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The Evolution of Economic Disparities in Romania during the COVID-19 Pandemic: A Comparative Analysis of Pre-Existing and Emerging Challenges

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Abstract. *The COVID-19 pandemic has had significant impacts on Romania, exacerbating existing inequalities in the country. Economic disparities between counties were deepened, with counties with higher GDP per capita and diverse economic activities faring better than those with lower GDP per capita and narrow economic activities. The pandemic also led to a decline in population numbers, with most counties in the historical regions of Muntenia and Moldova experiencing below-average declines. In addition, the pandemic had a significant impact on the average life expectancy in Romania, highlighting the need for targeted policies and interventions to address these regional inequalities. Lastly, the pandemic negatively affected labor force participation rates in Romania, further highlighting the need for policymakers to implement measures to encourage more individuals to enter and remain in the labor market, particularly in regions with lower participation rates.*

Keywords: COVID-19, regional disparities, economic evolution, cartographic representation

Introduction

COVID-19 pandemic represented a historically large economic shock for the entire Europe and beyond. Enterprises and consumers were forced to adapt at an accelerated pace to cope with distancing and isolation measures and restrictions. The economy of Europe stagnated in the fourth quarter of 2020 and in the first quarter of 2021 as public health measures were introduced to limit the spread of the virus. Starting in the second quarter of 2021, the EU and the euro area economies began to recover as vaccination rates increased and restrictions were reduced. The closure or suspension of economic activities, as well as physical distancing and isolation of people, generated high financial and economic costs. The prolonged effect of this led to a deterioration of potential economic growth, both in terms of investments and human capital. Although government intervention acts to mitigate a recession, there is a high possibility that economic activity will remain dominated by intense fragility even after restrictions are relaxed, following a slow pace and a considerable level of uncertainties in economic recovery.

Territorial disparities refer to economic, social, and demographic inequalities that exist between different geographical areas, in our case, the counties in Romania. These inequalities can be caused by various factors, such as the availability of jobs, the level of education and professional training, and access to health services or infrastructure.

The study focuses on analyzing the effects of the Covid-19 pandemic on regional disparities at the county level in Romania during the period of 2019-2021. Study of the evolution of territorial disparities in Romania is important and useful because it helps identify the less economically and

DOI: 10.2478/picbe-2023-0035
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socially developed regions that might need more support to reduce these disparities. In addition, the study can provide valuable information for the development and implementation of public policies at the national and regional levels, including regional development strategies, investment plans, and fiscal policy. It can also help identify economic sectors that might be more suitable for investment or development in those regions.

The COVID-19 pandemic had a significant impact on the labor force employment rate in Romania, according to Cristescu and Mercan (2021). During the lockdown period, many businesses were closed or operated at reduced capacity, leading to a decrease in the number of available jobs, as reported by Chivu and Georgescu (2020). According to the data published by the National Institute of Statistics (INS), the employment rate at the national level dropped from 69.7% in the second quarter of 2019 to 65.3% in the second quarter of 2020. The number of people available for work increased, and the unemployment rate peaked at 5.3% in May 2020.

Additionally, the pandemic had a greater impact on certain sectors such as tourism and hospitality, which were heavily affected by the restrictions imposed to limit the spread of the virus. These sectors registered a significant decrease in the number of employees and continued to have difficulties during the resumption of activity. On the other hand, some sectors, such as e-commerce and the food industry, experienced a significant increase in demand and activity during the pandemic, leading to an increase in the number of available jobs.

Azhgaliyeva et al. (2022) studied the effects of the COVID-19 pandemic on households in CAREC member countries and discovered that policy interventions such as lockdowns, travel restrictions, and uncertainties in future economic outcomes had a severe impact on employment and education in CAREC member countries. Nam and Lee (2021) examined the initial impact of COVID-19 on the labor market and compared it to that of the 2008 Global Financial Crisis. They found that the COVID-19 outbreak hurt the overall labor market, increasing the unemployment rate. Furthermore, the negative effects were more severe than those resulting from the 2008 Global Financial Crisis.

Dumitrescu (2021) attested that strict social distancing measures adopted during quarantine, the temporary interruption of economic activity, and the economic recession generated by these factors had a major negative impact on the labor markets of the EU member states.

The COVID-19 pandemic had a significant impact on the average life expectancy in Romania, as well as in other countries in the world. According to data provided by the National Institute of Statistics (INS), life expectancy at birth for 2020 was 75.1 years for men and 80.8 years for women, down from the previous year. This decrease is largely due to the increased mortality caused by COVID-19, but also to other conditions that were less treated or diagnosed later due to the pandemic. Furthermore, the pandemic had a negative impact on the mental health of the population, which could have a long-term effect on life expectancy. It is also important to mention that the COVID-19 pandemic has disproportionately affected certain categories of people, such as the elderly.

This article (Schöley, J., Aburto, J.M., Kashnitsky, I. et al., 2022) analyzes the impact of the COVID-19 pandemic on life expectancy in 29 countries, including most of Europe, the United States, and Chile. The study looks at life expectancy changes since 2020 and attributes them to mortality changes by age group. The results show that there has been a divergence in mortality impacts of the pandemic in 2021, with some countries experiencing bounce backs from life expectancy losses of 2020, while other countries have witnessed sustained and substantial life expectancy deficits. The study also found that life expectancy deficits during fall/winter 2021 were negatively correlated with measures of vaccination uptake across countries. The article discusses

how the age profile of excess mortality in 2021 was younger, with those in under-80 age groups contributing more to life expectancy losses. However, even in 2021, registered COVID-19 deaths continued to account for most life expectancy losses. The study concludes by quantifying the mortality burden of COVID-19 in 2021 and contributing to the debate about recent trends in life expectancy from a cross-national perspective.

Methodology

In our study, we analyzed the evolution of regional disparities during the Covid-19 crisis using two cartographic representation methods - the natural break map and the standard deviation map. First, a natural break map was employed to visualize the socioeconomic indicators disparities at the end of the year 2019. Jenks natural breaks classification (Jenks, 1967), is a method of choropleth map classification based on the natural groupings inherent in the data. It is commonly used to visualize data that exhibits a clear clustering pattern or natural breakpoints. The natural breaks method works by finding groupings in the data where the differences between the values within each group are smaller than the differences between the values in different groups. It aims to minimize the variance within each group and maximize the variance between groups. The algorithm works by iterating through all possible groupings of the data and calculating a sum of squared deviations from the mean for each grouping:

$$SSD_{i..j} = \sum_{k=1}^{j} \quad A[k]^2 - \frac{\left(\sum_{k=1}^{j} \quad A[k]\right)^2}{j-i+1},$$

Where: A is the set of values that have been ordered from 1 to N and 1 ≤ i < j < N;

The grouping with the smallest sum of squared deviations is selected as the best grouping. Once the groupings are determined, they are used to create a choropleth map where each group is assigned a different color or shade.

In order to examine and illustrate the changes in economic disparities in Romania during the COVID-19 crisis between 2019 and 2021, we employed a standard deviation map. This approach allowed us to determine the extent to which data from specific counties deviated from the national average, and to identify regions experiencing either high or low levels of a particular phenomenon. To categorize the regression results, we utilized a color palette consisting of six sections, with blue shades indicating counties with a value per capita below the national average, and red shades indicating those with above-average value per capita.

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n} \quad (y_i - \underline{y})^2}{n}}$$

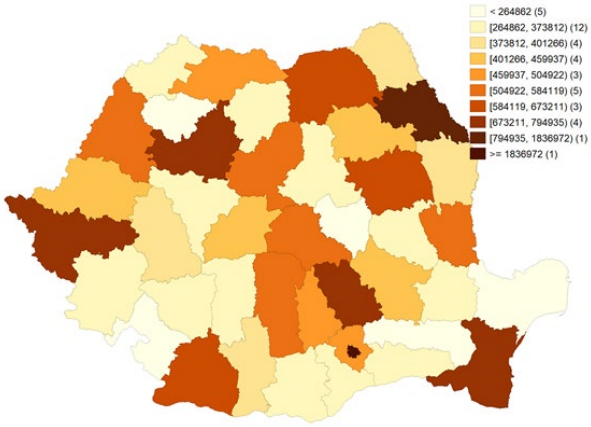
Where: σ stands for standard deviation, y_i are county values, $\underline{y}$ represents the national average and n the number of counties.

Results and discussions

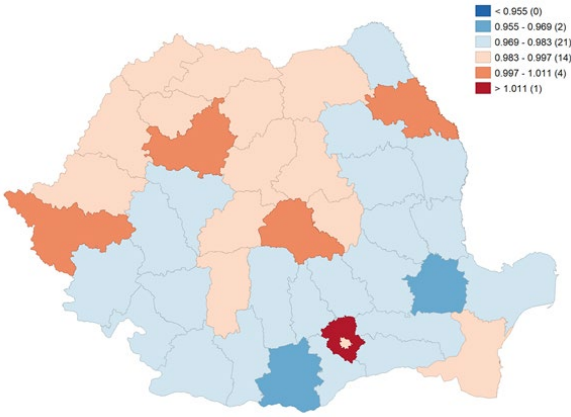
Resident population

The COVID-19 crisis has had a significant impact on the resident population in Romanian counties, which can be attributed to three major factors. Firstly, migration, where individuals and families

may have relocated to alternative locations in search of better economic opportunities, or to avoid pandemic-related restrictions or even immigration (Antonia and Prada, 2023). Secondly, mortality, which has resulted in a significant number of deaths in more affected counties (Muntele, 2022), potentially leading to a decrease in the population size of the respective areas. Lastly, the pandemic may have affected birth rates, with some individuals and couples choosing to delay or forgo having children, potentially leading to a reduction in the birth rate and a smaller population size over time.



Map 1.1 The resident population as of July 1, 2019 at the county level.



Map 1.2 Changes in population structure in 2021 compared to 2019

Data source: National Institute of Statistics.

Map 1.1 depicts county-level disparities in resident population in 2019, highlighting that more developed countries such as Timisoara, Cluj, Iasi, Constanta, Prahova, and the Bucharest Municipality were successful in attracting a larger number of individuals.

Map 1.2 pictures the changes in resident population during the COVID-19 pandemic in Romania. Analysis of the map reveals that certain counties, including Timis, Brasov, Iasi, Cluj, and Ilfov, experienced a modest rise in their resident population indicator. This suggests that the pandemic's impact on the resident population was less severe in these counties compared to others.

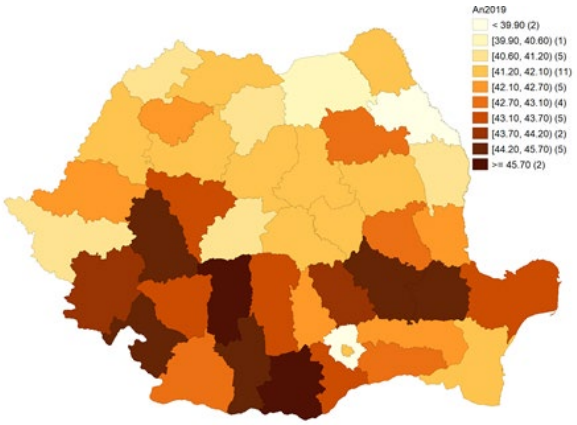
Interestingly, Ilfov experienced the highest increase in population, with a growth rate of 4.51% during the pandemic. It is possible that government policies aimed at controlling the spread of the virus, such as travel restrictions and quarantine measures, contributed to this trend by attracting new residents to the area. The relocation to Ilfov could have been driven by several factors, including proximity to workplaces or a desire to escape crowded living conditions in urban areas like Bucharest. However, further research is necessary to determine the exact reasons behind the population growth in Ilfov during the pandemic.

During the COVID-19 pandemic in Romania, most of the counties in the historical regions of Muntenia and Moldova experienced a decline in population number. The values of this decrease were below the natural average and coincided with economic disparities in the regions. This observation highlights the potential impact of economic factors on population changes during the pandemic.

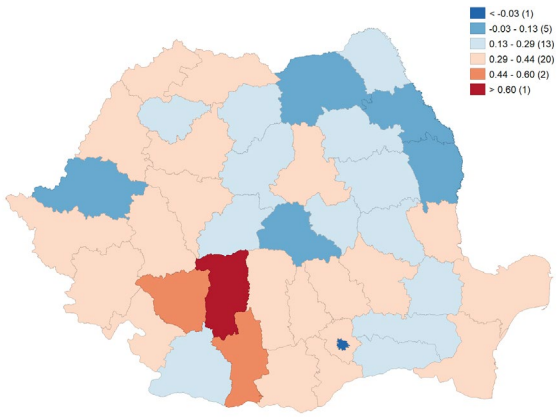
Average age of resident population

The average age of the resident population have relevance to the COVID-19 pandemic due to the fact that older individuals are generally more vulnerable to severe illness and death from the virus (Pantea Stoian, A., Pricop-Jeckstadt, M., Pana, A. et al., 2020). On the other hand, a population

with a lower average age may be less vulnerable to severe COVID-19 outcomes, impacting the overall spread and severity of the pandemic in a given area (Sandu, 2022).



Map 1.3 Average age of resident population as of July 1st, 2019, by county



Map 1.4 Evolution of the average age by county during the period of 2019-2021

Data source: National Institute of Statistics.

In Romania, the southern region of the country exhibited a higher average age in 2019, with peaks observed in counties such as Braila, Valcea, and Teleorman, where the average age exceeded 45 years. In contrast, counties with the youngest population were Iasi, Ilfov with an average below 40 years and Suceava, Vaslui, Satul Mare, and Bistrita Nasaud.

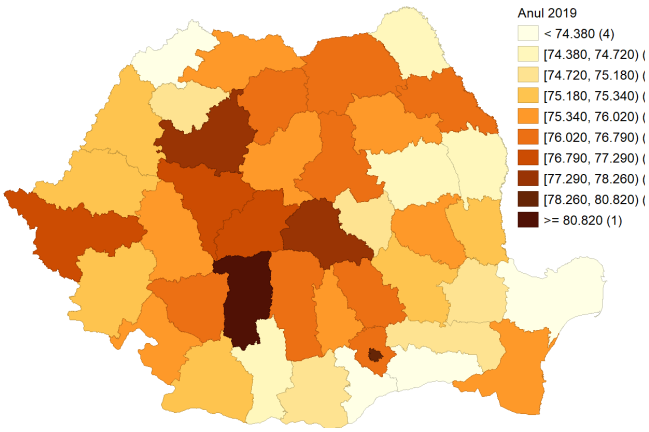
During the pandemic, the average age in Romania increased, consistent with previous trends, but with a smaller increase in counties with lower average age and a higher increase in counties with higher average age. However, there was an exception in the case of Bucharest Municipality, which managed to decrease its average age from 41.9 to 41.8 years.

Addressing these regional inequalities requires targeted policies and interventions, such as investing in age-specific programs and resources that cater to the unique needs of different age groups. Policymakers may consider investing in healthcare services and job training programs that specifically target older and younger adults, respectively, in order to ensure that all residents have access to the resources and services necessary for leading healthy and productive lives.

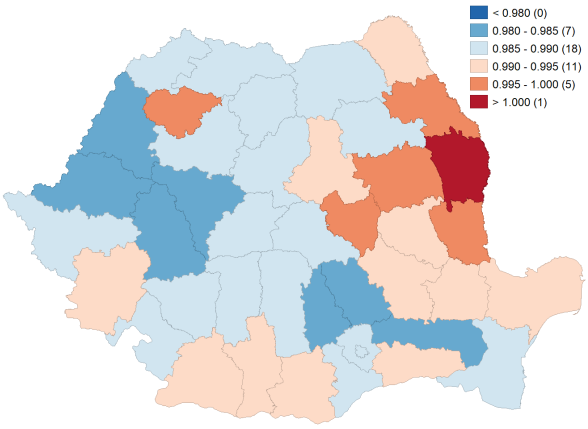
Life expectancy

COVID-19 has had a significant impact on the average life expectancy in many countries in Europe (Schöley, J., Aburto, J.M., Kashnitsky, I. et al., 2022). In general, COVID-19 mortality is higher among older people and those with pre-existing comorbidities. Additionally, there are a number of socio-economic and public health factors that can influence COVID-19 mortality (R.B. Hawkins, E.J. Charles, J.H. Mehaffey, n.d.) and average life expectancy in a particular region.

Regarding regional disparities, there are significant differences between high-income and low- and middle-income countries in terms of COVID-19 mortality and average life expectancy. Generally, high-income countries have had more resources to invest in their health and public health systems, which has allowed them to better manage the pandemic and reduce mortality. In contrast, low- and middle-income countries have had fewer resources and have therefore had a greater difficulty in managing the pandemic and reducing mortality.



Map 1.5 Average life expectancy by county in 2019



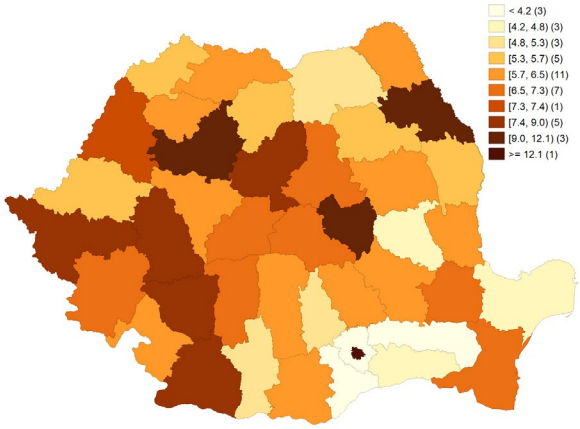
Map 1.6 Evolution of average life expectancy during the pandemic

Data source: National Institute of Statistics.

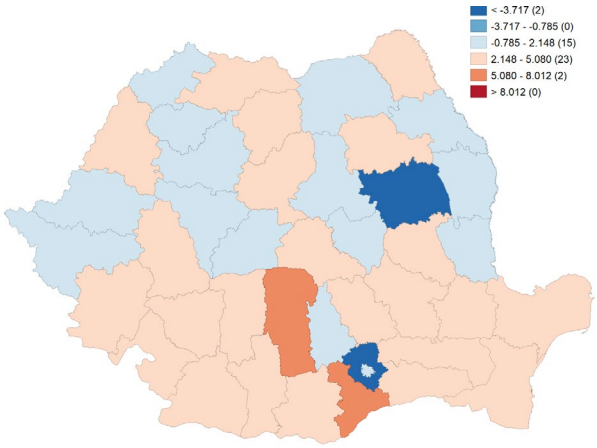
Map 1.5 and Map 1. depicts the national average life expectancy in Romania over a two-year period, from 2019 to 2021, with a particular focus on the impact of the Covid crisis on population health. The data indicates a decline in the average life expectancy from 75.92 years in 2019 to 75.13 in 2021, highlighting the significant impact of the pandemic on mortality rates and overall health outcomes. The study also highlights substantial regional variations in life expectancy, with the highest values recorded in Vâlcea (80.82 years), Cluj (77.56 years), Bucharest municipality (78.26 years), and Brașov (77.29 years) in 2019, and the lowest values found in Tulcea (73.56 years), Călărași (73.87 years), and Giurgiu (73.89 years) during the same period. Moreover, the analysis identifies Prahova (-1.38 years), Dâmbovița (-1.31 years), Hunedoara (-1.26 years), and Vaslui (+0.46 years) as the counties showing the most substantial changes in life expectancy between 2019 and 2021. The increase in Vaslui's life expectancy is likely due to its younger age average.

Healthcare infrastructure

The COVID-19 pandemic has highlighted the critical importance of having a strong and resilient healthcare infrastructure (Dascalu, 2020). Counties with well-established healthcare systems were better equipped to respond to the pandemic, with more available hospital beds, medical equipment, and trained healthcare professionals. In contrast, countries with weaker healthcare infrastructure faced significant challenges in managing the spread of the virus and providing adequate care to those infected. The pandemic has also highlighted the need for flexibility and adaptability in healthcare infrastructure. Many counties had to quickly repurpose existing facilities or build new ones to accommodate the surge in COVID-19 patients, quantified in our study as the number of beds available in medical facilities that have been approved for operation (Map 1.8).



Map 1.7: Average number of hospital beds per thousand inhabitants in 2019



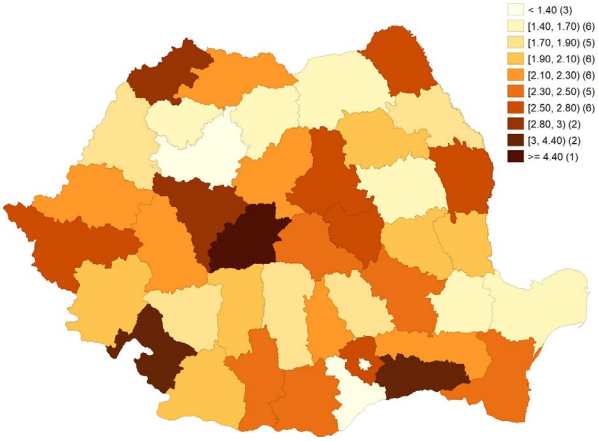
Map 1.8 Evolution of Average number of hospital beds during the pandemic

Data source: National Institute of Statistics.

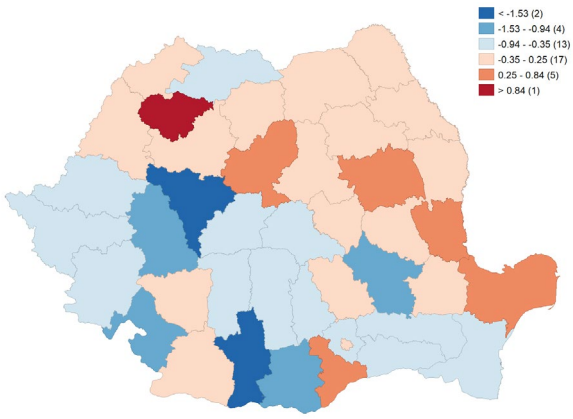
During the COVID-19 pandemic, almost all Romanian counties managed to either increase or maintain the number of hospital beds available to respond to the crisis. The average number of hospital beds per thousand inhabitants increased from 6.28 to 6.42 beds during the pandemic. Bucharest, Cluj, and Iasi had the highest values, with 12.3, 9.9, and 9.6 beds per thousand inhabitants, respectively. The lowest values were recorded in Ilfov (2.9 beds per thousand inhabitants), Giurgiu (3.2 beds per thousand inhabitants), and Ialomita (3.4 beds per thousand inhabitants). The largest drop in hospital bed availability was observed in Bacau county, where the indicator decreased by 10.6%.

Dropout Rate in Secondary Education

The rate of students leaving school before completion suggests the underlying issues faced by certain regions in terms of promoting children and young adults' involvement in education, along with their inability to engage and keep school-going populations. Concurrently, early school dropout and non-completion may lead to poverty, social marginalization, unhealthy well-being, and eventually, the emergence of under-skilled generations that struggle to assimilate in the job market, hence adding to the widening regional gaps. The COVID-19 pandemic, with the implementation of online classes and isolation measures, has the potential to affect the rate of students dropping out of secondary education, which could further exacerbate future inequalities.



Map 1.9 Dropout Rate in Secondary Education (%) by Counties in 2019



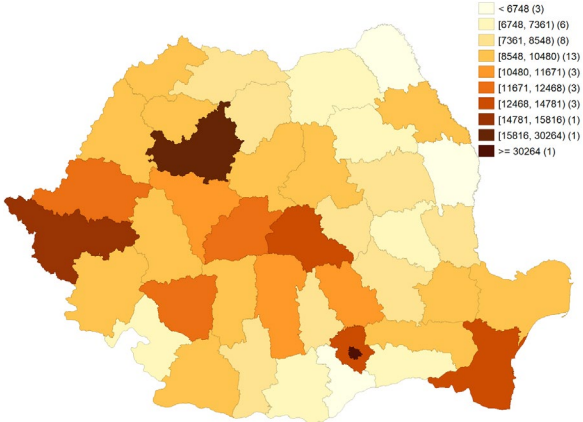
Map 1.10 Evolution of Dropout Rate in Secondary Education during pandemic.

Data source: National Institute of Statistics.

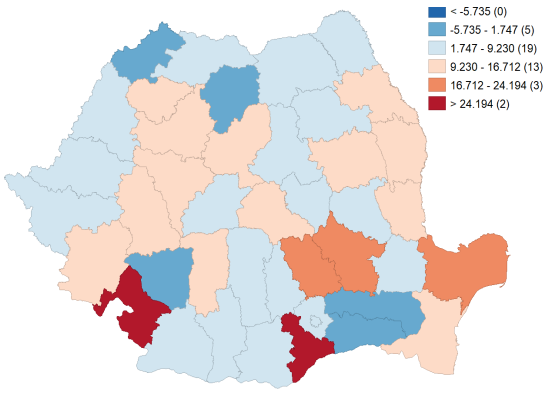
Amid the COVID-19 pandemic, there has been a decrease in the overall dropout rate in Romania's secondary education from 2.1% in 2019 to 1.76% in 2021. The counties of Alba and Olt experienced the highest recovery rates, with a reduction of 1.6% in their dropout rates, while the northeastern region witnessed an increase in the dropout rate. However, Salaj county registered a higher increase in the dropout rate, from 1.4% to 2.3%. It is important to note that these changes could be attributed to the pandemic, with the implementation of various measures such as online learning and social isolation, which could have different impacts across regions.

Gross Domestic Product

The Romanian GDP contracted by 3.7% in 2020 compared to the previous year, according to the analysis presented in the paper "The Impact of COVID-19 Pandemic on the Romanian Economy in the Year 2020." This contraction was largely due to the measures taken to control the spread of the COVID-19 virus, such as lockdowns and restrictions on economic activity, which had a significant impact on many sectors of the economy. The decline in economic activity resulted in reduced production, decreased consumer spending, and lower investment levels, all of which contributed to the contraction of the GDP in Romania in 2020.



The Map 2.1 Gross Domestic Product per Capita in Euros at the County Level in 2019



The Map 2.2 GDP Evolution during the COVID-19 Crisis Periods

Data source: Eurostat for the year 2019, National Commission for Strategy and Prognosis for the year 2021.

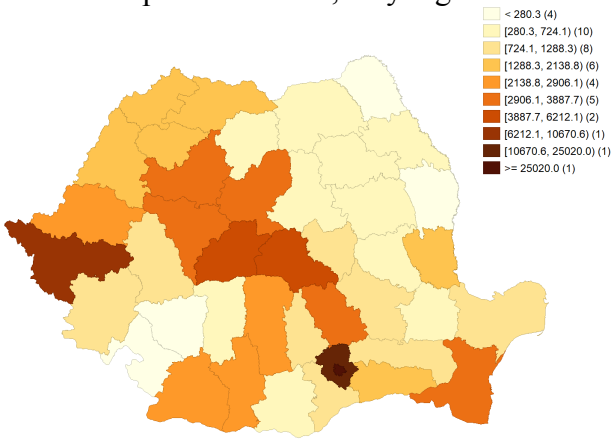
In 2021, Romania demonstrated economic recovery from the COVID-19 crisis with a growth rate of 5.1%, resulting in an average GDP per capita of 10110 euro, according to Eurostat. According to Comisia Națională de Strategie și Prognoză, Bucharest Municipality topped the list of counties with the highest GDP per capita in 2021, at 31938 euro per capita, followed by Cluj with 17426 euro per capita, and Timis with 15940 euro per capita. Conversely, Calarasi was at the bottom of the list with 6851 euro per capita, Botosani with 6386 euro per capita, and Vaslui with only 5745 euro per capita.

Comparing the GDP per capita of 2021 with 2019, almost all counties in Romania experienced an increase in GDP per capita, with the highest increases being observed in Giurgiu, which saw a growth of 36.7%, and Mehedinți, which experienced a growth of 27.6%. However, three counties saw a decline in their economies, with Calarasi experiencing a decrease of 1.14%, Satul Mare at -1.78%, and Ialomita at -4.44%.

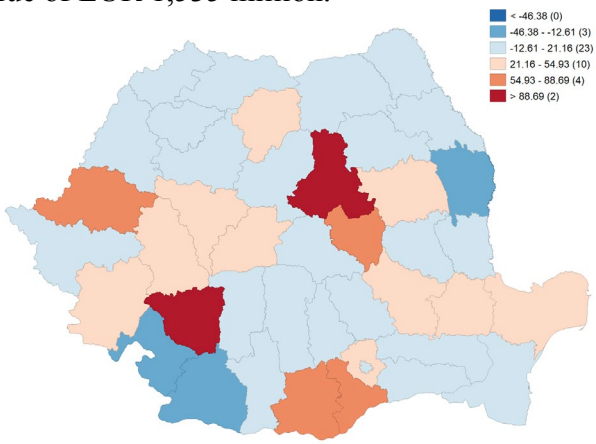
The COVID-19 pandemic had a significant impact on the economies of all countries, including Romania. However, counties that had higher GDP per capita and a more diverse range of economic activities seemed to have fared better during the pandemic, displaying greater resilience to the economic shocks. These counties had a stronger economic foundation and could withstand the negative effects of the pandemic. On the other hand, counties with lower GDP per capita and a narrow range of economic activities were hit harder by the pandemic, leading to a deepening of economic inequalities between counties in Romania. These counties were more vulnerable to external shocks. For instance, counties that relied heavily on tourism suffered greatly as a result of the pandemic, with many businesses being forced to close or operate at reduced capacity.

Foreign direct investment

COVID-19 pandemic has had a significant impact on the global economy, and uncertainty has led to a decrease in FDI net inflows worldwide, particularly in emerging economies (Linh Tu & Gan, 2021). Regarding the evolution of FDI in Romania in the recent period, 2020 was an atypical year, in which investors reduced their capital injections into the national economy (Ciobanu, et al., 2021). Thus, in the first quarter of 2020, foreign direct investments decreased by EUR 416 million, while in the same period of 2021, they registered the value of EUR 1,535 million.



The Map 2.3 Foreign Direct Investments at the County Level in 2019



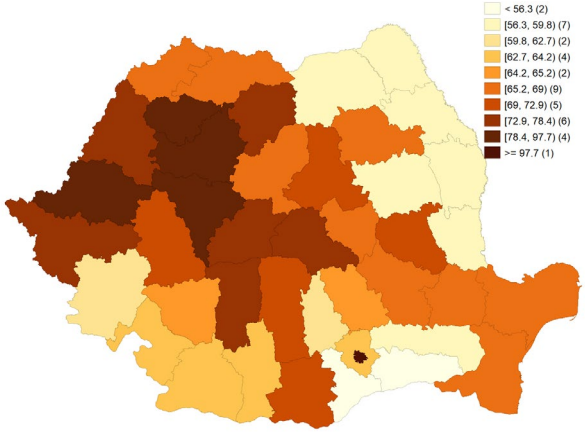
The Map 2.4 Pandemic Evolution

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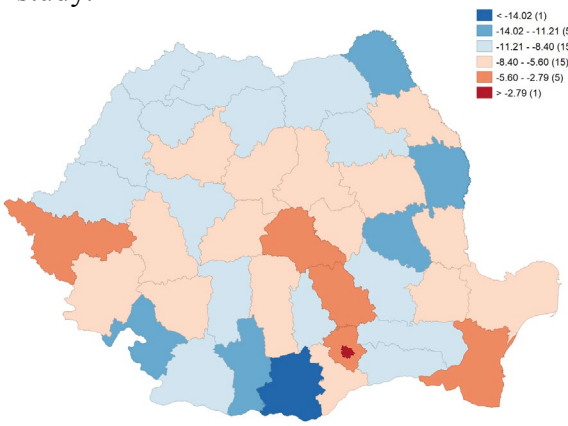
In 2021, the average foreign direct investment (FDI) per capita in euro increased from 2365 to 2754. However, there were certain counties with minimum values of FDI per capita, such as Vaslui with 98.4 Euro/capita, Mehedinti with 68.4 Euro/capita, and Gorj with only 22.88 Euro/capita. On the other hand, Timis, Ilfov, and Bucharest Municipality had the highest FDI per capita with 6780, 12972, and 29745 Euro/capita, respectively. Generally, the regions with low FDI values were located in the southwest and northeast of the country. The highest relative increases in FDI were observed in Gorj and Covasna.

Labor force participation rate

One way to assess the economic development of a region is by examining its ability to offer job opportunities to a large number of residents. Labor force participation rate represents the percentage ratio between the employed population and the labor force (which includes the working-age population, able to work, as well as people below and above working age who are employed). The labor force participation rate reflects the percentage of the population that is either employed or looking for work, while the unemployment rate measures the percentage of those in the labor force who are currently unemployed and seeking work. While both labor force participation rate and unemployment rate are crucial indicators to evaluate the status of a nation's labor market, in the current scenario of the COVID-19 pandemic, we deem it more appropriate to utilize the labor force participation rate as the primary measure in our study.



Map 2.6 Labor force participation rate (%) by county in 2019



Map 2.7 The Evolution of Labor Force Participation Rate during the Pandemic

Data source: National Institute of Statistics.

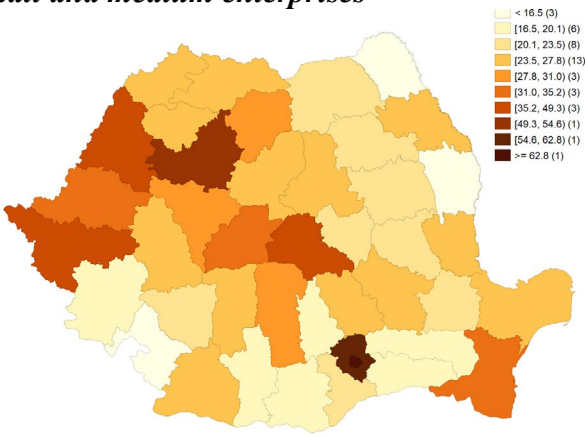
Labor force participation rate has decreased from 69.6% in 2019 to 62.3% in 2021, indicating a significant impact of the COVID-19 crisis on the country's economic development. This decline has been observed across all counties, with more developed countries experiencing smaller decreases: Timisoara (-5.3%), Constanta (-4.9%), Ilfov (-4.5%), Brasov (-3.7%), and Bucharest (-0.6%). Conversely, counties in the south and northeast of Romania have been hit harder: Vaslui (-11.9%), Botosani (-12.3%), Vrancea (-12.4%), and Teleorman (-15.9%).

The decline in the employment rate across all counties suggests that the pandemic has affected the labor market and economic growth at a national level. However, the varying degrees of decline between counties reflect the differences in economic development and the structure of local economies. Counties with more diversified and resilient economies have been able to mitigate

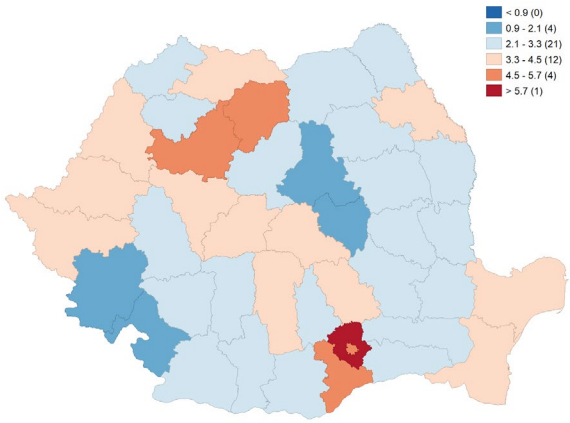
the impact of the crisis on employment to a greater extent, while counties with less developed and more vulnerable economies have been hit harder.

Overall, these findings suggest the need for targeted interventions to support employment and economic recovery in the most affected counties, particularly those in the south and northeast of Romania.

Small and medium enterprises



Harta 2.8 shows the number of small and medium-sized enterprises per thousand inhabitants in each county.



Map 2.9 Evolution of the number of small and medium enterprises during the pandemic

Data source: National Institute of Statistics.

Conclusion

The COVID-19 pandemic has had a significant impact on the resident population of Romanian counties, with migration, mortality, and birth rates being the major factors contributing to this impact. Before the pandemic, certain counties such as Timisoara, Cluj, Iasi, Constanta, Prahova, and the Bucharest Municipality attracted a larger number of individuals, but during the pandemic, some counties experienced a rise in their resident population indicator, while others experienced a decline. Most of the counties in the historical regions of Muntenia and Moldova experienced a decline in population number, below the natural average, and coincided with economic disparities in the regions. The pandemic also had a significant impact on the average life expectancy in Romania, with a decline from 75.92 years in 2019 to 75.13 in 2021.

Economic disparities exist between different counties in Romania, with some counties having significantly higher levels of economic development and prosperity compared to others. The COVID-19 pandemic has exacerbated these disparities, with counties that were already facing economic challenges before the pandemic being hit particularly hard. Labor force participation rate is an important indicator of economic development, and Romania's labor force participation rate of approximately 61.2% in 2021 is below the EU average of 70.3%. The COVID-19 pandemic has also had a significant impact on labor force participation rates in Romania, with many individuals losing their jobs or being unable to find employment due to the economic downturn.

Addressing these regional and economic inequalities requires targeted policies and interventions, such as skills training programs, job creation programs, and incentives for businesses to invest in regions with lower labor force participation rates. It is crucial to promote inclusive and sustainable economic growth to reduce poverty and inequality in Romania.

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