CEE-ClusterNetwork

Summary of the main research results

Yusaf Akbar, András Bakács, Sándor Buzás, Zoltán Pogátsa, Magdolna Sass, Miklós Szanyi (edited by Kinga Endrész)

2 July 2007

CEE-ClusterNetwork

Summary of the main research results[1]

Company information

ICEG European Center is an independent economic research institute analysing economic trends in Central and Eastern Europe. It carries out scientific research, prepares analyses and forecasts, provides policy advice and organises scientific events. It is a member of several international research networks and runs several networks under its own co-ordination. More information about ICEG European Center is available at www.icegec.org.

Contact

ICEG European Center, 6/B Dayka Gábor Street, Budapest, H-1118 Hungary. Phone: (+36) 1 248 1160. Fax: (+36) 1 319 0628. E-mail: office@icegec.hu.

Disclaimer

This document is for informational purposes only. It is not intended as an offer or advice in relation to any investment decision. ICEG European Center and the authors of this document are not responsible or liable for the accuracy, completeness and correctness of the information in this document and cannot be held responsible for any damage resulting from the use of this document. The contents of this document are subject to change without prior notice.

---

[1] Experts who have actively participated in the research activity and are the authors of reports on which this working paper is based: Yusaf AKBAR, András BAKÁCS, Sándor BUZÁS, Zoltán POGÁTSA, Magdolna SASS, Miklós SZANYI

Introduction

Since clusters operate mainly at a regional or local level cross-border co-operation has only recently become a part of their operations.

The CEE ClusterNetwork (Central and Eastern European Cluster and Network Area) consortium[2] involves eleven neighbouring cluster regions in Central and Eastern Europe who are keen to mobilise and support national and regional innovation policy actors to carry out and design co-operation activities together with other competent public authorities.

The CEE ClusterNetwork links these eleven partner regions/countries with the main objective to find coherences in the different regional cluster policy implementation methodologies and to shape a common policy in by defining common strategic issues, strategies and programmes.

The CEE ClusterNetwork project financed under the EU Sixth Framework Programme (Research and Innovation) aims for a coherent development of innovation and cluster policies in the strongest sectors of each regional economy at three levels: policy, administrative and regional development agencies and cluster initiatives. The project comprises different activities such as analysing existing innovation and cluster initiatives and programmes, elaborating Quality Guidelines and Strategic Cluster Memorandum 2007, Operative "Cluster Action Plan", planning and implementation of cross-border pilot actions and development of trans-regional programmes for innovation and cluster activities.

The West Pannonia Regional Development Agency (Hungary), as one of the consortium's partners contracted ICEG European Center in order to provide cluster expertise for the Work package 1 (WP 1) in the CEE ClusterNetwork project. WP 1 contained three tasks:

- Comparative analysis of national and regional cluster policies
- Comparative analysis of clusters operating in Central and Eastern Europe
- Common quality guidelines for effective cluster management

This working paper summarizes the results of research and cluster expertise carried out by ICEG European Center covering the three above mentioned tasks.

The two comparative analysis were based on questionnaires covering 43 clusters of 8 countries (Austria, Hungary, Slovenia, Slovakia, Czech Republic, Poland, Italy, Croatia) being partners in this project. The results and conclusions of these surveys were summed up in two reports: Comparative analysis of national and regional cluster policies, Comparative analysis of clusters operating in Central and Eastern Europe.

The third report using the main findings of the two comparative analysis examined the nature of industrial clusters in Central and Eastern Europe (CEE), their structure, activities and strategies. It also provided policy recommendations on how to best foster and develop industrial clusters in the CEE context and contained the common quality guidelines for effective cluster management.

This working paper is structured as follows: the first part gives an empirical introduction based on an earlier survey related to Central and Eastern Europe. The second section summarizes the main findings of the

---

[2] The partners are: Upper Austrian Technology and Marketing GmbH – (AT), ecoplus - Business Agency of Lower Austria Ltd. (AT), West Pannon Regional Development Agency (HU), Innovations – und Technologietransfer Salzburg GmbH (AT), Tiroler Zukunftsstiftung (AT), Maribor Development Agency / Euro Info Centre Maribor (SI), Czechinvest - Investment and Business Development Agency (CZ), BIC Bratislava - Business and Innovation Centre Bratislava spol s.r.o. (SK), ARP - Agencja Rozwoju Przemyslu (Industrial Development Agency) (PL), TIS - Techno Innovation South Tyrol (IT), Croatian Employers' Association National Centre for Clusters (HR), Clusterland Upper Austria Ltd. (AT)

comparative analysis of national and regional cluster policies, and the third section deals with the comparative analysis of clusters operating in Central and Eastern Europe, research carried out in CEE ClusterNetwork project. In section four conclusions from the survey and the literature are drawn and policy recommendations are made. Finally, in chapter five quality guidelines are presented in details.

1. The empirical evidence

Before presenting the results of research related to the CEE ClusterNetwork project it is useful to highlight the main elements of an earlier survey relevant to the Central and Eastern Europe.

Ketels and Sölvell (2005) run a comprehensive statistical survey of cluster mapping in the 10 new member states of the EU. Their methodology was based on the methods of a survey that was conducted at the Institute for Strategy and Competitiveness at Harvard Business School led by Michael Porter. The European survey used the amended American industrial classification method when identifying those business activities which belonged to cluster-industries. Spatial concentration was calculated for the European NUTS-2 level regions. Only employment data was readily available at this level of both sectoral and geographic dis-aggregation (38 businesses), and for two more recent comparative years (2000 and 2004). Thus, concentration was measured with this single data set. However, the authors calculated three different measures, in order to limit some of the distortions stemming from the special features of employment data. They wished to obtain a balanced picture of regions reaching sufficient specialized critical mass to develop the type of spillovers and linkages that create positive economic effects and can serve as a base for cluster initiatives.

The first measure expressed the size, if employment reached a sufficient absolute level that may trigger strong economic effects of clusters. This level was set for each NUTS-2 region and every of the 38 branch at 15000 employees at a location. The second measure expressed specialization, if a region was more specialized in a specific cluster category than the overall economy across all the regions, this was thought to provide enough strength for the regional cluster to attract related economic activity from other regions. This notion was operationalized by regarding fit those concentrations that reached a specialization quotient of more than 1,75, i.e. which had at least 75 % more employment within the given cluster, than the average of all regions would suggest given their size. The third measure expressed dominance, if branches employ a high share of the given region's overall employment. The measure was set at the level of 7 % of overall regional employment. The level of all three measures were set to separate the highest 10 percentile of all regional clusters.

As expressed also by the authors, the measurement method had several shortcomings. First being the usage of solely employment figures, this created bias towards labour-intensive sectors. Another problem is the level of dis-aggregation in both dimensions. The 38 activity groups or businesses contain many that are rather heterogeneous. A deeper level of disaggregation was not possible, since the original grouping pattern (which was based on more detailed surveys of the US economy) could be transformed from the American SIC classification structure to European NACE only at this level.

As concerns NUTS-2 regions, they are also too big in at least some countries and for some activities. In Hungary, for example, NUTS-2 regions were artificially created as requested by the EU, but they consist of usually 3 former *counties* which used to be the integrating geographic and administrative unit historically. The new NUTS-2 regions are so young that their economies could hardly amalgamate. On the other hand, there is no convincing evidence on clusters spreading according to administrative borders either. Thus, maybe some clusters escaped mapping because they spread over two or even more NUTS-2 regions.

A further problem comes from the inheritance previous industrial structures. In most socialist countries, production was heavily concentrated in large state-owned companies. In some cases these huge *combinates* were located in places of arbitrary choice, in other cases firms were created in the strive of these countries for self-supply in practically all commodities in the middle of nowhere. In many cases these giants or the remnants of them survived the turmoil of the transition process. In other cases the least mobile production

factor labour stayed at places where they were settled during the years of socialist industrialization. All this experience seriously distorted spatial concentration patterns from the hypothetical optimum, and the old patterns still exercise influence on spatial differences in the supply of production factors. Thus, we may have strong reservations as far as the applicability of the results of current cluster mappings is concerned.

Ketels and Sölvell's survey found nevertheless interesting results. 367 regional clusters met at least one of the three hurdle rates for absolute size, specialization and dominance. They represented 5,86 mn employees, about 58 % of total employment in the cluster sector of the 10 new member states. The capital regions of the largest countries lead the ranking of regions by cluster portfolio strength: Budapest first, Warsaw second, Prague fourth place. The largest seven cluster categories were food processing, heavy construction services, transportation and logistics, financial services, hospitality and tourism, metal forming, and building fixtures, equipment and services, and accounted for 50 % of all cluster sector employment across the EU 10. As is seen, it is mainly labour intensive branches with relatively lower level of productivity: a clear indication for sample bias (automotive or ICT employed much less people, albeit they used to be considered as leading sectors for many clusters).

The research confirmed existing hypotheses concerning the development gap between developed country and transition member states in the EU. The EU 10 economies had a specialization profile distinct from more advanced economies. Specialization was found to have far stronger natural resource driven sector (20 % share in employment) than developed countries. Within the cluster sector (32 % share in employment) there was a stronger bias towards labour intensive and manufacturing driven cluster categories, while these countries were relatively weak in advanced services and knowledge intensive cluster categories. Exceptions were the strongest clustering centres around capital cities. Also, in case of the Hungarian clusters, the above mentioned bias was less pronounced and specialization towards high value added services and industries was stronger (see the attached list below).

Table 1. Strong regional clusters and their specialization 2004 (Clusters qualifying for the top 10 % in all three measures)

Regions	Field of specialization
Czech Republic	
Liberec	Automotive
Liberec	Textiles
Ostrava	Metal manufacturing
Praha city	Education and knowledge generation
Praha city	Entertainment
Praha city	Financial services
Praha region	Automotive
Hungary	
Győr	Automotive
Szeged	Food processing
Székesfehérvár	Information technology
Lithuania	Apparel
Latvia	Entertainment
Poland	
Gdansk	Transportation and logistics
Katowice	Automotive
Lodz	Apparel
Warszawa	Financial services
Wroclaw	Automotive
Slovakia	
Bratislava	Financial services
Kosice	Apparel
Kosice	Metal manufacturing

Source: Ketels and Sölvell, 2005 pp. 62-65.

There may be several factors affecting the results of the above table, which seems to be rather rigorous. For example no Slovenian cluster qualified itself in all three dimensions. Ketel and Sölvell (2005) found convincing evidence on the correlation of spatial concentration and economic performance using the data of developed countries. However, spatial concentration had different historic reasons in practically all the EU 10 countries, and these traditions seem to have much weaker causal link to economic growth and performance today. For example, in the case of the strong position of the Kosice region in the Slovak Republic we must not forget that this is one of the poorest regions of the EU 25. The Kosice steel mill and very few other industrial facilities are the single most important employer of the region where unemployment rates are extraordinarily high. Thus, we may observe cases when spatial concentration of business is the result of an overall meltdown of business activity in some regions, and not the beneficial outcome of deliberate co-location decision of independent cluster actors.

It is perhaps more useful to look at regional centres' overall clustering performance. The next table contains the list of regional centres that attracted the largest cluster portfolio, i.e. businesses that qualified in one or more aspects of cluster measures.

Table 2. Regional clusters with strongest portfolio in EU-10, 2004

Region	Total number of qualifications	Average qualification per regional cluster	Share of qualified clusters in total regional cluster employment (%)
Budapest	23	1,53	77
Warsaw	22	1,38	77
Katowice	21	1,4	81
Praha city	19	1,9	78
Lithuania	19	1,58	70
Krakow	18	1,29	68
Liberec	17	1,55	62
Lodz	16	1,6	71
Wroclaw	16	1,45	60
Poznan	15	1,15	72
Nitra	14	1,4	60
Bydgoszcz	14	1,27	58
Slovenia	14	1,27	56
Olomouc	14	1,4	45
Latvia	13	1,44	62
Gdansk	13	1,44	59
Praha region	13	1,63	43
Bratislava	12	1,5	65
Brno	12	1,2	56
Miskolc	12	1,09	51
Kosice	12	1,71	45

Source: Ketels and Sölvell, 2005 p. 26.

There are large differences within the EU-10 across regions and cluster categories regarding their level of specialization and spatial concentration. These countries show much lower specialization on specific regional clusters within regions and much lower spatial concentration on specific regions within cluster categories than the original benchmark US economy. If as is suggested by the authors, higher levels of specialization and concentration enable higher productivity and innovation, this is a serious concern. The same concern arises with regard the EU-15 countries in comparison with the US, which is fully consistent with the performance gap relative to the United States.

2. Comparative analysis of national and regional cluster policies

In the CEE ClusterNetwork project the first phase of the research started with a questionnaire about the national and regional policy framework. We asked the partners:

- Whether there are direct/explicit policies on cluster development?

- What are the main objectives of the policies related to clusters?

- What kind of instruments do these policies use for implementing cluster development?

- Institutional framework?

Although the methods differ with which the Central and Eastern European countries have tried to manage cluster development, one common characteristic can be easily identified. There are no direct/explicit cluster policies at the national level in these countries. However there are national policies which – *inter alia* – include cluster development as an objective and there are some instruments which target cluster-like formations. In most countries certain national policies – even if indirectly – aim at establishing clusters and/or building networks. These kinds of cluster policies are flexible frameworks that supplement the various sectoral or horizontal policies on a national level.

It is evident that one has still very limited experience with clusters, and cluster related policies in the Central-Eastern European area, but this limited experience shows us that cluster development is a necessary and very potent way of helping SMEs to become or remain competitive in the global economy.

We have to underline that in the New Member States SMEs are not always able to recognize the benefits of networking and clustering, so bottom-up planning is constrained (mainly due to the lack of trust and confidence) in these regions. That is why the establishment and management of clusters should be financed by public sources in the first years of their existence.

On the basis of the analysed national policies one has the impression that the policy makers are uncertain about the clusters. They do not clearly know what clusters are, and what possibilities clusters offer for companies and what is the role of clusters as a tool for economic development. This uncertainty about the role of clusters is especially true in the case of New Member States.

Regional policy contours reflected closely those of the national level. Some countries had explicit cluster policies e.g. Austria and Slovakia while others had regional policies that had cluster emphasis. The survey did not really identify in any detail what the clusters themselves looked like in terms of their functioning. Nor was there detail on the kind of explicit cluster policies at the regional level that were being pursued. The surveys reported the use of regional policy instruments and funding such as ERDF support to foster cooperation between SMEs, local governments, research institutions such as Universities and foreign multinationals.

According to the questionnaires, the *main objectives of regional cluster supporting policies* were raising competitiveness in general, and enhancing innovativeness of companies in the region. In certain cases increasing employment and facilitating environmental protection was also mentioned. A *vast range of policy instruments* is used across countries. The role of tax/investment incentives is present in Croatia – perhaps due to the fact that the country is outside of the EU subsidy rules. Attempts to facilitate cooperation between (a) SMEs and government; (b) intra-SME; (c) Research institutions and SMEs; (d) International cluster cooperation featured heavily among the instruments used. While there was much agreement on the nature of instruments (a), (b) and (c), there was less agreement on what constitutes international cluster cooperation however – again, Austria had clearly defined partners while Croatia was extremely vague on this issue.

With the exception of Slovenia, all countries in the sample reported that they had a regional policy that incorporated cluster elements. All countries reported actual or aspirational internationalization of regional clusters – of note again is the EU role here with INTERREG playing an important support role for international cooperation among regions (and clusters).

The Austrian sample reported the most systematic and developed cluster policies having been involved in cluster development longer than any of the other countries in the sample. They also appeared to have a much clearer implementation mode and a learning/reporting mechanism based on evaluations of past policies. The majority of countries in the sample used top-down policy approaches (although again Austria reported a simultaneous top-down, bottom-up approach). The Austrian clusters are initiated top down but operationally they work bottom up.

Like with national level policies, the sample suggests that there are many different understandings of clusters; what the best policy for supporting them at a regional level is and whether the role of international cooperation is primordial in the future development of them. Again, relying upon the responses from the survey, Poland and Austria appear to have the clearest objectives for their regional support for clusters.

The most important problems which reported were the lack of direct cluster policies and the lack of coordination of the different policies which has effect on clusters. In some countries there is a lack of coordination and interaction between the policy maker and the cluster/company level actors due to unclear responsibilities on administration level. Most of the countries, especially the NMS, reported a need for trainings/education for cluster facilitators and cluster managers.

The first part of the first questionnaire was about the national policy framework in which the clusters operate. In most countries cluster-related policies are indirect and relatively new ones, there are very few official valuation of the effectiveness of these policies. Some of the reporters were too cautious to present unofficial, informal opinions about the policy framework.

3. Comparative analysis of clusters operating in Central and Eastern Europe

The second questionnaire in the CEE ClusterNetwork project was about the state and operation of clusters in these countries. The reporters were asked to give detailed information about their size, operation, problems and the services the clusters provide to the members.

We got answers from forty-three clusters[3] (twenty-two of them from Austria, three from Hungary, nine from Slovenia, three from Italy, three from Croatia and three from Poland, (there is no real cluster-organization in Slovakia).

The most typical sectors in which the cluster operates are automotive, mechatronics, plastics, construction, ICT, metals and timber/wood. There are also clusters in the domain of health technology, geodesy, design, media technology, creative industries, geographic information systems, furniture, manufacturing of tools for plastics processing, manufacturing of aircrafts & aviation equipment, health tourism/spa/ medicine, life sciences, architecture, food industry, textiles, chemicals and rubber.

The formation of clusters in the Central and Eastern European region is a recent phenomenon. The activities of the clusters examined started between 1996 and 2006, with most establishments taking place after the turn of the millennia.

The size of the membership varies greatly, from around a dozen members to as much as 1200. The number of members does not seem to vary according to the sector. One can also observe varying degrees of association with the cluster itself, from strongly formal membership/ different levels of membership/ to non-members taking place in activities all the way to clusters that work as free initiatives without any formal membership at all.

Different kinds of cluster members include mostly manufacturers. In addition, clusters often invite suppliers as members, as well as research institutes, R&D centres and Universities. Some clusters, although not typically, also include consultants, enterprise developers or regional development agencies in their membership. Clusters with finished products (such as furniture) might decide to cooperate with trading companies as well. In certain cases administrative units such as cities might also have a stake in the development of the cluster. Chambers and other associative bodies are often included.

As for formal institutions of cluster management, all forms of cooperation have established a formal cluster management. Most also hold formal meetings and workshops, although not all. They communicate with each other through newsletters, email and websites. It is interesting to note that certain clusters coordinate their activities through individual grants for specific activities carried out by cluster members. The size of the cluster management staff is around 3 and a half employees in most cases, but never more than 5 and a half. There are also informal opportunities for cluster members to interact, mainly in the form of common study trips and social events (in the summer, at Christmas).

Cluster managers usually report on the activities of the cluster towards either the managing director of the cluster, or a development organisation which might take the shape of a public sector development agency or a firm.

---

[3] Most of these clusters operate in the manufacturing (fifteen in industries like automotive, mechatronics, plastics and two of them in the food sector) or twelve in the service (health, tourism, information etc) sector. In our sample there were five clusters related to construction industry and seven in the wood-processing sector (including furniture). Finally two of them operate in the textile industry and one in the energy sector.

Clusters are usually top down organisations, except those ones in Slovenia, Poland and in some Austrian regions, which profess to be bottom up. (Austrian clusters are initiated top down but operationally they work bottom up.)

Employment in the clusters varies according to industry. In sectors such as geodesy or wellness the employment might not exceed a few hundred. Timber and wood clusters are usually middle sized (10-20 000), and automotive cluster are the largest, sometimes approaching the 100 000 employees range.

The total turnover per year of the cluster members once again varies greatly, from a few tens of millions euros to billions. The size of the cluster measured in terms of turnover does not correspond to either the lifespan of the cluster or the sector in which it operates.

The ratio of exports in the output of the clusters presents an interesting picture. *Automotive* clusters are typically export oriented, with export to total turnover ratios as high as 80%. (It is somewhat lower in the case of the Upper Austrian automotive cluster, at 60%, and significantly lower in the case of the Croatian Automotive cluster at 34%, although this cluster was just recently founded in 2006). *Health, wellness* and *safe energy* have understandably registered the lowest ratios, well below 20%. The export ratios of *timber and wood* clusters are puzzling: these clusters have registered anything between 6.4% and 80%. It is quite likely that these clusters operate based on very different organising principles. *Mechatronics* clusters are middle of the range, with around 50-65% export ratios.

The size of enterprises taking part in cluster cooperation varies according to the sector. The automotive sector typically consists of 20-30% large companies, while the rest are SMEs. Timber and wood clusters are overwhelmingly SME based, except for the Slovenian Timber Cluster, where large firms reach a 47% ratio. Health and wellness is also dominated by small and medium sized companies, as are mechatronics and construction. IT and ICT clusters can be very different, some reporting 20% SME memberships, some 100%.

The strength of cooperation between members of the clusters seems to correspond most strongly to the lifespan of the cluster. Exceptions include the Italian and Hungarian clusters, where relations are weak in spite of a relatively longer lifespan.

The financing of cluster operation costs takes place from various sources. With a few exceptions, *membership fees* typically make up between 7 and 20% of the total operating costs. Quite a few clusters do not have operating costs at all. *Grants* make up by far the largest source of financing. With a few exceptions they cover upwards from 60% of the operating costs. In quite a number of cases grants finance the total expenditure of the cluster. While most clusters do not charge a fee for their services, some do. In one group of clusters which do, the *service fee* covers either around 5% of the expenditure, in another group around 25%. Trainings, sponsorship and EU projects have also been mentioned as sources of revenue.

 Clusters carry out quite a wide range of activities. Almost without exception, they facilitate networking and act as an information transfer platform for members of the cluster. They also initiate cooperation between cluster members, and provide support for such joint projects. They organise workshops for cluster members. In addition to these more general activities, some cluster organisations provide additional services. They collect information about grants, notify cluster members and in certain cases assist members in applying. They run common internal R&D projects. They run joint marketing and promotion campaigns and handle the public relations of the organisation. Some clusters launch common industrial foresight programmes, carry out market analysis and support the internationalisation of their members. They organise trainings, know how transfer events and study trips. Some are involved in quality management and industrial benchmarking programmes for their members.

There is a growing trend for cross-border cooperation between clusters. All clusters share information with their counterparts, and the majority are involved in common projects (mostly innovation) or common grants across the border.

The services provided by the clusters

The average of the number of services these clusters provide to their members is 4 (they reported a total of 155 services). Certainly there are different definitions about what is "one service", but this number implies that the clusters analysed are active ones. However, this activity is in most cases a static one, since only one in every five cluster has initiated new services to after foundation. Already existing services are certainly modified and improved, but the lack of new services demonstrates that there should be (and we will see that there are) problems which hinder the cluster managers to dynamically change the service portfolio of the cluster.

The information provided has been summarised in two ways. First we have classified the services mentioned in the questionnaires into eight groups according to services. In this way we could establish a summary of the experiences of the clusters in providing different types of services. Consequently we attempted to analyse cluster-specific factors according to industrial sectors.

Types of services provided by clusters can be divided into eight different categories: 1. information provision, 2. education and training, 3. marketing, 4. R&D, 5. networking, 6. management, 7. business support and 8. market research. Certainly in some cases the categorisation or definition is ambiguous. For example, when the cluster reports organizing workshops, it could be classified as either as training, or as networking, or even provision of information, etc. and it can be all of these at the same time.

Only half of the clusters reported provided information (about grants, aids, cluster activities etc.) regularly in organized form to their members. In about two thirds of the clusters, there is ongoing marketing, R&D (know-how transfer, benchmarking etc.) as well as networking and management services (common project management). Business support (which we define as company specific help for businesses) is available only in 12 clusters (out of 43), and market research and education (by external entities) are very rare. We must take into account that most of our clusters are not older than a few years, so sophisticated services sometimes are too early to be expected from them. We believe that a recommendation of preferred services for clusters (with detailed but not obligatory descriptions) would boost the service providing capabilities of these clusters.

In most cases there exist problems which hinder optimal and effective service. Communication problems are typical in R&D related services and in case of networking. Financial constraints are felt in case of overhead type (non project financed) services such as management and business support. Finally, in most countries and clusters the lack of interest and motivation in certain cluster members is a basic limitation.

The answers to the questions are very heterogeneous, especially in case of financing, service resources and KPI. All in all, we can conclude that our clusters generally finance their services mainly through grants and projects. Membership fees are less important. Regarding key performance indicators, passive (activity oriented) and active (result oriented) forms of assessment are equally important, but there are a lot of services and clusters that use almost only passive indicators.

Research activities of the clusters

The clusters in the sample provided more or less detailed information on their research activities. The Volkswagen Slovakia "quasi-cluster", mainly because of its pre-cluster stage of development, has not given detailed information on its research activities. However, even in this particular case there is a direct contact between the companies in the cluster and one or more universities. Thus, contacts with universities can be evaluated as a type of relationship that is common for all the clusters in the sample, and is an essential part of cluster activities. This may include formal as well as informal contacts, though the "depth" and the type of the contact is not specified. Thus it may involve more intense (e.g. common research projects) as well as relatively "moderate intensity" (e.g. common organisation of conferences) forms of cooperation.

Contacts of the companies with non-university research institutions in the given clusters are rarer; approximately 20 per cent of the total number of clusters answering the question do not have such kind of a relationship. Besides the "brand new" Croatian cluster, the Hungarian Pannon Automotive Cluster, six Austrian clusters and one Slovenian cluster (Rast, operating in tourism) also indicated the lack of this kind of relationship. (However, differing perceptions of what belongs to this type of contacts may also explain the negative answers of the clusters in question.) All in all, one can state that an overwhelming majority of the clusters in the sample do cultivate such kind of a research contact. Hence establishing contacts with non-university research institutions is also a specific feature of the clusters.

Long-term research contracts have been signed by more than 30 percent of the sample. This can also be evaluated as a relatively high share of the total number of clusters, especially given the fact that the majority of the clusters do not operate in research and/or technology intensive sectors. Three automotive clusters out of the five in the sample have established this type of contract, while other clusters involved in this type of relationship belong to the aircraft manufacturing, aluminium, plastics, wood and timber construction, health technology and mechatronics industries. As far as the geographic locations of the clusters with long-term research contracts are concerned, one Hungarian, three Slovenian, one Polish and six Austrian clusters can be found in this group. In spite of the instructions of the questionnaire, few details have been provided about these contracts. One cluster usually signs two-year contracts, another one one-year contracts, while another one concludes individual contracts. One Austrian cluster signed such type of contracts with seven Austrian and German universities and research institutions. One cluster explicitly states that details of this type of contract are confidential.

On the other hand, ad hoc research assignments are used more often than long term contracts in helping the research activity of the clusters in the survey: more than 60 per cent of the clusters that provided information regarding the existence of this type of activity employ this type of relationship with various institutions or private persons. As far as the sectoral compositions of clusters is concerned, besides the more technology intensive life science, renewable energy, automotive, aircraft manufacturing, mechatronics and health technology clusters, certain food, wood-processing, furniture, construction, plastics and tourism clusters are also involved in such type of relationships. Concerning the geographic composition of clusters in this group, 60 per cent of the Austrian clusters in the sample, five of the 9 Slovenian clusters, all 3 Polish clusters and one of the 3 Italian clusters have ad hoc research assignments.

The existence of spin-off companies in the cluster may also indicate the intensity of the research activity carried out there. Spin-off companies are established based on the marketable research outcomes of the R&D activity carried out in the companies of the given cluster. Spin-off companies operate in 22 per cent of the clusters that answered this questionnaire. In terms of geographic locations, 27 per cent of the Austrian clusters, one Slovenian and one Polish cluster are home to spin-off companies. These operate in the traditionally more technology intensive life science, automotive, high tech sub-sector of the aluminium industry and aircraft manufacturing sectors, as well as in health tourism, forestry, and ecological architecture

industries. Interestingly enough, none of the four information technology-related clusters contain spin-off companies, though the Slovenian one indicated in its answer, that spin-off companies are expected to emerge there.

As far as the total number of research personnel in the cluster is concerned, 27 clusters provided information in response to the questionnaire, and the majority of them (almost 60 per cent of the clusters answering the question) have no such type of personnel. The remaining clusters (41%) employ various numbers of researchers and research assistants, spanning in range from 3 to one thousand. Eight Slovenian clusters of 9 in the sample have a certain number of research personnel, in the range of 3 to 1000 – which may be related partially to specific features of the regulatory environment. Besides the Slovenian clusters, two Austrian (with an employment of 150 and 20 research and related personnel) and one Croatian cluster (eleven employees of such type) belong to this group. As far as the sector composition of clusters employing research personnel is concerned, two in the automotive sector, ICT and wood sector, and one geodesy, construction, tourism, aluminium and well-being industry clusters can be found in this group, with an automotive cluster employing the highest and the tourism one the lowest number of such personnel. Given the relatively big range of the number of research personnel in the answers, here again one can assume that clusters apply different perceptions (definitions) classifications of "research personnel".

The number of patented inventions may indicate the efficiency of the research activity carried out in the cluster. However, none of the 28 clusters that answered this question have applied for any patents since their establishment, though one Slovenian cluster in a high tech industry indicated that patents emerging from research in the cluster are expected in the coming years. The other 12 clusters have indicated that such type of information is not collected by them.

4. Recommandations

The existence of clusters, spatial concentration in general largely contributes to increased economic efficiency through numerous mechanisms, ranging from simple agglomeration externalities to the creation of flexible cooperating spatial networks in clusters. There are many studies that confirmed the existence of a positive correlation in this regard. Empirical surveys on the other hand concluded that the level of regional specialization low throughout the European Union and lowest in the new member states. This observation is highlighted especially in comparison with the US economy. Proven correlations between regional specialization and economic performance suggest that policies pursued by the EU institutions should focus on enhancing the process of geographical specialization of industries.

Clusters in Central Europe have typically top-down organizations. Hence, formal cluster initiatives (CIs) led by various promotion agencies play crucial role in their establishment and financing at least in the early stage of their life cycle. Clusters, however in the sense of collaborating business entities, academic institutions, financial institutions may coexist and even cooperate without formal CI as well. In other words, it is collaboration that matters, not so much its institutions. Therefore, government sponsored CI's primary task should be supporting clusters and CIs. First condition of this process is choosing for support such CIs, which are based on sound background in all sides of the potential and required participants. The quality of adequate spatial and sectoral concentration is to be controlled first, through appropriate methods of cluster mapping that reveal potentials for clustering process. Without this sound background it is very difficult to establish CI which can achieve critical mass and be financially stable. Maybe cluster mapping reveals inadequacy in one or another dimension of clustering. In this case a preparatory work can be launched in order to strengthen weak capacities. This work may certainly also continue after launching the CI, since the development of lacking factors may take fairly long time.

A more general problem with launching CI is expressed also strongly in the literature. This is weak social capital base for regional cooperation. The situation is much worse in most transition economies due to the inherited lack of trust in entrepreneurship and entrepreneurs. Various members of the society share fundamental mistrust, but also entrepreneurs against each-other, as well as financial institutions with entrepreneurs. Hence, building of the necessary social capital base must be a high priority in any CI's preparatory stage, as well as in the first phases of development until achieving critical mass. Measures are numerous and are described in detail in many cluster development handbooks. What we would like to add, is that in transition economies these measures should also gain support from broader SME support actions, most particularly from training and information sharing campaigns. Here we also touch upon the problem of lacking information and knowledge of entrepreneurs (mainly SME-owners and managers). This means little information about clusters, knowledge of the benefits of cluster cooperation, but also low level of managerial experience and knowledge. Thus, building the social capital base also requires training programs for entrepreneurs.

Clusters have life cycles, with phases that are typical from several aspects. The first turning point is when the cluster achieved the critical mass. This is the point when clusters may become self-sustaining in terms of organization, action, financing and management. To achieve this stage, clusters need several years. Evaluation of cluster support programs must take into consideration the time factor. CI support must be changed after this turning point, hence the main tasks of cluster management also change. Mature clusters' activity focuses more on international linkages, supporting of spin-offs and outward investments. Support schemes must be changed accordingly. In mature clusters the structure of financing also changes. It is not necessarily membership fees that dominate CI incomes. But in order to raise sufficient funding, and to

finance spin-offs and research collaboration projects, etc. it is crucial to improve the capital supply of clusters, involving strong and risk sharing financial institutions, at latest in this stage.

Activity and collaboration in clusters are very much diverse. They range from joint sourcing and purchasing through development of commercial contacts (supplier networks) to sharing all kinds of information and joint R&D activity. Each cluster has its own preference, which very much depends on the structure of capabilities of partners. A competence matrix can map potential performances that can be utilized by CI. This matrix should present the basis also for the development of vision and longer term strategy of the cluster. The worse that national or regional policies can do in the frames of cluster policy is to reinforce tasks and goals of other policy areas on cluster development, and thus consider cluster policy as an extended arm of other policies. There are overlapping areas with innovation policy, regional policy or SME development, however, cluster policy's main goal is to develop cooperative regional networks of various economic and academic entities. There is some accumulated bad experience in this regard: clusters that were set up to serve various marginal policy tasks did not become strong or self-sustaining. Neither did the rich variety of cluster functions develop: they remained at the level of what was envisaged by the funding governments.

Another important source of failures with cluster promotion policies is the ad hoc design of grant programs that produce "virtual clusters", i.e. clusters which have been organized with the sole task of obtaining grants. They usually do not survive the period of granting, and have no chance to become self-governed and financially independent. Hence, we strongly suggest that policies must define their goals most precisely, provide grants on competitive basis and organize continuous control of the usage of the grant using checklists.

Literature also puts emphasize on the innovative character of cluster cooperation. The term "dynamic cluster" refers to clusters that work in some high-tech fields, the core action of which is barely commercial cooperation but much more common knowledge generation and sharing of knowledge. We would like to emphasize, that traditional clusters also may become innovative in the sense that knowledge generation and sharing is important also in mid- or even low-tech industries, and benefits from such cooperation can be equally important for firms regions and national economies. Hence, no exaggerated obsession with high-tech is recommended.

Firms, academia, financial institutions and governments are the key players of CIs. Intermediation among them and the role of catalyst is played by cluster brokers. They are essential for building the social capital base, for the dissemination of information on clusters and their benefits, for recruiting participants and thus achieving critical mass, for initiating collaboration projects. Their role is even more pronounced in transition economies where cluster members tend to be rather passive and lack ideas how to fill CI frames with viable and beneficial activities. It is therefore very important to choose the right persons for this task. Our suggestion is to nominee such persons who have sufficient local knowledge and also some sense for the technology which is at the core competence of the cluster cooperation. Cluster broker is supported by the organizational body of the CI, which should not be however very extensive. Consulting firms usually lack both types of experience and knowledge. Moreover, local individuals may possess very valuable links to key regional players. Face-to-face contacts in establishing and strengthening linkages are crucial. The job of cluster brokers is rather special and requires special skills that can be obtained through some formal education and training, as well as through practice. Since this is an extraordinarily important position, training of professional cluster brokers is suggested.

Mature clusters' internal power relations changes over time. While in the first phases government and cluster brokers take the initiative, this role slowly shifts to certain firms that may become leaders. Sometimes the take over the role of the cluster broker as well. In other cases it is rather a group of core companies that determine functions and actions of the clusters. We regard this as natural process, however, dominance in

clusters may limit the scope of initiatives and reduce dynamism within the cluster. This should be possibly avoided. Competition and cooperation are equally important for clusters: strong dominance will also reduce competition among cluster participants.

Clusters' internationalization is also important and should be supported. Main areas are commercial and trade links (market expansion), knowledge transfer (both cluster management and technology) and FDI (both in- and outward). International links largely contribute to the expansion and dynamism of clusters.

Recommendations for EU level policies

There are various ways how this process could be enhanced and promoted. European market integration and the further removal of barriers to trade, investment and migration is the most critical factor in improving the efficiency of the distribution of economic activity across regions. The recent watering down of the service directive, debates over a number of cross-European mergers, and the continuous use of rules to close labour markets in many EU-15 countries towards EU-12 are all signs of backward activities. These processes hamper efficient cluster development in the EU-12.

EU-12 countries underwent fundamental structural change in the past 15+ years. In the EU accession period population in these countries was largely willing to accept hardships of change as a condition of joining. With EU-membership achieved and memories of stagnation under socialist regimes bleaching pressure on the public for slowing the pace of structural change is likely to increase, albeit these countries are just half way in their transition process. EU institutions can help to alleviate this pressure by helping new member countries to provide effective support for employees and regions affected by structural change and limit barriers for the change to occur.

The EU should also remove barriers to structural change in its various policies. While many institutions and policies facilitated an effective geographic distribution of economic activity, this was not true for all. The first reason for this is the key policy objective of cohesion across countries and regions. The principle has been often interpreted as simple redistribution of resources from rich to poor regions which works against effective structural change. Another reason is the application of a policy model of defining similar policies throughout Europe, benchmarking all member countries against common goals. This method can be interpreted in ways that work against the development of regional economies that are increasingly more different.

Besides the general policy considerations the European Union can also directly support the creation of regional clusters in EU-12 countries. Structural change of these countries can be enhanced through cluster initiatives. The EU should provide data, tools and methods that improve the quality of cluster initiatives across Europe. Proper statistical database for cluster mapping could be the starting point. More precise, deeper level analysis and the use of several performance indicators would be desirable for this purpose. Another tool is the organization of European cluster initiative alliances, and international platforms for the exchange of best practices among European clusters. The EU can also provide a kind of methodology toolbox for regional cluster development and cluster initiatives. There is an increasing amount of knowledge and experience with practices that can be successfully applied everywhere. EU should coordinate the gathering and exchange of knowledge with the help of network practitioners and make this knowledge available to a wide audience.

Recommendations for national and regional governments

There is a solid underpinning of the argument stating that cluster cooperation positively correlates with economic growth, welfare and innovation. This is not surprising, since major changes in the way of doing business have occurred in the past 20 years. Our analysis also quoted some of these, which very much fitted in to the type of cooperation and action which is carried out in clusters, especially in dynamic clusters. Concentration on core competencies, opening up of global markets, an increase in the concentration of production on now not single companies but cooperating international networks all call for institutional solutions that facilitate networking among firms and also other key players of the national economies. Clusters are very useful institutions providing an efficient answer to these challenges. Hence, this form of networking has spread very quickly worldwide during the past 20 years. While the first cluster initiatives have been set up in the late 1980's (trying to imitate the classic development pattern of the famous predecessors in the US), Sölvell et. al. (2003) could identify over 500 cluster initiatives worldwide.

If we focus on transition economies, we may also add that these countries became integrated in a pan-European division of labour. Most of them are linked to the European economy through linkages of inter-company collaboration, and MNEs play an outstanding role in organizing this kind of cooperation. Hence, new member states of the EU have their role in most European businesses, be it at a lower or higher end of the value chain. The basic logic of development applies for them too and this is increasing concentration, targeting world markets. They also specialize rather strongly on certain segments of the value chains of different businesses. Thus, there is a reason to expect that sectoral concentration is also coupled with spatial concentration. Cluster mapping exercises do prove this, albeit they state that the level of concentration is lower, than in the most developed countries (notably the US and Sweden). We do not share their opinion that concentration should be artificially urged, but do share their suggestion that competition policy should not hamper the meaningful concentration of branches whit widespread international cooperation networks aimed at supplying global markets.

This short summary of the role of new member states in pan-European division of labour should provide the right impression that this collaboration calls for suitable institutions and clusters are one of them. Cluster development really makes sense, and is much more than fashion. We would like to emphasize this, because there is still no solid confidence in policy makers, governments but not in potential cluster members either concerning the importance and role of clusters in Central and East Europe. Thus, our first suggestion would be collecting much information and references on clusters, making this information available in local languages, and deliver the message to all potential participants. This could be envisaged as a form of marketing for cluster initiatives should be carried out.

But not only international references and best practices are required. A solid basis for cluster initiatives can only be created, if there is sufficient information on real ongoing clustering processes. We do not expect formal initiatives, hence bottom-up cluster engineering is not typical for emerging economies. Top down approaches on the other hand do require solid underpinnings which can be partly obtainable from the thorough mapping of local businesses, as well as of other key contributors (R&D, education, finance, etc.). High technology industries may deserve special attention, but cluster initiatives ought to target branches with existing competitive advantages, which are manifested in some spatial concentration. This means, that many of the traditional branches can be also suitable for forming that core competence, which is at the heart of the collaboration in the regional clusters.

In summary, gathering and dissemination of information is necessary on two topics. First is experience with clusters, best practices, and highlighting the rationale of cluster initiatives. A second area is a deep analysis of the spatial and sectoral features of the national economies that highlights those regions and businesses

that show up competitive advantages and are therefore suitable and fertile ground for cluster initiatives. In cluster mapping as well as in marketing the cluster idea regional governments may take the lead role.

The next topic is cluster establishment and development. Three issues deserve special attention. First is the creation of social capital and thus working interfaces for cluster activities, second is the role of governments and mediating persons and institutions in this process, third is appropriate tools for promoting cluster initiatives. The broadest issue is certainly creating strong social capital base. The problem is that due to the heritage from the socialist era, there is a fundamental mistrust between businessmen, business and government, but even between business and academia. The basic conditions for the building of social capital are extremely bad in the region. Both national and regional governments can do something to improve this situation: they must consider themselves as service suppliers to clients, treat themselves as institutions and persons who must serve customers, and not *vice versa*. If there is a change in the behaviour of authorities, or institutions that were set up to promote business but instead they behave as authorities used to, clients will trust them more. Respect to business people is a more difficult problem hence governments can help only little for the spread of ethical behaviour in business. Nevertheless, it is again mainly the regional governments, and chambers of commerce and trade which should organize courses among others on business ethics.

The second issue was the role of governments and mediating persons and institutions. Their role is outstanding in top-down cluster initiatives. Unfortunately, there are no professional cluster brokers available in the new member states. Maybe, this activity is not yet a real profession, though the qualities and knowledge which is desirable is well described, and there is already some accumulated experience and best practices. This important and until now not publicized knowledge should be distributed in form of some formal education. Probably a nationwide program could be launched which then could be executed by local authorities. Later, this formal education could be enriched with special trainings and presentations of internationally acknowledged experts, series of seminars, meetings of practitioners, etc. Important is sharing of knowledge, which is by the way also a fundamental feature of clusters. Cluster brokers should be chosen from applicants which have sufficient local knowledge, as well as a sense to the technologies and business which is at the core of the cluster. They can serve better as IFC leaders, than consulting companies, which lack the insider knowledge.

Cluster initiatives require government support to get launched. This support used to be financial aid, but they need more, they would also need some kind of professional support. Financial support should be granted on more rigorous basis, so that "virtual clusters" do not get financed. Money should be provided on competitive basis, and the use of the grants controlled also during the process of clustering. Here again an interplay of national and regional governments is necessary. The evaluation of projects should take into consideration the life cycle characteristics of cluster initiatives. There is no reason to expect major breakthrough within less than 3 years time. It is also worth considering if the time span of projects expands to over three years.

Our survey revealed the fact that in some respects current cluster policies and also the practice of cluster initiatives suffer from deficiencies. SME financing is a traditionally neuralgic point of most transition economies. Seed money provided by the state for cluster initiatives can do part of the job in the initial phase, but later there is an intensive need for financial institutions that specialize on making business in clusters. Venture capitalists were the first nominees for this role, however, their market is perhaps the least developed in the generally underdeveloped capital markets of transition economies. But we are afraid, that the situation is not much better in core Europe either. Thus, there should be some efforts taken to get financial institutions involved in cluster cooperation. One option could be including local savings banks, which at least hypothetically possess more local contact and know local customers better, than other banks.

5. Common quality guidelines for effective cluster management

Based on the results of our research carried out in CEE ClusterNetwork project and taking into account the main findings of other surveys (e.g Ketels and Sölvell, 2005) as well as the literature, common quality guidelines for effective cluster management can be formulated according to the following:

Policy level

Regional clustering of firms with interrelated activities is an important competitive feature of many economies. Clusters are regionally concentrated and specialized based on core competencies and activities collaboration of firms (both large ones and SMEs), academic and financial institutions. SMEs, as key cluster actors are connected to specific regions and increasingly capable of achieving world-class competitiveness as well as innovation in new ways. Hence they are able to engage in mutually beneficial collaboration with other firms and actors.

In many cases clusters also develop organizational frameworks called cluster initiatives.

Because of a cluster's strong effects on innovation, technology and knowledge transfer as well as on increased firm level and regional competitiveness, business promotion agencies, regional and national governments may also support clustering process.

►*Cluster initiatives are important instruments for economic development and innovation policy especially in case of SME's.*

Cluster cooperation positively correlates with economic growth, welfare and innovation. Concentration on core competencies, opening up of global markets, an increase in the concentration of production on now not single companies but cooperating international networks all call for institutional solutions that facilitate networking among firms and also other key players of the national economies. Clusters are very useful institutions for providing an efficient answer to these challenges.

Cluster development policies overlap with numerous more general policy fields on a regional, national and European level as well. When proper coordination of the various levels and areas of policy is at issue, the main concern for coordination should be that the basic rationale of clusters is not overshadowed by various other policy tools.

►*Strategic linkage of European, national and regional policies is crucial for dynamic and sustainable development of clusters.*

Cluster initiatives also fit smoothly into the European development policy concept. Whenever they serve as an agent for knowledge generation and transfer, they must use exploit potential for international reach and scope.

►*Regions of CEE cluster networks actively strengthen cross-regional co-operation to leverage the benefits of technology transfer and a competitive value-chain. This is the basis for internationally competitive "European innovation areas".*

Entrepreneurs from the CEE region are in general in the need of general managerial knowledge, knowledge and appreciation for cluster concepts. They also suffer from a fundamental mistrust of each other. These two factors combined imply that one major aim of cluster development policies should be to integrate into a broader concept of capability and social capital building process and policy at the regional level. The same also applies for proper financing. State support may play a crucial role in the initial phase of cluster initiatives' life cycle, but later there is an intensive need for greater involvement of (regional) financial institutions and venture capitalists in clusters.

►*Key success factors for cluster policy are active participation of cluster companies, clear organisational structures, and long term strategic financial support,*

Management level

Since clusters are characterized by simultaneous rivalry and cooperation – often called *coopetition* –, conflicts among cluster members are frequent. The steady process of managing cooperation of conflicting actors requires a suitable cluster manager. The cluster also needs a credible and sustainable framework within which to act and to have well defined objectives and activities.

►*Success of cluster management bases on the consensus on cluster strategy.*

The main actions of the clusters show a range of possibilities. The services provided by clusters may become more institutionalized when clusters pass infancy. A recommendation of preferred services for clusters would be to boost the service providing capabilities of these clusters.

►*Recommended services of cluster initiatives are in the field of:*

1. Networking, trust building among members

Creation of social capital and working interfaces for cluster activities are essential.

2. Information and communication systems using different channels, is essential for the success of cluster initiatives. They have an important role in helping the interchange of intra-cluster information and between the cluster and its marketplace.

3. Measures for qualification, professional and executive trainings and development of human resources are all potential tools for improving competency among employees of the member firms. Human resource management is also a key factor. These activities also have beneficial direct effects (e.g. share of experience) and indirect ones such as trust building, increased potential for cooperation etc.

4. Initiating, stimulating and managing innovation projects and technology transfer between SME's, large companies, universities and R&D institutions

Co-operation is essential for improving innovative capability and hence competitiveness. The initiation, development and support of co-operation projects (e.g. R&D) represent an important area of the activity of the clusters.

5. Marketing for the cluster members, projects and the region

Marketing and PR strengthen the involvement of the existing members and attract new companies or research organisations to join the cluster.

6. Market research and industrial foresight programs

Given the dynamic environments under which the market operators take decisions, knowledge about the market, trends and possible future scenarios is essential for success and even for survival. Jointly financed research projects about their market would help cluster members to develop their business and to share the costs and benefits of joint research.

7. Activities to open international markets

Clusters should support their members during internationalisation activities and be open for further international expansion.

8. Stimulation of common purchasing

Cost reduction is a basic instrument for surviving in competitive markets. Common purchasing in clusters is a cost effective instrument.

9. Improving members' access to capital

In most new member states, the lack of access to capital is still an important factor which limits the speed and possibility of development of the companies at all level.

10. Quality management (benchmarking)

Evaluation of a cluster initiative can be carried out by measurable indicators guaranteeing evaluation quality. These indicators can also be used as benchmarks for further comparisons.

References

Andersson, T., Schwaag-Serger, S., Sörvik, J. and Hansson, E. (2004): *The Cluster Policies Whitebook*. IKED, Malmö

Bakács A., Czakó V., Sass M. (2006) Beszállítók és hálózatosodás: az Electrolux-Lehel példája. (Suppliers and networking: the example of Electrolux-Lehel) Külgazdaság, L., no.7-8, pp. 44-59.

Bathelt, H., Malmberg, A. and Maskell, P. (2002) *Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation*. DRUID Working Paper No. 02–12, Copenhagen

Breschi, S. and Malerba, F. (2001) "The geography of innovation and economic clustering: some introductory notes", *Industrial and Corporate Change,* Vol. 10 No. 4, pp. 817–833.

CILOE (2006) "Cluster Management Guide – Guidelines for the Cluster Development and Management of Cluster Initiatives. Clusters Linked over Europe Program" www.clusterforum.org

ECOTEC (2003) "A Practical Guide to Cluster Development. A report to the Department of Trade and Industry and the English RDAs UK", London: Department of Trade and Industry

European Commission (2002) *Regional Clusters in Europe* Brussels: Observatory of European SMEs No 3.

European Commission (2003) *Final report of the Expert Group on Enterprise Clusters and Networks* Brussels: Enterprise Directorate General.

Hendry, C., Brown, J. and DeFillipi, R. (2000) "Regional clustering of high-technology-based firms: opto-electronics in three countries", *Regional Studies,* Vol. 34 No. 2, pp. 129–144.

Gecse, G. (2004): Hungarian Budding Clusters. Department for Innovation and Environmental Protection, Ministry of Economy and Transport

Gereffi, G., (1999) "International Trade and Industrial Upgrading in the Apparel Commodity Chain." *Journal of International Economics* 48, 1 (June): 37-70.

IKED (2004), *Enabling Trust in the Digital World* IKED Malmö

Kenney, M. (Ed.) (2000) *Understanding Silicon Valley: The Anatomy of an Entrepreneurial Region*. Stanford, CA: Stanford University Press.

Ketels, C. (2004) *European Clusters*, Hagbarth Publications.

Ketels, C. and Sölvell, Ö.(2005) "Clusters in the EU 10 new member countries" Europe INNOVA

Krugman, P. (1991), *Geography and Trade*, Cambridge MA: MIT Press.

Malmberg, A. and Maskell, P. (2002) "The elusive concept of localization economies: towards a knowledge-based theory of spatial clustering", *Environment and Planning A,* Vol. 34, No. 4 pp. 429–449.

Martin, R. and Sunley, P. (2003) "Deconstructing clusters: chaotic concept or policy panacea?" *Journal of Economic Geography,* Vol. 3 No. 1, pp. 5–35.

Marshall, A. (1890), *Principles of Economics* London, Macmillan

Nadvi K.(1997) "Industrial Clusters and Networks: Case Studies of SME Growth and Innovation", *UNIDO Small and Medium Enterprises Programme* (mimeo).

Nadvi, K., & H. Schmitz (1994), "Industrial clusters in less developed countries: Review of experiences and research agenda", *IDS Discussion Paper* 339. Institute of Development
Studies, Brighton.

Porter M. (2003) "The economic performance of regions" *Regional Studies* Vol. 37 No. 6, pp. 549–578.

——— "Clusters and Competition: new agendas for companies, governments, and institutions", in: Porter, M. (Ed.) *On Competition*, pp. 197–287. Cambridge, MA: Harvard Business Review Books.

——— (1990) *The Competitive Advantage of Nations*. New York: Free Press

—— (1998): On competition. Boston: Harvard Business School Press

Pouder W. and W St. John (1996), "Hot Spots and Blind Spots: Geographical Clusters of Firms and Innovation" *Academy of Management Review*, Vol. 24 No. 4, pp. 1192-1225.

Ravn, L. – Petersen, J.W. (2005): Cluster Development in Hungary. A study of the possibilities for the automotive industry and the wood and furniture industry to enhance regional sustainable development. Department of Environment, Technology and Social Studies, Roskilde University

Roelandt, T. and den Hertog, P. (1999) "Cluster Analysis and Cluster-Based Policy Making. The State of the Art" in *Boosting Innovation: the Cluster Approach* Paris: OECD.

Saxenian, A. (1994) *Regional Advantage: Culture and Competition in Silicon Valley and Route 128* Cambridge MA: Harvard University Press

Scott, A.J. (1996) "Regional motors of the global economy", *Futures* 28, pp. 391-411.

Sölvell, Ö., Lindquist, G. and Ketels, C. (2003), *The Cluster Initiative Greenbook* Stockholm: Ivory Tower AB.

SRI International (2001), "The Illinois Model of Technology Driven Economic Development" accessed from www.illinoisbiz.biz/tech/pdf/cluster_overview.doc

Sturgeon T. J. (2003) "What really goes on in Silicon Valley: Spatial clustering and dispersal in modular production networks" *Journal of Economic Geography* Vol. 3, pp. 199–225.

Venables, A.J. (2001): Geography and International Inequalities: the impact of new technologies. Paper prepared for World Bank Annual Conference on Development Economics, Washington.

Wolfe, D and Meric Gertler (2004) "Clusters from the Inside and Out: Local Dynamics and Global Linkages" *Urban Studies*, Vol. 41, Nos 5/6, pp. 1071-1093