Poverty in Romania: an analysis at regional level

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Abstract. *This paper proposes to analyze the poverty rate in the eight development regions of Romania (NUTS 2), in the period 2010-2019. To provide the most complex analysis possible, I examined the determinants of the poverty rate, and I concluded that the gross domestic product per capita and the gross value added of the ICT sector reduce the poverty rate, while the unemployment rates lead to poverty increases. However, at regional level, in general, the poverty rate decreased in 2019 compared to the 2010 levels.*

Keywords: poverty, regions, NUTS 2, GDP, ITC sector.

JEL Classification: I32, R11, O11.

1. Introduction

Poverty is defined as a social state in which an individual finds himself when the earned income could not ensure a decent standard of living or the minimum subsistence needs. The subsistence needs include covering the expenses necessary for a regular diet, clothing needs, heating, but also other necessities necessary for living. At the same time, poverty is directly related to the level of development of a country, because given that the more developed a state is, the lower is the level of poverty (Dinu, 2021).

Fighting against poverty is a global concern, and poverty reduction leads to a smart, sustainable and inclusive growth. Measures to eradicate the poverty include alleviating social inequalities, which can be achieved through an efficient education system adapted to current economic needs, qualification in the labour market, equal opportunities in the labour market, a fair wage system and taxation for work, respectively social protection and inclusion.

In 2019, Romania ranked second in the European Union in terms of poverty rate (Bulgaria registered the highest level of poverty). At the same time, Romania has three of the poorest regions in the European Union, namely North-East, South-East and South-West Oltenia. Although several measures have been taken in recent years to reduce poverty, these have not been sufficient.

The reason why I chose this topic consists in the intensification on the discussions on poverty related issues at the level of European Union and Romania, but also in the importance of finding solutions to generate social inclusion and convergence at Member States and regional level. The main objective of this paper is to analyse the factors that increase the level of poverty in some regions of Romania. This object can be reached by achieving specific objectives, respectively: identifying the impact of the determinants of the poverty rate, respectively validating the feasibility of the model.

2. Literature review

The poverty rate is calculated by the share of people who have a disposable income less than 60% of the median equivalent disposable income at the national level, in the total population (National Institute of Statistics), this being also one of the methodological approaches preferred by Eurostat, although there are other poverty lines taken into account. The United Nations states that poverty means more than a lack of income, it also referring to the socio-economic dimension, social protection measures, decent work and opportunities. In addition, the World Bank stated that the determinants of the poverty rate include regional characteristics, the specificities of communities and the individual characteristics of people.

Poverty concept has been analysed by many authors. Among them is Smith (2010), which stated that poverty is a multidimensional phenomenon, that can be influenced by social and economic factors, but also by age, sex and culture. Moreover, Atkinson (2013) argued that poverty is caused by national policies adopted by public institutions.

The relationship between GDP per capita and poverty rate was analysed by Cerra et al. (2021), which confirmed an inverse relationship between these variables. In addition, the authors emphasised that it is important to examine the sources of growth that underlie poverty reduction. Adams (2003) stated that the growth of GDP per capita leads to a reduction of the poverty rate. In addition, Muloc et al. (2012) showed that economic growth is necessary but not sufficient to reduce poverty in a region. On the other hand, Anser et al. (2020) showed that there is a "U"-shaped relationship between poverty rate and GDP per capita.

Another analysed relationship is that between poverty rate and technology. In this case, Liu (2021) indicated that the widespread use of technology has a significant impact on economic growth and human well-being. In addition, Deaton (2017) showed that investing in technology helps to eradicate poverty. On the other hand, Jaumotte et al. (2008) have shown that increasing inequality and poverty is a consequence of technological progress. Also, Mirsa et al. (2019) stated that technology can lead to increasing social inequalities, including increasing poverty.

Regarding the relationship between the poverty rate and the unemployment rate, Šileika and Bekerytė (2012) found that there is a direct link between these variables. In addition, the authors pointed out that poor countries do not always have a high unemployment rate. On the other hand, Nasar (2014) stated that a high unemployment rate generates poverty, while Duiella and Turrini (2014) and Caminada et al. (2011) showed that the poverty rate has a negative impact on the unemployment rate and on GDP per capita.

3. Methodology

In this section I have described the methods used to estimate the impact of poverty on GDP per capita and the gross value added of the ICT sector. The analysis is performed at the level of the eight development regions of Romania (NUTS2), namely: North-East, South-East, South-Muntenia, South-West Oltenia, West, North-West, Centre and Bucharest-Ilfov.

Therefore, to calculate the impact poverty selected determinants, I used panel data, with quarterly frequency, using the time period 2010-2019 (72 observations in total). The reason why I used this period is to capture the post-economic crisis period. Statistical data for the eight regions of Romania were extracted from the Eurostat database.

In this analysis I used the method Estimated Generalized Least Squares (EGLS), with fixed effects, this being weighted with the Cross-section SUR option (since the number of cross-sections is less than the number of observations per cross-section) to eliminate ex-ante issues related to heteroskedasticity and correlation. The adjustment of the model with the fixed effects method was based on the result obtained after using the Redundant Fixed Effects – Likelihood Ratio test, this being a technique used to address heterogeneity issues in panel series.

In order to process the statistical data, I have applied the EGLS method on the following equation:

$$poverty = \propto + \beta_0 \, poverty_{(-1)} + \beta_1 gdp\_capita + \beta_2 \, gva\_itc + \beta_3 \, unemployment_{(-1)} + \varepsilon_t, \tag{1}$$

where $poverty$ represents the rate of people at risk of poverty, $poverty_{(-1)}$ shows the rate of people at risk of poverty lagged by one year, gdp_capita is represented by the percentage change of the gross domestic product per capita, gva_itc represents the percentage change of the gross value added of the ICT sector, and $unemployment_{(-1)}$ shows the unemployment rate lagged by one year.

Finally, I tested the maximum likelihood of the estimators by examining the following hypotheses:
- The significance of the parameters.
- Statistical validity of the model – Fisher test.
- Absence of multicollinearity – variance inflation factors.
- Absence of heteroskedasticity – Breusch-Pagan-Godfrey test.
- Absence of serial autocorrelation – Breusch-Pagan test.
- Absence of cross-section dependence – Breusch Pagan LM, Pesaran scaled LM, Pesaran CD and Bias-corrected scaled LM tests.
- Normal distribution of the residuals – Jarque-Bera test.

4. Results and interpretations

In this paper, as mentioned above, I analysed the impact of poverty rate determinants, in the period 2010-2019. In this case, according to Figure 1, all estimators are statistically significant at 5%. In addition, the validity of the model is confirmed by the null probability of the F-statistical test. Moreover, the value of R-squared (98.67%) supports that the regressors have been properly selected.

Figure 1. *Estimation results*

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Dependent Variable: POVERTY
Method: Panel EGLS (Cross-section SUR)
Date: 11/23/21   Time: 21:08
Sample (adjusted): 2011 2019
Periods included: 9
Cross-sections included: 8
Total panel (balanced) observations: 72
Linear estimation after one-step weighting matrix
Cross-section SUR (PCSE) standard errors & covariance (d.f. corrected)
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Variable	Coefficient	Std. Error	t-Statistic	Prob.
POVERTY(-1)	0.341239	0.037513	9.096628	0.0000
GDP_CAPITA	-0.026690	0.012794	-2.086089	0.0412
GVA_ITC	-0.016641	0.003168	-5.252351	0.0000
UNEMPLOYMENT(-1)	0.165455	0.063796	2.593524	0.0119
C	14.68547	0.960362	15.29159	0.0000

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics

R-squared	0.986763	Mean dependent var	27.32945
Adjusted R-squared	0.984336	S.D. dependent var	66.22089
S.E. of regression	1.077471	Sum squared resid	69.65658
F-statistic	406.6083	Durbin-Watson stat	2.310209
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.939288	Mean dependent var	23.27083
Sum squared resid	386.9834	Durbin-Watson stat	2.002384

Source: Own calculations in Eviews 10.0 using Eurostat data.

Next, I have presented the impact of the selected poverty rate determinants. According to the results obtained, the increase by one percentage point of the rate of persons at risk of poverty lagged by one year, leads to the increase of the poverty rate by 0.341 percentage points, in the current year. Poverty is a challenge that the population faces in the short, medium and long term, and the process of overcoming it – is very difficult. In this case, individuals who fall into the category of people at risk of poverty will not be able to leave this category without earning higher incomes, and these high wages can be obtained mainly through better paid jobs. Also, people cannot get better paid job if they do not have a higher qualification. In addition, people may not be able to afford high qualifications due to their financial situation.

On the other hand, when the percentage change of the GDP per capita increases by one percentage point, the poverty rate decreases by 0.026 percentage points. GDP growth can be achieved in two ways: by increasing demand or increasing supply, both channels leading to better living conditions for the population, better health system, a better education system, and a social system that can help individuals to escape from the circle of poverty. In Romania, three out of eight regions have a high GDP per capita (Bucharest-Ilfov, West and Centre), the remaining regions facing major social problems, including a high level of poverty rate. In order to help the development of all regions, investments in infrastructure and human capital are needed, which promote social prosperity.

Table 1. *Tests performed*

Test	Test results (prob.)	Hypothesis accepted
Compatibility with fixed effects model		
Redundant Fixed Effects Test	0.000 (p<.05)	Fixed effects model is better than the random effects model
Autocorrelation test (Breusch-Pagan)		
R-squared (dependent variable: resid01)	0.020	There is no serial correlation between residuals
Observations (n)	72	
n*R-squared	1.440	
Degrees of freedom	1	
Prob. Breusch-Pagan	0.230	
Heteroskedasticity test (Breusch-Pagan-Godfrey)		
R-squared (dependent variable: resid01^2)	0.135	Homoskedasticity
Observations (n)	72	
n*R-squared	9.735	
Degrees of freedom	4	
Prob. Breusch-Pagan-Godfrey	0.045	
Cross-section dependence (CD) test		
Breusch-Pagan LM	1.000 (p>.05)	No CD
Pesaran scaled LM	0. 000 (p<.05)	CD
Bias-corrected scaled LM	0. 000 (p<.05)	CD
Pesaran CD	0.7721 (p>.05)	No CD
Normality test		
Prob. Jarque-Bera	0.278 (p>.05)	Normal distribution

Source: Own calculations using Eurostat database.

Further, I have found that the increase by one percentage point of the percentage change of the gross value added of ICT sector leads to a decrease in the poverty rate by 0.016 percentage points. Technology offers people the opportunity to have faster and easier access to information, which can generate opportunities at the individual level – especially related to jobs, qualifications and training programs, regardless of financial situation and

background. Therefore, technology can make a positive contribution to access to education, but on the other hand, it can limit access to the labour market as a result of the introduction of automation. Automation has begun to expand into many sectors, including in those where the minimum qualification is the secondary education cycle, which can lead to an increase in poverty if these people do not reorient themselves to other jobs on the labour market.

Regarding the effect of the unemployment rate lagged by one year, its increase by one percentage point lead to a hike in poverty rate of 0.165 percentage points. In this respect, a person falling into unemployment will suffer a significant reduction in income, and will be more likely to fall into the category of vulnerable people if fails to enter the labour market in a short period of time.

To verify the homoskedasticity of the model, I calculated the probability of the Breusch-Pagan-Godfrey test (Table 1). The value of the test confirmed that the model is homoskedastic. In addition, I used the Breusch-Pagan test to check the autocorrelation of the residuals, and the value obtained (0.230) confirmed the hypothesis of no serial correlation. The normality of the residuals has been verified using the Jarque-Bera test, which showed that the errors are normally distributed (the probability of the test was 0.278).

Figure 2. *Multicollinearity*

Variance Inflation Factors
Date: 11/23/21   Time: 21:31
Sample: 2010 2019
Included observations: 72

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
POVERTY(-1)	0.001407	267.2364	1.424457
GDP_CAPITA	0.000164	5.303481	1.973658
GVA_ITC	1.00E-05	1.980427	1.529435
UNEMPLOYMENT(-1)	0.004070	59.99942	1.078944
C	0.922295	323.8713	NA

Source: Own calculations in Eviews 10.0 using Eurostat data.

Figure 3. *Standardized residuals*
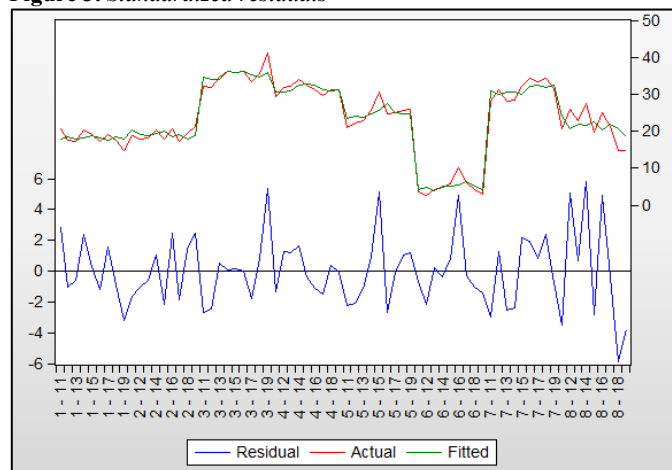
Source: Own calculations in Eviews 10.0 using Eurostat data.

As regards the cross-section dependence, I have confirmed its absence given that two of the four tests performed (Pesaran scaled LM and Bias-corrected scaled LM) supported this hypothesis. Multicollinearity has been verified using the Variance Inflation Factors test (Figure 2), which indicated that there is no multicollinearity at the level of the model. Next, according to Figure 3, it is observed that the residuals have a constant variation, their average being null, which is in line with the condition that a reliable model must meet.

5. Conclusions

This analysis showed that the poverty rate is influenced directly by the unemployment rate in the Romanian regions. The poverty rate is among the social indicators in which the Romanian regions are disadvantaged compared to other regions in the European Union, given the fact that in most regions about a quarter of the population falls into the category of people at risk of poverty. Unemployment rate is due to the lack of infrastructure, because the companies are not willing to open points in areas that do not have easy access to the distribution market, but in Romania, unemployment rate is, in some extent, undervalued.

On the other hand, GDP per capita and gross value added generated by the ICT sector lead to poverty reductions. However, the ICT sector is not developed at the level of all regions and there are not many people in the labour market in this sector (excepting Bucharest-Ilfov and Nord-Vest regions for which are reported a high value added by the ICT sector). In Romania there are several cities that are considered by investors as attractions in terms of labour, given the fact that many regions do not have skilled workers in this sector. In addition, the problem of attracting investors limits the regional GDP growth. In conclusion, policy makers need to make further steps forward to encourage companies to invest in disadvantaged areas, to create prosperity, and to support the efforts to reduce poverty and social inequality.

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