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## The Geography of Regional Clusters in Romania and Their Importance for Entrepreneurial Activities

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# **The Geography of Regional Clusters in Romania and Their Importance for Entrepreneurial Activities**

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**Abstract:** Regional clusters and entrepreneurship have become very popular subjects in economics, regional science, and economic geography.

In the last decade, a large number of scientific papers investigate the empirical evidence for clusters, their definition, and their implications for economic policy. Also, a series of working tools for regional cluster analyses have been proposed.

Entrepreneurial activities interact and their characteristics are normally bound to the region. Local entrepreneurial activities can be the starting-point for the evolution of a regional cluster.

There are lots of arguments for the hypothesis that existing regional clusters have positive impacts on and entrepreneurial activities. But, only few analyses exist referring to the relationship between clusters attributes of a region and the entrepreneurial activities in the same region. From my knowledge, it is not such of analyses about Romania.

This paper aims to identify regions with potential industrial clusters, from Romania, and to analyse their impact on the entrepreneurial environment. Data about all the companies acting in Romania in 2011 is used to elaborate the spatial clusters in the most concentrated Romania industries. A second data set, with information about new establishments in last year is used, from the National Trade Register Office statistics. This data set serves to assess the relationship between regional clusters and entrepreneurial activities. The paper tests the empirically proven hypothesis which stipulates that the existence of one or several cluster type agglomerations in a region has a positive impact on the number of start-ups in the same region.

The results obtained from descriptive and regression analyses have shown that there is a positive relationship between the number of cluster type agglomerations and the entrepreneurial activities.

**Keywords:** regional clusters, regional entrepreneurship, economic geography, economic impact, entrepreneurial activities

**JEL Classification:** R12, L26

## **Introduction**

The theories developed by Porter (1990, 1998) and Krugman (1991), which support the idea that “cluster type agglomeration of companies is favourable for entrepreneurship development by establishing of new spillover”, stimulate a lot of researchers to investigate the empirical evidence for clusters, their definition, and their implications in various economic areas.

In the presence of agglomeration economies, the potential for growth is increasing in the level of economic activity (Glaeser et al., 1992).

This paper examines a particularly important channel through which cluster-driven agglomeration might activate entrepreneurship.

The presence of a cluster of related industries in a location will foster entrepreneurship by lowering the cost of starting a business, enhancing opportunities for innovations and enabling better access to a more diverse range of inputs and complementary products Porter, 1998; Feldman et al., 2005; Glaeser and Kerr, 2009).

Questions concerning the relationship between entrepreneurship, innovation and regional development have tended to focus on the role played by agglomeration economies in fostering localized learning processes within the economy (Glaeser, 1992).

Even there are a lot of theoretical papers that discuss the relations between industrial clusters and entrepreneurship, there are very few practical based analyses which evaluate the relationship between clusters attribute of a region and entrepreneurship activities developed in the same region. There are few studies that talk about the local concentration or potential regional clusters available in Romania. Most of them are qualitative based studies, or employ the quantification of industrial specialisation and concentration at NUTS2 regional level, and ignore the spatial size of the regions investigated. But the cluster type agglomerations could be identified at lower levels, like NUTS3 (county) level or even at level of city/town.

This paper analyses some parts of the relationship between clusters and entrepreneurship. Romania's counties level will serve to exemplify this relationship, using data about companies residing in each county.

### **Regional Clusters in Romania**

According to Porter (1990), an industrial cluster is seen as a set of industries related through buyer-supplier relationship, or by common technologies, common buyers or distribution channels, or by common labour pools.

The regional cluster is defined as an industrial cluster, in which member firms are in close proximity to each other (Enright, 2000),

There is no agreed method for identifying and mapping clusters, either in terms of the key variables that should be measured or the procedures by which the geographical boundaries of clusters should be determined (Martin & Sunley, 2002).

Amongst the variation of results and methods to identify clusters there are, in general, two different approaches: the top-down, and the bottom-up or case study approach (for an assessment of the two approaches see Martin & Sunley, 2002).

Using the top-down approach, we have first to investigate to which degree an industry is spatially concentrated, before we try to localise regional clusters. For an assessment of the overall spatial

concentration of an industry compared to other industries, Krugman (1991) suggested to compute Gini's location quotient.

There are some statistical methods used to identify the inequality and concentration in distributions, which have been applied to many economic issues. Some examples are: the location quotient, Herfindahl index used to measure the industrial concentration, Gini coefficient which describes geographic concentration, Ellison and Glaeser index and Maurel and Sedillot index, which are designed to measure agglomeration.

In literature (Amiti, 1998, Kim, 1995, and Krugman, 1991) concentration is often described by measurements which specify the degree of spatial division of labour or more simply: industrial specialisation. The most common tool is the coefficient of localisation "which is based on the location quotient" (Kim, 1995). The location quotient was first defined by Hoover (1936) and depicts the degree of specialisation of a region in a certain industry.

In this paper I applied the Gini's index to determine the overall spatial concentration of industries and location quotient to measure company level concentration at the regional (county) level.

The general formula for location quotient is:

$$\text{Location quotient} = \frac{\frac{n_{A,R}}{N_R}}{\frac{n_{A,T}}{N_T}}$$
, where:  $n_{A,R}$ - the number of employees in industry A in region R  $N_R$  - the whole number of employees, in the region R,  $n_{A,T}$ - the number of employees in industry A, at the national level,  $N_T$ - the whole number of employees, from national level.

Based on this method, a region is considered to have a high degree of specialisation in one industry if the location quotient calculated for that county is greater than or equal to 1.5

Gini's method uses the following steps:

- It determines the share of employees in a particular branch, in total employment at the national level, using the following equations:  $l_i^n = \frac{z_i^n}{Z_i}$ , where:

$l_i^n$  – the share of employment in the branch i, of the region n,

$z_i^n$  – the number of employees in industry i, from the region n,

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

- The regions must be descending order to ensure that:  $l_i^1 \geq l_i^2 \geq \dots \geq l_i^N$

The whole number of regions is equal with N.

- It is necessary the cumulative share of the employees in the branch i and the cumulative share of the employment in the whole branch. The cumulative shares could be represented by so-called Lorenz curves. Gini's location quotient is represented by the surface between the straight line and an angular quotient of Lorenz curve, and could be determined using the equation:

$$GC = \frac{1}{2} \sum_{n=1}^N (u_{n-1} + u_n) g_n - \frac{1}{2}, \text{ where } GC \in [0; 0.5]$$

The more geographically concentrated the branch of industry is, the higher the value of GC is.

The Gini coefficient compares the Lorenz curve of a ranked empirical distribution with the line of perfect equality. This line assumes that each element has the same contribution to the total summation of the values of a variable. The Gini coefficient ranges between 0, where there is no concentration (perfect equality), and 1 where there is total concentration (perfect inequality).

An important problem related to the identification of an agglomeration and of regional clusters is that there is no “bottom line” against which to interpret the results. What is a “normal” distribution of an industry over space, and how we decide when to regard an industry as “more agglomerated than normal”. The Gini index only indicates the degree to which an industry deviates from a situation where its employment is distributed over regions precisely in the same way as the entire population.

The concentration index, like location quotient and Gini index is designate to provide information about the degree to which each industry from one country, in our case from Romania, is concentrated in a number of areas, but does not take into account if the areas are close together or not. But the proximity of regions or counties is essential for regional clusters setting up. It is possible to have two ore more industries equally concentrated, one being located in two neighbouring regions, and the other splits between two different parts of the country, like north and south or east and west. The location quotient and Gini index are inherently non spatial because they are totally insensitive to the relative position of the regions or counties, in space. These indicators measure the degree of variability of the distribution of employment across observations for a given partition of the space, a feature that in the literature is referred as concentration (Arbia, 2001) (Lafourcade, Mion, 2005).

A non-uniform spatial distribution of an industry and hence a certain spatial concentration of firms is the precondition for the formation of clusters. (Sternberg R., Litzenger T., 2004)

According to Gini’s coefficient the top of 30 most concentrate industries of Romania’s economy look, as presented in Table 1.

To avoid the identifying of a higher concentration industry due only to a lower number of firms compared to the number of counties in which the economic activity is developed, I excluded from my analyses the industries with less then 60 companies.

Table 1 – The top of most concentrated Romania’s industries

<b>Economic activity (NACE rev. 2 classification) – 2-digit level</b>	<b>Gini’s index value</b>	<b>Employment</b>	<b>No. of establishments</b>	<b>Counties with a higher level of concentration of economic activity</b>
Undifferentiated goods- and services-producing activities of private households for own use (NACE 98)	0.27	7	3	-
Activities of households as employers of domestic personnel (NACE 97)	0.23	57	27	-
<b>Manufacture of basic metals (NACE 24)</b>	<b>0.23</b>	<b>39336</b>	<b>527</b>	Tulcea, Braila, Galati, Buzau, Olt, Dambovita, Neamt, Bistrita-Nasaud, Cluj, Caras-Severin
<b>Crop and animal production, hunting and related service activities (NACE 01)</b>	<b>0.23</b>	<b>65945</b>	<b>13568</b>	Tulcea, Braila, Ialomita, Calarasi, Buzau, Vrancea, Vaslui, Neamt, Teleorman,

				Olt, Dolj, Alba, Salaj
<b>Manufacture of other transport equipment (NACE 30)</b>	<b>0.23</b>	<b>35060</b>	<b>555</b>	Tulcea, Constanta, Braila, Galati, Bacau, Olt, Mehedinti, Arad
<b>Manufacture of wearing apparel (NACE 14)</b>	<b>0.22</b>	<b>137119</b>	<b>4914</b>	Tulcea, Braila, Buzau, Ialomita, Calarasi, Vrancea, Covasna, Harghita, Neamt, Vaslui, Teleorman, Olt, Dolj, Alba, Arad, Salaj, Satu Mare
Remediation activities and other waste management services (NACE 39)	0.22	525	59	-
<b>Manufacture of chemicals and chemical products (NACE 20)</b>	<b>0.22</b>	<b>31466</b>	<b>1040</b>	Bacau, Neamt, Ialomita, Teleorman, Mehedinti, Valcea, Alba, Mures, Brasov
Mining of coal and lignite (NACE 05)	0.22	20139	55	-
<b>Fishing and aquaculture (NACE 03)</b>	<b>0.21</b>	<b>1947</b>	<b>780</b>	Tulcea, Braila, Constanta, Ialomita, Calarasi, Brasov, Dambovita, Iasi, Vaslui, Salaj, Bihor
<b>Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials (NACE 16)</b>	<b>0.21</b>	<b>47901</b>	<b>6708</b>	Suceava, Neamt, Bacau, Vrancea, Covasna, Brasov, Arges, Harghita, Mures, Alba, Bistrita-Nasaud, Maramures, Caras Severin, Mehedinti
<b>Veterinary activities (NACE 75)</b>	<b>0.2</b>	<b>3745</b>	<b>1700</b>	Vaslui, Vrancea, Covasna, Buzau, Tulcea, Suceava, Bistrita Nasaud, Maramures, Salaj, Arad, Caras Severin, Mehedinti, Olt , Teleorman
<b>Forestry and logging (NACE 2)</b>	<b>0.2</b>	<b>37509</b>	<b>4009</b>	Tulcea, Bucharest, Vrancea, Covasna, Suceava, Bistrita Nasaud, Hunedoara, Caras Severin, Bucharest
<b>Manufacture of food products (NACE 10)</b>	<b>0.19</b>	<b>146397</b>	<b>8804</b>	Tulcea, Braila, Ialomita, Calarasi, Ilfov, Buzau, Covasna, Bacau, Vaslui, Suceava, Satu Mare, Alba, Valcea
<b>Manufacture of machinery and equipment n.e.c. (NACE 28)</b>	<b>0.19</b>	<b>51411</b>	<b>1525</b>	Brasov, Dambovita, Prahova, Buzau, Braila, Teleorman, Bacau, Vaslui, Bistrita Nasaud, Alba, Caras Severin
<b>Manufacture of paper and paper products (NACE 17)</b>	<b>0.19</b>	<b>11597</b>	<b>811</b>	Suceava, Neamt, Bacau, Vrancea, Covasna, Cluj, Alba, Valcea, Dambovita, Calarasi
<b>Programming and broadcasting activities (NACE 60)</b>	<b>0.19</b>	<b>6040</b>	<b>604</b>	Bucharest, Gorj, Teleorman
<b>Water collection, treatment and supply (NACE 36)</b>	<b>0.19</b>	<b>28098</b>	<b>228</b>	Constanta, Calarasi, Braila, Galati, Vrancea, Covasna, Vaslui, Neamt, Suceava, Mures, Cluj, Alba, Hunedoara, Caras Severin, Mehedinti, Dolj, Teleorman, Dambovita

<b>Manufacture of textiles (NACE 13)</b>	<b>0.19</b>	<b>28857</b>	<b>1750</b>	Iasi, Vaslui, Neamt, Bacau, Buzau, Harghita, Covasna, Mures, Sibiu, Bistrita Nasaud, Salaj, Arad, Hunedoara, Dambovita, Olt
<b>Water transport (NACE 50)</b>	<b>0.19</b>	<b>3207</b>	<b>509</b>	Tulcea, Constanta, Braila, Galati, Mehedinti
<b>Manufacture of furniture (NACE 31)</b>	<b>0.18</b>	<b>59579</b>	<b>4256</b>	Arad, Alba, Arges, Satu Mare, Salaj, Maramures, Suceava, Harghita, Mures
<b>Manufacture of rubber and plastic products (NACE 22)</b>	<b>0.18</b>	<b>39208</b>	<b>3275</b>	Bihor, Satu Mare, Bistrita Nasaud, Neamt, Sibiu, Vrancea, Buzau, Ialomita, Ilfov, Arges, Olt, Gorj, Mehedinti
<b>Retail trade, except of motor vehicles and motorcycles (NACE 47)</b>	<b>0.18</b>	<b>403433</b>	<b>125287</b>	Suceava, Bacau, Ialomita, Teleorman
Activities of membership organisations (NACE 94)	0.18	277	39	-
<b>Manufacture of fabricated metal products, except machinery and equipment (NACE 25)</b>	<b>0.18</b>	<b>84085</b>	<b>6630</b>	Satu Mare, Alba, Hunedoara, Gorj, Valcea, Arges, Dambovita, Brasov, Buzau, Tulcea
<b>Manufacture of beverages (NACE 11)</b>	<b>0.17</b>	<b>19401</b>	<b>888</b>	Harghita, Vrancea, Prahova, Ialomita, Ilfov
<b>Residential care activities (NACE 87)</b>	<b>0.17</b>	<b>307</b>	<b>80</b>	Salaj, Vaslui, Sibiu, Arges, Bucharest
<b>Manufacture of electrical equipment (NACE 27)</b>	<b>0.17</b>	<b>35223</b>	<b>715</b>	Satu Mare, Maramures, Bistrita Nasaud, Arad, Timis, Sibiu, Arges, Dambovita, Dolj, Timis, Arad
<b>Security and investigation activities (NACE 80)</b>	<b>0.17</b>	<b>98820</b>	<b>2029</b>	Mehedinti, Bucharest
<b>Construction of buildings (NACE 41)</b>	<b>0.17</b>	<b>174293</b>	<b>36313</b>	Satu Mare, Maramures, Suceava, Harghita, Arges

Because the clusters are relative to the economics, geographic and regional situations, there is no agreement which magnitude of spatial concentration in a region, relative to the overall region constitutes a cluster. An exact threshold does not exist. The critical value depends on the scale of the region, the level of the industrial aggregation (Sternberg R., Litzenberger T., 2004), and on the number of clusters proposed to be identified. In the last column of Table 1 (Counties with a higher level of concentration of economic activity) there is the name of counties that could be part of an economic cluster in specified economic field. Function on the size of regional clusters, we can have one or more clusters in each activity domain.

### **Entrepreneurship at Regional Level**

For many years, academic papers explained the entrepreneurial activities abstracting completely the spatial factors. Recently, the consideration of environmental factors in a broad sense, including spatial proximity and features of the regional environment, is becoming more and more widespread and popular.

The totality of individual entrepreneurial activities in a particular region determines the entrepreneurial activity of the region. Not only intraregional environmental factors influence entrepreneurial activities.

According to Feldman et al. (2005), the factors that determine the start-up decision of an individual (entrepreneurial activity) are not identical to those that determine the start-up success and that this success of start-ups is dependent also on the characteristics of its regionally bound determinants.

Because entrepreneurs are essential agents of innovation, a strong cluster environment should foster entrepreneurial activity. (Delgado et al, 2010)

This paper tests the hypothesis that existing cluster type agglomerations have positive impacts on entrepreneurial activities. (Sternberg, 2004, Delgado et al, 2010)

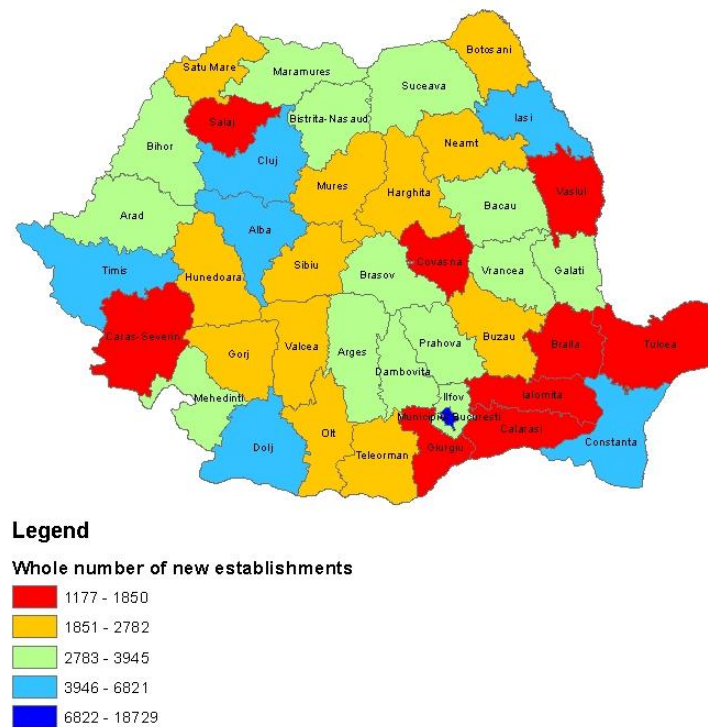
The main argument for this hypothesis is that the existence and development of already existing start-ups could generate a constructive regional environment, centered on an equally positive entrepreneurial climate. The companies within a geographically concentrated cluster share common technologies, skills, knowledge, inputs, consumers, and institutions, facilitating agglomeration across complementary and related industries.

To analyse the regional level entrepreneurial activities of Romania a data set, with information about new establishments in last year (June 2011 – May 2012) is used, from the National Trade Register Office statistics. Based on this data set, I calculated the geographical distribution of new establishments in last 12 months, in Romania and the results are presented in Figure 1.



**Figure 1**

New Establishments in the Last 12 Months, in Romania



### **The Relationship between Clusters and Entrepreneurship**

The relevant entrepreneurship and new companies establishment literature distinguishes between person-related and environment-related determinants as the main theoretical explanations for an individual's decision to start a new firm (Sternberg & Litzenberger, 2004). Environmental factors include all determinative of the potential entrepreneur's decision that is external to the person. The environmental factors include regional factors, too. In this paper I take into account the environmental factors only.

Industrial economics argues primarily from the point of view of the industry that the start-up belongs to and defines factors such as capital intensity, competition, or concentration in the relevant industry as the main factors that influence the decision to start a new firm. (Karlsson, 2005)

On the other hand, local entrepreneurial activities can be the starting-point for the evolution of a regional cluster. Entrepreneurial activities interact and their characteristics are normally bound to the region (Bergmann, 2002). Many start-ups lead to a spatial concentration of firms which is the main requirement for identifying a regional cluster.

In Romania, there is no data available about inter-firm co-operation for companies acting in a region or a county. But, when some companies acting in the same industry are grouped together in a spatial proximity, it implies that the employees of one company have relatively easy access to employees

from other companies, from the proximity. This allows for frequent direct informal face-to-face contact between employees of various companies, which may allow for tacit knowledge sharing between the individuals. Tacit knowledge is incomplete knowledge and is shared on a non-market basis. The informal knowledge sharing or mutual trading could allow each of the local firms to build up a more coherent picture of the overall market environment, thereby improving their ability to compete in the market, relative to those competitors in other locations. (McCann, 2006)

### **Empirical evidence on potential regional clusters and entrepreneurship**

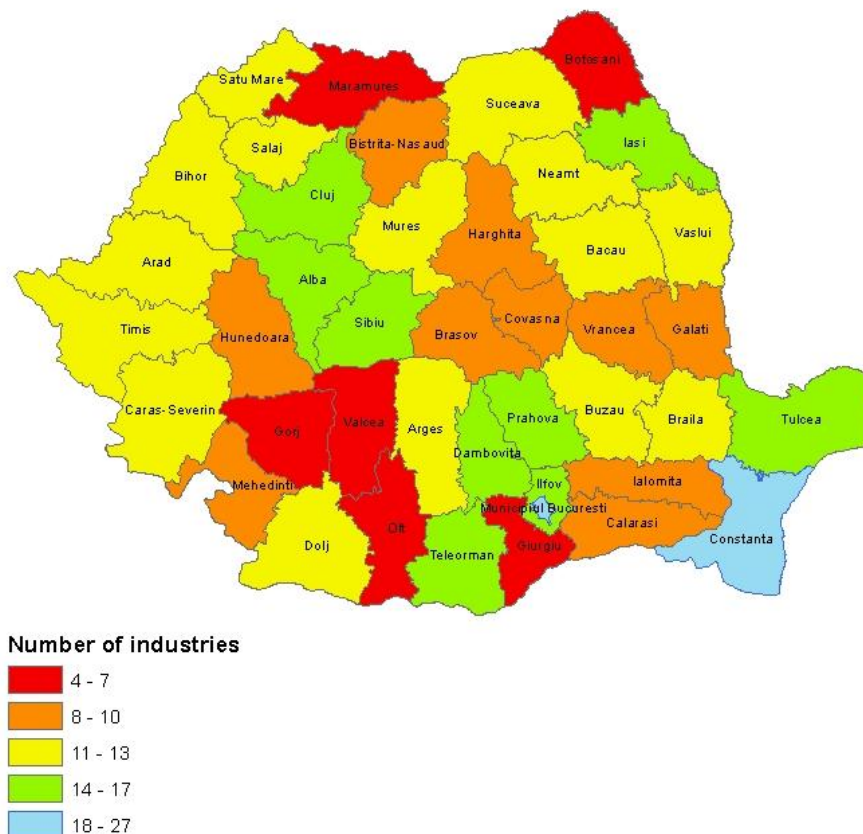
Data used to support the researches is provided by two data sources: data about all the companies acting in Romania, in 2011, is used to elaborate the spatial clusters in the most concentrated Romania industries. The location of each company, the number of employees and the NACE classification, used to describe the industry field in which the company is acting, disaggregated to the 4 digits level are used to describe each company. The data are processed and aggregated at the NUTS3 level (county) and at 2 digits level for NACE classification of economic activities.

A second data set with data about new companies established in the last 12 months, between June 2011 and May 2012, provided as part of National Trade Register Office statistics, serves to assess the entrepreneurial activities in Romania and the relationship between regional clusters and entrepreneurial activities.

Based on the data available I determined the number of industry in which the economic activity is specialised, for each county. The spatial distribution is presented in Figure 2.

Figure 2

## Concentrated Industries in Romania's Counties



In the next step, I analysed the correlation between the number of new companies established in each county of Romania in the last 12 months and the number of industries in which the corresponding county is specialised.

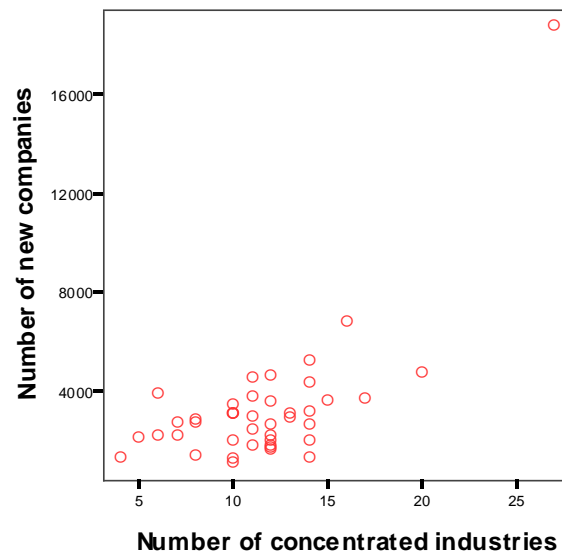
The scatter-plot chart of data is presented in Figure 3 and suggests a possible positive correlation between the number of concentrated industries and the new establishments from each county.

To test if it is a link between number of concentrated industries identified in each county and the number of new companies established in the last 12 months in the same area, the Pearson correlation coefficient has been calculate. The Pearson correlation coefficient value is 0.7, and the value is statistically significant, Sig value being 0.

Based on linear correlation coefficient (r) calculate to test the intensity of link between the number of concentrated industries form and the number of new companies established in last year, in each county of Romania, we can observe that the establishment of new companies is explained by the economic activities concentrations in a weight of 49%.

The regression equation will take the form: Number of new establishments=470xnumber of concentrated industries-2122.

**Figure 3 – The scatter-plot chart for relation between concentrated industries and new establishments**



The last step of my analyse follow to identify the correlation between the concentration of economic activity in each industry (expressed by Gini's index) and the number of new establishments from the same industry.

Based on linear correlation coefficient (r) calculate to test the connections intensity between the value of Gini index for top 30 industries analysed and the intensity of entrepreneurial activities in the last 12 months, in Romania, we can observe that the establishment of new companies is explained by the economic activities concentrations in a weight of 35%. The value of correlation coefficient between Gini's index and the number of new establishments in the last 12 months variables is 0.59 and the significance threshold value is 0.001, so the value of correlation coefficient is significantly.

The regression equation will take the form: Intensity of new establishments=1377xGini's index-243

The Pearson correlation coefficient value is good (value=0.59), and it is statistically significant (p=0.001).

## **Conclusions**

The specialisation in economic activity in the regional area, which could generate cluster type agglomerations, explained around 50% of new companies' establishments in the last year, in Romania.

The concentration of economic activity in various industries is explained by the entrepreneurial activities only in a proportion of 35%.

According with these results, we can conclude that, in Romania, the existence of one or several cluster type agglomerations in a region has a positive impact on the number of start-ups in the same region, but it is only a factor, an important one.

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