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The analysis of regional disparities in Romania with Gini/Struck coefficients of concentration

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Abstract: A key objective of regional development policy is to reduce disparities between regions and to ensure a relatively balanced level of development. To achieve this goal there are necessary studies and social and economic analysis, based on certain techniques and methods of evaluation.

In scientific literature, there are plenty of models that can be applied to assess regional disparities.

One of the methods commonly used in practice is related to the calculation and analysis of the degree of concentration/diversification of activities within a region.

The increase or decrease of the degree of concentration of certain activities or areas of activity in a region provides information on:

the level of overall economic development;

economic development and growth rate;

the specific of the region, the potential, local traditions, etc.

The expert analysis indicate that, in a high level of overall development or a sustained economic growth rate, there are favorable conditions for economic activities to locate in any region, so they are relatively uniformly distributed throughout the country.

Knowing the degree of concentration and also the influence factors is useful in making decisions and setting regional policy measures.

This article proposes a synthetic analysis of the development level of regions in Romania with the concentration/diversification model (Gini/Struck coefficients), based on the existing key statistical indicators.

JEL classification: R1, R12, R15

Keywords: regional disparities, concentration/diversification, regional analysis

1. Introduction

Lately, an increased interest, in regional research area, presents the concentration analysis, with which it can be illustrated the intensity of certain phenomena on economic and social categories, the dominant areas, the territorial distribution of some phenomena, etc. In addition, the concentration analysis allows comparability of data between identical or different phenomena, starting from the same or different number of units, for the same year or different years, etc.

Given the above considerations, this article proposes an assessment of the degree of concentration/diversification in the developing regions of Romania, through a method commonly used by experts in the field: analysis of regional concentration/diversification degree. This method of analysis is also known by the name of Gini/Struck coefficients method[1].

To achieve the analysis, there were used statistical indicators that exist at regional level, grouped by main areas, so that it can be covered the whole range of economic and social activities of scientific interest: demography (total population, urban, rural), workforce (employees), economic potential, health, telecommunications, urban infrastructure, investment, regional GDP.

Interpreting the results of this analysis took into account the fact that a higher value of the concentration/diversification coefficients involves an increase in disparities at territorial level, while a lower value may reflect a balanced distribution of some general or specific activities/phenomena. Also, the interpretation of results was envisaged that the Region 8 Bucharest-Ilfov is a major urban area, which may significantly affect the obtained results.

2. Theoretical and methodological issues concerning the analysis of concentration/diversification at regional level

The methodology proposed in this article is based on the analysis of regional disparities performed on the coefficients of concentration/diversification (also known as indices of geographic distribution).

The interpretation of concentration coefficients shows, in the situation when they are close to zero level, the state of "equity", balance or proportion between the different analyzed elements.

Measuring the concentration degree of an activity in a region is achieved using the Lorentz curve and the Gini/Struck coefficient[2] (Figure 1).

The concentration curve (Lorentz-Gini) is a graphical representation of a q variable according to p, the values of the two variables being defined by the following relations:

$$p_i = N_i/\Sigma n_i \qquad (1)$$

$$q_i = L_i/ \Sigma x_i n_i \qquad (2)$$

where: pi represents the relative flocks cumulated till the i level of the clustering feature and qi represents the global values cumulated till the i level.

---

[1] **The Gini coefficient is the measure of statistical dispersion used, in particular, to represent the distribution of income and wealth disparities. Gini's coefficient was invented by the Italian statistician Corrado Gini and published in 1912 in his book entitled „Variability and mutability".**

[2] **There are also other indicators related to this coefficient, which may provide an insight into the level of concentration/diversification of a regional series, as follows:**

The Onicescu informational energy – calculated as a sum of the squares of weights of all parts of a collectivity; it has the disadvantage of variability of the minimum possible value, depending on the number of categories/groups and the corrected informational energy, which eliminates the inconvenience of the indicator;

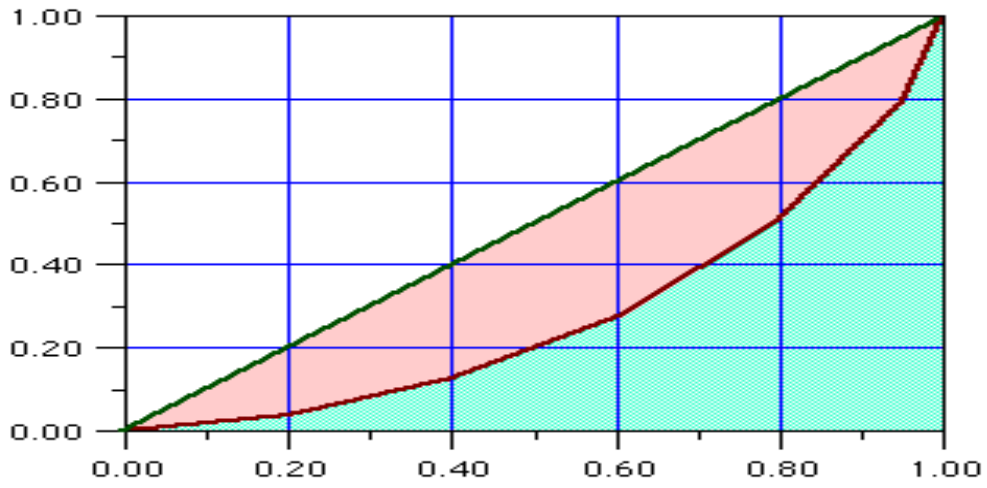
The index of qualitative variation, its value ranging between 0-1; the more it approaches to 0, the more it increases the degree of uniformity (reduced variation);

The degree of polarization – polarization is a process that can run in parallel with the convergence, towards the emergence of homogeneous subgroups from the perspective of the regions which form the subgroup, but differences between subgroups become, over the time, more and more larger; this concept is also called „development in two speeds": (1) polarization of society and (2) the state of inequity.

The Lorentz curve gives the intensity image of the analyzed process or phenomenon, and also the ability to quantify its level of concentration. Thus, as the concentration curve deviates more from the square's diagonal, the disparities are larger and the concentration is stronger.

The Gini concentration coefficient is defined as ratio between the concentration surface and the square's area, but the square's area being equal to 1 or 100%, the index value is dimensionless, that is independent of the measure units of the studied variable.

Figure 1: Lorentz-Gini concentration curve



The formula used to calculate the Gini coefficient (GC) is the following (with values on the interval [$1/n^{0,5}$; 1] and n = number of observations):

$$CG = \sqrt{\sum_{i=1}^{n} p_i^2}$$

For normalization is also used the corrected GC (CGC), by the next formula:

$$CGC = \frac{CG - 1/\sqrt{n}}{1 - 1/\sqrt{n}}$$

CGC takes values in the interval [0; 1]; for a better use of the CGC interval, it amounts to square.

The Struck concentration coefficient represents the corrected form of the Gini coefficient; the values may be in the interval [0; 1]; the minimum possible value (zero) is independent of the number of considered categories, which allows comparison with other structures. Struck concentration coefficient is calculated as:

$$Cs = \frac{n\sum g_i^2}{n-1}$$

The analysis of indicators on the concentration/diversification can indicate us how far we place in comparison with the state of uniform and balanced distribution of economic results registered at the regional level.

Next, to identify the regional disparities in Romania, in 2008 and compared with 2000, we will use the Gini/Struck concentration/diversification coefficients method.

3. The assessment of regional disparities

In 2008, at regional level, the concentration analysis was based on the two coefficients presented above (Gini/Struck), taking into account 10 groups of indicators.

If the value of the coefficients exceeded 0.3, there is a relative concentration that can be mentioned and taken into account, and if the value was close to 0.5, then we can speak of a high concentration.

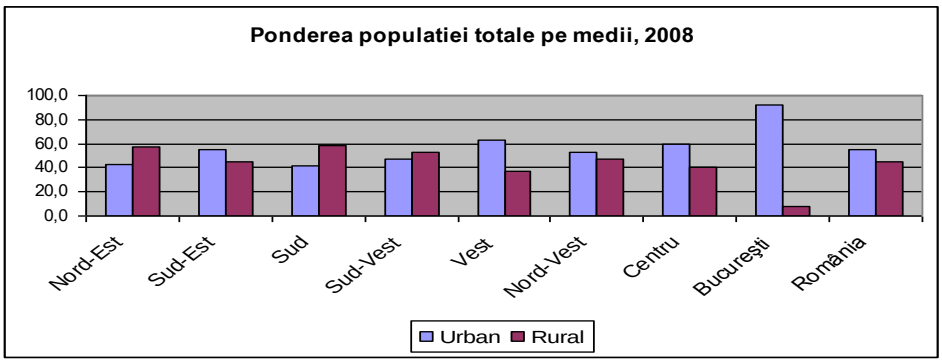
The calculations were made at regional level, taking into account the inherent limitations related to available statistical databases.

3.1. Population at regional level

Regional concentration analysis was based on the following statistical indicators: total population, population in urban and rural areas.

The analysis of existing data shows that, in 2008, nationally, was a predominantly urban population (55.04%), while at regional level, five of the eight regions hold a majority urban population (South-East, West, North-West, Centre and Bucharest).

Figure 2: Structure of total population in urban/rural and developing regions, 2008



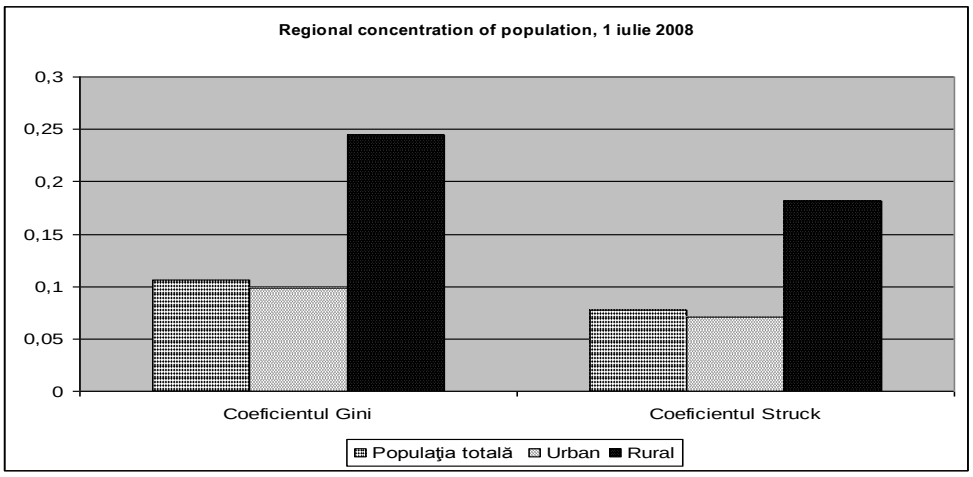
Source: Data processing Romanian Statistical Yearbook 2009, NSI, Bucharest

Concerning the concentration of total population and in urban and rural areas, the coefficients value is below 0.15, which means that, in the year 2008 (July 1), there was no significant concentration of the total population in the eight development regions. Also, the urban population does not have an important concentration at regional level (Gini coefficient is below 0.1).

Regional allocation of the population is relatively balanced, the exception being given by the allocation of rural population at regional level, where, because the Bucharest-Ilfov region is highly urbanized, there is a greater concentration of rural population in the other regions (the Gini coefficient is 0.244) (Figure 3).

Compared with the year 2000[3], it is found that there was no increase in the concentration of total population, but there was a slight increase in the concentration of rural population (the Gini coefficient was 0.233 in 2000, while in 2008 it came to 0.244).

Figure 3: Regional concentration of population, year 2008



Source: Data processing Romanian Statistical Yearbook 2009, NSI, Bucharest

3.2. Workforce

The analysis of the concentration of workforce was based on the following indicators: employment in major economic sectors, number of employees and the number of unemployed.

The level of Gini/Struck coefficients reveals that there is a low concentration of the employed population in the eight development regions, the value of Gini coefficient being around 0.114 and the value of Struck coefficient being only 0.083. Compared with 2000, there is an increase in the degree of concentration of employed population (the Gini coefficient was 0.095 and Struck coefficient was 0.069).

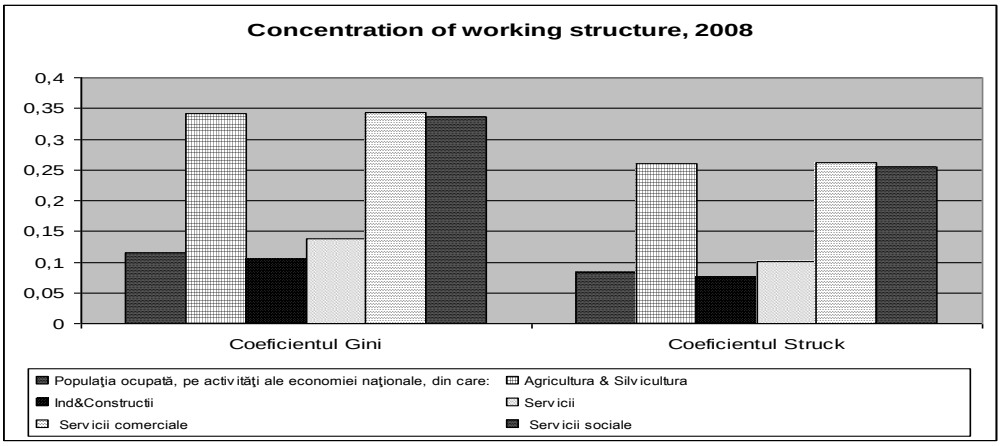
There is a relative concentration of employed population in agriculture and forestry, the Gini coefficient being over 0.3 (the Gini coefficient is 0.341 and the Struck coefficient is 0.259), largely due to the importance of Bucharest-Ilfov urban region.

Although there is no strong phenomenon of the concentration of employed population in services (the Gini coefficient is 0.138 and the Struck coefficient is 0.101), there is a relatively high concentration in the two major categories of services: commercial (Gini coefficient is 0.343) and social (Gini coefficient is 0.335) (Figure 4).

[3] **See: Daniela Antonescu – „Regional Development in Romania – concept, mechanisms, institutions", Oscar Print Publishing, 2004.**

Compared with 2000, there was a significant increase in the concentration of employed population in the service sector (in 2000, the Gini coefficient was 0.128 in commercial services and 0.008 in social services).

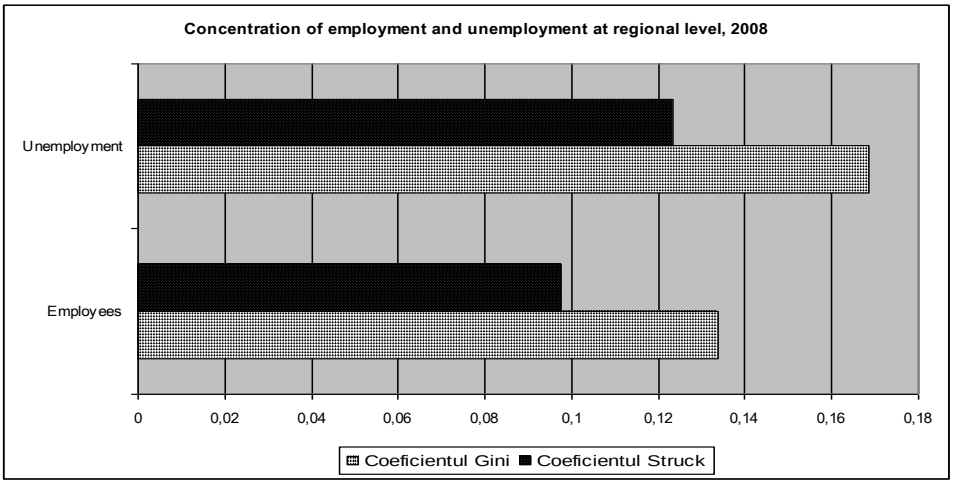
Figure 4: Regional concentration of workforce, 2008



Source: Data processing Romanian Statistical Yearbook 2009, NSI, Bucharest

At the same time, we can not say that there is a strong concentration of the number of employees at regional level, their distribution being relatively balanced in the territory (the Gini coefficient is 0.133). Regarding unemployment, it approaches the value of employees, not being recorded a high concentration (Figure 5). There are no significant changes in the Gini/Struck coefficients values compared with 2000.

Figure 5: Regional concentration of the number of employees and unemployed, 2008



Source: Data processing Romanian Statistical Yearbook 2009, NSI, Bucharest

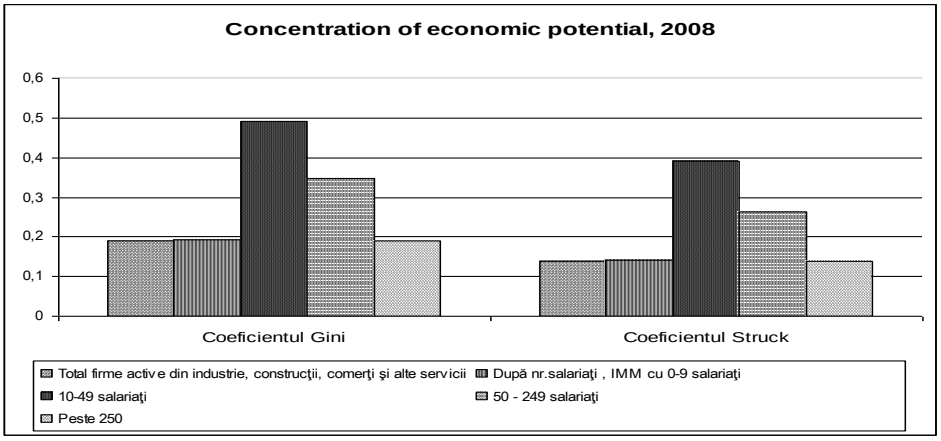
3.3. Economic potential

To assess the concentration of economic potential at regional level there have been used the following indicators: the number of active firms at regional level, grouped by categories of size and the number of employees.

According to the figures recorded by the Gini/Struck coefficients, there are, at regional level, the following situations (Figure 6):

- Relatively low concentration of the total number of firms (the Gini coefficient is 0.189 and the Struck coefficient is 0.139);
- Relatively low concentration of small firms (0-9 employees) and large companies (over 250 employees); the calculated coefficients record values below 0.20;
- Relatively high concentration of companies with 50-249 employees (the Gini coefficient is 0.346);
- Strong concentration of firms with 10-49 employees (the Gini coefficient is 0.49);
- Compared with 2000, the values of the two coefficients have recorded significant increases; in 2000 all the values were below 0.15.

Figure 6: The regional concentration of economic potential, 2008



Source: Data processing Romanian Statistical Yearbook 2009, NSI, Bucharest

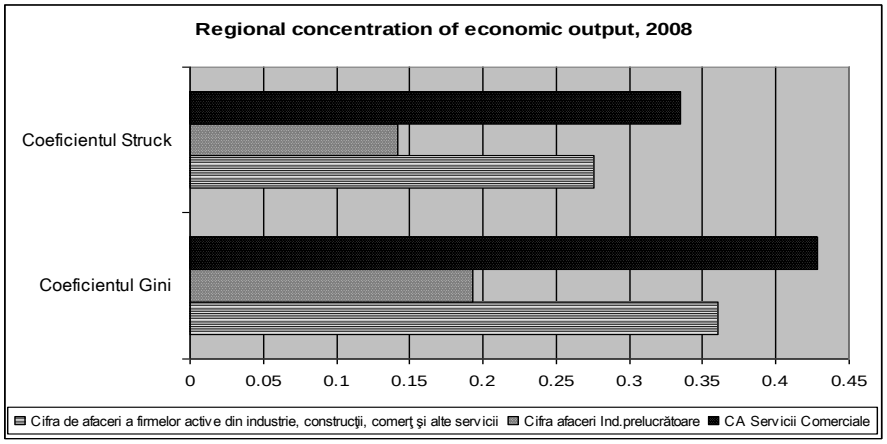
3.4. The economic and financial results

The analysis of economic results has been achieved in terms of total turnover, the turnover assigned to manufacturing industry and also to the one obtained by the business services sector.

As shown in Figure 7, there is a significant concentration of the total turnover (the Gini coefficient is 0.360 and the Struck coefficient is 0.275). The greatest concentration is recorded in the turnover of commercial/business services, which has a Gini coefficient of about 0.428. The concentration is especially visible in the Bucharest-Ilfov region, which owns 41% of the total turnover of the business sector.

Compared with 2000, it is recorded an increase of the concentration of total turnover, from 0.28 to 0.36 (an increase of about 30%) in 2008. At the same time, the concentration of turnover in commercial services recorded a much smaller increase (from 0.41, in 2000, to 0.428, in 2008).

Figure 7: Regional concentration of economic and financial results, 2008



Source: Data processing Romanian Statistical Yearbook 2009, NSI, Bucharest

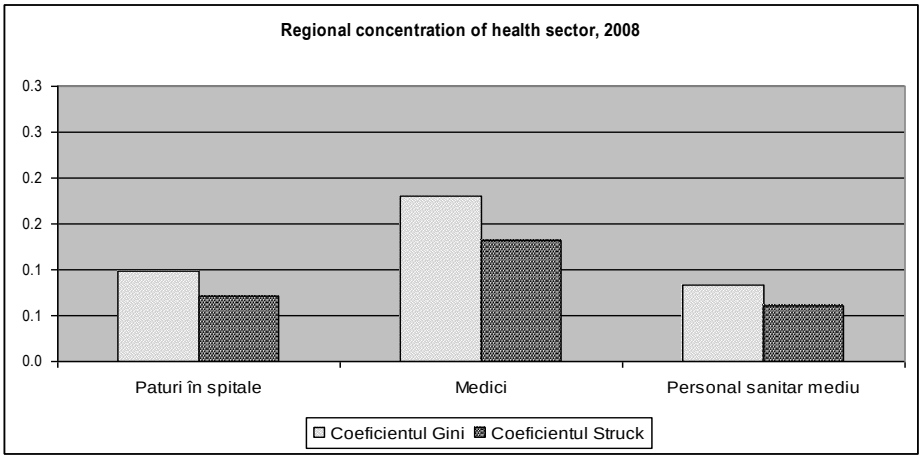
3.5. Health infrastructure

The analysis of the concentration in this sector was made using the following specific indicators: the number of doctors in the region, the number of existing beds and the number of average staff that works in the sector.

As shown in Figure 8, there is no significant regional concentration (the values of the two coefficients are below 0.3).

Compared with 2000, there is a relatively small increase of the concentration of health infrastructure at regional level, especially regarding the number of beds (from 0.08 to 0.1) and the number of doctors (from 0.10 to 0.18). This increase may be due to the concentration of this sector in large urban centers and in the Bucharest-Ilfov region (which holds about 23% of the total number of doctors in Romania and 16% of the number of beds).

Figure 8: Regional concentration of health facilities, 2008



Source: Data processing Romanian Statistical Yearbook 2009, NSI, Bucharest

3.6. Urban infrastructure

Given the importance and complexity of this area, but also the existence of an increased volume of specific data, for the calculation of the degree of concentration/diversification of the sector on development regions there were used several key indicators:

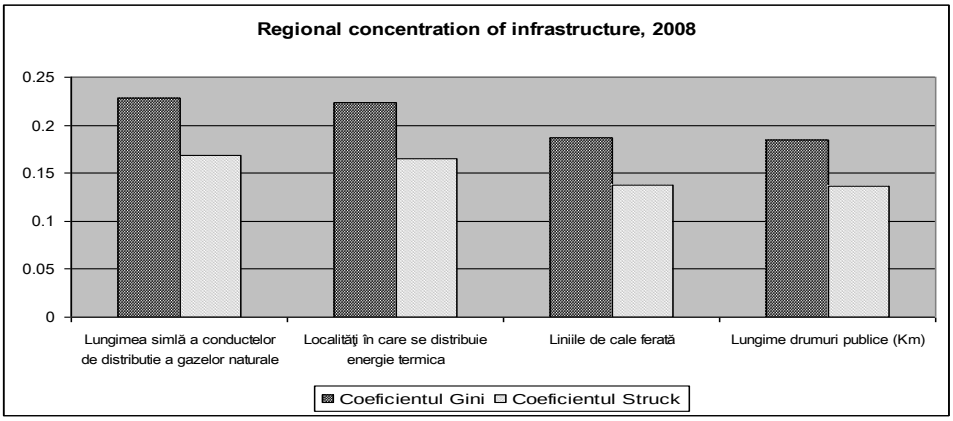
- The simple length of gas distribution pipelines;
- The localities where thermal energy is distributed;
- Railway lines;
- The length of public roads.

As shown in Figure 9, the regional infrastructure has a relatively high concentration, with Gini coefficients values over 0.22 for the indicators simple length of gas distribution pipelines and localities where thermal energy is distributed, especially in the Center region (it holds about 0.25% of the total length of pipelines) and the South region (with 19% of total localities in which heat is distributed).

Slightly lower values are recorded at the other two indicators (railway lines and public roads), the Gini coefficient value being under 0.20. In this case, the regions that have high weights are: the West region, which owns 18% of the total railway lines, and the North-East region, which owns 17% of the total urban public roads

Compared with 2000, there is an increase in the concentration of all examined indicators.

Figure 9: Regional concentration of urban infrastructure, 2008



Source: Data processing Romanian Statistical Yearbook 2009, NSI, Bucharest

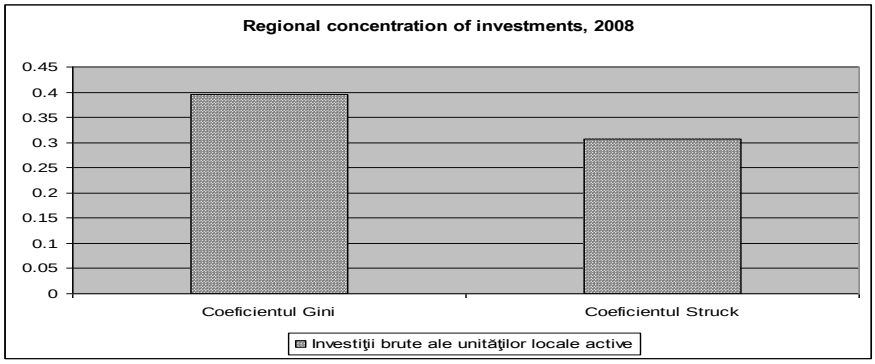
3.7. The investments

The analysis of regional concentration of investments was achieved with the help of the indicator: gross investments of active local units.

Thus, as shown in Figure 10, both Gini and Struck coefficient indicates that, at regional level, there is a significant concentration of gross investments, implying that, some regions (especially the Bucharest-Ilfov region) have achieved or have attracted a bigger number of investors. We can talk about an important concentration of investments at regional level, the values of the two coefficients being over 0.3 (the Gini coefficient is 0.396).

Compared with 2000, this concentration is increasing visibly and some regions are more attractive in terms of local investors (the Gini coefficient increased from 0.3 to about 0.4 in the period under review).

Figure 10: Regional concentration of investments, 2008

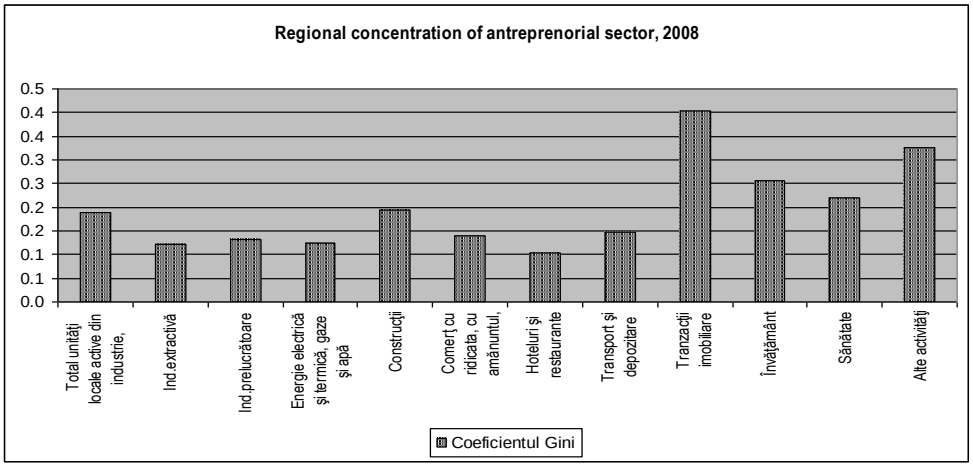


Source: Data processing Romanian Statistical Yearbook 2009, NSI, Bucharest

As concerns the concentration of active companies in economic sectors, we may also find that, some regions are more attractive than others and the concentration is stronger.

Thus, in 2008, there was still a greater concentration in the real estate transactions field (the Gini coefficient was 0.403). At a big distance, there were other areas with a relative concentration: education (the Gini coefficient was 0.255), health (the Gini coefficient was 0.219), construction (the Gini coefficient was 0.194). The lowest regional concentration is represented by the hotels and restaurants sector (the Gini coefficient was 0.102), whose relatively uniform distribution at regional level could lead to a relatively balanced and sustainable development (Figure 11).

Figure 11: Regional concentration of active companies in economic sectors and regions, 2008



Source: Data processing Romanian Statistical Yearbook 2009, NSI, Bucharest

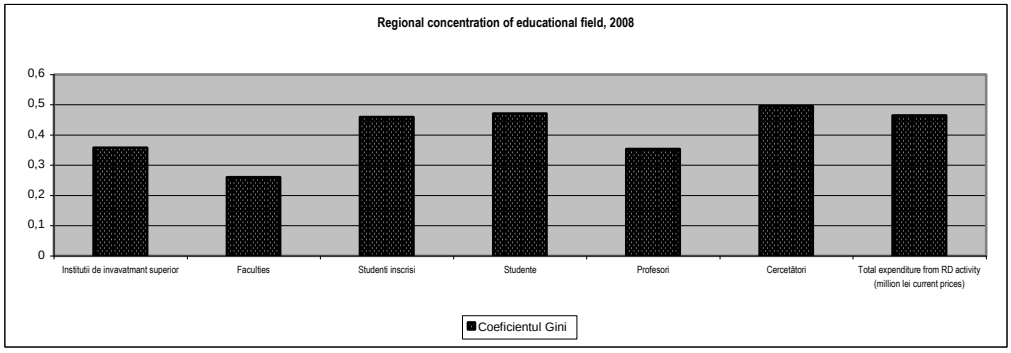
3.8. Education and research

As a result of the fact that the Bucharest-Ilfov region holds approximately 0.45% of total higher education institutions and 47% of researchers, the values of Gini/Struck coefficients being higher than those registered by other indicators examined so far.

Thus, in 2008, in this area, most indicators that have been analyzed have recorded significant concentrations at regional level, exception being the indicator number of universities/faculties, whose coefficient was below 0.3 (Gini coefficient was 0.260).

The most important concentration was recorded by the indicator number of researchers, whose Gini coefficient reached the value of 0.494, followed closely by the indicators: number of students (Gini coefficient was 0.471) and total research expenditures (Gini coefficient was 0.464) (Figure 12).

Figure 12: Regional concentration in education and research field, 2008

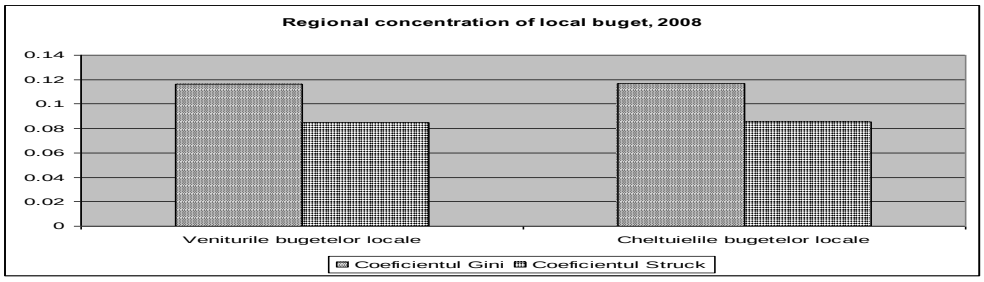


Source: Data processing Romanian Statistical Yearbook 2009, NSI, Bucharest

3.9 Local budget

At regional level, there is no significant concentration of the revenues and expenditures of local budgets. The value of Gini coefficient is below 0.12, which means a relatively balanced distribution at development regions level (Figure 13). Also, the Struck coefficient is approximately 0.085. There is a slight concentration of local expenditures (0.117), compared with the recorded revenues (0.116).

Figure 13: Regional concentration of local budgets, 2008



Source: Data processing Romanian Statistical Yearbook 2009, NSI, Bucharest

3.10. Regional concentration of GDP

The evolution of total GDP indicator concentration was calculated for the period 1995-2007.

In 1995, regional GDP concentration was very low, the Gini coefficient being 0.066. The difference between the highest and lowest value of the regional GDP was between the South and South-West region, including West (22%).

In 2000, there is a first clear trend of increasing concentration, the Gini coefficient reaching 0.142.

Calculated for 2007[4], the Gini coefficient recorded a value of 0.172, which means a relatively low concentration of total regional GDP (Figure 14).

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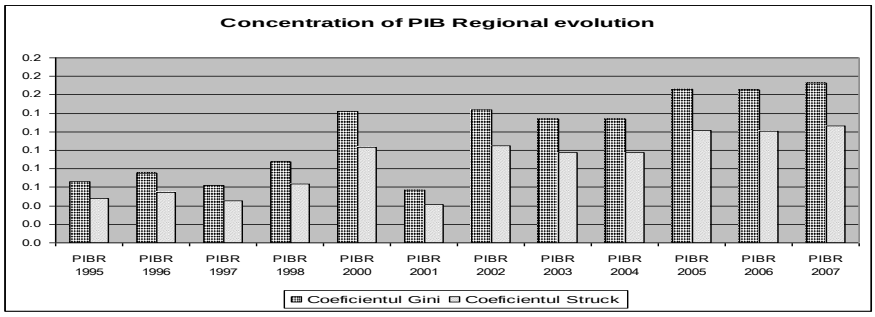
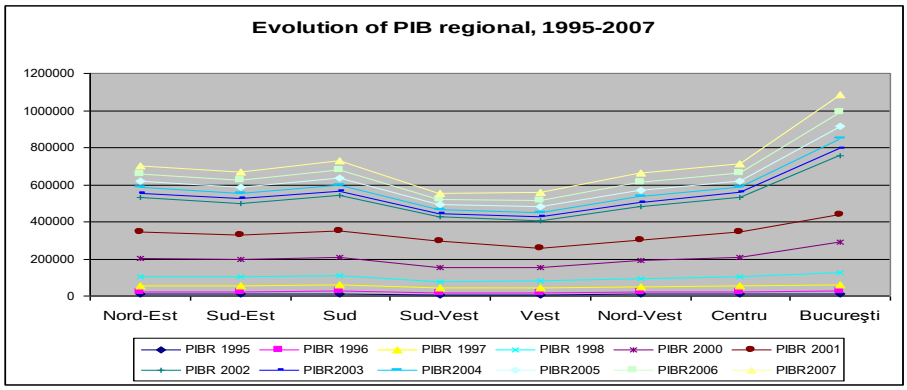
[4] **Although there are national GDP data for 2008, at regional level, this indicator stops in 2007 (According to the Romanian Statistical Yearbook 2009, NSI, Bucharest).**

Figure 14: Concentration of regional GDP, 1995-2007



Source: Data processing Romanian Statistical Yearbook 2009, NSI, Bucharest

Figure 15: The evolution of regional GDP, 1995-2007



Source: Data processing Romanian Statistical Yearbook 2009, NSI, Bucharest

4. Regional concentration of EU financed projects

At the end of the analysis regarding the degree of concentration of some indicators relevant to the general level of regional development, it was also made a brief assessment on how it was carried on the implementation of Regional Operational Programme 2007-2013 until the year 2008 (December 31)[5].

According to this programming document, the allocation of funds to regions was made in order to achieve the established strategic goal: the balanced development of all regions in Romania, giving priority to the regions and areas less developed to prevent increasing social and economic disparities between regions.

Programming the allocation of funds by regions was done differently, in inverse proportion to their level of development[6]. Thus, regions with a low GDP per capita will receive a higher share of total program funds, while the share of financial allocations will be smaller for regions with a higher GDP per capita[7].

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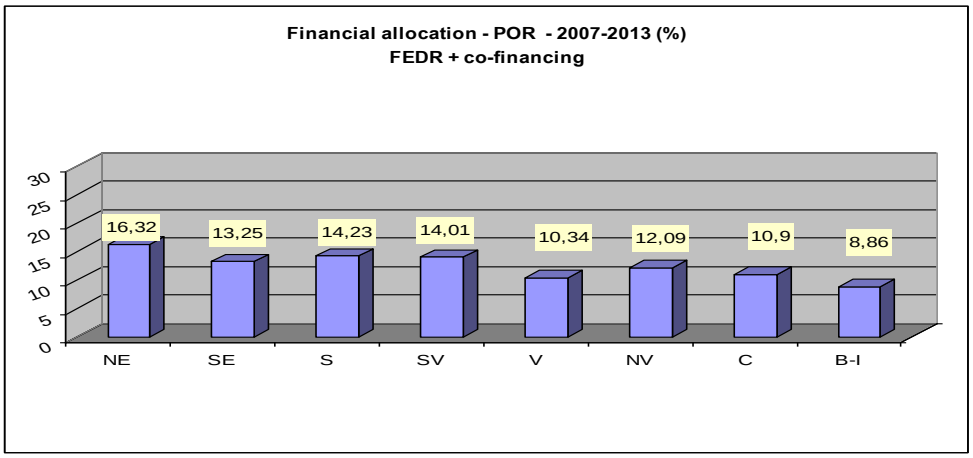
[5] **The status of implementation of ROP 2007-2013 at 31 December 2008 was as follows: about 1337 projects were submitted, relating to 11 major intervention areas (ROP 14 areas in total), totaling 3.46 billion Euros; ERDF funding was 2.1 billion Euros. There have been contracted 40 projects (representing 3% of submitted projects) totaling 352 million Euros (10.1% of the total sum of submitted projects), of which ERDF funding was 251.7 million Euros. In 2008, payments were not made.**

[6] **Measured by the GDP per capita, adjusted by a coefficient of population density.**

[7] **The financial allocations to regions lies between the minimum of 8.86% in Bucharest-Ilfov region and 16.32% in the North-East region, evaluated as the poorest region in the EU.**

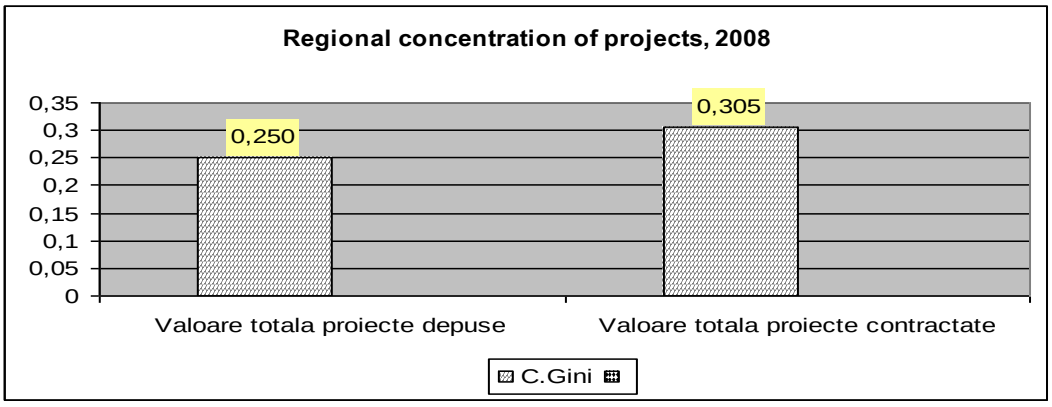
Figure 16: Financial allocation by development regions of the Regional Operational Programme (2007-2013)



Source: Data processing Romanian Statistical Yearbook 2009, NSI, Bucharest

From the analysis of Gini coefficients can be seen that, at regional level, there is a significant concentration of contracted projects value (the Gini coefficient is 0.305) and a relative concentration of submitted projects value (the Gini coefficient is 0.250) (Figure 17).

Figure 17: Comparative analysis – submitted projects, contracted projects and regional GDP (2007-2013)

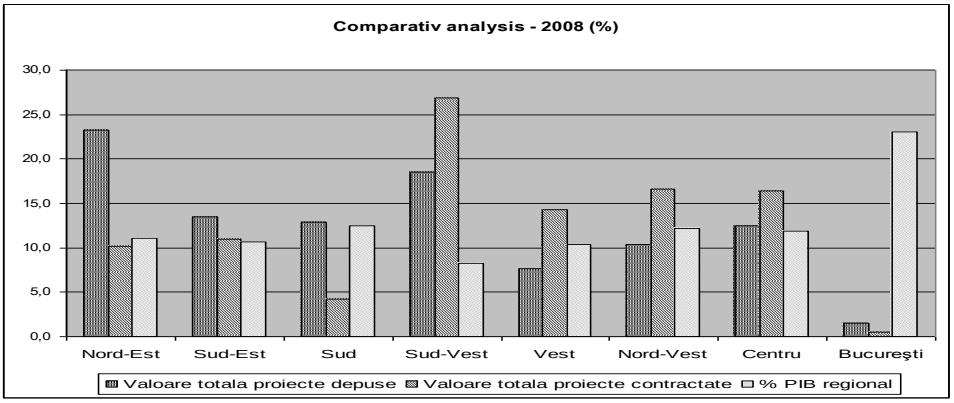


Source: Data processing Romanian Statistical Yearbook 2009, NSI, Bucharest

First place in the submitted projects is held by the North-East region, with 23.2%, followed by the South-West region (18%) and South-East (14%). The last place was held by Bucharest-Ilfov region, with only 0.01% of the submitted projects value.

In terms of total value of contracted projects, the first place is held by the South-West region, with 26% of total contraction, followed by North-West (17%) and Center (16% of total contracted value) (Figure 18).

Figure 18: Comparative analysis – submitted projects, contracted projects and regional GDP (2007-2013)



Source: Data processing Romanian Statistical Yearbook 2009, NSI, Bucharest

5. Conclusions

Through this article we have sought an analysis of the main types of regional disparities, in 2008 and also in comparison with 2000, based on the Gini/Struck coefficients method and the existing statistical data in the Romanian Statistical Yearbook – year 2009. The results obtained after applying the concentration coefficients are the following:

1. Most coefficients have values placed in the interval [0-0.3]; this shows a relatively uniform distribution, without too much concentration in those areas;
2. There are, however, some sectors that have a high degree of concentration (coefficients values being over 0.35: population from urban/rural, the SME sector [10-49 and 50-249 employees], total turnover and trade, employment in some sectors [trade], gross investments, active local units from the real estate transactions sector, institutions of higher education, research;
3. Also, there were high levels of Gini coefficients for the submission and contracting of projects financed by the Structural Funds, which shows a greater concentration, at regional level, of the capacity to absorb funds;

4. The analysis of the evolution of Gini/Struck coefficients shows a clear trend of increasing the concentration of regional disparities in Romania, after the year 2000.

As regards the Structural Funds absorption indicators, it appears that there is a higher concentration compared with other analyzed indicators (population, number of employees, employment). The degree of deposition and contracting of projects, financed from the Structural Funds, is determined, on the one hand, by the capacity of a region to propose viable projects, and on the other hand, by the local power to co-finance. Although the proposed financial allocation in the Regional Operational Programme, for the current programming period, took into account the regional development level, it appears that, the poorer regions (example: North-East), although they had done and made a large number of projects, they have not yet been contracted. The most contracted projects, under implementation, have been deposited in the South-West, North-West and Centre.

The explanation of this phenomenon results from the following aspects:

The access to finance: "freezing" the banking sector, with direct effects on the access to credits, which seriously affects the capacity to co-finance of the recipients of ROP (both local authorities and the sector);

The availability of public resources: deteriorating the situation of public finances, that leads to a higher public deficit, which is a pressure factor on the capacity of the Ministry of Finance to ensure co-financing;

Maintaining the relevance of some targets, which not fit anymore to the current context: create jobs – 15000 new jobs;

Other macroeconomic factors: the decrease of foreign investments, elimination of a large number of companies, etc.

Finally, one can say that the regional disparities level, in terms of economic and social development, is in a process of growth across all country, without being able to identify one or another model of development. Also, it is clear that the Bucharest-Ilfov region, the most developed region of the country, determines an increase in the concentration of certain areas. In parallel, we can observe a slight increase, which is concentrated in the regions from the west of the country (North-West, Centre and West) and less in the eastern regions (North-East, South-East, South and South-West), although the real growth could be better assessed at the sub-regional level[8], where are very obvious the signs of economic decoupling of some marginal areas located on the periphery or face specific development problems.

[8] **To better highlight the current regional situation, we propose, in a future article, a further analysis of development disparities within regions.**

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References

1. Antonescu D. – „Regional development in Romania – *concept, mechanisms, institutions*" Oscar Print Publishing (B+ category), ISBN 973-668-011-8, 238 pages, 2004 (www.bookfinder.com);
2. Nicolae V., Daniela-Luminita Constantin, Basis of regional and urban economy, Os*car Print Publishing, Bucuresti, 1998;*
3. Paelinck J.H.P, L.H. Klaassen, 1979, *Spatial Econometrics,* Saxon House;
4. Pecican E.S., 2007, *Econometria pentru economişti,* Editura Economică, Bucureşti.
5. Săvoiu Gh., Crăciuneanu V., Ţaicu M. *O metodă statistică nouă de analiză a concentrării sau diversificării pieţelor, Revista Română de Statistică nr. 2/2010;*
6. Quah D., 1996, *Twin peaks: Growth and convergence in models of distribution dynamics,* Economic Journal, 106.
7. Waterson M., 1984, *Economic Theory of the Industry*, Cambridge Univ. Press;
8. *** 2003, *Dicţionar de statistică generală,* Editura Economică, Bucureşti;
9. *** 1979, *Dicţionar de matematică şi cibernetică economică,* Editura Ştiinţifică, Bucureşti;
10. *** Anuarul Statistic al României, INS, 2000-2009, Bucureşti;
11. ***Raportul Anual de Implementare a Programului Operaţional Regional 2007-2013.