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CLUSTERS IN HUNGARY AND IN CENTRAL EUROPE

Regional clusters evolved spontaneously at various places in the world following different development patterns. Their success in enhancing competitiveness moved governments and entrepreneurs to copy the patterns. Later on cluster development became part of the European Union's long-term Lisbon competitiveness program in the form of innovative clusters. This article introduces the basic characteristics and features of regional clusters. Then, it argues that without paying due attention to the proper establishment of the basic features fulfillment of other policy goals, like curbing innovation process, cannot be expected.
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Introduction

Agglomeration of economic activity is a phenomenon which has occurred as long as human history. In ancient times certain business activities (e.g. trading) concentrated in specific locations, mainly in large settlements of population. Centers of active and vibrant economic development and welfare continued to attract various businesses later on. With the advance of capitalist economic and social development some of these centers begun to specialize in certain industrial activities. Technological development remained an important driver of specialization also later on. Improved production technologies increased batch sizes suitable to deliver ever increasing numbers of customers and promoted economies of scale and scope. For example, 100 years ago the Pittsburgh area of the United States accounted for 80 % of world steel production. Hence, regional concentration is not a new phenomenon. What is then new in clusters? What are their beneficial features? If yes, how should be clusters promoted?

This document explores possible answers to these and related questions. Its main concern is the proper distinction of clusters from other types of economic activity concentrations, both theoretically and empirically. The paper is structured therefore as follows: the first part deals with some conceptual questions. How and why are

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economists concerned with the phenomenon, what are the most important theoretical underpinnings of the cluster concept? We briefly introduce here the ideas of Michael Porter who has provided some of the most influential contributions in the field recently. In the second section we discuss the most important features of modern working clusters, and also highlight some special circumstances that may influence cluster development: cluster size and specificities of transition economies. In the third part cluster mapping survey results are introduced. Cluster mapping may identify those geographic locations and economic activities where a critical mass of firms and related institutions, as well as economic potential is concentrated that may create a sound basis for institutionalized forms of clustering.

1. The concept: agglomerations, traditional and dynamic clusters

As early as the work of Marshall (1890), there has been an awareness of the importance of geographical proximity in determining the location of industrial activity. Marshall argued that clusters develop as a consequence of three factors (a) the presence of a skilled local labor market, (b) key inputs from suppliers and (c) rapid know-how transfer between firms leading to technological spillover. Similar arguments have been put forward in Krugman (1991, 1995) and Krugman and Venables (1995). Econometric evidence from Audretsch and Feldman (1996) also suggests that innovative activity – at the core of cluster development – tends to cluster due to technological and knowledge-based spillovers.

Much of the literature has sought to interpret the reasons of three simultaneous observations. The first was that a large portion of total world output was being produced in a limited number of highly concentrated industrial core regions. The second observation was that firms in related industries tended to co-locate and thus form spatial clusters. The third observation was that both these phenomena tended to be persistent over time as these agglomerations became institutionalized. Once in place the agglomerative process tended to be cumulative and therefore path dependent. In more recent scholarly work further empirical observation has come to the forefront: certain agglomerations tend to produce superior innovative outputs.

One of the central outcomes of this literature is that in imperfectly competitive markets economic activity is likely to be spatially distributed in an uneven fashion. Industries will tend to cluster in response to agglomeration economies – where cost savings and efficiencies from production emerge as a consequence of proximity. Examples of agglomeration economies include access to a local skilled labor force, existing physical and technological infrastructure, links between universities and industrial activities. Agglomeration economies are especially important in industries where innovation is a central factor in the success of industrial activity. Firms in related industries will be attracted by the innovative activities of other firms through learning spillovers between them. Networks of communication and interaction between the firms in the cluster play a large role in the sustainability of the cluster.

A distinction can be made among different types of agglomeration economies (i.e. various kinds of rationale of agglomeration process). One type relates to general

economies of regional and urban concentration that apply to all firms and industries in a single location (urbanization economies), representing those external economies enjoyed by firms as a result of saving from the large-scale operations of the agglomeration as a whole. These are the forces leading to the emergence of industrial core regions and metropolitan regions. A second type is the more specific economies that relate to firms engaged in similar or inter-linked activities that lead to the emergence of industrial districts (localization economies). Such districts provide the base for flexible production systems that can serve volatile markets. In both cases agglomeration economies are rooted in functioning processes where linkages among firms, institutions and infrastructure of a given location give rise to economies of scale and scope. Examples are the development of general labor markets and pools of specialized skills, dense interactions between local suppliers and customers, shared infrastructure and other localized externalities. Agglomeration economies arise when such links lower the costs and increase the returns of the firms taking part in the local exchange. Presence in agglomerations improves performance by reducing the costs of transactions for both tangibles and intangibles.

Clustering is generally defined after Porter's first description (Porter, 1990) as a process of firms and other actors co-locating within concentrated geographical area, cooperating around a certain functional niche (competing elsewhere), and establishing close linkages and working alliances to improve their collective competitiveness. This concept is related to but goes beyond that of agglomeration of related activities. Whereas simple co-location may be associated with favorable external effects that are not intended but rather incidental, joint strategies and actions motivated by the anticipation of mutual benefits are fundamental to clustering.

The industrial clustering work of Porter (1990, 1998 and 2003) is regarded as seminal. Conversely to the prevailing in the US local development approach focusing on diversified economies, he advocated specialization according to historical strength by emphasizing the power of industrial clusters. Porter emphasized that firms' competitiveness was determined by multiple factors only partly endogenous to them. In his "diamond model" four sets of interrelated forces were brought forward to explain industrial dynamics and competitiveness. These were associated with factor input conditions, sophisticated local demand conditions, related and supported industries and firm structure, strategy and rivalry. A core notion arose around his model stressing that collaborative, mutually supportive group of actors could enhance regional competitiveness in global markets and thus creates growth and other benefits. Also, the significance of face-to-face contacts and personal demonstration, exchange of experience, the role of geographical proximity for knowledge transfers and innovation has been explored and emphasized.

Another string of related economic thought elaborated on knowledge creation and innovation as a social process engaging individuals that exchange tacit and explicit knowledge. Trust-based relationships and social capital may thus be important for enabling horizontal cooperation between individuals within and across firms and institutions. Further support for Porter's findings comes from research on the importance of social networking as central to cluster development (Pouder and St.

John 1996, Saxenian 1994). With reference to CEE, the work on developing country clusters is also important. Of note – the research of Nadvi (1997) and Nadvi and Schmitz (1999) who provide excellent case analyses of labor-intensive export based clusters in India and South America.

Porter (1998) further stressed that local competition creates incentives to emulate best practice and boosts pressures to innovate, while also connects the strengths of competition with the virtues of selective cooperation. The concept of clusters was related to the competitiveness of industries, regions and nations. Hence he formulated the definition of clusters as follows: "Clusters are a geographically proximate group of interconnected companies and associated institutions in a particular field linked by commonalities and complementarities. Clusters encompass an array of linked industries and other entities important to competition…including governmental and other institutions – such as universities, standard setting agencies, think tanks, vocational training providers and trade associations." (Porter, 1998) Porter thus believed that clustering was largely an organic bottom-up process driven by the market.

Traditional advantages of the agglomeration phenomenon are predominantly static. Increased efficiency of the transactions of goods and services provide benefits for firms located in agglomerations. This strong focus on the efficiency and intensity of local arms length transactions has lost importance in current cooperation models. The much theorized business links among agglomerated firms has proven to be weak. In today's global economy a large proportion of firms have few or no trading links with other local firms in the same cluster, even when there is a strong spatial clustering of a particular industrial sector. But such clusters continue to play an important role without any significant local input-output relationships. Sustained competitiveness is increasingly explained by capabilities leading to dynamic improvement than by achieving static efficiency (Porter, 1990). In this context clusters are not solely fixed flows of goods and services or production inputs, but rather dynamic arrangements based on knowledge generation and innovation in a broad sense. Innovation, knowledge generation and transfer have become primary explanatory factors of the new agglomeration types, the dynamic clusters.

Thus, clusters are made up not only of physical flows of inputs and outputs, but also by intensive exchange of business information, know-how, and technological expertise both in traded and non-traded forms. While Porter was mainly concerned with the existence and reproduction of clusters with technologically related firms, latest attempts are targeted at the analysis of learning abilities and creativity of spatial agglomerations. Instead of specialization and spatial clustering of related industries, emphasis is placed on the presence of a regional variety of skills and competencies, where the interaction among different actors leads to new and often unexpected ideas. The concept of the dynamic clusters was elaborated and introduced by Sölvell *et al.* (2003) and Sölvell (2008). This concept is very much in line with current developments of the production factors engaging technology and skills intensively with the increasing knowledge content of traded goods, and services becoming more pervasive.

Growth and prosperity today crucially depend on the ability of individuals and organizations to generate access and utilize knowledge and information. Information and communication technologies play the role of a generic-purpose technology, the production and use of which provides pervasive driving force for productivity growth. International exchange is further boosted by the intertwined influence of liberalization and globalization of goods and factor markets. Large scale investments in human capital and intensified learning process are also important elements of the new growth trajectory. From the viewpoint of our topic organizational changes in the new environment are of paramount interest. In particular, the significance of its connection to human interactions and innovation has to be underlined. Studies have explicitly demonstrated the influence of organizational change on the use of skills, technologies and economic performance, or the emergence of learning organizations. One of the relevant research areas in this vain is the focus on clusters. Here the roles of interactions and mutual adjustment to relationships are linked to proximity and the idiosyncratic features of a place. The interest in clustering (most importantly dynamic clusters) has been boosted by the coinciding disappointments with other policy approaches, the appreciation of innovation in academia as well as business and policy circles, and innovation's perceived links to clustering process and dynamic clusters. Though benefits and usefulness of agglomerations and static clusters is widely acknowledged yet, innovativeness is a key aspect of dynamic clusters that policy mainly concerned with today.

The emphasis on the outstanding role of knowledge generation, innovation and information exchange in dynamic clusters in contrast with traditional clusters means that this is one of their most important functions. Information sharing and innovation also occur in traditional clusters but their most important function is enhancing regular trading contacts and production via various economies of scale and scope. Hence, in the further analysis of empirical facts we treat innovation and the exchange of information among other features as important functions of both static and dynamic clusters. Dynamic clusters are however, differentiated by their closer specialization on technology intensive branches of production, and cooperation aimed at knowledge generation and innovation rather, than on economizing in arms length business contracts. Needless to say, both types of clusters have their place under the sun. However, their roles as well as the means of their promotion are largely different.

2. Characteristic features of clusters

Spatial concentration

Spatial concentration has been central to the cluster idea from the outset. Even though some approaches have tried to disprove or query the importance of physical agglomeration, there are many aspects that remain at the core of the cluster concept. Venables (2001) proved that the "death of distance", i.e. the extensive use of modern ICT technologies and other technological achievements do not necessarily weaken agglomeration effects. The impact is rather mixed: some effects are weakened, but many others became stronger. Hence, the structure of balance of centrifugal and

centripetal forces in agglomerations probably changed, and so did the structure and functions of agglomerations. But agglomerations and clusters remained strong features of regional development.

The hard facts underpinning the importance of geographical concentration which we described in the previous section remained largely unchanged since the seminal works of Marshall (1890) though their weight and importance changed over time. Thus, for example, availability of specific natural resources as a reason for co-location has lost importance as the knowledge content of traded goods increased and material intensity diminished. This means, that clusters with specialization on natural resource intensive activities were outweighed by other types of clusters. Some of them remained in place; others changed profile (like the already mentioned Pittsburgh area in the US). Economies of scale and scope achieved by sharing infrastructure and information, as well as by the proximity of suppliers, factor markets and demanding customers continue reducing transaction costs of arms length business. For these reasons firms may experience that their belonging to a set of inter-related actors which can in the given region enhance efficiency, supports productivity growth, raises innovativeness, especially due to better access to knowledge, ideas and skills. From this set of potential advantages access to specialized factor markets deserves special attention. It enables companies concentrating on their core competencies and allows outsourcing auxiliary activities to specialized suppliers. Increased flexibility is achieved through the use of cooperating production networks, which is in most cases based on a dense population of firms with inter-related activities. This type of networking lies at the heart of many successful clusters (Third Italy, Baden-Württemberg) that became a kind of benchmark. Networks operating within clusters may enhance cooperation on various other issues as diverse as training, finance, technological development, product design, marketing, export or distribution.

Specialization

Clusters are usually viewed as organizations or networks of participating actors linked together via a kind of core activity, which provides clear emphasis on the same markets and processes. Traditional clusters showed activity specialization patterns. Various studies have found however, that many clusters have limited business transactions among firms within the cluster. The attention has gradually shifted to the significance of knowledge spillovers and to the dynamic clusters. Hence, specialization in these clusters is primarily not expressed in co-location of business entities of a given sector and their dense business contacts. Dynamic clusters' specialization is not viewed as necessarily limited to a given product or industry category. The dynamic cluster may go beyond relations within a specific sector and its value-chain. In this vain effective clustering needs a strong element of complementary specialization between actors, a common denominator. Actors focusing on core business can couple at these common denominator useful linkages, important synergies in a learning process engaging various organizations. Examples of such inter-sectoral specialization areas are telematics, biotechnology and many other technology areas utilizing interdisciplinary approach in their innovation process.

Cluster actors

Essential to clusters is pluralism. Successful clusters constitute of various kinds of actors, not just firms. In the absence of such pluralism an agglomeration is no more than an enlarged enterprise (a network of companies in which one has the prime role). In such conditions smaller companies may merely serve as subcontractors or clients of the main entity. Recent cluster mappings (e.g. Commission, 2003) report that most clusters comprise mainly of a fairly large number of SMEs. Clusters may also encompass intensive links and alliances with various institutions like universities, research institutes, public authorities, consumer organizations, think tanks, and others. Sölvell et. al. (2003) argue that four main categories of actors are vital and normally present in clusters: companies, governments, the research community and financial institutions. Of importance for cluster initiatives are also the so called Institutions for Collaboration (IFCs), defined as formal or informal actors to promote interest in the cluster initiative among the actors involved.

The various actors are attracted into the cluster by diverse incentives. Their capabilities and roles may vary according to national context and may also evolve over the course of the cluster life cycle. In some countries for example public sector plays the initiative role in the early stage of the cluster life cycle. In others private actors dominate from the outset. In certain countries with strong regional government mandates cluster initiatives are launched by local governments. In other countries relevant decision making is more centralized. In most economies there is a tendency for regional and local authorities to become more active in clustering initiatives, and gain importance relative to national governments in this respect. Nonetheless, national authorities still need to be engaged in cluster policies due to inherent vested interest, and the link to a number of other policy areas which are managed by national authorities.

When the cluster concept was first introduced, the focus was clearly on firms. But as attention has gradually shifted to the challenges of sharing knowledge and skills and to dynamic clusters, a systemic approach emerged which underlines the interplay and interdependence of different actors. The role of universities for example has attracted much attention. Universities are important not only because of their natural missions in education and research, but also because of their potential to serve as nodes for entrepreneurship and science-industry interplay. The extent to which they are able and willing to fulfill these tasks varies country by country. In some transition economies for example, universities have accumulated great strengths in traditional sciences but are not accustomed and open to meet their roles in the context of broader social needs and functions e.g. in the innovation process.

Competition and cooperation in clusters

Connections between cluster actors are characterized by simultaneous competition and cooperation. Competition remains important element of the market also in clusters. It delivers important drivers for improving corporate performance: reduce prices, increase quality, reliability, search for new products and markets, boost innovations. Clusters are not about reducing the importance and extent of

competition. Clusters should not serve as an elite club thus trying to ensure privileges for incumbents either, but they should be open to new entrants. Open entry may also provide new impetus a source of new technologies and knowledge for incumbents.

At the same time actors in a cluster may cooperate around a core activity using their competencies to complement each other. When operating in tandem firms may also be able to attract fresh resources and services that would not be available to isolated participants. By pooling resources and risks and by developing complementary functions firms achieve economies of scale and scope. Central to the quality of cluster operation in terms of information exchange and knowledge flows is trust and recognition. In this sense trust is about sharing a vision and belief in mutually fruitful relations. Building trust means people enabling other people to believe in their mutual long-term benefit. This may be demanding at first contact, especially when new actors enter new markets. It is strongly present in exchanges between people with diverging history and practices. Yet, because the establishment of social capital and trust carries features of a public good, there is a tendency for under-investing in committed relationships. Traditional face-to-face exchange hinges on a spectrum of cultural, institutional and practical means to build security and trust.

Critical mass

Inner dynamics can be achieved only if numerous actors participate in the cluster. The critical mass is necessary for the realization of various scale and scope economies. Multiple interactions are conditional for these, and so are variety of possible combinations, sufficient pool for choice, as well as learning by doing. The presence of critical mass may also support industrial restructuring in a cluster, fostering linkages and complementarities between flexible SMEs and larger corporations. Critical mass may serve as a kind of buffer and make cluster resistant to exogenous shocks and pressures, including the loss of important companies, even if they were regarded as key companies. The absence of critical mass can in turn make a region or a cluster vulnerable to the loss of specific resources and skills, which are essential building blocks of cluster development. Due to path dependence also the likely hot spots of economic development are likely to be in places, where there is a critical accumulation of assets and skills today. Of course, there is no precise description what should be the sufficient level of critical mass, not even the exact measures are applicable. Most likely these variables shall be different in each single location, and dependent on sectoral characteristics, and the constitution of the clusters. In case of industries like nuclear science, pharmaceuticals, motor vehicles, achieving critical mass is likely to be more difficult.

Cluster life cycle

A further important element of the cluster is the mode of organization, the way how actors are linked together. Cluster organization usually undergoes changes during the different periods of cluster life cycle. Clusters are not temporary solutions for acute problems, but have a sense of direction and inner stability over time. However, their structure is not rigid or static, and experience shows that they have

development stages. The stages may not be identical, neither is the pace of development similar. Still, there is an inherent logic to the way how clusters develop, which makes it possible to find some characteristic patterns.

The first stage (or pre-cluster stage) is the simple co-location of various market actors with potential albeit not institutionalized cooperation activities. Second stage is the emerging cluster, in which a number of actors of the agglomeration start to cooperate around a core activity realizing common opportunities through their linkages. The third stage developing cluster attracts new entrants through the positive experiences of collaborating. They may be engaged in the same or related to the core activities, and present in the geographical vicinity of the developing cluster. Formal or informal IFCs may start their activity as organizers of cluster activity. The outside appearance of the cluster becomes established in the form of a label, website, etc. A mature cluster has reached critical mass in the long term stable sense. It has also developed relations outside the cluster to other clusters, activities and regions. There is an internal dynamic of new firm creation through start-ups, joint ventures, spin-offs. The mature cluster is in the last phase transformed into new cluster organizations. As time goes by, markets, technologies and processes change thus, the core competencies of firms and that of clusters also change. In order for a cluster to survive, be sustainable and avoid stagnation, it has to innovate and adapt to the changes. This can mean transformation into one or several new clusters that focus around new core activities (SRI International 2001).

The impact of size

In the first approach, the impact of size can be approached from a national level. Country size impacts the conditions for clustering because of its influence on critical mass and diversity in domestic markets, and thus on international trade and resource flows. Large economies have multiple strongholds in R&D, attracting financial and human resources and FDI. They can also afford more experimentation; are able to devote more financial means for business promotion and are less dependent on export markets or inward-FDI. But they are less exposed to competitive pressures. Current technological change combined with deregulation and liberalization reduced some of these advantages and experience rising costs from failure to enhance flexibility and adjustment process. France, Germany or Italy have been hosts to many pioneering clusters that were leaders in international competitiveness but which have weakened recently just mirroring the slow-down of their overall economic background.

Small economies on the other hand are more dependent on access to global markets. They may have fewer clusters, less resources, narrower spectrum of specialized workers. They may be more dependent on foreign investment companies' activities and face high costs in maintaining institutions in education or in science that cover a broad range of subjects. Innovators can find less receptive firms and competent financiers for commercializing new ideas. On the other hand, the cluster concept may fit well with small countries, since the above mentioned bottlenecks call for prioritizing and for opening towards external markets in order to gain scale economies. Strong incentives are delivered for specialization. Small countries'

innovation systems are more focused on capturing the benefits of technology inflow. Countries like Finland, Ireland or Korea have benefited from being relative latecomers in terms of heavy technology-based institutions, further reducing their inertia to adjustment and facilitating their reorientation towards new priorities.

The second aspect of size relates to firms. Large companies usually enjoy advantages over SMEs in a number of areas, including market power, access to capital. They have access to a deeper pool of human resources and more strategic expertise. They are also more likely to undertake greater investments in R&D and tend to be more international especially in their market reach. In contrast, the vast population of SMEs is greatly heterogeneous and their broader scope for more radical innovations coupled with higher levels of risk-taking, flexibility and entrepreneurship. This advantage of innovative SMEs can be complemented by clustering with other firms that may provide them with the crucial means to compensate for their lack of economies of scale at firm level. Success in this respect requires conditions that allow for a strong presence of complementary factors, such as supportive business services, effective provision of seed and venture capital.

Economies with predominantly large companies tend to obtain stronger impetus from these in cluster initiatives. Focusing on the development of already established core business large firms can be expected to be highly selective and demanding, in shaping external linkages, in order to keep their prices down and transfer development costs to their suppliers. Countries and regions where the majority of firms are directly linked to one company may therefore not be well suited for developing cluster strategies. Chances for success will be improved by private sector business organizations that take the role of establishing trust while maintaining SME integrity.

Special features in transition economies

Though transition economies have experienced fundamental changes since 1989, their economies are still characterized by many important features that differ from more developed traditional market economies. They are still marked by their history of strong public ownership and state dominance over resource allocation. Another important trait is the existence of accumulated investments in basic science, education and training, whereas access to some specific skills used to be withheld. There is also the common heritage of massive past expansion of heavy industries, with underdeveloped consumer goods and electronics production.

The classic weakness experienced by SMEs tends to be particularly pronounced in transition economies. This applies for example to the reliability of transactions, to the underdeveloped supply of professional services in marketing, logistics, technology absorption, etc. Fundamental institutions of a market economy may still be underdeveloped or weak, enforcement of contracts or even property rights may be problematic. The reasons are partly related to regulatory deficiencies, but also to the way bureaucracy is maintained. Many officials still lack the skills and training that would allow for effective reforms and institutional support of market mechanisms. Moreover, the commercial mentalities and cultures of transition economies have not

dramatically changed thus allowing state bureaucracies to be replicated in the form of private bureaucratic practices, slowing down innovation and strategic flexibility. Changes in government often bring unexpected alterations in the rules of the game. Traditional value systems and attitudes continue to account for misallocation in education and training. Less diversified financial markets sharpen resource and liquidity constraints.

Transition economies have a marked history of adverse sentiments in regard to entrepreneurship, although it existed and sometimes even flourished under harsh circumstances. Today's entrepreneurs in these countries carry that heritage. To some extent they comprise the survivors of the old regime others constitute younger generations whose practices contrast sharply with the old ways. In both cases entrepreneurs may confront widespread suspicion in broader society. This has strong implications for trust and networking, and the viability of top-down versus bottom-up approaches of cluster development.

3. Empirical evidence: cluster mapping surveys

In this chapter results of cluster mapping efforts are discussed. While the origins of clustering included mostly bottom-up organizations, increased interest in cluster development as policy tool resulted in large numbers of clusters that did not have traditional or organic spatial development roots. Many times it was governments that boosted the organization of cluster initiatives. In many cases general purpose tools and public funds were used without specific regional or sectoral targeting. Hence, cluster initiatives might have started functioning wherever local or regional actors could organize themselves for this purpose.

In the previous chapter we defined some of the specific features of the clusters. First was spatial concentration, second specialization on some core competence. It is rather obvious that in the case of a top-down initiative these characteristics can be controlled in advance. It is therefore quite surprising, that cluster mapping has not become a general practice by governments. Up till 2005 it was only the USA, where nationwide effort was made in the late 1990's. The measurement methodology was developed by Michael Porter's "Competitiveness Center" at Harward Business School (for details see: http://data.isc.hbs.edu/isc/index.jsp). And while many governments started to support cluster initiatives the first comparative surveys of existing cluster organizations and mapped spatial concentrations showed no convincing overlap. The first attempts at calculating spatial concentration measures were carried out in the mid 2000's but even these efforts were not always given the right attention by policy makers. For example, in Hungary, there was such an effort in 2003, but it was conducted when the cluster promotion program has already been opened for applications (Ravn and Petersen, 2005). An *ex-post* survey compared the identified clusters with the list of existing cluster initiatives. Only 10 of the then 22 Hungarian cluster initiatives matched the hot spot map, that identified 24 examples of above average spatial concentration of industries (Gecse, 2004).

The above mentioned weak result of match by actual cluster initiatives and statistically registered spatial concentrations raises the question of how to explain this failure? Was it the inappropriate analytical framework that created distortions in the mapping procedure? Or rather, it was due to a high number of "virtual cluster initiatives"? Or maybe, and most likely, do both explanations contribute an overall explanation?

Without going into detail, a brief overview of methodological problems is due here. The cluster mapping procedure tries to identify spatial locations where the representation of certain industries or economic activities is higher than average, i.e. where they seem to concentrate. The logic is simple, in these places there must be some kind of a competitive advantage that is perceived by economic actors, and they tend to co-locate. There are three types of industries that have different reasons to co-locate. A large number of manufacturing branches and even more service providers (typically personal services) are located right at their markets. The dispersion of such industries is roughly even in all regions. Per capita measures for example are very close to each other in the various geographic regions of a country. Natural resource based industries on the other hand tend to concentrate mainly at the location of the valuable asset. These industries may serve the global market, but they do not have much location choice. The third group of activities is most important for us, these are industries that concentrate at locations, hence, they choose among many potential sites. These industries are regarded as cluster-industries. In the case of the US economy their proportional share in employment was close to one third, but they recorded higher than average wages, productivity and innovation (Ketels and Sölvell, 2005).

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 disaggregation 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.

Ketels and Sölvell's survey found nevertheless interesting results. We summarize them in the following. 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).

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. Ketels 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.

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
Warsawa	22	1,38	77
Katowice	21	1,40	81
Praha city	19	1,90	78
Lithuania	19	1,58	70
Krakow	18	1,29	68
Liberec	17	1,55	62
Lodz	16	1,60	71
Wroclaw	16	1,45	60
Poznan	15	1,15	72
Nitra	14	1,40	60
Bydgoszcz	14	1,27	58
Slovenia	14	1,27	56
Olomouc	14	1,40	45
Latvia	13	1,44	62
Gdansk	13	1,44	59
Praha region	13	1,63	43
Bratislava	12	1,50	65
Brno	12	1,20	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.

In Hungary Gecse (2004) calculated the first locational quotients. He was commissioned to compare spatial endowments (especially the density of business) with the regional distribution of cluster initiatives that received state support in the period 2000-2002. This was the first attempt in Hungary to measure regional concentration of activity using official statistical figures. The main finding of the paper was that in many cases rent seeking could be detected: cluster initiatives formally met weakly defined support qualification requirements without having sufficient background to meet the long term goals of the projects. In some cases applicants obviously had no intention to do so at all.

The following table shows all Hungarian clusters that obtained more than one stars:

Cluster mapping results of Hungary (2004)

Region	Branch	Evaluation
Nyugat-Dunántúl	automotive	***
Dél-Alföld	food	***
Közép-Dunántúl	information technology	***
Közép-Magyarország	business services	**
Közép-Magyarország	entertainment	**
Közép-Magyarország	financial services	**
Közép-Magyarország	building fixtures	**
Közép-Magyarország	information technology	**
Közép-Magyarország	paper and publishing	**
Közép-Magyarország	transportation	**
Észak-Alföld	food	**
Észak-Alföld	construction	**
Nyugat-Dunántúl	food	**
Nyugat-Dunántúl	information technology	**
Észak-Magyarország	metal	**
Közép-Dunántúl	food	**
Közép-Dunántúl	building fixtures	**
Közép-Dunántúl	metal	**

Source: Ketels és Sölvell (2005)

As far as methodological aspects are concerned, Gecse's exercise suffers all the usual shortcomings of the method. He only used employment data, observed mainly NACE 2 digit level regions comparing them to the national average concentration levels as a benchmark. Also Gecse used threshold levels, but they were much lower than e.g. in case of Ketels and Sölvell (2005). His threshold level was only 2000 employees, but he went in many cases even below this choosing in one case a branch with just 1149 employees as likely for clustering. A third shortcoming of his calculations was that unlike Ketels and Sölvell (2005) he could not use Porter's original classification method of "traded clusters", but used just the standard NACE 2 digit level categories instead. The very strong aggregation at this level, as well as the completely different content (mixing tradable and non-tradable activities) deteriorated the quality of his results substantially. There was a further problem with the statistical recording of economic activity: most statistical data of the Hungarian Statistical Office records economic activity using the location of the headquarters of firms instead of the place where activity is carried out actually. Hence, in the very much centralized Hungarian economy much of the country-side economic activity is registered for the capital city Budapest. This further increases the dominant economic position of Budapest even further.

Evaluation of Hungarian clusters (2007)*

All regional clusters in Hungary 1,2 and 3 star regional clusters								
Region	Cluster category	Employees	Size	Spec.	Focus	Stars	Innovation	Exports
Kozep-Magyarorszag	**Transportation**	50163	0,81%	1,23	4,00%	**	High	Weak
Kozep-Magyarorszag	Education	44476	1,00%	1,89	3,00%	**	High	N/A
Del-Alfold	**Food**	34101	0,68%	2,89	7,00%	**	Low	Weak
Kozep-Magyarorszag	**IT**	30735	1,00%	2,26	2,00%	**	High	Strong
Kozep-Dunantul	Automotive	17091	0,66%	2,85	4,00%	**	Low	Strong
Nyugat-Dunantul	**Automotive**	16741	0,64%	2,98	4,00%	**	Low	Strong
Kozep-Magyarorszag	Biopharma	14197	1,00%	2,61	1,00%	**	High	Weak
Kozep-Dunantul	**IT**	12535	0,61%	2,64	2,00%	**	Low	Strong
Kozep-Dunantul	**Building Fixtures**	11702	0,50%	2,17	2,00%	**	Low	Strong
Nyugat-Dunantul	**IT**	10995	0,54%	2,47	2,00%	**	Low	Strong
Nyugat-Dunantul	Lighting	6888	1,00%	6,17	1,00%	**	Low	Very strong
Kozep-Magyarorszag	Lighting	6832	1,00%	2	0,56%	**	High	Very strong
Del-Dunantul	Leather	3086	1,00%	10,32	0,95%	**	Low	Weak
Kozep-Magyarorszag	**Finance**	43439	0,61%	0,92	3,00%	*	High	Weak
Kozep-Magyarorszag	**Entertainment**	28559	1,00%	1,96	2,00%	*	High	Very strong
Eszak-Alfold	**Food**	22460	0,45%	1,73	4,00%	*	Low	Weak
Eszak-Alfold	**Construction**	18230	0,28%	1,07	3,00%	*	Low	N/A
Kozep-Dunantul	**Metal**	17403	0,44%	1,92	4,00%	*	Low	Weak
Kozep-Magyarorszag	**Publishing**	16886	1,00%	1,55	1,00%	*	High	Weak
Eszak-Magyarorszag	Food	16116	0,32%	1,51	4,00%	*	Low	Weak
Kozep-Dunantul	Construction	16020	0,24%	1,06	3,00%	*	Low	N/A
Eszak-Magyarorszag	Construction	15650	0,24%	1,11	3,00%	*	Low	N/A
Kozep-Dunantul	**Food**	15246	0,31%	1,32	3,00%	*	Low	Weak
Nyugat-Dunantul	Food	14718	0,29%	1,36	3,00%	*	Low	Weak
Del-Dunantul	Food	14374	0,29%	1,63	4,00%	*	Low	Weak
Del-Alfold	Construction	13783	0,21%	0,89	3,00%	*	Low	N/A
Eszak-Magyarorszag	**Metal**	13190	0,34%	1,57	3,00%	*	Low	Weak
Nyugat-Dunantul	Construction	12918	0,20%	0,91	3,00%	*	Low	N/A
Kozep-Dunantul	Transportation	12078	0,20%	0,85	2,00%	*	Low	Weak
Nyugat-Dunantul	Hospitality	11702	0,32%	1,47	2,00%	*	Low	Strong
Del-Dunantul	Construction	11151	0,17%	0,96	3,00%	*	Low	N/A
Del-Dunantul	Finance	9012	0,13%	0,72	2,00%	*	Low	Weak
Eszak-Magyarorszag	Chemical	6130	0,64%	2,97	1,00%	*	Low	Weak
Eszak-Magyarorszag	Communications	5910	0,74%	3,47	1,00%	*	Low	Very strong
Kozep-Dunantul	Communications	5890	0,74%	3,21	1,00%	*	Low	Very strong
Nyugat-Dunantul	Heavy Machinery	5341	0,64%	2,97	1,00%	*	Low	Weak
Eszak-Alfold	Heavy Machinery	4362	0,52%	2,02	0,92%	*	Low	Weak
Del-Dunantul	Communications	4333	0,54%	3,09	1,00%	*	Low	Very strong
Del-Alfold	Constr, Materials	3863	0,64%	2,72	0,89%	*	Low	Weak
Nyugat-Dunantul	Communications	3475	0,44%	2,01	0,87%	*	Low	Very strong
Kozep-Magyarorszag	Jewelry	3445	1,00%	1,75	0,28%	*	High	Weak
Eszak-Magyarorszag	Lighting	3357	0,65%	3,04	0,85%	*	Low	Very strong
Eszak-Alfold	Lighting	3084	0,60%	2,3	0,65%	*	Low	Very strong
Eszak-Alfold	Footwear	3066	0,70%	2,71	0,64%	*	Low	Weak
Del-Alfold	Oil and Gas	2372	0,67%	2,84	0,55%	*	Low	Weak
Del-Dunantul	Fishing	1369	0,38%	2,16	0,42%	*	Low	Weak
Eszak-Alfold	Leather	1167	0,69%	2,65	0,24%	*	Low	Weak
Nyugat-Dunantul	Leather	1041	0,61%	2,83	0,26%	*	Low	Weak

* A brief description of the calculation method is provided in the text. In case of the size one star was given to clusters that belonged in this regard to the top 10% of all clusters in the EU concerning this feature. The % figure in this table shows the actual share of the given Hungarian cluster in Europe's total (total employment in the given sector in all European clusters). In the case of specialization values over 2 earned one star. For the notion of focus those clusters got one star, which belonged to those 10% of clusters that contributed the most to total local cluster employment. The % figure in the table shows the actual share of the cluster in employment of the region. Those clusters that also appeared in Ketels and Sölvell's 2004 table are bold.
Source: http://www.clusterobservatory.eu

The European Union picked up Porter's idea and its extension by Sölvell and addressed dynamic clusters (in EC terms "innovative clusters") one cornerstone of the more concrete and operative implementation plan of the Lisbon targets by the mid 2000's. The emphasis on cluster development via European means gave new impetus for cluster research as well. Based on previous works at the Stockholm School of Economics new research institutions were created. The European Cluster Observatory started to work in 2005. One main research output of this institution is its cluster mapping database (http://www.clusterobservatory.eu). The database contains employment data broken down according to Porter's original categorization of "traded clusters" for the European NUTS 2 level regions. The same types of measures are calculated than what was used in Ketels and Sölvell (2005). Thus, the problem of using only one indicator (employment), as well as the too broad and rather rigid separation of regions still remained also in this database. Nevertheless, the availability of methodologically comparable data for the whole territory of the EU is an important new feature in cluster research. Also, the database contains some basic evaluation of the registered clusters' exports and innovative activities that helps readers identifying the "true innovative clusters".

As far as the actual results are concerned, data of the observed Hungarian clusters are summarized in the next table. As is seen, none of the spatial concentrations in Hungary qualified in all three measurement aspects in 2007 (in 2004 there were three). The number of two-stars clusters also declined. Some of the 2004 two stars clusters lost one star, but in two cases (building fixtures and business services in Central Hungary) the 2004 clusters were not mentioned in the 2007 table. On the other hand, 6 "new" two star clusters appear in 2007 table. They are certainly not new in the sense that these spatial concentrations have been rather known, since they used to have rather solid and traditional background, and qualified from one to two stars level.

Looking at the 2007 list of Hungarian clusters, we can observe the still strong positions of traditional sectors. This is despite of the less favorable development tendencies during the 1990's and 2000's. Strong path dependency is observed here. Despite of massive foreign investments in some global industries, like automotive, electronics and communication technology, important features of the Hungarian economy prevailed: food industry, construction, light industry still retained important positions despite of heavy contractions during the past 15 years.

Another important message of the table is that innovation was found strongest mainly in sectors that did not export much and did not belong to traditional high technology activities. The loose relationship of high-technology, innovation and exports calls for caution when designing cluster promotion tools aiming at "export-oriented innovative clusters", which is at the heart of the current Hungarian but to some extent, also the European innovation policy (see for example EC 2008a, 2008b, European Cluster Observatory, 2007). Porter stressed the importance of innovation in cluster activity, but never mentioned that clusters were "reserved" for high-technology activities, or for export-oriented industries. Heart of his concept is joint action for increasing regional competitiveness in general. One tool of this strive is supporting innovative cooperation in a wide range of industries and activities.

Equally important in the cluster concept is its basing on traditional regional sources and areas of competitiveness. These should be promoted by cluster cooperation. Clusters should not be regarded as means of "capitalist industrialization".

As a conclusion we can suggest further research in mapping spatial concentrations of business activity in the "traded cluster" sectors. It seems to be necessary to use alternative indicators like sales turnover, investments or paid salaries (instead of the number of employees). Also, strict administrative boundaries of NUTS 2 regions should be treated more flexibly to allow the observation of "cross-border" clusters, or less spread spatial concentrations that "disappear" from calculations when comparing them with aggregated figures of larger areas. Such refinements in methodology will enhance a more reliable comparison of functioning cluster organizations and their background. Which in turn would also contribute to a better formulation of cluster policies.

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