgrade their industry over the next five to ten years. The four pilot clusters have all undertaken research looking at the connections and opportunities within their industries, and have designed processes to get industry participants to talk, work and learn together.	Instruments have to be tailored to the needs of the specific cluster. In a fragmented industry like Food, one of the key actions has been to create an atmosphere where collaboration and competition can happen alongside each other. An emerging cluster like Biotech has a greater emphasis on delivering infrastructure, e.g. research and incubation facilities. In Semiconductor, the cluster approach has encouraged industry to work closely with academics in devising new strategies for research collaboration.

* The main difference from the old approach seems to be a stronger focus on funding projects instead of organisations. Projects that will be funded are: (i) collective research among a group of enterprises. (ii) technical support services, (iii) stimulation of innovation in localities, and (iv) stimulation of innovation in specific technological fields.

Source: The ENSR network

5.4. EU policies towards regional innovation systems

Several EU policies are of relevance in stimulating regional clustering. In some countries and regions European funds, especially the European Regional Development Fund (ERDF), support clustering initiatives. In UK regions, for example, through Objective 2 programmes the ERDF supports projects aimed at developing supply chains, local sourcing and networking activities between companies in order to develop specific clusters. The Fund also supports projects to develop cluster strategies, projects aimed at mapping cluster make-up, developing business led cluster groups, and increasing the application of ICT, the level of R&D, and allowing further exploitation of research by cluster firms.

A particularly important European Commission initiative to develop and further regional cluster policies is the RIS programme (Regional Innovation Strategies), which has been run by the European Regional Development Fund since 1994. RIS aims (i) to make the promotion of innovation a key priority for the policy agenda of regional governments, (ii) to increase the number of innovation projects in firms, (iii) to promote public/private and inter-firm co-operation and networks, and (iv) to promote a more efficient use of scarce public and private resources for innovation activity.

The most common outcome in the 30 regions that have taken part in the RIS pilot action has been the promotion of sectoral business networks, supply chain or cross-sectoral clusters and business forums around innovation issues (Landabaso 2001). New interfaces between business and the knowledge base, the integration and co-ordination of diverse research and technological development infrastructures, and development of new financial instruments for the financing of innovation have also been a fairly common result generated by the RIS programmes. Attempts to build up less developed parts of regional innovation systems have been given most priority. Less common are instruments focusing on individual firms in order to upgrade their innovation capabilities.

Largely influenced by experiences through RIS, the European Commission in January 2001 offered each region in the European Union the opportunity to develop a regional programme of innovative action for a two-year period⁴⁸. Landabaso (2001) analyses responses to this invitation as regards proposals from peripheral regions to develop clusters and business networks. The regions propose three broad categories of cluster policies: (i) a more traditional approach of strengthening business networks and sectoral platforms. Firms collectively design innovation action plans, which also include 'softer' aspects such as 'trust building' and efforts to maximize the response by the existing regional technological infrastructure to demands for innovation support; (ii) promoting Information and Communication Technologies (ICT) in SMEs as a new tool for facilitating business networking. Some proposals also include measures that may make R&D resources in advanced areas more accessible to less favoured ones; and (iii) supply chain integration, for example aimed to increase the innovation capacity and growth among SME suppliers.

The approach focuses on a wide set of links between regional players, inspired by the recent regional innovation system and 'learning region' literature (op. cit, cf. also Chapter 2.1). The approach pays particular attention to the way education and R&D institutions, technology diffusion organisations, public authorities and firms interact to foster regional competitiveness. In addition, firms and other players outside the clusters are considered as important collaborators in innovation processes.

⁴⁸ Communication from the Commission 'The regions in the new economy: guidelines for innovative actions under the European Regional Development Fund in 2000-2006. Brussels 31.01.2001 COM (2001) 60 final'.

Chapter 6

Conclusions and policy issues

Four main questions have been raised:

1. What do we mean by the concept of regional clusters?
2. How important are regional clusters in the economy of Europe?
3. What characterises regional clusters in Europe, and what are the development tendencies in the clusters?
4. Why and how should economic development policy and regional policy take into account the clusters?

What regional clustering means

The report advocates the use of narrow and precise definitions of central analytical concepts to be used as tools in empirical studies, and as a basis for policy-making. Thus, the report restricts regional clusters to geographical concentrations of interconnected *firms*, and uses the concept regional innovation system to denote regional clusters surrounded by 'supporting' institutions. Distinguishing between these two concepts is especially relevant when discussing how public policy can stimulate the competitiveness of cluster firms. Regional clusters are seen as mainly a spontaneous phenomenon; a geographical concentration of firms often developed through local spin-offs and entrepreneurial activity. Regional innovation systems, on the other hand, have a more planned and systemic character. The development from a cluster to an innovation system may be *one* way to increase the innovation capability and competitiveness of cluster firms. The development requires a strengthening of inter-firm collaboration and a strengthening of the institutional infrastructure, i.e. that more knowledge organisations (both regional and national) are involved in innovation co-operation.

Based on this understanding, clusters may be upgraded by, in particular, stimulating more intense formal and informal, efficiency-enhancing co-operation between firms and strengthening links to the knowledge infrastructure. This argument rests on the view that improving competitiveness is an interactive process between firms and their (territorial and functional) environment.

The quantitative importance of regional clusters

Statistical mapping of regional clusters exists in approximately half of the countries, while some others have identified and mapped national or sector-based clusters. Moreover, the existing studies use a different terminology, are based on different theoretical approaches, use different methods and criteria to identify individual clusters, and the criteria are often not explicitly stated. Consequently, the results from the studies are very difficult to compare. The general impression, however, is that the countries have numerous regional clusters, or potential clusters, which also are of considerable relative importance, especially in manufacturing industries⁴⁹. The studies also hint at the fact that regional clusters in general perform better than the national average in respective industries.

However, the great interest in regional clustering by policy makers demands more analyses to identify regional clusters, preferably using the same kind of methods and indicators in individual countries. Such an exercise, coupled with analyses of strengths and weaknesses in clusters, may well be a first step in designing and implementing cluster policies, following the recent approaches taken in the United Kingdom, Denmark and Portugal.

⁴⁹ The relative importance of regional clusters has been measured in three countries only (Table 3.1). The employment in regional clusters ranges from 42 % of the national manufacturing employment in Italy to 22 % in Norway.

The characteristics of regional clusters in Europe

A comparative survey of 34 regional clusters in 17 European countries has been carried out. The aim of the survey is to compare European regional clusters, characterizing the nature, working, performance and developments of the clusters.

Most of the surveyed clusters are growing in the number of firms and employees. However, this fact reflects a high number of science-based clusters (which are, in general, growing industries) and a high number of young clusters (which are in an expansive phase of their 'life cycle') in the survey. Thus, we cannot conclude that European regional clusters as a general rule perform well. However, theoretical considerations, some quantitative studies and several case studies point in the same direction as the cluster survey.

The cluster survey demonstrated a mixed picture of a globalisation trend (more supranational knowledge and production networks) and a regionalisation trend (continued importance of regional resources and collaborators), which influence the development of clusters. The globalisation trends include an increasing number of MNEs in many regional clusters, as well as the fact that cluster firms more and more source major components and perform assembly manufacturing outside the clusters. These development tendencies illustrate that cluster policy must not be too regionally or locally focused, for example in only trying to stimulate regional collaboration, organisations and resources. 'Placing the emphasis (only or mainly) on local knowledge can be catastrophic if that's not where the essential knowledge is located' (Storper 2000: 24).

The cluster survey points to the fact that regional resources and collaborators are of major importance in stimulating the growth of regional clusters. Many of the activities along the value chain in the industries dominating the cluster take place inside the clusters. In many clusters, firms also increasingly find relevant research activities and other supporting services inside the cluster boundary. Besides, the survey includes some evidence of social institutions that help to co-ordinate activities in the clusters. Long term relationships and temporary coalitions are, for example, becoming more important ways of managing transactions. Different place-specific, socio-cultural factors are seen to be of continued importance for the knowledge creation and the efficient working of regional clusters in the globalising economy.

Why and how to take into account regional clusters in enterprise policies?

Principally, 'cluster policy' can be of two main types: (i) to support existing or embryonic regional clusters, and (ii) to let the notion of regional cluster inform policy-making. These approaches have some characteristics in common; a focus on local/regional systems of firms (and often SMEs) and firms' value adding environment; a concentration on indigenous growth processes; a kind of 'picking the winners' strategy; a focus on stimulating social processes; and seeing an important role of public authorities as broker between companies and between companies and the knowledge infrastructure.

Another important feature is the fact that cluster policies of the first type above should be tailored to the specific circumstances and innovation barriers in each region and cluster through finding the right combination of policy elements. No one permanent 'best practice' cluster policy, valid for each and every situation, exists. However, policy learning, in which policy makers may learn how to design tools and improve the efficiency of tools from successful instruments in other clusters, is highly relevant. There is scope for importing elements of good practice from one context into another.

The need to adapt cluster policies to specific circumstances in individual regions and clusters demonstrates the role of cluster mapping in policy design. Thus, a process of cluster identification, analyses of strength and weakness and selection may be a first step in designing a cluster policy. Cluster policy is a means to promote regional economic development and structural changes more generally, often through enhancing regional innovation capability. Cluster policy also encourages the integration of many different aspects of economic development and development policy, such as trade development, inward investment, skills development, physical infrastructure and the encouragement of entrepreneurship.

Notwithstanding the need to adjust instruments to differences in regional circumstances, policy to support (existing or embryonic) regional clusters may generally aim to:

- (i) Strengthen inter-firm collaboration and business networking, and
- (ii) Build up the local institutional thickness corresponding to firms' needs.

These two tasks include efforts to upgrade regional clusters to become regional innovation systems (Chapter 2.1).

The first general task of cluster policy may hopefully encourage 'efficiency-enhancing collaboration amongst firms, such as joint marketing initiatives, joint design and sponsorship of training etc.' (OECD 2001: 3). Collabora-

tion is facilitated if common conventions and norms, which may function as common cognitive 'key codes', exist or may be developed in a local community. These kinds of social conventions and norms arise organically through daily life in industrial communities, but some conventions can also be promoted by policy (Lorenzen 2001)⁵⁰. Asheim (1998) refers to empirical studies demonstrating that trust and co-operation between regional firms can be intentionally created. An important strategy in that respect may be the development of regional 'club goods', which are assets that are accessible and beneficial to specific groups of firms and organisations in a locality, and which sustain the collective learning capability of regional clusters (Lagendijk 2000).

Another strategy is network brokers, which may be non-profit organisations or Regional Development Agencies (OECD 2001). In particular at an early stage of cluster building, a third party is often required to take care of necessary co-ordination, building of mutual trusts etc. Relevant policy instruments in this respect may be to invite and engage firms and knowledge organisations collectively in helping to formulate for example a regional innovation strategy, create other nodes for local cooperation and collective organisation, generate demand for joint projects such as training courses, as well as providing bridges between firms and technological and knowledge resources. There seems to be a need for proactive consultancy and a supervising role from an intermediate partner to encourage such kind of inter-firm collaboration.

Regarding the second general task in cluster policy, several examples point to the importance of local and regional organisations for the development of regional clusters. The examples point to the general importance of, in particular, regionally located knowledge organisations for the innovation capability and competitiveness of cluster firms, and in particular SMEs. In many clusters, a kind of technology centres and knowledge intensive business services providers is seen as important to provide scale and services that SMEs often cannot perform or afford for themselves individually (Amin and Thrift 1995). These organisations ideally should play a two-fold intermediary role; they keep abreast of technological improvements taking place in other areas, and have close contact with local firms in order to be aware of their problems. This points to the importance of involving the local industry in policy design and implementation.

The second main task also benefits from the creation of 'club goods', as institutional thickness includes social institutions that facilitate dense, informal collaboration between local actors, besides creating 'supporting' organisations (or formal institutions). The importance of this kind of community building is underlined by several observers indicating that areas holding a shared sense of purpose, working towards a common good, and sharing information, often perform comparatively well economically (Enright 2000; Chapter 2.3). Generally, important organisations are those related to specific vocational education and training, as training requirement of a cluster is a key consideration in many cases (OECD 2001). The purpose is to provide skills and capabilities that can be a source of localised competitive advantage. One problem in many regional clusters, however, is co-operation with R&D-institutions and access to and adoption of R&D. This is particularly a problem in clusters dominated by SMEs, as many SMEs often lack competence to co-operate with R&D-institutions and lack resources and competence to carry out research and development on their own. Thus, a major problem perceived by policy-makers in recent years has been that of improving links between the knowledge infrastructures and firms in general, and especially making the infrastructure more responsive to individual and collective needs of SMEs. This calls for the development of a more co-ordinated policy with respect to the delivery of services to SMEs across a range of sectors.

⁵⁰ Thus, the Scottish Enterprise Network has designed processes to get participants in the four pilot clusters of oil and gas, food, semi-conductor and biotechnology to talk, work and learn together (information from Scottish Enterprise at website: www.scottish-enterprise.com). Pioneering work was done in Scotland in the early 1990s following ideas of Porter in the development of clusters, and as such Scotland was well ahead of other UK regions in this field.

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Annex I

Names and addresses of the consortium partners

Organisation	Address	Telephone Telefax	Contact person
KPMG Special Services	PO Box 74500 1070 DB AMSTERDAM The Netherlands http://www.kpmg.nl	31 20 6567890 31 20 6567700	Michael Veltman veltman.michael@kpmg.nl
EIM Business & Policy Research	PO Box 7001 2701 AA ZOETERMEER The Netherlands, and: Avenue des Arts 41, box 4 1040 BRUSSELS Belgium http://www.eim.nl	31 79 3413634 31 79 3415024 32 2 5100884 32 2 5100885	Rob van der Horst rvh@eim.nl
Intomart	PO Box 10004 1201 DA HILVERSUM The Netherlands http://www.intomart.nl	31 35 6258411 31 35 6246532	Atty Smit atty.smit@intomart.nl
ENSR - European Network for SME Research			
Austria Austrian Institute for Small Business Research (IfGH)	Gusshausstrasse 8 1040 VIENNA http://www.ifgh.ac.at	43 1 5059761 43 1 5034660	Thomas Oberholzner t.oberholzner@ifgh.ac.at
Belgium Small Business Research Institute, K.U. Brussel	Vrijheidslaan 17 1081 BRUSSELS http://www.kubrussel.ac.be/index2.html	32 2 4124211 32 2 4124200	Dr. Rita Wardenier rita.wardenier@kubrussel.ac.be
Denmark Danish Technological Institute (DTI)	PO Box 141 2630 Taastrup COPENHAGEN http://www.uk.teknologisk.dk	45 7220 2000 45 7220 2707	Frank Skov Kristensen frank.skov.kristensen@teknologisk.dk
Finland Small Business Institute, Turku School of Economics and Business Administration	PO Box 110 20521 TURKU http://www.tukkk.fi/sbi	358 2 3383548 358 2 3383393	Ulla Hytti ulla.hytti@tukkk.fi
France Association pour la Promotion et le Développement Industriel (APRODI)	Boîte Postale 151.16 75764 PARIS Cedex 16 http://www.aprodi.com	33 1 47275149 33 1 47275150	Jean-François Papin devpmi@aprodi.com
Germany Institut für Mittelstands- forschung (IfM)	Maximilianstrasse 20 53111 BONN 1 http://www.ifm-bonn.org	49 228 729970 49 228 7299734	Dr. Sanita Schröer schroeer@ifm-bonn.org
Greece University of Piraeus	Ipsilantou 130 PIRAEUS 185 32 http://www.unipi.gr	30 1 4142280 30 1 4142629	Professor Petros Livas kepp@unipi.gr
Iceland National Economic Institute of Iceland (NEI)	Kalkofnsvegi 1 150 REYKJAVIK http://www.ths.is/eng/natec/natecins.htm	354 569 9500 354 562 6540	Sigurdur Gudmundsson sigurdur.gudmundsson@ths.is

Regional clusters in Europe

Organisation	Address	Telephone Telefax	Contact person
Ireland The Economic and Social Research Institute (ESRI)	4, Burlington Road DUBLIN 4 http://www.esri.ie	353 1 6671525 353 1 6686231	Dr. Eoin O'Malley eommsc@esri.ie
Italy CREA 'Furio Cicogna' Università Bocconi	Viale Filippetti 9 20122 MILAN http://www.uni-bocconi.it/bocconi/ricerca/centri/csi/csi4.htm	39 02 58363709 39 02 58363792	Professor Giuliano Mussati cscicogna@uni-bocconi.it giuliano.mussati@uni-bocconi.it
Italy Istituto Guglielmo Tagliacarne	Via Appia Pignatelli 62 00178 ROME http://www.tagliacarne.it	39 06 780521 39 06 7842136	Paolo Cortese p.cortese@tagliacarne.it
Liechtenstein Schweizerisches Institut für gewerbliche Wirtschaft an der Universität St. Gallen (IGW)	Kirchlistrasse 44 9010 St. GALLEN http://www.igw.unisg.ch	41 71 2430700 41 71 2430701	Walter Weber walter.weber@unisg.ch
Luxembourg Chambre des Métiers du Grand-Duché de Luxembourg	Boîte Postale 1604 1016 LUXEMBOURG http://www.cdm.lu	352 4267671 352 426787	Marc Gross marc.gross@chambre-des-metiers.lu
The Netherlands EIM Business & Policy Research	PO Box 7001 2701 AA ZOETERMEER http://www.eim.nl/	31 79 3413634 31 79 3425786	Koos van Elk kve@eim.nl
Norway AGDER Research Foundation (ARF)	Serviceboks 415 Gimlemoen 4604 KRISTIANSAND http://www.agderforskning.no/english/index.htm	47 381 42200 47 381 42201	Dr. Per-Anders Havnes per_a_havnes@agderforskning.no
Portugal Instituto de Apoio às Pequenas e Médias Empresas e ao Investimento (IAPMEI)	Rua Rodrigo da Fonseca, 73-2° 1296-158 LISBON http://www.iapmei.pt	351 21 3836000 351 21 3836234	José Luis Santos jose.luis@iapmei.pt
Spain Instituto Vasco de Estudios e Investigación (IKEI)	Avda. de la Libertad 20-3 20004 SAN SEBASTIAN http://www.ikei.es	34 943 426610 34 943 423501	Iñigo Isusi iisusi@ikei.es
Sweden Swedish National Board for Industrial and Technical Development (NUTEK)	117 86 STOCKHOLM http://www.nutek.se	46 8 6819100 46 8 6819118	Henrik Levin henrik.levin@nutek.se
Switzerland Schweizerisches Institut für gewerbliche Wirtschaft an der Universität St. Gallen (IGW); Observa St. Gallen	Kirchlistrasse 44 9010 St. GALLEN http://www.igw.unisg.ch	41 71 2430700 41 71 2430701	Margrit Habersaat margrit.habersaat@unisg.ch
Switzerland Eco'Diagnostic; Observa Geneva	32, Rue de l'Athénée 1206 GENEVA http://www.ecodiagnostic.ch (under construction)	41 22 7891422 41 22 7891460	Dr. Alain Schoenenberger schoenenberger@ecodiagnostic.ch
United Kingdom Centre for Small and Medium Sized Enterprises, University of Warwick	COVENTRY CV4 7AL http://users.wbs.warwick.ac.uk/csme	44 24 76523692 44 24 76523747	Professor David Storey smeds@razor.wbs.warwick.ac.uk
United Kingdom Centre for European and International Consultancy, Leicester Business School, De Montfort University	The Gateway LE1 9BH LEICESTER http://www.dmu.ac.uk/Faculties/BL/CEIC.html	44 1162 506293 44 1162 577264	Julian Hancock jmhbus@dmu.ac.uk