Business Clusters a Solution for Economic Development of Companies and Regions

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The paper addresses the issue of business clusters and their skills to improve the economic development of companies and regions. The main factors that influence the identification, promotion and support the development of business clusters are considerate. A set of statistical methods used to identify the economic concentration and specialised geographical areas, with significant concentration of economic activities are reviewed and applied for Romania. The results gained in this way are the first step in the process of identification of cluster type agglomeration, able to generated economic benefits for companies and their regions. The methods are integrated into a Geographic Information System, which allows the usage of spatial characteristics to represent and display the achieved results, on the map.
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1.Introduction

When analyzing the issue of business clusters and their economic benefits, it is important to understand the difference between clusters, clusters policy and initiatives related to clusters.
While clusters are economic real phenomena that generate measurable economic effects, the clusters policies are an expression of political

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commitment to support existing clusters or establishing new ones. (Braunerhjelm, P., Johansson D., 2003) Clusters policies deal with the construction of rigorous strategies, setting up of political priorities and allocating funds to promote innovation, regional development and other political purposes.

Policies related to clusters are specific government efforts, with the goal to support clusters, taking various forms and follow different objectives, in conjunction with other policies such as: industrial policy, small and medium enterprises policy and research and innovation policy. (European Commission, 2008)

Policies relating to clusters are in many cases, supported and implemented by governmental specific cluster programs or initiatives.

Clusters initiatives are practical steps needed to develop clusters, which may or may not be formulated based on cluster policies. (European Commission, 2008)

The clusters could be financed by public authorities or it is initiated spontaneously, by the collaboration between universities, business incubators, authorities, and private companies and aimed to assure cooperation between partners and allow for building a trust relation between partners.

There are a lot of examples supporting the idea that firms belonging to a business cluster get higher economic performances, than those obtained outside the cluster. Cluster initiatives can be understood as organized efforts to increase the size and competitiveness of business clusters within a region, involving companies, government and research community, or only a part of these actors.

The tools, methods and measures related to the business cluster issues cannot be transferred from a political, cultural and administrative context into another, without precise adjustments. In order to achieve a cluster analysis the following steps must be completed:

- The description of operational conditions and economic performance of the business clusters. Since the cluster concept is not a single dimension, it is necessary to analyze a set of performance indicators and economic results of the cluster.
- Examination and quantification of cluster specific working conditions and evaluate the differences at national and regional level.
- Examination the specific work conditions for the business clusters with good results. Each business cluster is considered to be unique, but nevertheless it is possible to catch some common economic characteristics and to implement similar clusters policies in different regions or countries.

One of the well known methodologies used to compare the regional clusters is implemented in the European Cluster Observatory project, financed by the European Union, which provided for the first time a comparative representation of clusters in Europe.

I. Identification of Business Clusters and Their Economic Benefits

There are two different approaches related to how we could identify business clusters, each with their own advantages and disadvantages. The most popular approaches are the case studies that provide intensive and qualitative information available through interviews with local experts and desk research. The second approach refers to various quantitative techniques based on sophisticated economic modelling and on mathematical-statistical methods, in order to indirectly identify business clusters, by measuring the effects of results supposed to be obtained when the business cluster is functioning.

The most case studies provide qualitative information about creating, strengths and weaknesses of a particular cluster. This may

allow identifying the key success factors and the areas of activity of any specific cluster. However, each case study describes a particular situation and the results are difficult to compare. Often it is not possible to make a clear distinction between clusters, as empirical factors and cluster initiatives, in order to create strategies and methodologies for developing clusters.

The case studies, analyzed as a whole, can provide qualitative information that allows the description of certain details, the essence of important links within one cluster, processes and interactions between innovation actors and other important factors for the emergence and operation of a particular cluster.

The disadvantage of this method is that for producing and analyzing data, the method is based on interviews with experts, and this operation is time consuming. Due to the dynamic changes in time, the results obtained by this method can quickly become outdated. Individual elements identified are subjective, dependent and specific to each case, making it difficult to compare the different case studies about clusters. In addition, this does not allow to easily formulating the conclusions. For these reasons, qualitative analysis of case studies it is recommendable to be used as a complement to mathematical-statistical quantitative analysis.

The second method for identifying business clusters relate to different quantitative techniques, based on sophisticated economic models and mathematical-statistical methods.

As an example, for the identification and analysis of clusters in European Union, of a great interest is the approach used by the European Cluster Observatory. This approach is based on measuring indirect effects of the presence, in different locations, of business that is part of a cluster. From these effects, the easier to estimate and quantify is the concentration of employment and the productivity of the cluster components. European Cluster Observatory provides the

first quantitative analysis of clusters in all the EU countries. (European Commission, 2008)

European Cluster Observatory was created in September 2006, in Europe INNOVA project and is funded and supported by the European Union. European Cluster Observatory has adapted and developed the methodology created by the Institute for Strategy and Competitiveness of the Harvard Business School, according with the coding system and data available in all the European countries. (European Commission, 2008) Initial results were provided in June 2007, offering a first draft of regional clusters in 38 sectors, from 32 European countries: 27 EU countries plus Iceland, Israel, Norway, Switzerland and Turkey.

The covered sectors are: Aerospace, Instruments, Apparel, Automotive, Building Fixtures, Business Services, Chemical, Communications, Food, Agricultural, Distribution, Education, Entertainment, Heavy Machinery, Finance, Fishing, Footwear, Forest, Furniture, Construction, Hospitality, IT, Jewellery, Leather, Lighting, Constr. Materials, Medical, Metal, Oil and Gas, Biopharma, Plastics, Power, Production Tech., Publishing, Sporting, Textiles, Tobacco, and Transportation.

Although the local areas, like local services and local trade, cover approximately 57% of the total workforce in Europe (European Commission, 2008), serving mainly local markets, they are not considered because they are not seen as being in direct competition with each other.

A set of quantitative methods for identifying clusters have been defined and used, but no data are available and continually updated for them, in all EU countries.

European Cluster Observatory identifies clusters based on data related to the regional employment, data collected mainly from Eurostat and national sources or other regional statistical sources. The approach used to identify clusters is based on measuring the effects

and links that externalities have on business location decisions, and is not a direct measurement of these dynamic interactions among the driving forces of a cluster. This led to some misunderstandings because the statistics are not always easy to interpret, especially because they are not necessarily related to business cluster initiatives. The quantity and quality of knowledge circulating and transmitted between firms located in a cluster depend on cluster size, its degree of specialization and the extent to which city or region is oriented and focused on production, in the relevant industries included in the cluster. These three factors: size, specialization and concentration are chosen in the methodology applied by European Cluster Observatory, to assess whether the cluster has reached the so-called "critical mass of specialist" to develop the positive effects of outsourcing and links with other sectors. European Cluster Observatory defines the extent to which clusters have achieved this critical mass of specialty, by measuring these three factors and assigns each cluster a value of 0, 1, 2 or 3, representing the number of "stars", function on how many criteria are met. (European Commission, 2008)

The considered indicators are presented below:

- Size measures if the employment reaches a large enough share of total employment in Europe. They have regard, in particular clusters, in the top 10% of all regions from Europe, within the same cluster, in terms of number of employees;
- Specialization measures if a region is specialized in a certain area, compared with the global economy in all regions. It is sought where the cluster from a region has a specialization factor of 2 or higher.
- Concentration: if a cluster has a higher share of employment in the labour force, in the region. From this point of view, clusters that are of interest are the first 10% of all clusters, from the same category. (European Commission, 2008)

European Cluster Observatory has identified 2017 business clusters, in Europe, using the analysis of employment. Assigning a star for each of the mentioned criteria: size, specialization and concentration of employment in a region, have been identified 155 clusters of three stars (7.68% of all clusters identified), 524 clusters of two stars (25.98% of all clusters), and 1338 one star clusters (66.34% of all clusters). (European Commission, 2008)

The main disadvantage of this method is that if they would use other indicators, instead of labour measurement, other clusters would result. Another important disadvantage is given by the fact that the number and percentage (number of stars) measured of clusters are not stable over time.

Nevertheless, this quantitative approach has the clear advantage that allows comparability between different countries, and in time. In addition, statistical data resulting from such an approach can be analysed in conjunction with other statistical indicators, thus offering new perspectives on economic realities and economic growth by further correlation analysis. Although these results should be interpreted with some reserve, because they do not reveal causality, it can contribute to a better understanding of the importance of economic clusters.

II. Romanian Experience in Business Clusters Setting-up

In Romania, the planned economy before 1989 had led towards a type of economic agglomerations, namely "industrial centres". After 1990 the Romania's economy was marked by an accentuate decrease of the industrial activity. But starting with 2001, when the economic growth was re-launched, a discussion about economic concentrations take sense.

A series of studies have identified industrial concentrations of cluster-type in Romania. One of these studies was developed in 1998

and was coordinated by the International Centre for Entrepreneurial Studies (CISA), from Bucharest, for the World Bank's Institute for Economic Development and focused on the competitiveness of the Romanian entrepreneurs. The analysis identified the existence of three forms of cluster in the software manufacturing, naval engineering and wood industries. (CISA, 1998)

Ionescu (1999) realised a relevant research study in this area, his analysis being based on the results of previous studies. Ionescu reveals the differences between various applied methodological criteria and underlines some uncertainties of diverse cluster definitions. The researcher concludes that there are no functional clusters in Romania, regardless of the definition used. His analysis was applied only into two possible clusters, one in the ceramics industry, located in Alba, and the other one in the software industry, located in Bucharest. (Ionescu, 1999)

An important project on Romanian clusters has been INCLUD23, financed by Interreg III B CADSES Programme. The objective of this project was the study of potential clusters in the partner states, from Central and Eastern Europe as well as their support based on the Austrian and Italian experience. Thus, some potential clusters were identified in the textile sector (North-East Region, Bacau county and Region West, Timis county), software (Timis, Cluj and Bucharest), wood processing, steel components and metal products (Centre Region). Moreover, the study revealed that the Brasov county had concentrations of companies in the field of chemical industry, machinery and engines. (Schops S., Valle C., 2007)

Another reference for research in Romania is the WEID24 project (2001-2004), which investigated, by means of several case studies, the relations between clusters at European level. The project brought together partners from Western, Central and Eastern Europe. It reveals, by two case studies referring to Romania, the existence of potential clusters in two areas in the Western part of Romania – Banat

and Crisana - in the footwear industry and sportswear. (WEST-EAST-ID, 2007)

An additional initiative in supporting the automotive suppliers was the FP6 project "SPRINT" (2005-2007) which had as an objective the development of an innovative network of automotive suppliers, in Romania. This project has been of a special interest for the research-development activities, by creating joint industrial research kernel in regard to specific topics of research. (SPRINT, 2007) Also, the FP7 Project "Pro Wood" (2008-2010) aimed to establish an innovative cluster in the Brasov – Covasna area (centre of Romania). (Pro Wood, 2010)

Finally, and probably the most complete study was developed between 2008 and 2010, throw bi-lateral cooperation agreement between the German Government (represented by the GTZ) and the Romanian Ministry of Economy, which launched a new campaign of identifying existing emerging clusters in Romania (Guth, 2010). One result was a national project aiming to elaborate a handbook for cluster development, Innov Cluster. In this project 8 workshops were implemented, each organised in one major location, in each NUTS 2 region. The methodology used to indentify and to analyse the clusters is based on the investigation of the existing elements from Porter's definition about clusters.

Porter defines a regional cluster as "a geographic concentration of interconnected businesses, suppliers, and associated institutions (like research institutions, training organisations) in a particular field of the economy" (Porter, 2000, p. 15).

The clusters identified in this project display the following configuration:

- Bucharest -Ilfov Region: Clothes, shoes and fashion, Construction materials, Food industry and Publishing
- West Region: Automotive and ICT
- Centre Region: Wine and Pottery

- North-West Region: Geo Thermal Energy
- North-East Region: Tourism and Agro Food
- South-West Region: Automotive, Tourism and Agriculture
- South: Agriculture, Tourism and Electro Technical Industry
- South East: Tourism and Ship Building.

The most important conclusions of this study point out a series of notable aspects such as:

- The criteria employed to identify business clusters envisage: the identification of companies, and their region, implied in one industry; the identification of regions owning research centres and universities; the evaluation of labour force, from quantity, quality and quantification point of view; the cooperation issue, and the existence of third party service suppliers, who provides additional services relevant for the cluster.
- In total 55 clusters or potential clusters were identified in the 8 NUTS 2 regions. From the 55 clusters identified, only 19 passed the criteria of actual cooperation and availability/usage of innovation services. An additional desk research has been developed by the authors of the project, in which relevant publications and projects were screened. In these conditions, three additional clusters were acknowledged, namely Automotive in the South Region, Logistics in South East Region and Wood in Region Centre.
- The study reveals as a main weakness of the cluster scene in Romania the lack of cooperation between companies, through common projects.
- The labour and human capital endowment is rather favourable and can be regarded as an asset of the Romanian clusters.

This study has emphasized potential business clusters, in the Romania's regions from both scientific definition and application methodology point of view. Unfortunately, the results have not been followed by a coherent supportive action on the Romanian authorities' side. The study used qualitative methods to investigate the business

clusters and it has an important shortcoming: the checking of regional clusters inside the NUTS2 regions, only. But, the cooperation in a business cluster can take place between firms located in different NUTS2 regions.

As a response to these limitations, this paper proposes a cluster mapping exercise able to combine statistical investigation techniques with GIS analysis, so as to display a more realistic cluster configuration from the physical, location perspective.

III. Methods for Identification and Quantification of Business Concentrations and Specialised Industries

There are several ways of grouping industries into clusters, presented in the literature. The business cluster identification is based on the detection of the concentrated industries and of the specialised industries, in each region or county.

To have a more realistic image on clusters identification, different types of statistics, databases and ways of collecting information are used. In general, the choice of method to identify the cluster depends on the cluster type.

In this paper, some of the most popular and widely used methods for identification and quantification of business clusters are presented, together with the results obtained by applying them for Romania.

Location Quotient Method is designed to group local industries into clusters, using regional data about employees. The method was created by Michael Porter, Harvard Business School (Porter, 1998). The method is relatively easy to use and rely only on statistical data on employment, data relatively easily available.

Formula used to calculate the location quotient is:

$$Location\ quotient = \frac{\frac{n_{A,R}}{N_R}}{\frac{n_{A,T}}{N_T}}$$

where: $n_{A,R}$ is the number of employees in industry **A,** in region **R**,

N_R is the whole number of employees, in the region **R**,

$n_{A,T}$ is the number of employees, in industry **A,** at the national level,

N_T is the whole number of employees, from national level.

A region is considered to be specialized in one industry if the location quotient calculated for that region is greater than or equal to 1. (Porter, 1998)

The method is structured as following:

1. The target geographical area is divided into regions.
2. Identification of global industries, based on the location quotient calculates for each industry. Using this quotient, the industries from each regions, could be classified in three groups: local industries, global industries and dependent by the resources industries. If there are several regions specialized in an industry, the methodology assumes that the industry is globally oriented. An industry is considered to be globally or global oriented if it exports the products outside the region or country. These are very important industries for a region because they are promoting economic growth for other industries. Local industries are the industries without export outside the region or country. Dependent by resources industries are those for which the location is defined by the resources availability.
3. Location quotients are analysed to identify patterns of clustering. Clustering algorithm is used to browse the different ways of grouping the industries, to identify the best solution for grouping industries, based on the location quotient. It is used as a cluster quotient when the same group of industries is over represented in some different regions.

The choice of regions, industries and group identification are parts of an iterative process. In each step, refinements can be made, until the definition of clusters match the reality. To do this, the resulted clusters are verified by various qualitative assessments.
The method has been applied in many countries because it uses only employment data, which are relatively easy available.

The main shortcoming of the method is the large dependence by the regions bounds choosing. The choice of regions must be a priori to identify clusters.

Ellison and Glaeser's agglomeration index

Another method able to establish the degree to which an industry is distributed in a geographic territory is designed by Ellison and Glaeser. The method calculates an index of geographic concentration derived from a model of location choice, in which localized industry contributes to determine the degree of geographic concentration within an industry. The proposed index is used to test whether levels of concentration observed across territorial units are greater than it would be expected to arise randomly, as if the firms had chosen locations by throwing darts on a map. (Ellison, Glaeser, 1997)

The main advantages of this method are: the approach builds on a statistical model in which a situation of random distribution of economic activities across the areas is taken as a benchmark, and the index is able to correct the fact that in industries consisting of few relatively large firms, industry concentration may appear to be higher than it is in reality. (Ellison, Glaeser, 1997)

The index defines the share of total geographical concentration for industry *i*.

$$G_{EG}^{k} = \frac{\sum_i (l_i^k - x_i)^2}{1 - \sum_i x_i^2},$$

where: $x_i = \frac{\sum_k z_i^k}{\sum_i \sum_k z_i^k}$ – is the share of region *k* in the employment of the whole industry.

$l_i^k = \frac{z_i^k}{Z_i}$, where:

l_i^k – the share of employment of region *k*, from industry *i,*

z_i^k – the number of employees in industry *i*, in region *k*,

Z_i – the number of employees in industry *i*, at the national level.

The index is based on the comparison of the shares of employees in the selected industry, from one region and from the whole industry. If the index values are less than 0, the industry is considered to be dispersed across the whole territory and cannot be described as geographically concentrated.

For the index value in the range: 0 to 0.02, an insignificant, very weak geographical concentration of the industry is considered. For an index value between 0.02 and 0.05, it is a medium-strong geographical concentration, and for a value above 0.05, a strong geographical concentration is measured. (Bertinelli & Decrop, 2002)

The index is designate to provide information about the degree in which each industry from a country is concentrated in a number of areas, but does not take into account if the areas are close together or not.

But, the regions are not isolated, so it is useful to measure the spatial agglomeration which takes into account spatial dependence and spatial autocorrelation among regions or counties.

Spatial autocorrelation occurs when values of a variable observed at close locations are more similar than those observed at locations more distant. Positive spatial autocorrelation occurs when high or low values of a variable tend to cluster together in space and negative spatial autocorrelation when high values are surrounded by low values and vice-versa. A number of formal statistics have been developed to measure spatial autocorrelation. (Braunerhjelm,

Johansson, 2003) One example of spatial autocorrelation index is designed by Moran and is presented below.

Moran's Spatial Correlation Coefficient

The Moran's *I* coefficients of spatial autocorrelation are obtained by using the location quotient relative to each industry and each region or county as the basis for computations. To allow comparisons between different regions or counties, the Moran's *I* coefficients are expressed in standardized scores. The statistic compares the value of a continuous variable at any location with the value of the same variable at surrounding locations.

A spatial correlation coefficient alone is not a good measure of spatial concentration. It is designed to identify spatial patterns in the distribution of the variable under analysis. It is therefore interesting to consider jointly coefficients, Ellison and Glaeser index and Moran's index, since they are complementary to each other. (Arbia, 2001) Both are measures of the localization of industries across areas, but the Ellison and Glaeser index focuses more on the relative distribution pattern among observations while the Moran's I focus more on the spatial pattern of this distribution.

Formally, for each variable of interest, the Moran's *I* is: $I = \left(\frac{1}{s_y^2}\right) \frac{\sum_i^N \sum_{\langle j:i\neq j\rangle}^N w_{ij}(y_i-\bar{y})(y_j-\bar{y})}{\sum_i^N \sum_{\langle j:i\neq j\rangle}^N w_{ij}}$

where: $\bar{y} = \sum_i {}^{y_i}/_N$, $s_y^2 = \frac{1}{N}\sum_{i=1}^N (y_i - \bar{y})^2$,

$w_{ij} = \begin{cases} 1 \; if \; i,j \; are \; \text{neighbourhoods} \\ 0 \qquad\qquad otherwise \end{cases}$, N – total number of geographic units.

The value of *I* usually ranges between -1 and 1 and the expected value is: $E(I) = -1/N-1$. The range of *I* depends on the values of the weight function (Waller, Gotway, 2004)

Positive values of *I* are associated with strong geographic patterns of spatial clustering, negative values of *I* are associated with a regular pattern, and a value close to zero represents complete spatial change.

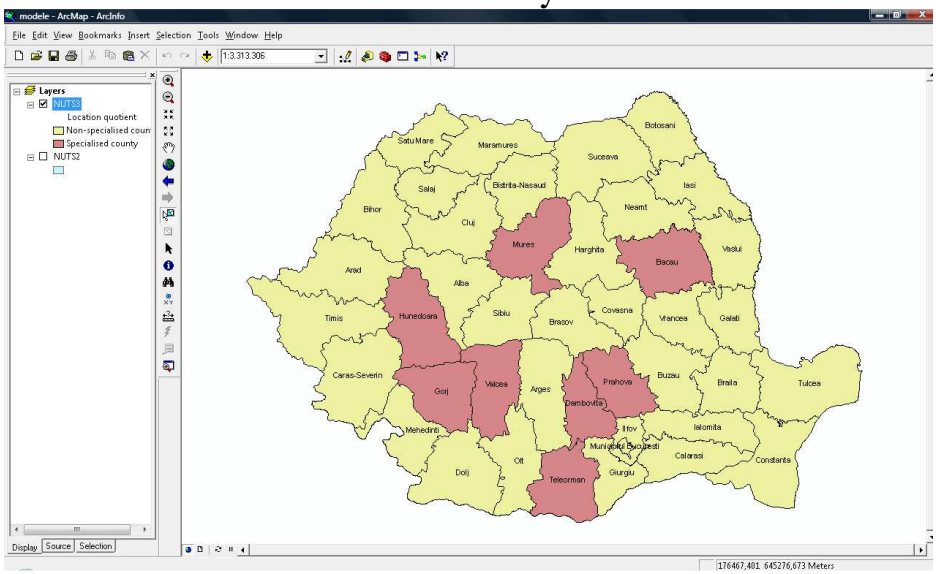
IV. Applying Methods of Identification and Quantification of Business Concentrations for Romania Case

In this section the presented methods of identification and quantification of regional concentrations will be exemplified, on a set of statistics on employment, from 2009, in all counties of Romania. Data source is the Statistical Yearbook of Romania, in 2010.

In figure 1, we exemplify the results of applying the location quotient model in Mining and quarrying industry. There are eight counties that are considered to be specialized in this industry: Bacau, Mures, Hunedoara, Gorj, Valcea, Dambovita, Prahova and Teleorman, which are considered to be specialised in this industry.

Figure 1

Location quotient method results- Mining and quarrying industry



Source of data: my elaboration

Function on their arrangement on the map and their proximity, we can define three areas that could form a cluster, namely: 1 - the counties of Hunedoara, Gorj and Valcea, 2 - includes the counties of Prahova, Dambovita and Teleorman and 3 the counties of Bacau and Mures.

The table 1 contains the values of **Ellison and Glaeser's agglomeration index** and the type of resulted geographical concentration, calculated based on employment statistical data available for the main industries from Romania.

Table 1
The Ellison and Glaeser's agglomeration index results, in Romania

NACE	Ellison and Glaeser index value	Type of geographical concentration
Hotels and restaurants	0.31619	Strong
Information and communication	0.19040	Strong
Real estate activities	0.16910	Strong
Professional, scientific and technical activities	0.13824	Strong
Health and social assistance	0.10843	Strong
Industry	0.08482	Strong
Shows, culture and recreation activities	0.07344	Strong
Financial intermediation and insurance	0.07051	Strong
Water supply; sewerage, waste management and decontamination activities	0.06339	Strong
Transport and storage	0.05531	Strong
Manufacturing	0.04904	medium-strong
Activities of administrative services and of support services	0.04569	medium-strong
Wholesale and retail; repair of motor vehicles and motorcycles	0.04110	medium-strong
Construction	0.03936	medium-strong

Electricity, gas, steam and air conditioning production and supply	0.03698	medium-strong
Education	0.03675	medium-strong
Public administration and defence; social insurance of public sector	0.03474	medium-strong
Mining and quarrying	0.02170	medium-strong
Agriculture, forestry and fishing	0.01997	very weak
Other service activities	0.00000	very weak

Source: my elaboration

Table 2 contains the values of Moran's index calculated for Romania's industries. Expected value E(I)= -0.0244.

For *Mining and quarrying* and *Construction* industries there is no tendency of agglomeration of similar values in nearby areas. Sectors above mentioned were medium-strong concentrated, as it results in the previous section, when we have considered only the results produced by the Ellison and Glaeser index. Another interesting situation of industrial localization is given by the *Information and communication* and *Shows, culture and recreation activities* sectors because the concentration within theses sectors, calculated using Ellison and Glaeser index, is among the highest in Romania. However, when we consider explicitly spatial dependence this sector shows a spatial change and a regular pattern, respectively, so it is not a spatial concentration.

Table 2
The Moran's I coefficients of spatial autocorrelation results, in Romania

NACE	I	Spatial autocorrelation
Manufacturing	0.343	strong
Industry	0.341	strong
Electricity, gas, steam and air conditioning production and supply	0.337	Strong
Education	0.307	Strong
Public administration and defence; social insurance of public sector	0.233	Strong
Professional, scientific and technical activities	0.186	Strong
Agriculture, forestry and fishing	0.172	Strong
Other service activities	0.169	Strong
Water supply; sewerage, waste management and decontamination activities	0.168	Strong
Hotels and restaurants	0.137	Strong
Transport and storage	0.131	Strong
Health and social assistance	0.113	Strong
Wholesale and retail; repair of motor vehicles and motorcycles	0.089	Strong
Activities of administrative services and of support services	0.072	Strong
Real estate activities	0.010	spatial change
Financial intermediation and insurance	0.002	spatial change
Information and communication	0.001	spatial change

Shows, culture and recreation activities	-0.011	regular pattern
Mining and quarrying	-0.027	regular pattern
Construction	-0.147	regular pattern

Source: my elaboration

Conclusions:

In this paper we argue that the business clusters could have an important role in the improvement of economic development of companies, especially of small and medium size and of their regions. The most important issues, in this context, is a correct identification of business clusters.

The problem of identifying business clusters is very complex. In this paper the most important prerequisites of the issue have been reviewed. It focused primarily on the application of quantitative methods existing in literature, used as tools to identify business clusters. Variety of methods used to identify business clusters is very high. It is not possible to state that a particular method is, in general, better or worse than other methods. Selecting a particular method depends on the cluster and the nature of links between its members.

In practice, the most commonly used method is the location quotient. This method cannot be used independently, to identify local and business clusters as it cannot commensurate reciprocal links from within the economic field. The strength of the method is given by the use of readily available statistical data.

The Ellison and Glaeser agglomeration index is used to determine whether an industry is geographically concentrated at national level. But, a simple concentration of certain industries in the region does not necessarily mean the presence of a cluster.

Combining a method that quantifies the concentration of economic areas with a method that takes into account the spatial distribution is a useful solution to identify business clusters.

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References

Andersson & al. (2005): "One typology divides cluster stages into: Agglomeration, Emerging, Developing, Mature, Transformation/Decline", *The Cluster Policies Whitebook*.

Arbia, G. (2001): „The Role of Spatial Effects in the Empirical Analysis of Regional Concentration". *Journal of Geographical Systems*.

Bertinelli, L., Decrop, J. (2002): „Geographical Agglomeration: the Case of Belgian Manufacturing Industry". In: *Working Paper 14-02*. Federal Planning Bureau, Brussels.

Braunerhjelm, P., Johansson D., (2003): „The determinants of spatial concentration: the manufacturing and service sectors in an international perspective. ", *Industry and Innovation, no* 10.

Brülhart, M., Torstensson J. (1996): „Regional Integration, Scale Economies and Industry Location in the European Union". *In CEPR Discussion Papers Series*.

Ellison, G., Glaeser E., (1997): „Geographic Concentration in U.S. Manufacturing Industries: A Dartboard Approach", *Journal of Political Economy*, vol. 105, no. 5.

European Commission (2008), "The Concept of Clusters and Cluster Policies and their Role for Competitiveness and Innovation: Main Statistical Results and Lessons Learned", Commission Staff Working Paper, SEC 2637, Brussels

Fujita, M., Krugman P., Venables A., (1999): „The Spatial Economy: Cities, Regions, and International Trade." The MIT Press, Cambridge.

Guillain, R., Le Gallo, J. (2006): „Measuring agglomeration: an exploratory spatial analysis approach applied to the case of Paris and

its surroundings", *International Workshop in Spatial Econometrics and Statistics*, Rome.
Guth M., 2010, "Clusters and Potential Clusters in Romania", ZENIT GmbH
Krugman, P., (1991): „Increasing returns and economic geography." *Journal of Political Economy* 99, 483-499.
Ionescu, V. (1999), „Supply-Side Strategy for Productivity, Competitiveness and Convergence between the CEECs and (in) the EU - Romania Case Study" Retrieved from gea.org.ro
Lafourcade, M., Mion G., (2005): „Concentration, agglomeration and the size of plants." *In PSE Working Papers*, Ecole normale supérieure, Paris.
Moran, P.A.P., (1950): „Notes on Continuous Stochastic Phenomena. Biometrika".
Porter M., (1998). „The Competitive Advantage of the Inner City, In: On Competition", Boston, Harvard Business School Press.
Waller LA, Gotway CA, (2004): „Applied Statistics for Public Health Data." New York: Wiley.
International Centre for Entrepreneurial Studies CISA (1998), „Avantajul Competitiv al Regiunilor: Evaluare a Competitivitatii de tara".
Industrial districts' re-location processes WEST-EAST-ID, Final Report, EUR 23161, 2007, http://cordis.europa.eu/documents/documentlibrary/100123911EN6.pdf
FP6 project "SPRINT", 2007, www.sprintnetwork.ro
FP7 Project "Pro Wood", 2010, http://ec.europa.eu/research/regions/ index_en.cfm?pg=project-details& title=PRO%20WOOD and http://www.prowood.ro/
Schops S., Valle C. (2007), "Interreg III B CADSES Project Book Advancing Transnational Co-operation", Joint Technical Secretariat.

Porter M.E., "Location, Competition and Economic Development: Local Clusters in a Global Economy", Economic Development Quarterly 14, no. 1, February 2000.