

ANALYZING THE REGIONAL DISPARITIES IN ROMANIA USING THE GINI INDEX AND THE LORENZ CURVE

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Abstract: *Inequality has recently become a topic generating increased interest both in political debates and in the academic environment. The issue of regional inequalities is systematically approached by specialists to provide the decision-makers with data and relevant information about the trends in this field, the elements that influence the level and evolution of disparities and to facilitate the evaluation of the effectiveness of the development strategies. The Gini index is one of the standard methods used in empirical research to analyze the territorial inequalities. Initially used to highlight the inequality of people's incomes, it has become more and more used in the field of spatial analyses.*

Key words: inequality, regional development, Gini index.

JEL Classification Codes: C43, O18, R11.

1. INTRODUCTION

The issue of mitigating regional imbalances and supporting regional development processes became a major concern with the start of negotiations for Romania's accession to the European Union. The explanation of the growing interest in such concerns comes from the maintenance, sometimes the aggravation of imbalances that occurred in previous periods, as well as from the new perception of them in the current economic, social and political context.

The regional development policy is one of the most important and complex policies of the European Union, a status that derives from the fact that, through its objective of reducing the economic and social disparities existing between the various regions of Europe (Constantin, 2013), it acts on significant development areas, such as the economic growth and the SME sector, transport, agriculture, urban development, environmental protection, employment and professional training, education, gender equality, etc.

Each country faces problems regarding the balanced economic development of its territory. Inequalities between the levels of development of the regions of a country occurred either as a result of economic changes by developing new economic branches and the decline of the old ones, or as a result of the concentration of economic growth in certain regions, or due to the existence of sparsely populated regions or with production coming mostly from primary sectors, which could not maintain the economic development or the social infrastructure at a satisfactory level (Russu, 2014).

The regional development policy promoted by each country does not involve the initiation of some short-term interventions, but the long-term harmonization of regional economic conditions to allow the normal functioning of the market mechanism (Babucea, Rabontu, 2014). A few decades ago the general objectives of this development policy were to reduce the territorial disparities and to achieve a relative balance between the levels of economic and social development of different areas of a national territory or to ensure a certain interregional entity, the



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current regional development policies must include a clear dynamic that satisfies the continuous and extensive needs related to regional and local restructuring, increasing competitiveness and productivity, continuous innovation and the internationalization of economic activity.

Quantifying the income inequality, poverty or regional disparities have been the focus of many specialists in the last decades.

The process of industrialization has caused growing disparities between the less developed regions and those with higher productivity. In addition, the process of economic integration and the phenomenon of globalization have favored international competition and the growth of development inequalities (Beckfield, 2019). In this scenario, the reduction of regional disparities and the economic support given to less developed regions represent the key objectives for the institutions at all levels (Iammarino et al., 2019).

2. RESEARCH METHODOLOGY

The analysis of regional disparities and spatial inequalities is based on a series of methods and indicators that can scientifically substantiate the hypotheses and conclusions of the spatial research.

Usually the spatial inequality, one of the major topics in regional research, is analyzed with the help of indices that express the differences in territorial structure and their variation over time (Cartone et al., 2021).

As a result of the research in the field of territorial comparisons and the assessment of gaps in the development of different regions, numerous methods and techniques of spatial analysis were developed. Each of these methods has advantages and limitations.

Two of the standard methods used in empirical research that pursue the simple analysis of the territorial inequalities are the Gini index and the Lorenz curve.

The Gini (coefficient) index (Gini, 1939) represents one of the most widespread indicators of disparities, both in methodological studies and in applied research, being considered a standard measure in analyzing the inequalities.

It was initially used to highlight the inequality of people's incomes, being later used with predilection in the field of spatial analyses. The Gini coefficient (GC) is a statistical measure that highlights the degree of concentration of the values of a series of statistical data, based on the formula:

$$CC_j = \frac{\sum_{i=1}^n (2i - n - 1) \cdot X_{ij}}{n \sum_{i=1}^n X_{ij}}$$

in which: X_{ij} = the level of variable j in region i

n = the number of regions

Gini index measures the deviation of the distribution of income. Its formula is as following: the numerator is the area between the Lorenz curve of the distribution and the uniform distribution line; the denominator is the area under the uniform distribution line. A value of 0 represents absolute equality, and a value of 100 represents absolute inequality. Out of the many ways possible to measure inequality, Gini index stands out for several reasons. First, it is the most accessible and there are more sources available compared to other ways combined; second, most of the research papers that elaborate on inequality which we include in the literature review use Gini index as its measurement of inequality. Therefore in this paper we used Gini index to measure inequality in Romania.

The values of the Gini coefficient are between 0 and 1, increasing with the degree of inequality. The Gini coefficient is a relative measure and its evolution over time can only capture the degree of heterogeneity within the regions of a country.

The Lorenz curve allows to appreciate the degree of concentration and measures the Gini concentration indicator.

The Lorenz curve is constructed in a square with side 1 (100%), and the surface between the concentration curve and the diagonal of this square represents the concentration surface, depending on which the concentration level of the analyzed indicator is evaluated. The concentration is stronger the more the Lorenz curve deviates from the diagonal.

The concentration is minimal (nil) when the global value of the analyzed indicator is equally distributed among the territorial units (counties/regions). In this case, the concentration curve coincides with the diagonal of the square.

We will apply the previously presented methods to analyze the level and dynamics of the territorial disparities in Romania, as well as to highlight the convergence/divergence processes for the development regions.

3. RESULTS

Assessing imbalances in the territorial profile is a necessary and useful approach, providing important support in directing and using efficiently the structural and cohesion funds that Romania will benefit from in the following period.

The analysis of the economic evolution for each region highlights their contribution to the overall development of the Romanian economy, as well as the manner in which the regional development programs are reflected in the future evolution of the economy by region.

The statistical data show that Romania entered the process of transition to the market economy with a relatively low level of regional disparities, compared to other member states. But they have grown rapidly and especially between Bucharest and the rest of the country.

The modern theories of economic growth consider that the gaps in the regional economic development recorded between different regions cannot be explained only by the endowment with production factors (Cojocaru, 2013).

The elimination of obstacles to the mobility of goods and/or factors of production would automatically remove the cause of the gaps and contribute positively to the convergence in the standard of living. However, the empirical evidence shows that there are relevant influencing factors that are missing from the traditional analysis, factors that have been highlighted by recent localization theories.

The main contribution of the theories brought together under the name "new economic geography" is to bring together, in a common analytical framework, the convergence and divergence forces, helping to better understand the mechanism of regional gaps (Zaman, Goschin, Vasile, 2013).

As for the analysis of regional convergence, there are a number of restrictions regarding the use of statistical techniques, which are determined by the use of non-homogeneous calculation series and which can lead to unrealistic results and affect the perception of convergence trends. The alternative is to attach different values to each individual observation, reflecting their relative contribution. For example, if we have the regional income (GDP) as variable, the indicator can be weighted by the number of the population in the respective territory.

The region represents the fundamental element in regional science, in general and in the regional economy, in particular. In the period 1998 - 1999, a complex institutional framework was developed in Romania, intended to achieve the objectives of regional development.

The eight regions that were thus born in Romania represent the NUTS II level, the basic level of the regional development policy. The purpose for which these development regions were created is to support larger communities in solving problems that go beyond administrative borders and that exceed the financial possibilities of a county. If each county were nominated as a development subdivision, the division of possible available resources among so many development target areas, coupled with the lack of economies of scale, would most likely lead to destructive use or, at best, resource inefficiency.

Romania entered the transition process with a relatively low level of regional disparities, compared to other member states or candidate countries. However, these disparities have grown rapidly and especially between the Bucharest - Ilfov Region (which includes the country's capital) and the other regions. A comparison of regional disparities in Romania reveals that in Romania, as in most European countries, the most developed region is the one that includes the capital; the least developed are the border areas.

Thus, in Romania, the most developed region is Bucharest-Ilfov, which in 2021 had a Regional Gross Domestic Product of over 125 billion euros (27.37% of the total) with a population of over 2.3 million inhabitants (12.12% of the total).

As a contribution to the national Gross Domestic Product, the North-west region follows, with a regional Gross Domestic Product of over 57 billion euros (12.42% of the total), with more than 2.5 million people (13.21% of the total).

The smallest contributions in the national Gross Domestic Product were recorded by the regions South-west Oltenia, with a regional Gross Domestic Product of over 35 billion euros (7.63% of the total) and almost 1.9 million inhabitants (9.85% of the total) and West, with a regional Gross Domestic Product exceeding 42.5 billion euros (9.27% of the total) more than 1.7 million persons (9.15% of the total).

It should be noted that the West region is the only region, next to Bucharest-Ilfov, where the contribution of the regional Gross Domestic Product in total is higher than the share of the population, which makes this region second in terms of the level of economic development (expressed by Gross Domestic Product per inhabitant).

Table 1. Population and Gross Domestic Product by development regions in 2021

Regions	Population	% Population	GDP	% GDP
South-west Oltenia	1,892,078	9.85	35,081.58	7.63
West	1,758,582	9.15	42,612.11	9.27
South-east	2,351,636	12.24	44,406.71	9.66
North-east	3,163,465	16.47	49,732.22	10.82
South - Muntenia	2,868,994	14.94	52,231.25	11.36
Center	2,302,833	11.99	52,612.33	11.44
North-west	2,537,017	13.21	57,081.09	12.42
Bucharest - Ilfov	2,327,057	12.12	125,784.81	27.37
Total	19,201,662	100	459,542.1	100

Source: Eurostat

The issue of disparities between regions, based on the Gini index, in terms of GDP distribution, is of primary importance especially for the analysis of the means, policies and instruments put into operation to promote economic and social equity, cohesion, solidarity and inclusion at the level of the entire society, on the local, regional, national and international levels.

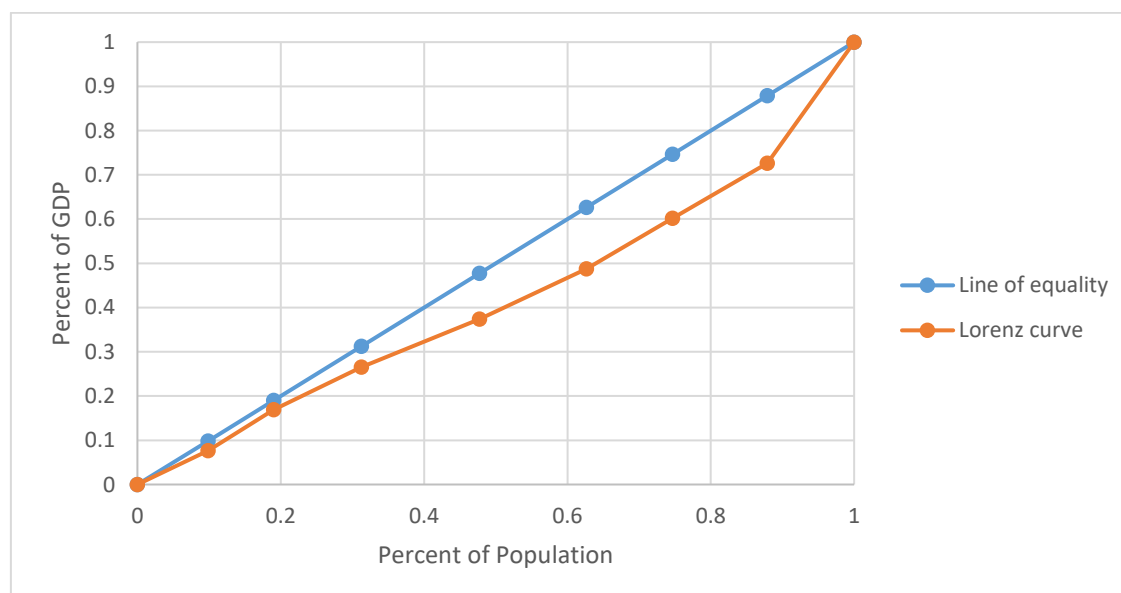
Table 2. The level of inequality (Gini Index) of the distribution of the Gross Domestic Product by region in 2021

Regions	% Population	% Cumulative population	% Cumulative GDP	Area under the Lorenz curve
South-west Oltenia	0.0985372	0.0985372	0.076340296	0.003761179
West	0.091584885	0.190122084	0.169067622	0.011237828
South-east	0.12247044	0.312592525	0.265700139	0.0266231
North-east	0.164749541	0.477342065	0.373921388	0.052688677
South - Muntenia	0.149413837	0.626755903	0.487580724	0.064360168
Center	0.119928837	0.74668474	0.602069321	0.065340232
North-west	0.132124865	0.878809605	0.726282293	0.087754139
Bucharest - Ilfov	0.121190395	1	1	0.104604416
	1			0.416369738
			Area A	0.083630262
			Gini	0.167260523

Source: own results

The level of inequality of GDP distribution measured with the Gini index (value of 0.1672 in 2021) confirms the existence of small differences between regions, a moderate level of territorial disparities regarding GDP (Table 2). Certainly the level of inequality of GDP distribution at county level would be significantly higher.

The Lorenz curve (Figure 1), which allows the appreciation of the degree of concentration at the regional level, also indicates a rather low level of concentration, the concentration curve (Lorenz curve) being quite close to the diagonal of the square (line of equality).


Figure 1. The Lorenz curve regarding the concentration of the Gross Domestic Product on developing regions in 2021

Source: own results

The issue of income inequality has become one of the most important macroeconomics issues in the last few decades. In line with globalization, the gap between the rich and the poor seems to increase over time. There are several factors causing the rise of income inequality, such as the rising incomes of high wealth individuals, and the role of technology in the globalization era.

GDP growth has become one of the most important goals for countries in the past decades. The growth rate of GDP is often used as a sign that the economy is doing well. It is also often used as an indicator for foreign investment and government performance. However, GDP growth also brings negative consequences such as aggravating the gap between the rich and the poor.

Bucharest-Ilfov is the most developed region of Romania. The Gross Domestic Product per inhabitant of this region exceeds more than 2.5 times the value of the indicator at the national level. The region is very attractive for foreign investors (approximately 60% of the volume of foreign investments have been allocated to this region from 1991 to the present).

Of course, the country's capital is an important economic engine, benefiting from an adequate infrastructure (transportation, telecommunications, production and storage spaces), as well as a well-qualified and quite numerous workforce.

Due to the differences in economic development between the region Bucharest-Ilfov and the other development regions of Romania, we analyzed the value of the Gini coefficient excluding Bucharest-Ilfov (Table 3).

Table 3. The level of inequality (Gini Index) of the distribution of the Gross Domestic Product by region in 2021 (without the region Bucharest-Ilfov)

Regions	% Population	% GDP	% Cumulative population	% Cumulative GDP	Area under the Lorenz curve
South-west Oltenia	0.112125765	0.1051110524	0.112125765	0.105111052	0.005892829
West	0.104214706	0.1276739453	0.216340471	0.232784998	0.017606869
South-east	0.139359469	0.1330509065	0.355699941	0.365835904	0.041711746
North-east	0.187468981	0.1490071423	0.543168922	0.514843047	0.082549993
South - Muntenia	0.170018439	0.1564947091	0.713187361	0.671337756	0.100836304
Center	0.136467372	0.1576364969	0.849654733	0.828974253	0.102371819
North-west	0.150345267	0.1710257475	1	1	0.137488811
	1				0.48845837
				Area A	0.01154163
				Gini	0.02308326

Source: own results

We notice that the level of inequality of the distribution of the Gross Domestic Product measured with the Gini index, without the region Bucharest-Ilfov, has a value of approximately 0.0230 in 2021, which shows a very low level of inequalities between the 7 development regions (the value of the Gini coefficient without the region Bucharest-Ilfov is 8 times larger than the one calculated for all 8 development regions).

The Lorenz curve (Figure 2), which allows the appreciation of the degree of concentration at the regional level, also indicates a very low level of concentration, the concentration curve (Lorenz curve) being very close to the diagonal of the square (line of equality), much closer than in the situation in which we also took into account the region Bucharest-Ilfov.

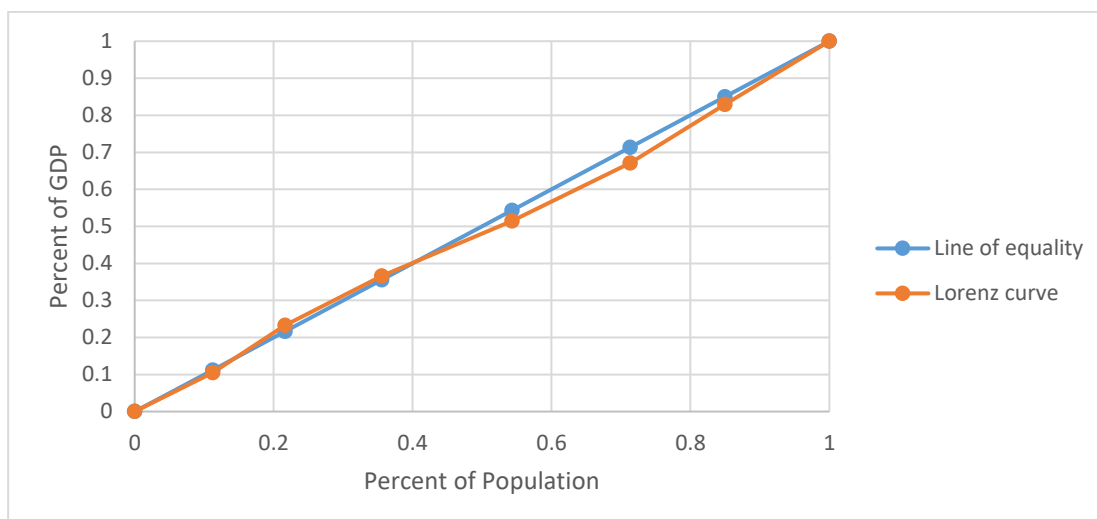


Figure 2. The Lorenz curve regarding the concentration of the Gross Domestic Product by development regions in 2021 (without the region Bucharest-Ilfov)

Source: own results

4. CONCLUSIONS

The theories on regional disparities point to a relative variety of techniques and analyses that can reflect this.

There is a permanent preoccupation of economics to estimate and evaluate the dynamics of territorial entities, taking into account the existing conditions and the reported time periods.

The regional analysis models aim in particular to explain the causes that lead to the occurrence of economic and social disparities between and within regions, in order to identify the best actions to counteract the effects of their occurrence or accentuation.

The results of calculating the Gini coefficient and the analysis of the Lorenz curve indicate a low level of regional disparities in Romania, especially if we do not take into account the Bucharest-Ilfov region.

The region Bucharest-Ilfov, which has a higher economic-social development level than the other regions, seems to be a significant factor in deepening the regional differences and has a relatively modest contribution in terms of the economic-social development of the other regions.

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