

# The Dynamics of Regional Inequalities in Romania. Comparative Analysis between the major Crises – Financial and Sanitary

Daniela Antonescu<sup>1,\*</sup> , Ioana Cristina Florescu<sup>1</sup> 

<sup>1</sup> Institute of National Economy, Romanian Academy, 13 Calea 13 Septembrie, 050711 Bucharest, Romania;  
daniela.antonescu25@gmail.com (D.A.); ioanaflorescu2001@yahoo.com (I.C.F.)

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**ABSTRACT:** In Romania, the issue of economic inequalities and regional convergence is one of the current important topics on which the attention of economic specialists and the decision-making factors is focused. In the actual context, the regional policy in Romania is implemented at regional level, the regions being formed by counties that have voluntarily associated on the basis of a convention signed by the representatives of the County Councils, respectively of the General Council of Bucharest. After the year 2000, the development regions faced two major crises: the global financial crisis (2008-2009) and the one caused by the COVID-19 pandemic (2020-2021). Both crises have caused important effects at regional level and both have been supported by a number of territorial strategies and policies, to which there was added the cohesion and regional development policy financed by the EU Structural Funds. The paper is based on the analysis of the differences between the regions of Romania, in the period 2008-2022, during the COVID-19 pandemic, by highlighting the differences between the dynamics of certain indicators, of the analysis of the GINI coefficients for measuring inequalities, trying to answer the question which of the two crises, financial or health, affected the level of territorial inequalities more and what was the evolution of the regions of Romania in these two sub-periods. Regarding the financial crisis versus the pandemic one, in the majority of the indicators, it was shown that the values of the Gini Coefficients in the 2020-2022 were higher than the ones in 2008-2010 and also after the COVID-19 crisis the tendency of increased disparities was maintained. The only domains that were least affected by the pandemic were demography (rural population), transportation infrastructure and economic potential (companies with 10-49 employees).

**KEYWORDS:** regional inequalities, convergence, GINI Coefficient, NUTS 2 Regions, COVID-19 pandemic crisis, economic-financial crisis

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## 1. INTRODUCTION

In Romania, the problem of economic inequalities and regional convergence represent one of the important current topics on which the attention of theoreticians but mostly of practitioners (the decision factor) is focused. Also, in the context of the integration in the European Union structures, the matter of convergence represents a particular interest which takes into account the size of the gap (economic, social, infrastructure, etc.) between the European Union regions and Member States.

After the year 2000, the development regions in Romania faced two major crises: the one from 2008 known as the global financial crisis and the one from 2020 caused by the COVID-19 pandemic. Both crises have caused significant losses at regional level and both have been supported by a number of

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\* Corresponding author: daniela.antonescu25@gmail.com; Tel.: +40 766 295 926

territorial strategies and policies, to which there was added the cohesion and regional development policy financed by the EU Structural Funds. Also, the COVID-19 pandemic attracted a series of effects whose repercussions were felt on the level of territorial inequalities. Even though the health crisis has had an impact on all regions and sectors of activity, it seems that there have been areas that have done better, while some sectors have experienced real revigoration.

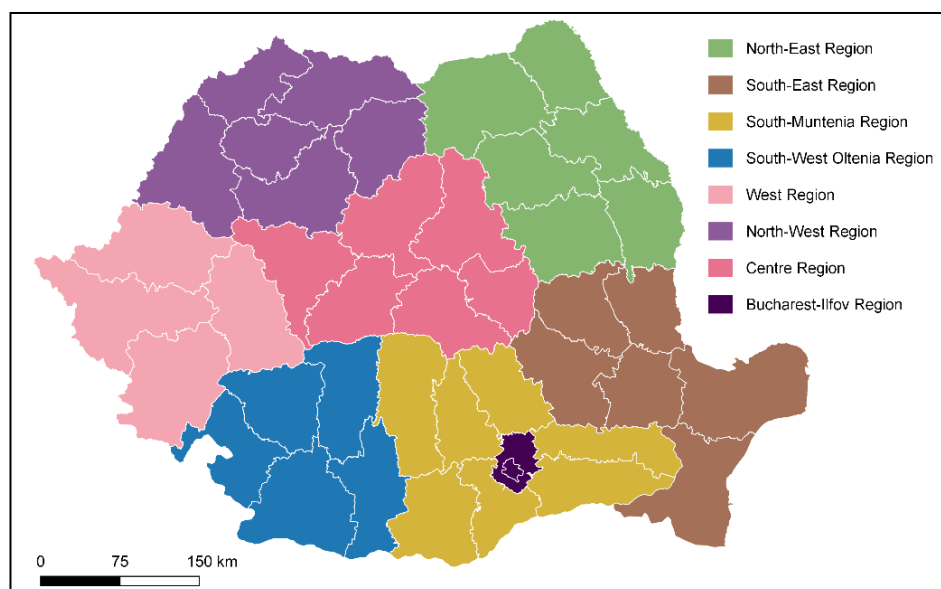
Three years after the emergence of the health pandemic and 12 years after the financial one, the counties economies are still going through a process of recovery and resilience. It is important to know which regions have recorded the largest losses and which are the economic sectors in these regions that have suffered the most. This information is useful for establishing directions and recovery measures and the most appropriate territorial policies.

During the financial crisis of 2008, many states had and needed financial help, which often took the form of loans from outside the country, which, over time, led to the increase in national debt. Increasing the state and private debt, but also spending money that the governments did not have are the causes that have contributed to raising the debt levels for many states.

The pressure borne by the citizens of a country in terms of public debt has also been supplemented by the pressure directly exerted by external creditors on citizens due to the amounts borrowed for the goods and services purchased. On the other hand, the global health crisis started in 2020 came with new constraints. The constraints generated by this new pandemic are multiple and have caused numerous problems at the economic, social and security level in all of the countries affected by it. The COVID-19 pandemic has highlighted, more than any global event or phenomenon, the reality that we live in an interconnected society; no country, no society, no community can address this issue alone.

The major systemic crisis, the pandemic is an attempt, an examination, for the current values and civilization, in their globality. It also highlighted the great vulnerabilities and structural dysfunctions of the current world and moreover of the discrepancies of the regions, in terms of the phenomenon of poverty and economic crisis, climate change, and migration crises or respect for human rights. It showed that globalization and progress can be reversible, that challenges affect all areas covered by the Sustainable Development Goals whose achievement is seriously threatened.

In the actual context, the regional policy in Romania is implemented through the development regions that contain counties formed by voluntary association based on a convention signed by the representatives of the county councils and the General Council of the Bucharest Municipality, respectively.



**Figure 1.** The eight development regions of Romania.

Source: Marin V.A., 2022

The context of analyzing inequalities and economic convergence is represented by the eight development regions (statistical regions) created after the accession to the European Union (in 2007).

These regions were established considering the potential functional integration criterion around some polarizing centers (Iași, Timișoara, Craiova, Constanța, Brașov and so on), corresponding to the NUTS 2 system of the European Union. Other criteria were taken into account as well in creating the regions, such as: resource complementarity, economic and social activities, functional links, etc. The eight development regions created in accordance with the Regional Development Law no. 151/1998 (amended by Law no. 315/2004), are presented in Figure 1 and Table 1.

The development regions represents "areas which correspond to county groups, established by their voluntary association based on agreement signed by the representatives of county councils, as well as by those of the General Council of Bucharest; regions represent the framework of design, implementation and evaluation of regional development policies, as well as collection of specific statistical data, in accordance with European regulations issued by Eurostat for the second territorial classification level, NUTS II, existing within the European Union" (European Parliament, 2023).

The regional policy in Romania is implemented by development regions, made up of counties formed by voluntary association based on a convention signed by the representatives of the county councils and of the General Council of the Bucharest Municipality, respectively.

**Table 1.** Development regions in Romania – NUTS 2.

Region code	NUTS 2	NUTS 3 regions (counties)
RO05	West	Timiș, Arad, Caraș-Severin, Hunedoara
RO06	North-West	Bihor, Bistrița-Năsăud, Cluj, Maramureș, Sălaj, Satu-Mare
RO07	Centre	Alba, Sibiu, Brașov, Covasna, Harghita, Mureș
RO01	North-East	Bacău, Botoșani, Iași, Neamț, Suceava, Vaslui
RO02	South-East	Brăila, Buzău, Constanța, Galați, Tulcea, Vrancea
RO03	South-Muntenia	Argeș, Călărași, Dâmbovița, Giurgiu, Ialomița, Prahova, Teleorman
RO08	Bucharest-Ilfov	Bucharest Municipality, Ilfov County
RO04	South-West Oltenia	Dolj, Gorj, Mehedinți, Olt, Vâlcea

Source: Eurostat, 2023.

The paper analysis the regional inequalities of the development regions in Romania (presented above) during the periods 2008-2010 and 2020-2022, based on several direct and derived indicators specific to some economic fields of activity.

The article tries to identify the impact of the financial and sanitary crises upon the level of development of NUTS 2 regions (Eurostat, 2022). We are trying to answer the question: which of the two crises affected the level of territorial inequality more and what happened over time with their evolution?

## 2. LITERATURE REVIEW

The issue of regional inequalities and the growth of social cohesion is systematically addressed by numerous universities and scientific institutions abroad, many of them of great prestige. The purpose of these studies is to provide policy makers with data and information relevant to the trends taking place in this field, which influence the level and evolution of inequalities at territorial level (Antonescu, 2004).

Traditionally, international and national economic analyses have explained the territorial inequalities on the basis of differences between regions in terms of natural resource potential, factors of production, infrastructure and technology as mentioned in multiple research (Ailenei & Dachin, 2007; Goschin et al., 2008, 2009; Constantinescu & Constantin, 2010; Boboc et al., 2012).

As mentioned by Benedek and Kurkó (2011) "an important role in the emergence and evolution of territorial disparities" begins with the unequal allocation of the economic factors. The economic and financial crisis was manifested by an unequal distribution of regional effects, depending on specific economic and social structures, the degree of regional specialization and other local factors. The impact of the crisis has been added to pre-existing regional problems, aggravating them (Goschin & Constantin, 2010; Ailenei et al., 2012).

During the years there were several approaches "regarding the relation between regional development and disparities" as stated by Kuttor (2009). After an in-depth study of the evolution of the

world economy, but also of the Romanian economy, we can see that the effects of the financial crisis that also started in Romania in 2008 brought special and difficult to anticipate effects on the momentary evolution and on a short term in the economy of our country. Romania, with a questionable strategy in terms of how the macroeconomic priorities were set, was unable to cope with the crisis that came as a roller for the whole of Europe, especially for the Romanian economy. The economic relations were uncoordinated, the plan or better said the government program that was somewhat established on other conditions had the effect of bringing Romania into a rather delicate situation (Enache, 2015).

Romania, as a member of the European Union, should have had a concrete action plan that would also correlate with the EU's strategies in a period with such effects on the national economy. Romania had a program of sustainable economic growth in the short, medium and long term (Romanian Government, 2008), but unfortunately it was not sufficiently well established, correlated at macroeconomic level, this has caused an instability of the Romanian economy for the moment.

Even though Romania as a whole has benefited, in social and economic terms, from EU integration, the territorial disparities within the country have increased (European Commission, 2020) and they also took some new forms (Török, 2019). The local educational capital inequalities have shaped the successful absorption of EU funds, while fixed capital investments have targeted the most developed regions. The unpredictability of policies, the rigid administration, with complicated regulations for auctions, unclear distribution of responsibilities between national, county and local levels and the lack of regional administrative capacity remained bottlenecks for Romania in terms of using the opportunities offered by the EU's regional cohesion policies (European Commission, 2020). The competitiveness and cohesion reveals the effects of the transition period and of the economic crisis, both having enhanced the inter- and intraregional disparities; this happens because regional polarization is still very strong despite the policies tending to re-balance development opportunities (Mitrică et al., 2021a).

What should be changed in European regional policies to effectively reduce social and economic disparities in Romania is not only a technical issue of policy management, but also a broader political issue to bring to the center of attention, throughout the regional cohesion policies, some of the major sources of inequalities in Romania. "The regions have evolved and developed at a different pace" leading to discrepancies (Boldea, Parean & Otil, 2012). These in terms of productivity and income between the agricultural sector and the manufacturing industries should not be hidden behind the so much discussed about namely the rural-urban cleavage, but approached in relation to the green, sustainable, production, and with the prevailing forms of employment in these sectors.

Supporting the agriculture and the green jobs should also strengthen the labor regulations and collective bargaining, ensuring access to social security and subsidized services. Child poverty and the prospects for upward social mobility should not only be framed as problems of low income, but also as a historical result of past injustices endured by peasant families or other ethnocultural minorities. The school dropout and low educational qualifications should be seen as intrinsically linked to the long underfunding of public education and the shortage of qualified staff for inclusive education that offsets the disadvantages of socio-economic disadvantage. From an administrative viewpoint, the local capacity building and regionalization should be given a greater weight, taking into account the significant inequalities between regions that make national redistribution necessary.

The vulnerability level of the regions of Romania is divided into two parts: the southern and north-eastern regions mainly defined by a high and very high degree of vulnerability and the central and western regions marked by a medium and very low vulnerability level mainly due to the very low sensitivity factor; Cluj, Timiș and Hunedoara Counties are, after Bucharest Municipality, the less vulnerable (Mitrică et al., 2021b).

The COVID-19 pandemic has also exposed the existing and persistent health inequalities in our societies. This pandemic has had a strong impact on the lives of people living in deprivation or facing difficult socio-economic circumstances.

The pandemic is affecting the world's poorest and most vulnerable people and "assessing the poverty impact of COVID-19 is no trivial matter" as stated by Laborde, Martin & Vos (2021). Thus, the harsh and profound inequalities in the society and the ever-increasing differences already existing within and between countries have been revealed. In advanced economies, the mortality rate was the highest

among a few vulnerable groups such as the elderly, and in developing countries the most vulnerable categories (the elderly, people with medical conditions, children, migrants and refugees) risk being even more affected.

In 2020, the world was facing its worst economic recession since the Great Depression, with an expected drop in real GDP per capita of 4.2%. The international trade in goods was expected to decline by 13% to 32%. The most vulnerable countries were the ones affected most. The foreign direct investment was expected to decline by up to 40% in 2020 (United Nations, 2020).

In the context of the COVID-19 crisis, the global community is facing unprecedented challenges, as the pandemic is substantially transforming the world we know. The pandemic has abruptly halted the implementation of many sustainable development goals and in some areas has led to a reduction in progress. The crisis has affected all segments of the population, all of the economic sectors and all of the regions of the world. If the world had been on track towards the targets set out in Agenda 2030, then it would have been better prepared to face the pandemic.

Lately, there has been an increased interest for the regional research area, presented through the concentration analysis, with which it can be illustrated the intensity of certain phenomena on economic and social categories.

In addition, the concentration analysis allows the comparison of data between identical or different phenomena, starting from the same or different number of units, for the same year or different years, etc (Nijkamp, 2016). 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.

In order to achieve the analysis, there were used statistical indicators that exist at regional level, clustered 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, research, telecommunications, urban infrastructure, investment, regional GDP.

The interpretation of the results of this analysis considered 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 took into consideration that Bucharest-Ilfov region is a major urban area, which may significantly affect the obtained results.

### 3. METHODOLOGY

The methodology proposed in this article is based on the analysis of regional disparities performed on the coefficients of concentration/diversification (also known as indexes of geographic distribution). The Gini coefficient (GC) developed by the statistician Corrado Gini<sup>1</sup> (1884-1965) is the most used measure of inequality. It is typically used as a measure of income inequality, but it can be used to measure the inequality of any distribution (Hasell, 2023). It measures inequality on a scale from 0 to 1, where the higher the value of the coefficient, the greater the level of inequality is. When it is computed as a percentage with values from 0 to 100%, then it is known as the 'Gini coefficient'. A value of 0 indicates perfect equality – where everyone has the same income. A value of 1 indicates perfect inequality – where one person receives all the income, and everyone else receives nothing. The interpretation of the concentration coefficients indicates that when the value is close to the zero there is a balanced distribution of the corresponding vectors' elements. The measurement of the concentration degree of an activity in a region is performed using the Gini/Struck coefficient (Antonescu, 2010).

The formula used to calculate the Gini coefficient (GC) is the following (1) (with values on the interval  $[\frac{1}{n} * 0.5; 1]$  and  $n$  = number of observations):

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<sup>1</sup> C. Gini developed the theory of dispersion in *Variabilità e Mutabilità* (1912) and the concentration ratio. This led to his most famous contribution, the Gini Coefficient, which is used in a mathematical formula to determine the measure of dispersion in a concentration.

$$GC = \sqrt{\sum_{i=1}^n p_i^2} \quad (1)$$

For normalization it is also used the corrected GC (CGC), also known as the Gini-Struck coefficient or as we are to mention it for simplicity in our analysis as the Struck Coefficient for which the following formula was used (2):

$$GSC = \frac{GC - \frac{1}{\sqrt{n}}}{1 - \frac{1}{\sqrt{n}}} \quad (2)$$

The analysis of the indicators on the concentration/diversification can indicate how the development regions of Romania are placed comparing the uniform and balanced distribution of economic results obtained. In order to identify the regional inequalities in Romania, in period 2008-2010 compared to 2020-2022, the Gini/Struck concentration/diversification coefficients method was used.

In the next table we gathered all the indicators that were analyzed in the next chapter. The computing techniques were as followed: dynamics and structural analysis, for the period 2010-2022.

**Table 2.** The indicators used in accordance to the analyzed domains.

Domain	Indicator	
Demography	Total population	Evolution, structure and dynamics
	Urban population	
	Rural population	
Workforce	Employees	
	Unemployed	
	Total employees	
Economic potential	Total active companies	
	Micro companies 0-9 employees	
	Small companies with 10-49 employees	
	Medium companies with 50-249 employees	
	Large companies - 250 employees and over	
Health infrastructure	Total Regional GDP	
	Physicians	
Transport infrastructure	Hospital beds	
	Total length of public roads	
Education	Total length of railways	
	Researchers	
	R&D expenses	
	Students	

Source: own processing of the indicators used.

The limitations of the study were comprised by the fact that most of the data that was gathered from the National Institute of Statistics from Romania through their Tempo-online database stops at the year 2022. Also, the fact that there were fewer indicators in 2008 that we could use thus leading to a lesser analysis was another limitation that we confronted with but in the future articles we will try and complete our study with new indicators. Another challenge is the fact that the Gini/Struck method is mostly used in national analysis and less in the regional ones by national organizations which have as a target a longer timeframe than we proposed for this article. Moreover, another challenge is due to the fact that the eight regions of development are comprised by counties that have major differences regarding their level of development which lead to discrepancies that affect the income level and their future territorial development.

#### 4. THE ASSESSMENT OF REGIONAL INEQUALITIES. RESULTS AND DISCUSSIONS

At regional level, the concentration analysis was based on the two coefficients presented above (Gini/Struck), taking into account 10 groups of indicators, all of them gathered from the Eurostat database

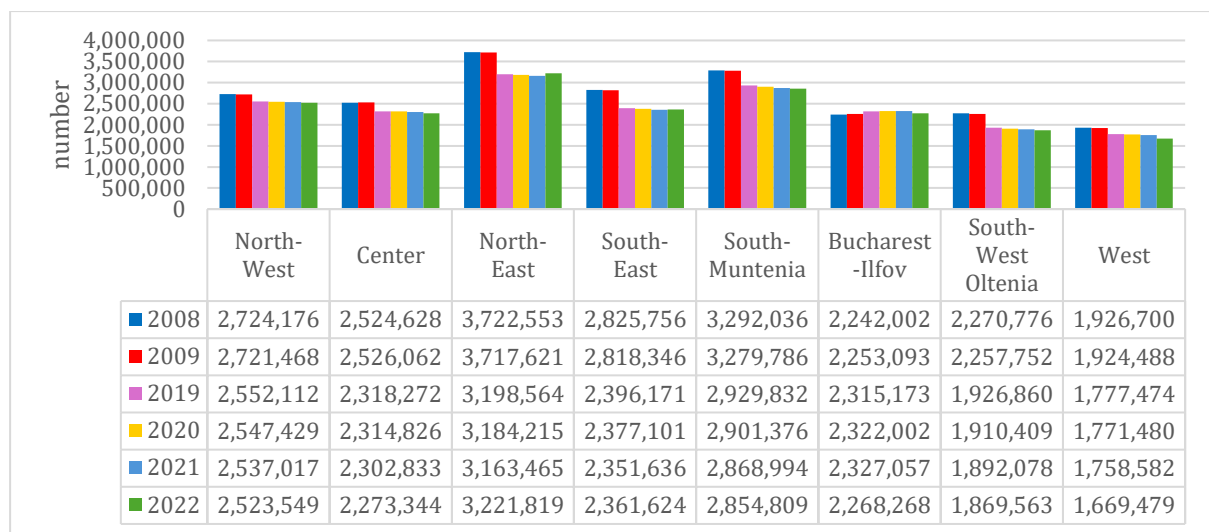
(2023). If the value of the coefficients exceeded 0.3, there is a relative concentration that can be mentioned and considered, and if the value was close to 0.5, then we can speak of a high concentration.

The computations were made at regional level, considering the inherent limitations related to available statistical databases.

#### 4.1. Population at regional level

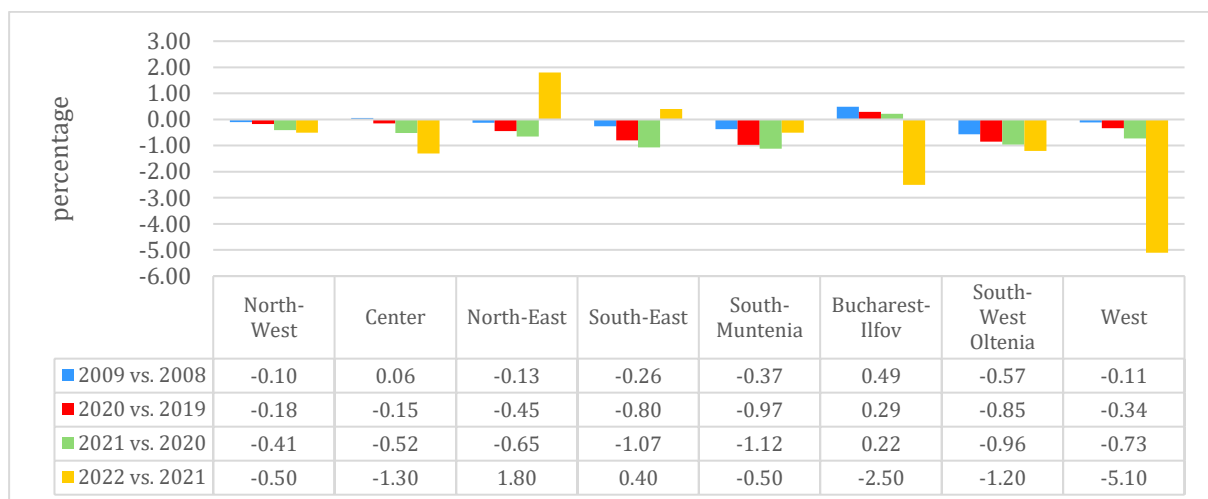
The regional concentration analysis was based on the following statistical indicators: total population, population in urban and rural areas.

The analysis of the population at regional level showed that in 2008, the region with the largest demographic base was North-East, with 3.722 million inhabitants, followed by South-Muntenia (3.29 million inhabitants). The last place was held by the West region (1.92 million). In 2022, we find in the first place the same region – North-East (3.221 million inhabitants), followed by South-Muntenia (2.854 million inhabitants) and North-West (2.523 million inhabitants) (Figure 2).



**Figure 2.** The evolution of the population at regional level, in Romania (no.).

Source: computed by the authors using Excel.



**Figure 3.** Dynamics of the population – comparative analysis (%).

Source: computed by the authors using Excel.

Comparing the two periods of crisis (financial and health), regarding the population, the crisis caused by COVID-19 has had a greater impact on the population at regional level. The only exception was the Bucharest Ilfov region, which experienced an increase in population in both periods. Interestingly,

regarding the health crisis, the declining demographic trend maintained in the following years, 2021 and 2022, with a sharper decline. There is a significant decrease in the population of the West region (-5.1%), followed by the demographic decrease in the Bucharest-Ilfov region (-2.5%). At the same time, there is an increase in the population of the North-East region of 1.8%, followed by the South-Muntenia region with +0.4% (Figure 3).

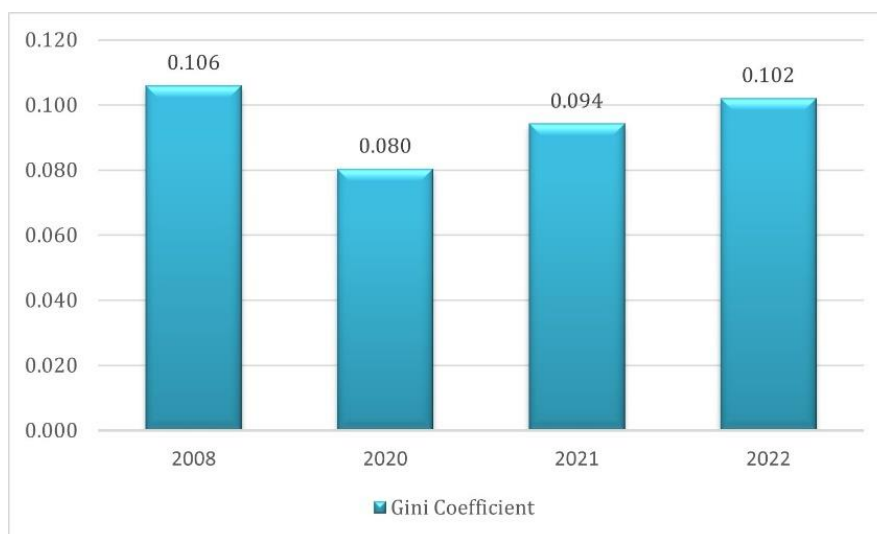
The analysis of the coefficients of variation at the level of the eight development regions indicates that, in the period following the financial crisis, from 2008 to 2011, their values were similar in both situations (with and without the Bucharest-Ilfov region). Since 2012, there has been a slight decrease in variation, with a higher amplitude in the case of coefficients that did not include the country's capital (Table 3). The health crisis of 2020 brought with it a decrease of the variance between regions (with Bucharest-Ilfov), while maintaining the values in the situation without the Bucharest Ilfov region at a value of 0.21. The years following the health crisis lowered the coefficient of variation to the same value from the financial crisis.

**Table 3.** Dynamics of Variation Coefficients in demography (number).

Variation coefficient	2008	2010	2012	2014	2016	2018	2020	2022
without Bucharest-Ilfov	0.220	0.222	0.208	0.208	0.209	0.209	0.207	0.224
with Bucharest-Ilfov	0.219	0.218	0.218	0.198	0.198	0.197	0.195	0.210

Source: computed by the authors using Excel.

In order to identify the trend of regional concentration and inequality, the Gini coefficient was calculated for the two periods of crisis. Thus, there is a slight tendency to reduce the concentration of demographics during the health crisis, but the value of the coefficient (0.106 in 2008 and 0.080 in 2020) isn't one to demonstrate that the regional population is predominant in one or more development regions (Figure 4) (there is no significant demographic concentration).



**Figure 4.** Dynamics of Gini Coefficients in demography, at regional level (number).

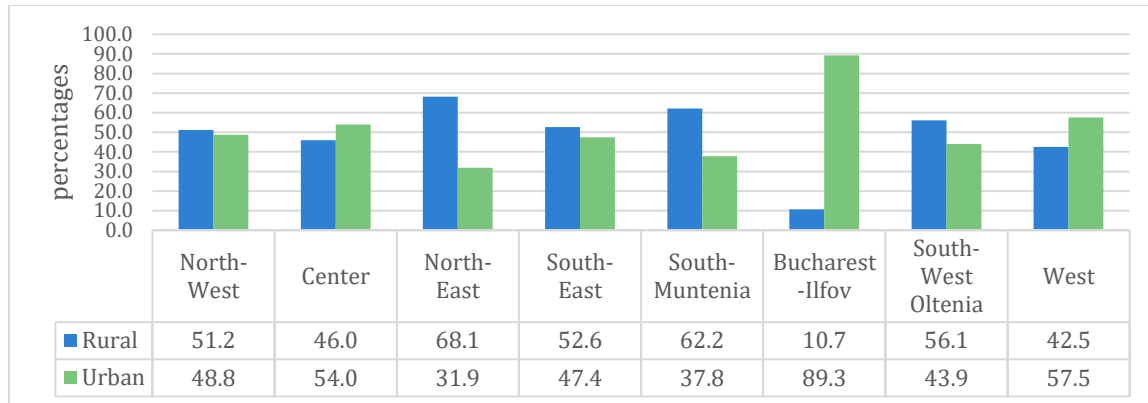
Source: computed by the authors using Excel.

The analysis of the existing data shows that, in 2008, at the national level, there was a predominantly urban population (55.04%), while at the regional level, five of the eight regions held most of the urban population (South-East, West, North-West, Center and Bucharest-Ilfov).

In 2020, the rural population in Romania was of 9,665,204 inhabitants, representing 50.004%, while the urban population was of 9,663,634 inhabitants (49.996%). The most urbanized region remains Bucharest-Ilfov with an urban population of 89.3%, followed by the Center (54%) and North-West (48.8%). In terms of rural area, it has the largest share in the North-East (68.1%) and South-Muntenia (62.2%) and South-West Oltenia (56.1%) (Figure 5).



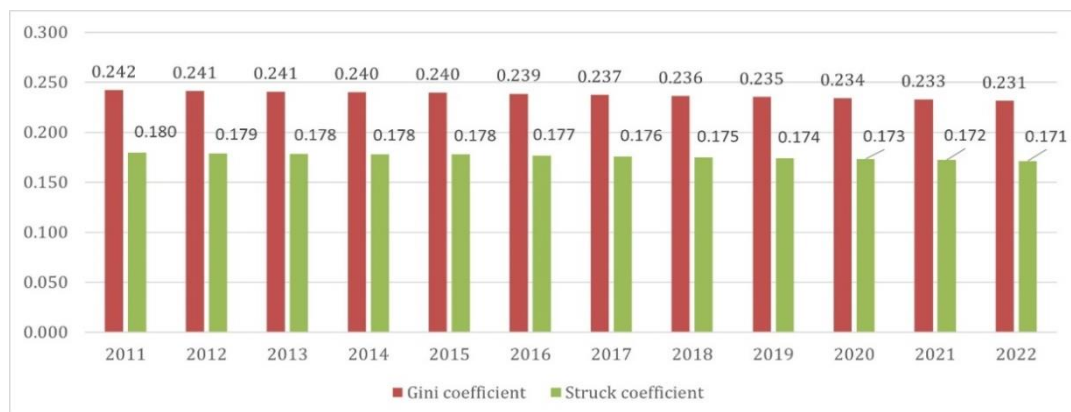
There is a phenomenon of decrease in the degree of urbanization in the year of the pandemic – 2020 – compared to 2008 (Figure 5). An analysis of the last year found in the national statistics (2022) showed a tendency of increase regarding the degree of ruralization of Romania, reaching a value of 50.4%. Moreover, the Bucharest-Ilfov region had an increase of the rural population by 1 p.p. (from 10.7 to 11.6% - year 2020 compared to 2022) and the West region by 3 p.p.



**Figure 5.** Urban – rural structure, at regional level, 2020 (%).

Source: computed by the authors using Excel.

The analysis of Gini/Struck coefficients at regional level shows that there is an easy tendency to reduce the concentration of the rural population, from 0.242 in 2011 to 0.231 in 2022, for Gini and from 0.180 in 2011 to 0.171 for Struck (Figure 6).



**Figure 6.** Dynamics of Gini Coefficients in demography, at rural regional level (no.).

Source: computed by the authors using Excel.



**Figure 7.** Dynamics of Gini Coefficients in demography, at urban regional level (no.).

Source: computed by the authors using Excel.

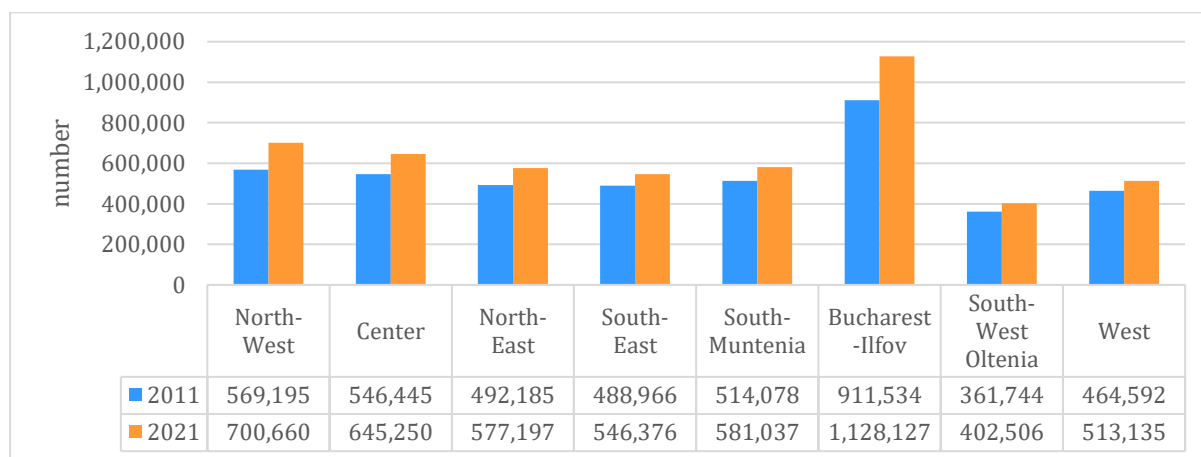
The decrease in concentration of the rural population was analyzed in parallel with a growing evolution of the concentration of the urban population (from 0.106 to 0.131 for the Gini coefficient and from 0.077 to 0.095 for Struck coefficient), in the period 2011 - 2022 (Figure 7).

#### 4.2. Workforce

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

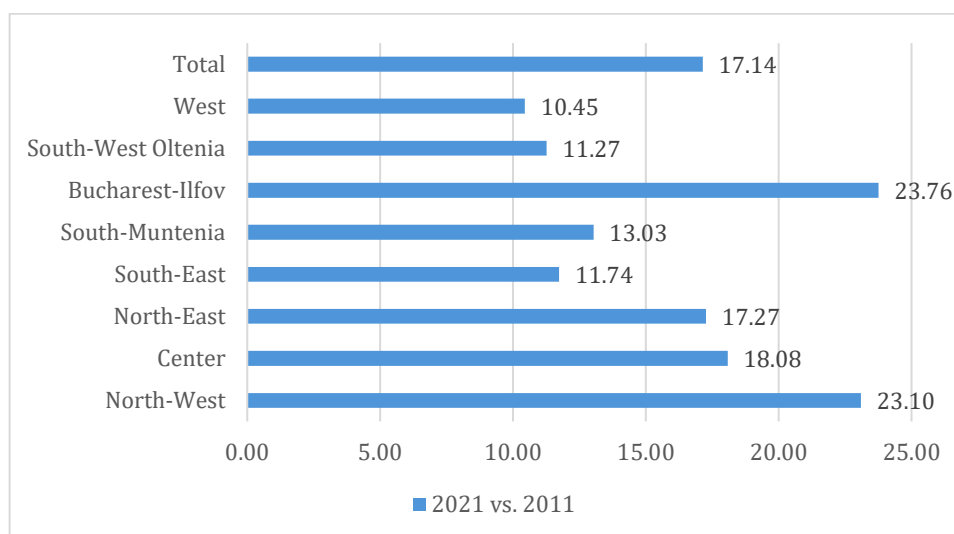
In 2008, the level of Gini/Struck coefficients reveals that there is a low concentration of the employed population in the eight development regions, the value of Gini coefficient being around 0.114 and the value of Struck coefficient being only 0.083. Compared with 2000, there is an increase in the 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. In 2008, the first year of the financial crisis, there was increase regarding the concentration of employed population in services (the Gini coefficient is 0.138 and the Struck coefficient is 0.101), but there was a relatively high concentration in the two major categories of services: commercial (Gini coefficient is 0.343) and social (Gini coefficient is 0.335).

The scoreboard of employees' situation at regional level shows that in 2021, in Romania there were 5,096,309 employees (Figure 8), with 17.14% more than in 2011 (4,350,750 employees).



**Figure 8.** The number of the employees at regional level in 2011 and 2021 (no.).

Source: computed by the authors using Excel.



**Figure 9.** The dynamics of employees at regional and national level, 2021 vs. 2011 (%).

Source: computed by the authors using Excel.

The dynamics at regional level in the period 2011-2021 shows that the largest increases in the number of employees were registered in the regions: Bucharest-Ilfov (+23.76%), North-West (+23.1%), Center (+18.08%) and North-East (+17.27%) (Figure 9).

In 2020, the year of the health crisis, the value of the Gini coefficient increased slightly to 0.165, but without proving that there is a significant concentration at regional level. However, in the period 2011-2021, the evolution of the Gini coefficient was slightly increasing, from 0.143 to 0.164 (Figure 10).



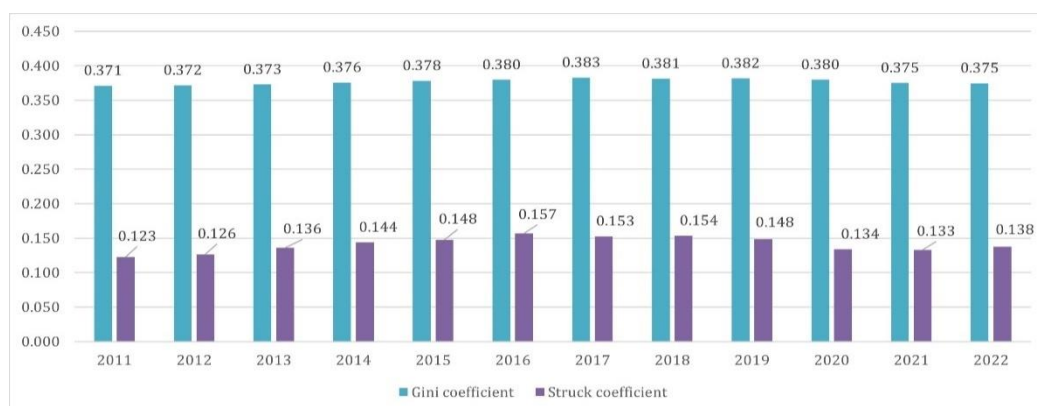
**Figure 10.** The dynamics of Gini Coefficients in employees, at regional level (no.).

Source: computed by the authors using Excel.

Also, in correlation with the workforce, we continue to analyze the situation of the unemployed at regional level. Thus, according to Eurostat, in 2022 there were 239,064 unemployed people in Romania. As it can be seen in the chart below, their number showed a decreasing trend in the period 2010-2022. In the year of the health crisis, there is an increase in the number of unemployed by 38,186 people. In the following years, 2021 and 2022, the downward trend resumed, but at a lower level.

The evolution regarding the structure of the number of unemployed at regional level shows that there is a decreasing trend throughout the period in four of the eight regions. In 2010, the largest number of unemployed was registered in the South-East (17.72%) and in the North-East (16.31%), the least being in the Bucharest-Ilfov region. The year of the pandemic crisis led to an increase in the unemployed in the North-East, South-East, Bucharest-Ilfov and South-West Oltenia regions. The period after the COVID-19 crisis brought a decrease in the number of unemployed in five of the eight development regions. In 2022, the most people unemployed were in the North-East region (18.07%), followed by the South-West Oltenia region (16.67%) and South-East (15.91%).

Regarding the evolution of the Gini/Struck coefficients related to the number of unemployed, it was showed that there is no high concentration at regional level, their value being below 0.2. In the period 2011-2022, there is a slight tendency in the increase of the concentration, from 0.168 to 0.187. In the year of the pandemic crisis, the concentration decreased slightly, from 0.209 (year 2019) to 0.183% (year 2020) (Figure 11).



**Figure 11.** The dynamics of Gini Coefficients in unemployed, at regional level (no.).

Source: computed by the authors using Excel.

Regarding the decrease in concentration of the employed population and the increase of the unemployed in all of the regions in both of the crisis, this is due to the fact that Romania lacked some strong policies meant to support those with fragmented working lives and periods of unemployment and to facilitate the labor market transitions in the industrial and services sectors. Unfortunately, in these two sectors the policies implemented in those two periods, 2008-2010 and 2020-2022, failed to address the long-term precariousness of those employed in agriculture or in other sectors with strong seasonal fluctuations, such as construction.

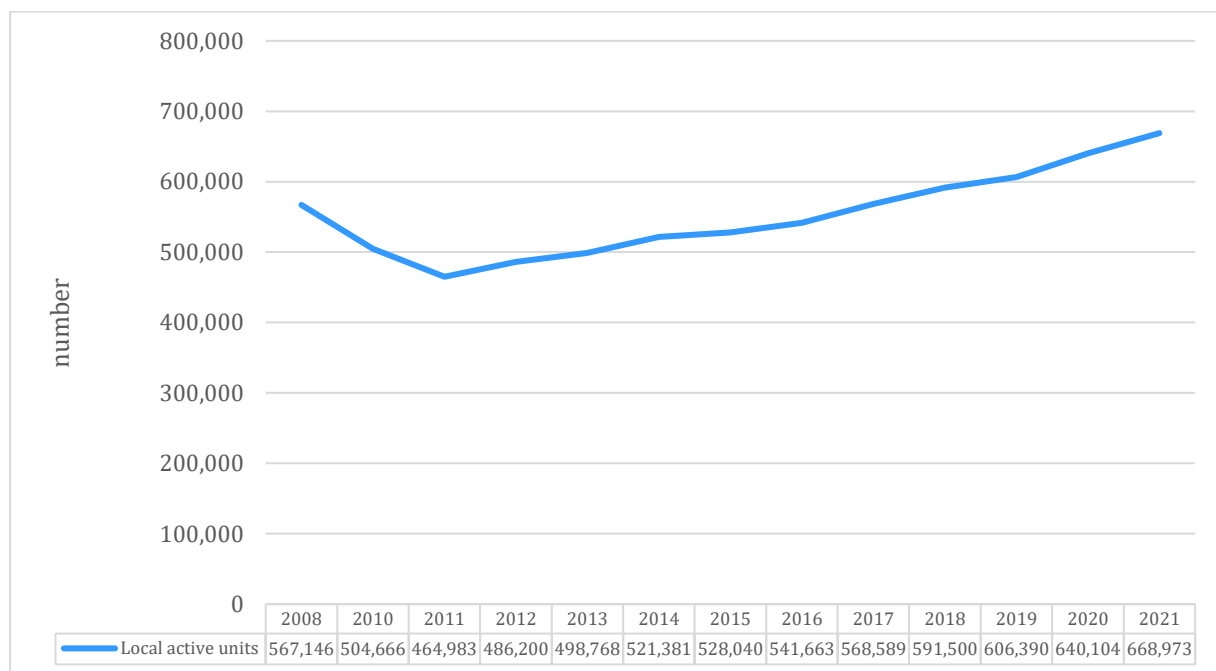
#### 4.3. Economic potential

In order to assess the concentration of the economic potential at regional level there were used the following indicators: the number of active firms at regional level, grouped by size and the number of employees.

In 2010, according to the Gini/Struck coefficients, the following situations were registered at regional level:

- There is a relatively low concentration regarding the total number of companies (the Gini coefficient is 0.189 and the Struck coefficient is 0.139);
  - There is a relatively low concentration of small companies (0-9 employees) and large companies (over 250 employees); the calculated coefficients having values below 0.20;
  - There is a relatively high concentration of companies with 50-249 employees (the Gini coefficient is 0.201);
  - There is a low concentration of companies with 10-49 employees (the Gini coefficient is 0.176);
- Compared with 2008, the values of the two coefficients have registered a slight decrease; in 2021 all of the values were below 0.17.

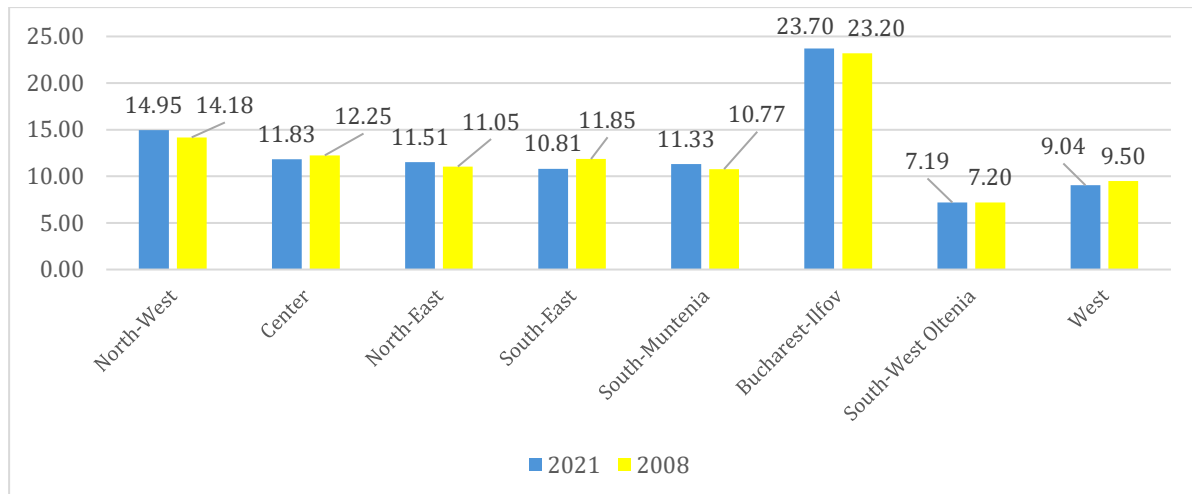
In 2021, 668,973 active companies were registered nationally, with 101,827 companies more than in 2008 (567,146 active companies), their trend being one of growth (2008-2021) (Figure 12).



**Figure 12.** The evolution of local active units in Romania, 2008-2021 (no.).

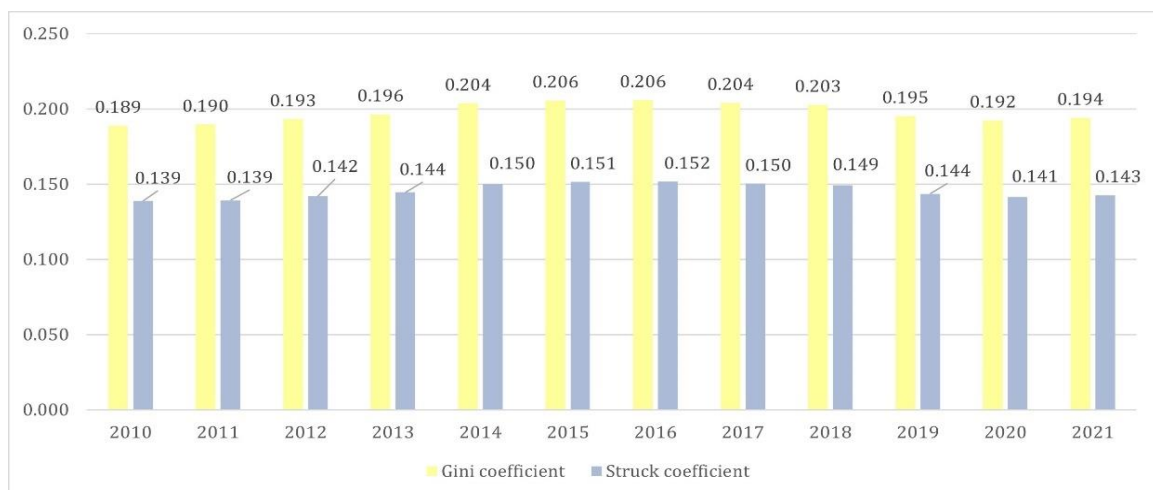
Source: computed by the authors using Excel.

Next, we analyzed the regional structure of local active units, in 2008 and 2021. Most are found in the Bucharest-Ilfov region (23.7%), followed by North-West (14.95%). The fewest are found in the South-West Oltenia region (7.19%) and West (9%) (Figure 13).



**Figure 13.** The evolution of structure of local active units at regional level, for 2008 and 2021 (%).  
Source: computed by the authors using Excel.

The values of the Gini coefficient showed a slight upward trend, from 0.189 to 0.194, but without a significant concentration in terms of local active companies. The Struck coefficient revealed the same result with values between 0.139 in 2010 and 0.143 in 2021 (Figure 14).



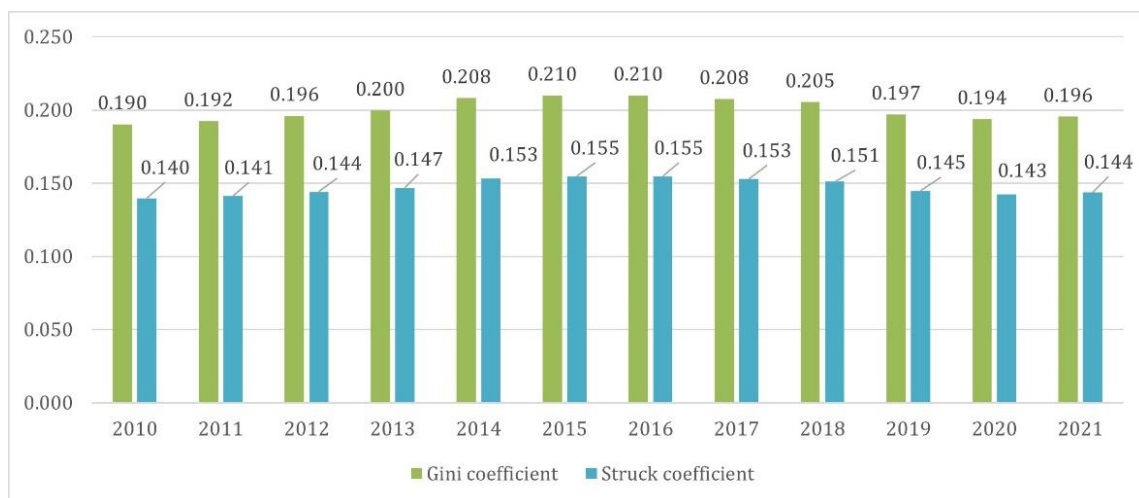
**Figure 14.** Dynamics of Gini Coefficients in local active units, at regional level (no.).  
Source: computed by the authors using Excel.

Regarding the spread of the Gini coefficient for the number of companies that have employed between 0 and 9 employees there is a slight tendency of increase till 2016 from 0.190 to 0.210 followed by a one of decrease till 2021 when it registered a value of 0.196. The same thing is applied for the Struck coefficient with values of 0.140 in 2010, 0.1555 in 2016 and 0.1444 in 2021 (Figure 15 a). Both the results of the Gini coefficient and the Struck coefficient indicate a low level of concentration regarding the number of employees in microenterprises.

Regarding the number of small enterprises with 10-49 employees the situation is different then for the microenterprises both the Gini and the Struck coefficients registering variations in the entire timeframe but both of them demonstrated a low level of concentration as well (0.176 for Gini coefficient in 2010 vs 0.170 in 2021; 0.129 for Struck coefficient in 2010 vs 0.125 in 2021) (Figure 15 b).

In the case of medium enterprises with 50-249 employees there is registered a slight increase in the entire period of time regarding both the Gini coefficient and the Struck coefficient its values varying between 0.201 in 2010 and 0.231 in 2021 for Gini and 0.148 in 2010 to 0.171 for Struck. Although the increase in these coefficients is of 0.03 we can say that the tendency is of an increase in concentration for 2010-2021 (Figure 15 c).

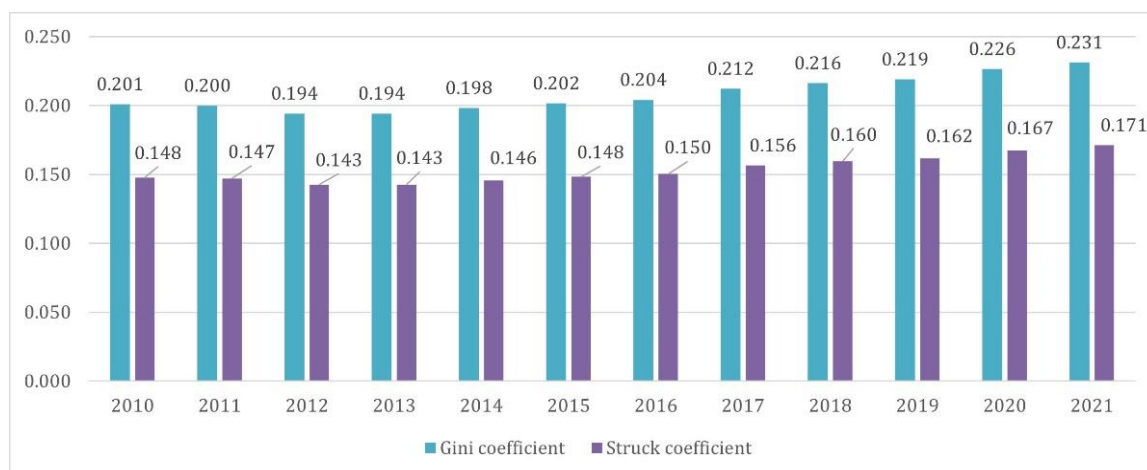
The strongest increase regarding the concentration of the number of local active units for 2010-2021 was in the case of the large enterprises that have over 250 employees, the Gini coefficient registering an increase of 0.074 in 2021 (from 0.212 in 2010 to 0.286 in 2021) and the Struck coefficient had an increase of 0.058 (from 0.156 in 2010 to 0.214 in 2021) (Figure 15 d).



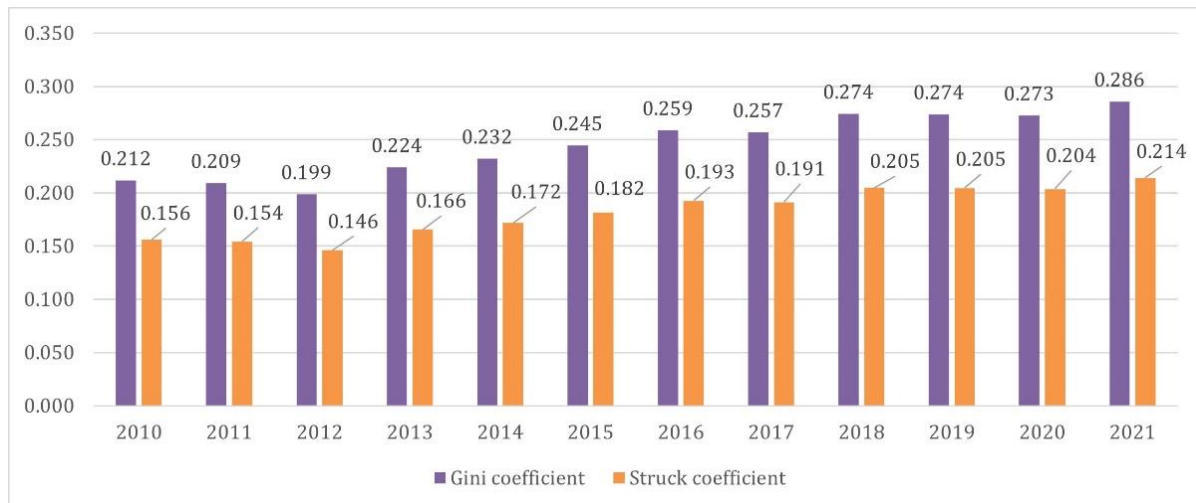
(a)



(b)



(c)



(d)

**Figure 15.** Dynamics of Gini Coefficients at regional level (no.): (a) in local active units with 0-9 employees; (b) in local active units with 10-49 employees; (c) in local active units with 50-249 employees; (d) in local active units with over 250 employees.

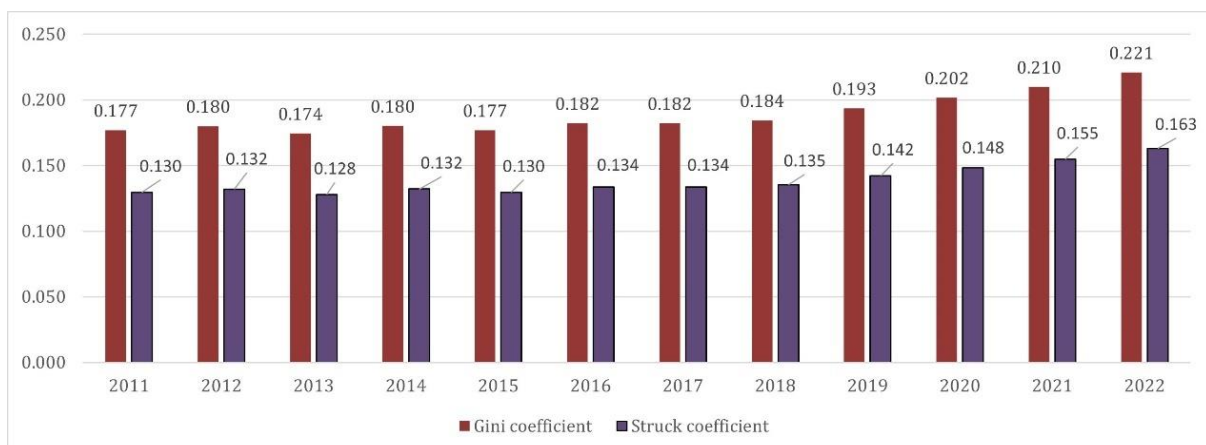
Source: computed by the authors using Excel.

The increase in concentration of the local active units is due to the fact that the majority of the larger companies are located in the developed cities which offer bigger possibilities to expand and to develop.

#### 4.4. Health infrastructure

The analysis of the concentration in the health sector was based on the following specific indicators: the number of doctors in the region and the number of existing beds. In 2008, 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 in 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 held about 23% of the total number of doctors in Romania and 16% of the number of beds).

Regarding the concentration of healthcare staff (doctors), in the period 2011-2022, there is a slight increase in the value of Gini/Struck coefficients, from 0.177 to 0.221 and from 0.130 to 0.163 (Figure 16).

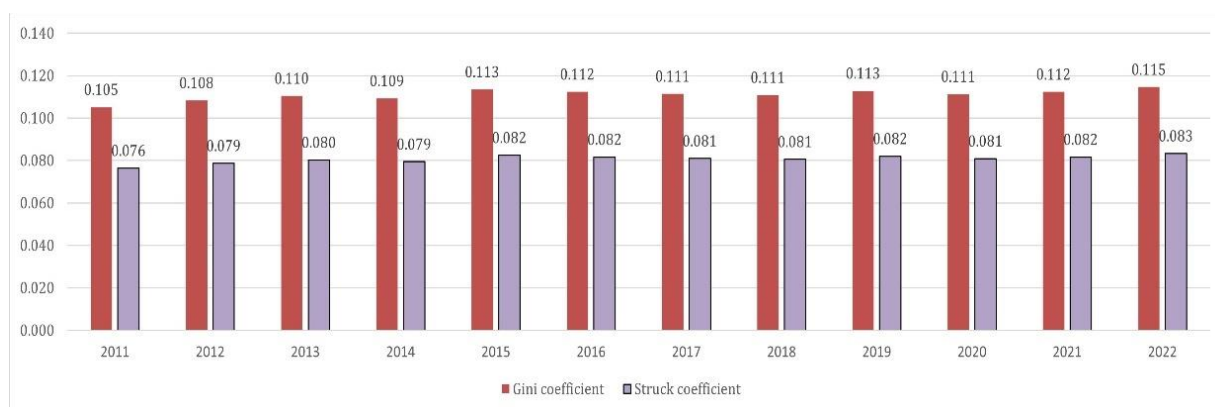


**Figure 16.** Dynamics of Gini Coefficients in Healthcare staff (no.).

Source: computed by the authors using Excel.

Analysis of Gini/Struck coefficients of the number of beds shows that there is no increased concentration, although there is a slight upward trend in 2011-2022 (Figure 17).

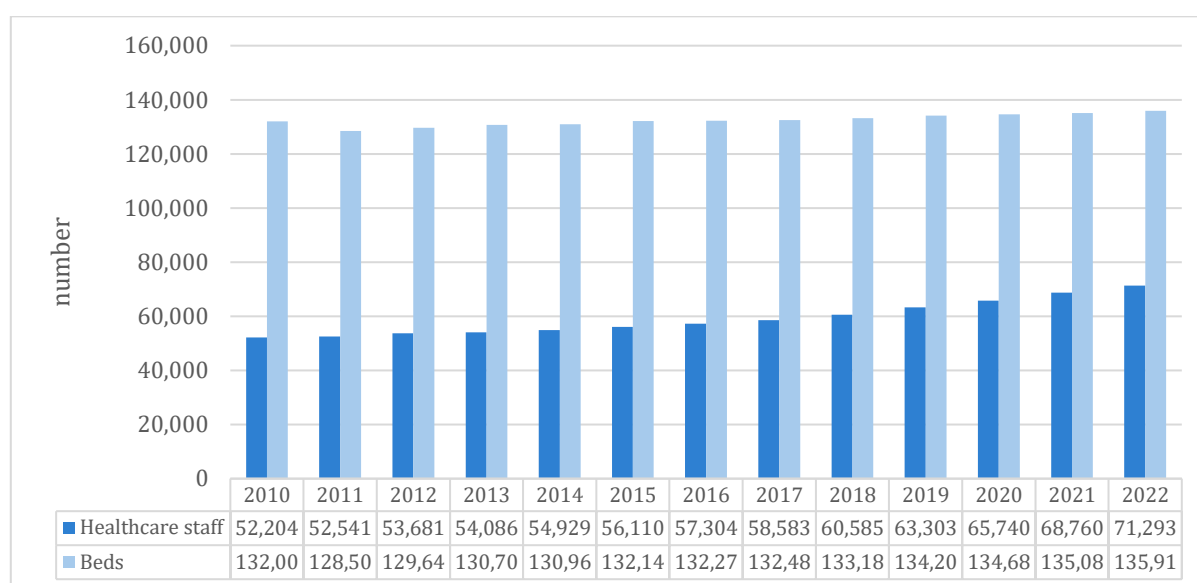




**Figure 17.** Dynamics of Gini Coefficients in Number of the beds from sanitary units (no.).

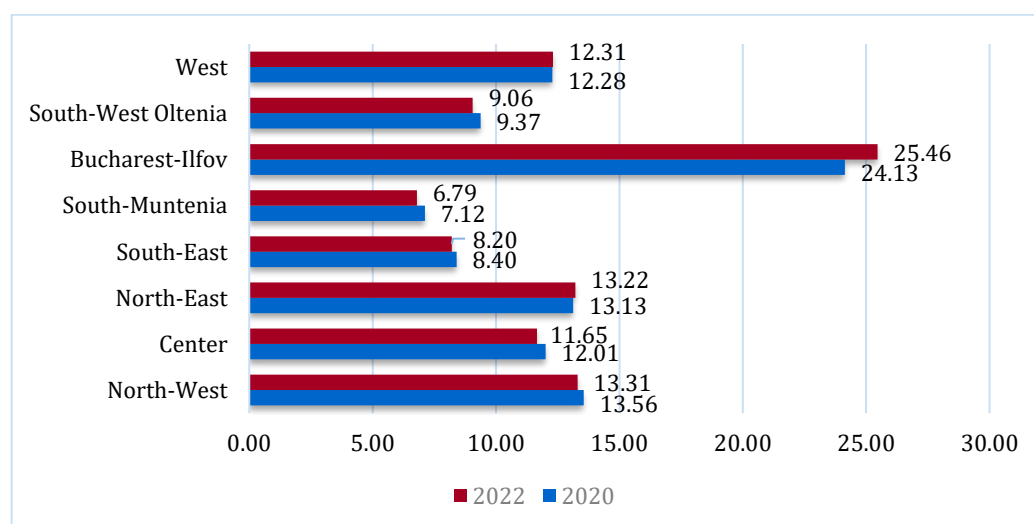
Source: computed by the authors using Excel.

Between 2010 and 2022, the number of doctors increased from 52,204 to 71,293 (+36.6%), while the number of beds increased by only 3% (from 132,004 to 135,917) (Figure 18).



**Figure 18.** Dynamics of Healthcare staff and Beds in Romania (no.).

Source: computed by the authors using Excel.



**Figure 19.** Regional structure of medical staff (doctors) (%).

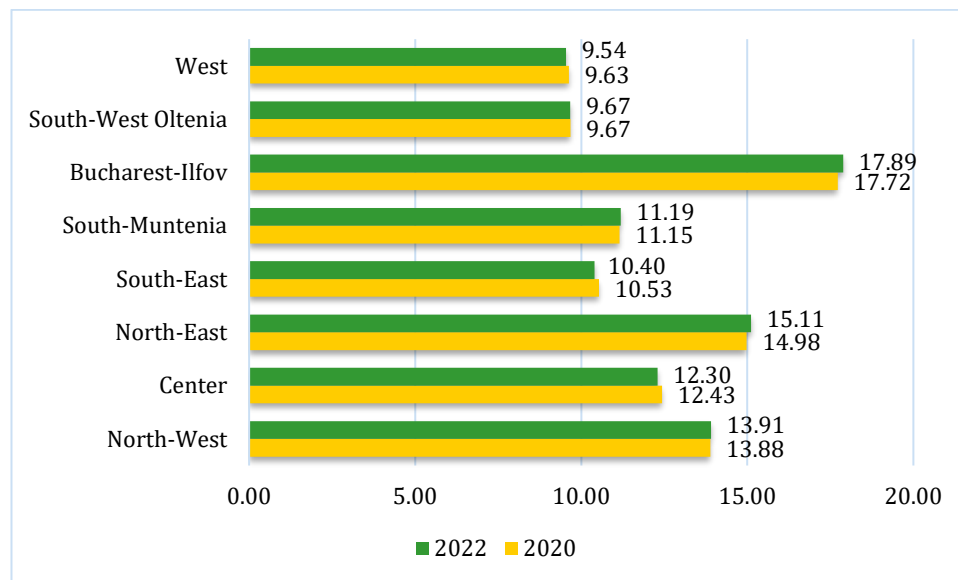
Source: computed by the authors using Excel.



At the regional level, in 2022, the majority of the doctors are in the Bucharest-Ilfov region (25.5%), increasing compared to the pandemic year, when it registered a share of 24.13%. The following places are held by North-West (13.3%), North-East (13.2%) and West (12.3%). After the pandemic, some regions lost medical staff (doctors): South-Muntenia, North-West, South-West Oltenia and South-East (Figure 19).

There was registered a slight increase regarding the concentration of the doctors in each region due to the fact that once with the increase in their salaries this job was pursued by more and more youngsters and some of doctors even returned from abroad to work in the Romanian hospitals.

In terms of the number of beds, it remained constant in the two analyzed years, in all of the regions (Figure 20).



**Figure 20.** Regional structure of medical infrastructure (beds) (%).  
Source: computed by the authors using Excel.

#### 4.5. Urban infrastructure

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

- railway lines;
- the length of public roads.



**Figure 21.** Dynamics of Gini Coefficients in railway network length under operation (no.).  
Source: computed by the authors using Excel.

In 2008, there was registered a slightly lower value for the railway lines and public roads indicators, the Gini coefficient value being under 0.20. In this case, the regions that registered high percentage values: the West region, which owns 18% of the total railway lines, and the North-East region, which owns 17% of all urban public roads. Compared with 2000, there is an increase in the concentration of all examined indicators (Antonescu, 2010).

In the period 2011-2022, for the railway network length in km, the Gini coefficient decreased from 0.187 to 0.170 and the Struck coefficient from 0.137 to 0.125 proving a low level of concentration (Figure 21).

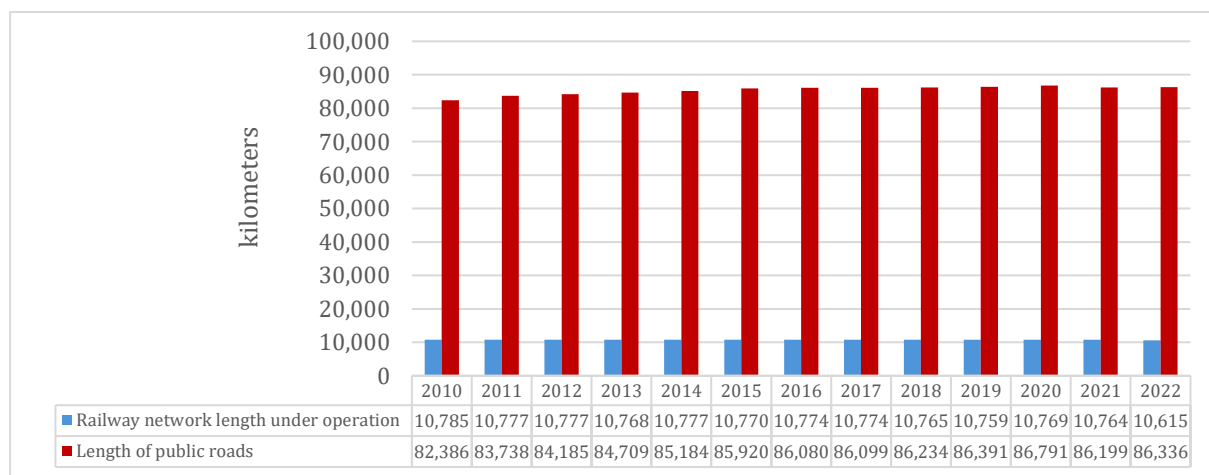
Both the Gini and the Struck coefficients for the length of public roads showed a small level of concentration in the entire period of time, their values being almost constant (0.187 and 0.137 in 2011 and 0.1888 and 0.138 in 2022) (Figure 22).



**Figure 22.** Dynamics of Gini Coefficients in Length of public roads (no.).

Source: computed by the authors using Excel.

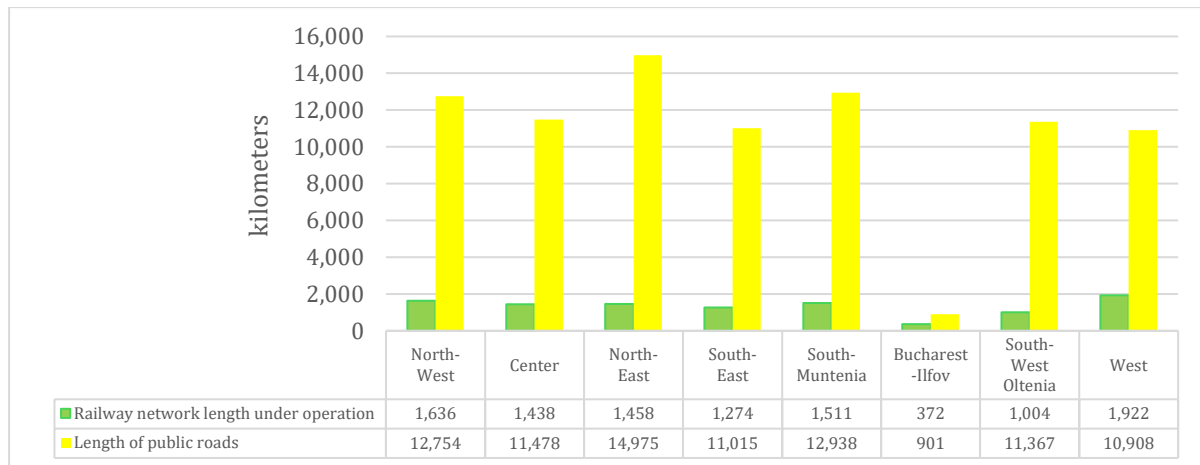
At the national level, in 2022 there were 10,615 km of railway network under operation and 86,336 km of public roads (Figure 23).



**Figure 23.** Infrastructure at national level, 2010-2022 (km).

Source: computed by the authors using Excel.

For the year 2022 on a regional level the region that has the largest number of railway network length under operation is the West Region with 1,922 km, followed by the North-West Region with 1,636 kilometers and the South-Muntenia Region with 1,511 kilometers. Regarding the length of public roads, the first place is occupied by the North-East Region with 14,975 km, followed by the South-Muntenia Region (12,938 km) and North-West Region (12,754 km). The region that registered the lowest number of km in both cases was Bucharest-Ilfov with 372 km for the railway network and 901 km for the length of public roads (Figure 24).



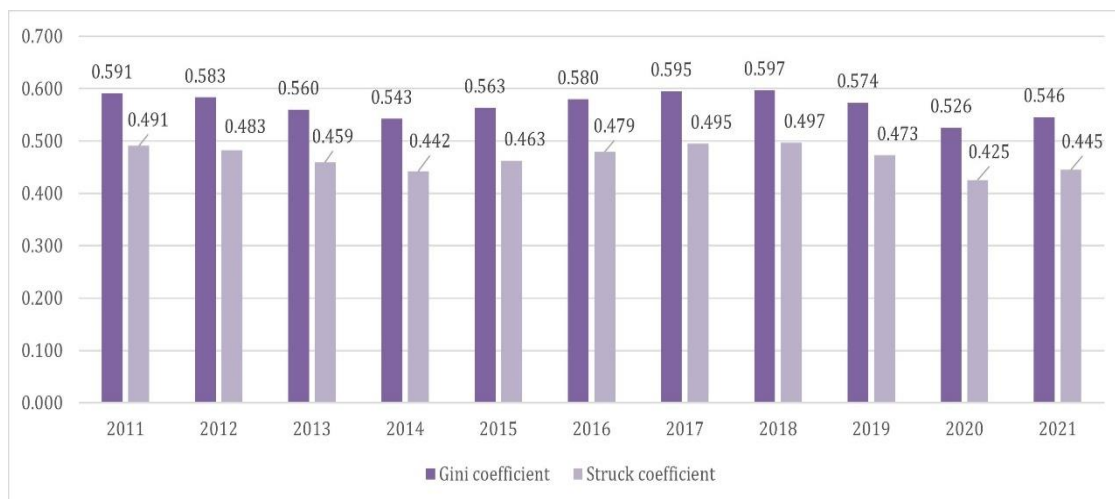
**Figure 24.** Infrastructure at regional level, 2010-2022 (km).

Source: computed by the authors using Excel.

#### 4.6. Education and research

Due to the fact that Bucharest-Ilfov region holds approximately 32% of the total higher education institutions and 47% of the researchers, the values of Gini/Struck coefficients were higher than those registered by the other indicators examined so far.

Thus, in 2008, in this area, the majority of the indicators that have been analyzed have recorded significant concentrations at regional level, the exception being the number of universities/faculties index, whose coefficient was below 0.3 (Gini coefficient was 0.260) (Antonescu, 2010). There was registered a high concentration both in the Gini and Struck coefficients for the year 2021 regarding the number of researchers with values of 0.546 and 0.445 showing an oscillatory tendency then the first year mentioned in the analysis, 2011 when the values were 0.591 and 0.491 and the entire timeframe (Figure 25).



**Figure 25.** Dynamics of Gini Coefficients in Employees from research - development activity (in full time equivalent), 2011-2022 (no.).

Source: computed by the authors using Excel.

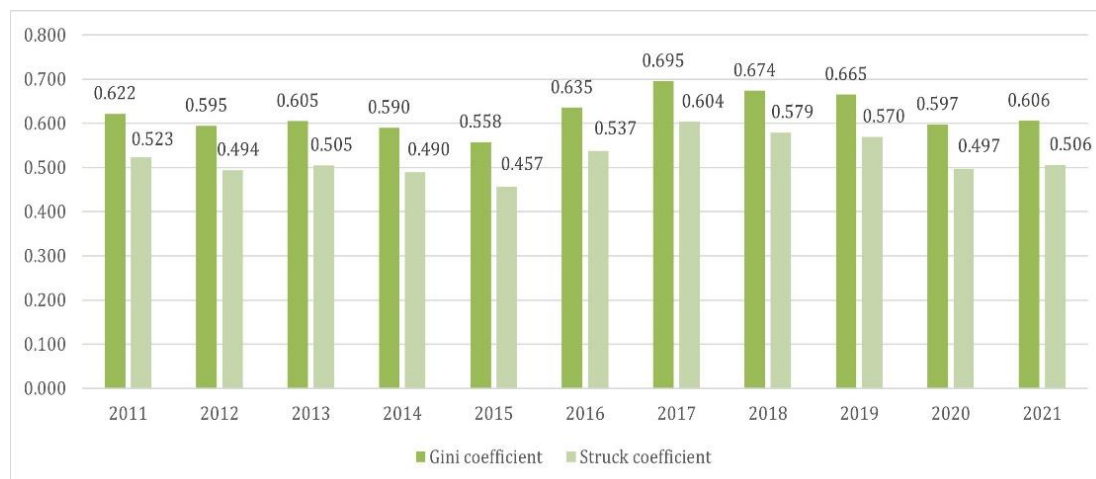
For the number of students, the Gini coefficient was in 2020, 0.351 and the Struck coefficient was 0.267 demonstrating a medium level of concentration and a small increase from the year 2011 when the values were 0.330 respectively, 0.250 (Figure 26).



**Figure 26.** Dynamics of Gini Coefficients in Students, 2015-2020 (no.)

Source: computed by the authors using Excel.

The highest concentration was recorded by the total research expenditures from research and development activity (Gini and Struck coefficients were 0.622 and 0.523 in 2011 and 0.606 and 0.506 in 2021) (Figure 27).



**Figure 27.** Dynamics of Gini Coefficients in Total expenditure from research-development activity, 2011-2022 (no.).

Source: computed by the authors using Excel.

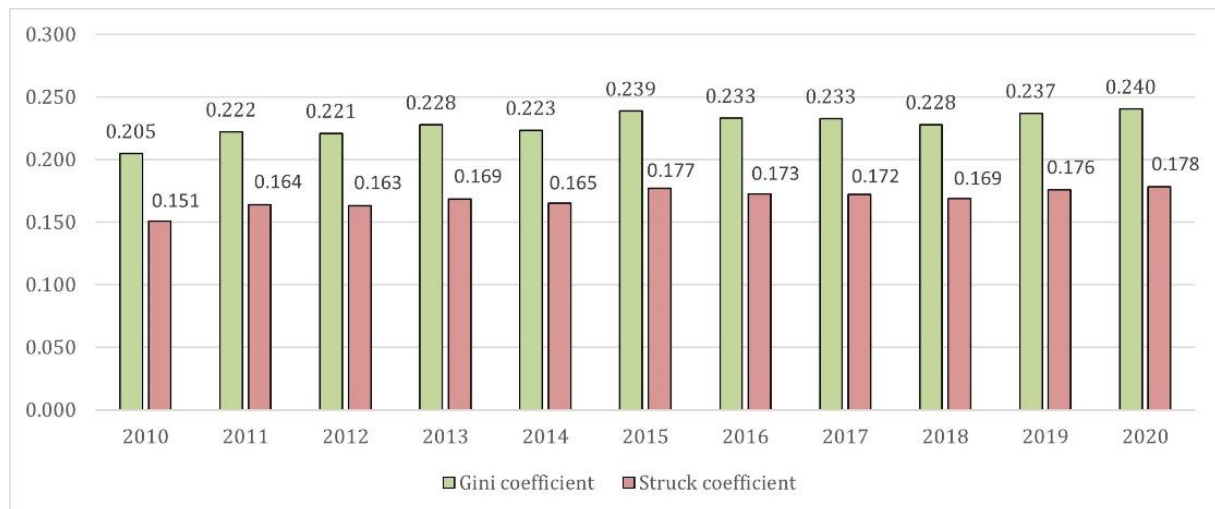
The decrease of concentration and the persistence of inequalities regarding education is due to the context of the transfer to online learning because of the COVID-19 pandemic, the worsening of inequalities regarding the access to education is due to lack of digital equipment and Internet access, but also of the material conditions at home, as well, given that many families live in overcrowded households that make it difficult for children to attend virtual classes.

The decrease of concentration in research is due to the fact that this is a domain poorly funded with financial resources allocated being of 2.22% of the total GDP of Romania (Eurostat, 2023).

#### 4.7. Regional concentration of GDP

The evolution of total GDP indicator concentration was calculated for the period 1995-2008. In 1995, the 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-Muntenia and South-West Oltenia region, including West (22%). In 2000, there is a first clear trend of increasing concentration, the Gini coefficient reaching 0.142. When computed for year 2008, the Gini coefficient registered a value of 0.172, which means a relatively low concentration of total regional GDP (Antonescu, 2010).

In the period 2010-2020, the total GDP increased from 0.205 to 0.240. It is an average concentration of this indicator at regional level, with a clear growth trend (Figure 28).



**Figure 28.** Concentration of regional GDP, 2010-2020 (no.).

Source: computed by the authors using Excel.

It is worth mentioning that the Gini coefficient in the case of researchers and the R&D expenses reached a level of higher inequality in 2022 than it was in 2020. The regional concentration had a greater amplitude during the health crisis, which leads to the idea that the territorial inequalities increased during the pandemic (Table 4).

**Table 4.** The Gini coefficient values for Romania - years 2000, 2008, 2020 and 2022 (number).

Domain / Indicator	2000	2008	2020	2022	Tendency of concentration (2008 vs. 2020)
Total population	0.104	0.106	0.109	0.111	<i>Has increased</i>
Urban population	0.090	0.098	0.124	0.131	<i>Has increased</i>
Rural population	0.233	0.244	0.234	0.231	<i>Has decreased</i>
Employees		0.113	0.162	0.164	<i>Has increased</i>
Unemployed		0.165	0.186	0.120	<i>Has decreased</i>
Total active companies	0.152	0.189	0.192	0.194	<i>Has increased</i>
Small companies 0-9 employees	0.144	0.192	0.194	0.196	<i>Has increased</i>
Large companies - 250 employees and over	0.101	0.189	0.273	0.286	<i>Has increased</i>
Total employees	0.076	0.133	0.165	0.164	<i>Has increased</i>
Hospital beds	0.078	0.098	0.111	0.114	<i>Has increased</i>
Physicians	0.108	0.180	0.202	0.220	<i>Has increased</i>
Total length of public roads		0.200	0.187	0.188	<i>Has decreased</i>
Total length of railways		0.210	0.186	0.170	<i>Has decreased</i>
Total Regional GDP	0.170	0.172	0.240		<i>Has increased</i>
Companies with 10-49 employees	0.144	0.490	0.169	0.171	<i>Has decreased</i>
Researchers		0.494	0.526	0.546	<i>Has increased</i>
R&D expenses		0.464	0.597	0.606	<i>Has increased</i>
Students		0.471	0.351		<i>Has decreased</i>

Source: computed by the authors using Excel.

The results obtained for the Gini coefficient for the indicators analyzed in the article are presented in Table 4. In the year of the health pandemic crisis, 2020 in the case of the unemployed population it was

shown a higher level of inequality due to the value of 0.186 as many people lost their jobs but in the same year, this value decreasing in 2022 showing that the economy of Romania has recovered rather fast. It can also be noted that the growing trend of regional inequalities is maintained even after the removal of social distancing and travel restrictions after the health crisis.

Regarding the financial crisis versus the pandemic one, in the majority of the cases, it was shown that the values of the coefficients in the 2020-2022 were higher than the ones in 2008-2010 and also after the COVID-19 crisis the tendency of increased disparities was maintained. The only domains that were least affected by the pandemic were demography (rural population), transportation infrastructure and economic potential (companies with 10-49 employees).

## 5. CONCLUSIONS

Through this article we have made an analysis of the main types of regional inequalities, in 2022 and also in comparison with 2020 and 2008 based on the Gini/Struck coefficients method by using the existing statistical data on Tempo-online.

The results obtained after applying the concentration coefficients are the following:

1. The majority of the coefficients had values placed in the interval [0-0.3] on a regional and national level apart of the number of the researchers whose coefficient at national level was both in 2020 and 2022 over 0.5; this showed a relatively uniform distribution, without too much concentration in those areas;

2. There are, however, some sectors that have a high degree of concentration at regional level (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. The analysis of the evolution of Gini/Struck coefficients showed a clear trend in the increase of the concentration of regional disparities in Romania, after the year 2008 till the COVID-19 pandemic affected Romania's economy. It appears that there is a higher concentration regarding the population, number of employees, employment indicators.

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, thus affecting the results of the entire country. 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-Muntenia and South-West Oltenia), although the real growth could be better assessed at the sub-regional level, where are very obvious the signs of economic decoupling of some marginal areas located on the periphery or face specific development problems.

From all the analysis done in this article we can see that Romania in 2008 when the financial crisis just started and even in 2020 with the beginning of the COVID-19 pandemic still has a developing economy. Its analysis of the past situation can offer better perspectives for future perspectives regarding the country's policies and reforms. Through their impact on the quality of life and the collective well-being, the social policies, similar to fine seismographs, record both the quality of reforms and the need for change.

The measures that were taken in both of the crisis are still far from satisfactory. From the beginning, since Romania joined the European Union, the economy was considered as a priority for the new country's model. Although the privatization is over, the resulting economy is still underdeveloped. The signs of an inefficient economy are visible: GDP, the synthetic indicator, places the Romanian economy on the last places of Europe, at a great distance from the European average. The structure of the economy is that of an underdeveloped country with important areas affected by disorganization and poor management. The economic growth is not ensured by innovative areas supported by the research and development sector and services, but the country's economy is based more on trade. The industry has not yet recovered from the program of rapid privatization and from the financial and sanitary crisis, which in many respects has been a waste for Romania. The important industrial points are the result of external investments. The domestic investments are placed below the level of small and medium-sized economies with low efficiency. They offer more poorly qualified work. The agriculture still suffers from excessive

ownership segmentation and the lack of capital. It is now unable to cope with external competition in the agricultural products market. In general, we can characterize the periods of crisis in Romania as being centrally oriented on the economic issues, but with low interest in ensuring the social rights of the individual and his well-being.

In fact, a faster sustainable economic growth with the help of the funds and grants would also help to alleviate other important problems that the country's economy is now facing as a result of the COVID-19 pandemic, for example, rapidly growing budget deficits and the increase in the level of public debt relative to GDP. Romania must make a priority the absorption and efficient use of these funds in all of the regions, in order to support and develop the regional economy.

In 2020, COVID-19 reduced the prosperity gap between rich and emerging countries, between the more developed and less developed regions as the strong economies were hit hard at the start of the pandemic. However, in the medium and long term, its consequences could further affect the emerging markets.

The trend of a continuously decreasing Gini coefficient in the majority of the indicators analyzed as seen in 2022 is due to the fact that after the COVID-19 crisis the Romanian economy started to recover with the help of the policy responses and the funding that was received from the European Union due to the relative focus on those towards the poorer regions who were potentially the most affected by the pandemic.

The analysis that was made in the article proved that the financial crisis had a higher impact upon the territorial inequality than the COVID-19 pandemic. Thus, the values of the Gini and Struck coefficients of were higher in 2020-2022 than the ones in 2008-2010. The tendency of increased disparities that began with the financial crisis were maintained in the pandemic, the only domains that were least affected by the pandemic being demography (rural population), transportation infrastructure and economic potential (companies with 10-49 employees).

The main factors that had an influence over the increase of the territorial inequalities were determined by the political measures that were taken in the period before the crisis and by a series of elements that are part of the endogenous potential of a regions: the capacity of developing projects with a high territorial impact, the degree of research and development, the possibility of the implication in different areas like the infrastructure, health, education. The fact that the cohesion policy of the EU (for example European Regional Development Fund) follows the decrease of the territorial inequalities has led to specific measures and policies to be applied both at national and regional level.

The importance of the study is given by the fact that the stakeholders should keep in mind the evolution of the regional inequalities and create specific and adapted policies in cooperation with the development councils and the authorities of the counties.

The pandemic has generated an increase in income inequality between rich and poor regions because the latter have had in the beginning fewer policies to mitigate the impact of the crisis and, at the same time, limited access to vaccines. In addition, the pandemic has accelerated long-term structural trends that will not be conducive to many emerging economies. In the post-COVID-19 world, the comparative advantages of the relatively cheap workforce - on which the growth of emerging and global markets was primarily based - would count less. In this context, the path to high-income status could become longer and more difficult for these countries.

#### **USE OF AI TOOLS DECLARATION**

The authors declare they have not used Artificial Intelligence (AI) tools in the creation of this article.

#### **AUTHOR CONTRIBUTIONS**

All authors contributed equally to this work. All authors read and approved the final manuscript.

#### **CONFLICTS OF INTEREST**

The authors declare no conflict of interest.

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