

*Dejan Stankov**

INCOME AND INEQUALITY ELASTICITY OF POVERTY: THE CASE OF CESEE COUNTRIES

ABSTRACT: *This paper examines poverty changes decomposed into two components: the growth effect and the distributive effect. This contribution is based on an empirical analysis of the Central and South-Eastern Europe (CESEE) countries, drawing on the latest years' official data. The income and inequality elasticity of poverty is estimated using the established panel data model. Based on linear regressions, the transformation of economic growth and income inequality to poverty reduction in CESEE countries is analysed. The study found that*

income growth contributes to poverty reduction, while the contribution of inequality is stronger and in the opposite direction. Thus, further progress in tackling poverty may be achieved under a relatively favourable income distribution. Since sub-regional differences in income inequality elasticity were not found, it would seem reasonable, therefore, to give special attention to reducing inequality in all CESEE countries.

KEY WORDS: *growth, inequality, poverty, income elasticity, inequality elasticity*

JEL CLASSIFICATION: O40, E25, I32

* State Statistical Office of the Republic of North Macedonia,
e-mail: dejan.stankov@stat.gov.mk, dejanstankov62@yahoo.com,
ORCID: 0009-0001-5664-2075

1. INTRODUCTION

Poverty reduction represents a fundamental challenge for transition countries. Although many economists in the past worked on growth, inequality and poverty in the context of developing countries¹, the available literature is focused mainly on the identification of the factors for growth and an understanding of the reasons for income distribution. Despite the increased interest in studying the link between growth, income distribution and poverty and the role of income distribution in the growth–poverty nexus in transition countries, there appears to be limited comparative evidence on the transformation of income and inequality growth to poverty alleviation in the Central and South-Eastern Europe (CESEE) region. The lack of studies and harmonised statistical data has made it difficult to compare the situation between the countries of this region and between the sub-regions. The obstacle is that in the past statistical data were produced using varied methodological concepts collected from different sources, resulting in structural breaks.

The hypothesis established in this paper is that economic growth contributes to poverty reduction, while inequality growth contributes to increased poverty. The goal of this paper is more straightforward, namely, to analyse the relative contributions of changes in income and inequality for poverty reduction in the CESEE countries. To pursue this objective, we calculate the income and inequality elasticity of poverty for the CESEE countries. For this purpose, we use a panel model based on comparable indicators for relative poverty, income and inequality from the Eurostat database². We analyse the extent to which the poverty changes might be decomposed into income and inequality factors and the differences in the magnitude of changes in poverty. The results presented emphasise the important role of income distribution in reducing poverty. We shed some light on the sub-regional differences in the responsiveness of poverty to income growth and inequality changes.

We analyse the CESEE countries because of several characteristics they have in common. Firstly, they are small and open economies with strong ties with the EU

¹ For example: Fosu, A. K. (2011). Growth, inequality, and poverty reduction in developing countries: Recent global evidence. World Institute for Development Economics Research.

² All figures are available as a separate file in Excel format upon request.

economies. Secondly, some of them are already members of the EU (EU-CESEE), and others are candidates or potential candidates for EU membership (non-EU-CESEE)³. Thirdly, the transition process to market economies undertaken in the 1990s is also a shared characteristic.

The outline of this paper is as follows: First, we review the theoretical literature on the relation growth–inequality–poverty. Second, we discuss the established methodology and the data that we use, accompanied by some descriptive statistics. Then we present the results from the econometric model and the conclusion.

2. LITERATURE REVIEW

Three groups of researchers proposed specific visions on the relation between income growth–inequality–poverty. The first group confirms that growth on its own is sufficient to reduce poverty (Bhalla, 2002; ; Sala-i-Martin, 2002; Turunc, 2009). The second elaborates that growth is good for the poor (Dollar & Kraay, 2002; Ravallion & Chen, 1997, 2001, 2003; Sala-i-Martin, 2002; World Bank, 1990, 2000). The third group suggests that economic growth is an important factor, but not sufficient on its own, and inequality should not be omitted (Bourguignon, 2003 Deininger & Squire, 1998; Dollar & Kraay, 2002; Mchiri & Moudén, 2011; Ravallion, 2001, 2003; Ravallion, 2005).

The phenomena of growth, income inequality and poverty have been studied independently in different traditional theories of development. In the past, a nearly universal consensus in the empirical literature suggests that economic growth has a “first-order effect” on poverty reduction. Dominant development thinking in the 1950s and 1960s was the “trickle down” theoretical concept (Kakwani & Pernia, 2000). This concept assumes that growth will automatically reduce poverty. This exogenous view in the early debates led to tolerance of income inequality and a trade-off between growth and inequality. According to the trickle down concept, the vertical flow of income is the result of economic growth, where in the first phase benefits from economic growth are felt by the population with higher income, while the population with lower income benefits only in the second phase. Furthermore, many years ago, Adelman and Morris

³ Analysed candidate countries for EU membership: Serbia, Montenegro and North Macedonia.

(1973) concluded that there is no automatic trickling down of the effects of growth to the people who belong to the lowest income group. Stiglitz (2016) explained that the old-fashioned version of “trickle-down economics” did not follow with evidence. According to the Nobel laureate, urgent rethinking of the trickle-down model was necessary, together with a theoretical explanation. Stiglitz (2015) argued that in some cases, economic growth can lead to higher inequality and poverty. If inequality is increasing in parallel with GDP per capita, people’s well-being can become worse. Average economic growth is not a reflection of how growth is distributed among households with different characteristics.

Therefore, the transformation of income growth into lower poverty requires a deeper analysis of the nature of poverty and the pattern of growth. For a variety of reasons, most sources of growth generate unbalanced growth rates. Therefore, it is not possible to generalise about the distributional effects of growth. This virtue of sustained growth is sometimes missed because people confuse rising inequality with a failure to make progress against poverty⁴. In economies without growth, a widening gap between rich and poor does indeed entail an increase in poverty, while, in fast-growing economies, it is possible and quite normal for poverty to fall even as inequality rises.

In recent years, income distribution has had a central role in policy discussions. In the analysis of how growth may contribute to poverty reduction, it is important to understand the role of income distribution in the growth–poverty nexus. There are even cases in which higher economic growth can increase poverty if inequality is increased so much that the positive effects of the growth are neutralised by the negative effects of the increased inequality. Bhagwati (1988) called this “immiserising growth”. If inequality is increasing in parallel with the GDP per capita, economic growth can lead to higher poverty (Stiglitz, 2015). Based on cross-country data, Ali and Thorbecke (2000) elaborated that the poverty trend is less sensitive to the level of income and more sensitive to income inequality. Conceptually, at a certain point and for a certain population, the level of poverty is connected with average growth and inequality. Therefore, as a direct influence

⁴ Angelsen, A. and Wunder, S. (2006) Poverty and inequality: Economic growth is better than its reputation. In D. Banik (Ed.). *Poverty, Politics and Development: Interdisciplinary Perspectives* (pp. 79–103). Bergen: Fagbokforlaget.

of these functional links, the poverty change over time is determined in principle by changes in both factors. Lustig (2002) argued that “economic growth is a crucial factor in poverty reduction, but the level of inequality and its evolution affects its impact on poverty”. Fosu (2011) presented evidence with findings that there is a significant discrepancy in countries’ abilities to channel economic growth to poverty reduction based on different inequality profiles. Ferreira (2010) noted that poverty rate alleviation is a result not only of economic growth, as a key factor, but it is also a reflection of growth elasticity of poverty reduction concomitant with high inequality. Other modern economists (Adams, 2004; Bourguignon, 2003; Ravallion, 1997) concluded that a higher level of inequality in society neutralises the extent of the effects of growth on the level of poverty. Inequality can be harmful to the poor, but if the inequality reduction policies lead to additional distortions in the economy, the results of those policies can have ambiguous effects on economic growth and the reduction of poverty (Ravallion, 2005). (2013), in his cross-country analysis, indicates that low growth rates and high inequality are the main barriers to decreasing poverty. Bergstrom (2022) concluded that, on average, the growth elasticity of poverty reduction is lower than its inequality elasticity. At the same time, he highlighted that this growth elasticity declines sharply with a country’s initial level of inequality.

Following the review of the literature in the field, poverty changes can be decomposed into two components: a growth effect (changes in poverty due to changes in income with an unchanged level of inequality) and a distributive effect (changes in poverty due to changes in the level of inequality without changes in mean income). The growth elasticity of poverty in the studies that analysed the period of the 1990s was usually estimated to be in the range of -2.0 to -3.0 (Bruno et al., 1998; Ravallion & Chen, 1997, as cited in Adams, 2003). Expressed in other words, a 1% increase in economic growth (however measured) will lead to a 2–3% decrease in poverty. Bhalla (2002) argued that the “correct” growth elasticity of poverty should be around -5.0. Using absolute poverty data, Bruno et al. found that the growth elasticity of poverty was -2.12. For this purpose, they analysed 20 developing countries in the period from 1984 to 1993. Taking into account inequality as the second factor influencing how much economic growth reduces poverty and analysing the same countries and period, the authors regressed the poverty change on both factors: the change in mean income growth and the change in the Gini coefficient, obtaining a coefficient of -2.28 for mean income

growth and 3.86 for the Gini coefficient. Analysing the growth elasticity of poverty in 126 intervals from 60 developing countries, the econometric study by Adams (2004), used survey mean income as an indicator for economic growth and found that the growth elasticity of poverty is -2.79. This estimation is in the range of the estimates suggested by the previous studies. However, the growth elasticity of poverty is lower when Adams (2004) uses GDP per capita as an indicator for economic growth, obtaining a *statistically insignificant* coefficient of -2.27. The study found that the effectiveness of growth on poverty reduction depends on how economic growth is defined. The author concluded that there is a strong, negative correlation between growth and poverty when survey mean income is used as an indicator for economic growth. The statistical link between economic growth and poverty reduction is weaker when GDP per capita is used as an indicator for growth.

3. METHODOLOGY

Economic growth, in terms of quality of standard of living, is usually analysed using two of the most important indicators: GDP per capita (macro indicator obtained from national accounts) and mean equivalised net income growth (micro indicator obtained from household surveys). The indicators in this area are developed using a variety of sources and different concepts and methodologies, which is a major challenge in conducting such an analysis. It is difficult to conclude how growth is shared among the population. Income inequality is driven by different economic factors, such as the level of unemployment, inactivity and informal employment, different (re)distributive factors, etc.

Usually, the poverty index is defined as the number of individuals in a population whose living standard is below some predetermined threshold. The absolute poverty line can be defined in terms of consumption or income, and it is assumed to be constant over time. If y is an indicator of standard of living or income per adult and z is the poverty line, income distribution at some point in time t is expressed with the distribution function $F_t(Y)$, which refers to the proportion of the population with a standard of living or income, y , less than Y . The proportion of the population below the poverty line, z , is the most commonly used poverty indicator.

$$Ht = Ft(z)$$

The change in poverty between two points of time t and t' can be expressed as:

$$\Delta H = Ht' - Ht = Ft'(z) - Ft(z). \quad (1.1)$$

To analyse the contribution of growth to poverty change, it is appropriate to define the relative income distribution at time t as the income distribution after normalising it by the population mean. $Ft(X)$ can be that distribution. The distribution of income may be decomposed into a “growth” effect and a “distributional” effect. The growth effect is determined when the proportional change in all incomes leaves the distribution of relative income, $Ft(X)$, unchanged. The distributional effect is referred to as the change in the distribution of relative incomes, which by definition is independent of the mean. The relative poverty decomposition can be presented as:

$$\Delta H = Ht' - Ht = [Ft'(z / yt') - Ft(z / yt)] + [Ft'(z / yt') - Ft(z / yt')]. \quad (1.2)$$

The first square bracket expression corresponds to the growth effect when the relative income distribution is constant, while the second expression represents the distribution effect, i.e. the variation in the relative income distribution $Ft'(X) - Ft(X)$, at the level of the relative poverty line, which is the ratio of the absolute poverty line and the mean income $X=z/y_t$.

The variables entering the decomposition should be analysed as long as one observes any continued approximation of the distribution functions (F) at the different points of time, t and t' .

The growth elasticity of poverty can be expressed as:

$$\varepsilon = \lim_{t' \rightarrow t} \frac{Ft\left(\frac{z}{yt'}\right) - Ft\left(\frac{z}{yt}\right) / Ft\left(\frac{z}{yt}\right)}{(yt' - yt) / yt}. \quad (1.3)$$

The fact that the distribution effect cannot be presented by a scalar is a reason why it is more difficult to translate in terms of elasticity. A simple approximation

of equation 1.2 may be calculated when the distributions are assumed to be lognormal. This is a standard approximation of empirical distributions in the applied literature. In this case, the relative income distribution can be presented as:

$$Ft(X) = \Pi [(\log(X)/O') + (1/2 O')], \quad (1.4)$$

where $\Pi ()$ is the cumulative distribution function of the standard normal and O' is the standard deviation of the logarithm of income. Poverty change between two time periods t and t' depends on the level of mean income at these two dates, y/z , expressed as a proportion of the poverty line, and on the standard deviation, O' , of the logarithm of income.

The growth elasticity of poverty, ε , may be defined as the relative change in poverty for 1 per cent growth in mean income for constant relative inequality, O' :

$$\varepsilon = (\Delta H)/(\Delta \log(y)Ht) = ((1/O')\lambda) [(\log(z/yt)/O') + 1/2 O'] . \quad (1.5)$$

The growth elasticity of poverty is a growing function of the level of development, as measured by the inverse of the ratio z/y^t , and a declining function of the degree of relative income inequality, as measured by the standard deviation of the logarithm of income, O' . If a country becomes richer, then the elasticity increases and, at the same time, the economy becomes more sensitive to the level of inequality.

On the basis of theory, Bourguignon (2002) compared four different models. For this purpose, he used data from the World Bank, the annual growth rate of poverty and the annual growth rate of mean income. He made some modifications to the original data to eliminate all the cases where the percentage change in poverty was extremely high in relative values or the value of poverty was zero or negligible. The first model, termed the naive model, corresponds to the simple view that there is a constant elasticity between growth and poverty reduction. Regression consists of two variables: changes in poverty and changes in mean income. Concerning growth, this model suggests a negative elasticity of poverty but the R^2 coefficient is low (26 per cent). This means that the explanatory power of this model is low. In the second model, called the standard model, Bourguignon included an additional explanatory variable, the Gini coefficient, as

a measure of income inequality. With its inclusion in the regression, the R^2 coefficient becomes significantly higher (49 per cent). With this result, he concluded that despite income growth, distributional changes are also responsible for poverty reduction. In the third model, termed standard model 1, Bourguignon improved the previous model by adding the coefficient poverty line/mean income and the initial degree of inequality. These two coefficients are multiplied by mean income growth. The author concluded that these two explanatory variables are significant and reduce the growth elasticity of poverty. Bourguignon explained that the joint effect of income growth, the poverty line/mean income ratio and the initial degree of inequality follows the elaborated theoretical elasticity with the presumption that the distribution of relative income is lognormal. In the second improved standard model, these two variables, the poverty line/mean income ratio and the initial degree of inequality, are multiplied by the Gini coefficient. The author assumed that the distributional change in poverty reduction depends on the initial level of inequality and the level of poverty threshold placed in relation to the mean income. In comparison with standard model 1, the value of R^2 shows much better results in the improved model, standard model 2, because of the relation between the Gini coefficient and the initial inequality and the ratio of the poverty line and mean income.

The final model is based on the lognormal approximation, where two explanatory variables are the growth and inequality elasticities. If the lognormal approximation is satisfactory, then the coefficient of the theoretical elasticity in the regression is not considerably different from unity. The lognormal approximation has an important role in R^2 . Additionally, the R^2 coefficient demonstrates higher values with the inclusion of the above explanatory variable. Bourguignon's experiment suggests that if we want to go beyond the poverty rate in the measurement of poverty, then growth approximations and distribution elasticities of the reduction of poverty could be insufficient. Satisfactory solutions, in the long run, require the use of with the full income distribution or standards of living more preferably than a few summary measures.

Generally, lower inequality would imply a higher absolute value of elasticity, so that a higher poverty reduction would arise from a given level of growth. We analyse the evidence of the transformation of growth to poverty reduction, taking into consideration inequality as an important intermediation factor. Following

Fosu (2011), Bourguignon (2002) and Epaulart (2003), we calculate the income-poverty transformation equation taking into consideration the assumption that the income is normally distributed:

$$P = b_1 + b_2y + b_3yG' + b_4y \left(\frac{Z}{Y}\right) + b_5g + b_6gG' + b_7g(Z/Y) + b_8G' + b_9 Z/Y , \quad (1.6)$$

where P is the at-risk-of-poverty rate, y is income (mean equivalised net income, PPS), g is the Gini coefficient, G' is the initial Gini coefficient expressed in logarithms and Z/Y is the ratio of the poverty line to income expressed in logarithms.

We can obtain income and inequality elasticities using the following equations:

$$Ey = b_2 + b_3G' + b_4Z/Y \quad (1.7)$$

$$Eg = b_5 + b_6G' + b_7Z/Y . \quad (1.8)$$

Ey is expected to be with a negative sign, which means increasing growth should decrease poverty, while Eg is anticipated to be positive, meaning that inequality decline results in a poverty reduction.

Including these two elasticities can be crucial in determining the nature of poverty reduction over time in a given country.

4. DATA

The data used in the present panel data model are derived from the Eurostat database⁵. We use fully harmonised and comparable micro indicators for income growth, relative poverty and inequality derived from the EU-SILC survey, which is the reason why we do not calculate annual growth rates. As an indicator of growth, the mean equivalised net income (PPS) is used. We consider mean income as a more appropriate indicator for our panel data model because of the data comparability and the fact that the other indicators are micro variables. Additionally, economic theory confirmed that the statistical link between

⁵ Source: www.ec.europa.eu/eurostat/data/database

economic growth and poverty reduction is weaker when GDP per capita is used as an indicator of growth. However, despite the criticism that GDP is an imperfect measure (Stiglitz et al., 2010), GDP remains a key indicator of economic growth and the comparison of the economic performance of countries. The Gini coefficient of equivalised disposable income is used as an indicator of income inequality. Concerning poverty, we use the at-risk-of-poverty rate, where the cut-off point is 60% of median equivalised income after social transfers. In our analysis, we use panel data, combining time-series of cross-section observations. We analyse 14 CESEE countries for the period from 2010 to 2022⁶, creating 14 cross-sectional units and 13 time periods, therefore generating 182 observations.

We also shed some light on the analysed indicators, comparing descriptive statistics calculated as average annual growth for the analysed period for the CESEE countries. Table 1 presents data on GDP per capita growth (PPS), income growth, growth of inequality represented by the Gini coefficient and poverty growth.

A common characteristic of the countries that registered the highest average poverty reduction in the analysed period is the significant decrease in the average annual growth of income inequality and different rates of economic growth (mean income and GDP per capita). In some countries (e.g. Romania), strong average mean income growth is not accompanied by an average poverty reduction because the resulting growth of inequality thwarts the transformation process. Estonia and Latvia are special cases because of the positive sign of income growth, while, at the same time, modest average GDP per capita growth, accompanied by an average inequality reduction, does not result in poverty reduction. The reason for this, among other factors, can be the insufficient inequality decline. Apparently, the main cause of poverty reduction appears to be the negative sign of inequality change complemented by income growth. As in the observed theory, it seems that income growth and GDP per capita are

⁶ The EU-SILC survey was introduced in 2010. In order to maintain the consistency of the data and analysis, we use data only from this source. For Montenegro and Serbia, data are available from 2013; for the period from 2010 to 2012, the data in the panel are estimated by the author. Because of no data availability, 2022 data are estimated for Montenegro and Serbia, while 2022 and 2021 data are estimated for North Macedonia. More information about the methodology is available on the following link: <https://ec.europa.eu/eurostat/web/income-and-living-conditions/methodology>

important factors behind falling poverty. Nevertheless, income distribution has an important role in poverty behaviour. By analysing the data for different countries, we can find exceptions where the level of inequality is an important factor for the level of poverty. For example, the at-risk-of-poverty rate for Czechia for 2022 is 10.2 per cent, the lowest in the European Union, but the Gini coefficient, in comparison with the other countries is still high, 24.8 per cent.

Table 1: Indicators for average annual growth rate of poverty, GDP per capita, income and inequality in the period from 2011 to 2021⁷

	GDP per capita, PPS, average annual growth	Mean income, PPS, average annual growth	Inequality (Gini coef.), average annual growth	Poverty rate, average annual growth
Bulgaria	4.81	5.45	1.64	0.60
Czechia	3.20	3.33	-0.04	-0.41
Estonia	5.22	6.01	-0.21	2.44
Croatia	3.68	3.38	-0.72	-0.64
Latvia	5.06	6.50	-0.05	1.03
Lithuania	6.08	7.75	-0.40	-0.22
Hungary	3.63	3.83	1.24	0.22
Poland	4.40	5.18	-1.34	-1.56
Romania	5.66	8.18	0.21	0.37
Slovenia	3.02	2.52	-0.31	-0.74
Slovakia	1.67	0.49	-1.55	0.22
Montenegro	3.79	1.51	-2.10	-2.14
N. Macedonia	2.82	4.43	-2.61	-2.12
Serbia	3.64	4.20	-1.64	-1.79

Source: Own calculation based on Eurostat data

Figure 1 illustrates the relationship between changes in poverty and in income inequality observed through the S80/S20 ratio, as a comparison between 2021 and

⁷ Average growth rates for poverty, income and inequality for Serbia and Montenegro are calculated for the period from 2014 to 2019 because of the data availability.

2010. The x-axis represents the change in the at-risk-of-poverty rate and the y-axis the change in the inequality rate. Most of the CESEE countries are located in the bottom-left quadrant with a decrease in both inequality and poverty. The Macedonian economy achieved a significant improvement in income distribution in the last decade, observed through the ratio of the highest and lowest 20 per cent equivalised incomes, and at the same time, the highest reduction in poverty. Despite the achieved improvement, the reason for this is, among others, the highest level of initial poverty and inequality in 2010. Inequality reduction and a poverty increase are estimated in the case of two countries, Slovakia and Latvia. These two countries achieved higher poverty despite the improved income distribution.

Figure 1: The interaction between poverty and inequality of income distribution⁸



BG- Bulgaria	CZ- Czechia	EE- Estonia	HR- Croatia	LV- Latvia	LT- Lithuania	HU- Hungary
PL- Poland	RO- Romania	SI- Slovenia	SK- Slovakia	ME- Montenegro	MK- North Macedonia	RS- Serbia

Source: Eurostat, own calculations

⁸ Data are available for Montenegro and Serbia from 2013 on; data are not available for North Macedonia for 2021.

Concerning our panel model, three types of models are usually used in theory and practice: the pooled regression, fixed effect (FE) and random effect (RE) models. The pooled regression model has constant coefficients relating to the intercept and slopes. FE explores the relationship between predictor and outcome variables within an entity. Each entity has its characteristics that may or may not influence the predictor variables. With the FE, we assume that something within the individual may impact the outcome variables and we control this. We remove the effect of the assumption of the correlation between an entity's error term and predictor variables so we can assess the net effect of the predictor on the outcome variable. The time-invariant characteristics are unique to the individual and should not be correlated with other individual characteristics. If we analyse different countries, the country's error term and the constant should not be correlated with the others. If the error terms are correlated, then FE is not suitable for use since the inferences may not be correct and we would probably need random effects, which can be determined with the Hausman test. Unlike the FE model, in the RE model, a random distribution of the individual effects between the cross-sectional units is present. To take into account the individual effects, the regression model is described with an intercept term reflecting an overall constant term. If we have reason to believe that differences across entities influence the dependent variable, then we should use random effects (Torres-Reyna, 2007). In our analysis, we have no reason to believe that entities' differences have a direct influence on poverty. Every country is a separate entity without the direct influence of the independent variables of one country on the dependent variable of other countries. In our model, we have included the initial Gini as a constant variable, which is contained in the equation, but it cannot be calculated as a separate estimation with the FE model.

We will use the Hausman test to decide which model is more suitable.

Table 2: Hausman Test – Test cross-section random effects

Test summary	Chi-sq. statistic	Chi-sq. d.f.	Prob.
Cross-section random	22.423055	7	0.0021

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(diff.)	Prob.
incgr	-0.002698	-0.001860	0.000000	0.1155
incgringini	0.001748	0.001252	0.000000	0.1779
incgrlineinc	-0.000437	0.000165	0.000000	0.0277
ginigr	-0.105262	-0.325879	0.031509	0.0151
ginigringini	0.566235	0.212841	0.023968	0.0224
ginigrlineinc	-1.437742	-2.020861	0.199466	0.1917
lineinc	176.577824	202.669301	335.117079	0.1541

Cross-section random effects test equation:

Dependent variable: Poverty

Method: Panel least squares

Cross-sections included: 14

Periods included: 13

Total panel observations: 181

Variable	Coefficient	Std.Error	t-Statistic	Prob.
c	31.90998	10.76127	-2.965262	0.0035
incgr	-0.002698	0.000885	-3.050397	0.0027
incgringini	0.001748	0.000590	2.960943	0.0035
incgrlineinc	-0.000437	0.000364	-1.201542	0.2313
ginigr	-0.105262	0.488204	-0.215612	0.8296
ginigringini	0.566235	0.426861	1.326510	0.1866
ginigrlineinc	-1.437742	1.102885	-1.303619	0.1942

Source: Author's estimations, results from the model

Since the fixed effect is consistent when $c_i c_i$ and $x_{it} x_{it}$ are correlated, but the regression effect is inconsistent, a statistically significant difference is interpreted as evidence against the random effects assumption. The results presented for the Hausman test in Table 2 show that the p -value is less than 0.05, which means that

we reject the null hypothesis. We conclude that individual effects u_i are strongly correlated with at least one regressor in the model and, consequently, the random effect model is problematic. Therefore, an appropriate model for our analysis is the fixed effects model with robust standard errors rather than the random effect counterpart.

5. RESULTS

In this section, on the basis of linear regressions, we estimate the relative contributions of income and inequality changes to poverty reduction in the CESEE countries.

With the fixed effects model and robust standard error, the intercept varies for each country, assuming that the slope coefficients are constant across countries, to take into account the individuality of each country. The term fixed effect in this model is useful because the intercept may differ across countries, but the intercept of the countries is time-invariant, i.e. each country's intercept does not vary over time. At the same time, it is assumed that the coefficients of the regressors do not vary over time or between individuals. The regression results seem acceptable (Table 3) and show that most of the coefficients are significant.

Table 3: Regression results, fixed effects model with robust standard errors

Method: Panel least square

Cross-sections included: 14

Periods included: 13

Total panel observations: 181

povgr	Coeff.	Std.Err.	<i>t</i>	<i>P</i> > <i>t</i>	[95% Conf. interval]	
incgr	-0.0017121	0.001436	-1.19	0.254	-0.0048145	0.0013903
incgringini	0.0012282	0.0009243	1.33	0.207	-0.0007687	0.003225
incgrlineinc	-0.0005869	0.0004862	-1.21	0.249	-0.0016373	0.0004634
ginigr	-0.1028423	0.6626913	-0.16	0.879	-1.5345	1.328815
ginigringini	-0.0074224	0.5650966	-0.01	0.99	-1.228239	1.213395
ginigrlineinc	-4.224317	1.682044	-2.51	0.026	-7.858152	-0.5904827
ingini	0 (omitted)					
lineinc	276.9522	62.71503	4.42	0.001	141.4646	412.4397
_Iyear_2011	0.1115122	0.1832801	0.61	0.553	-0.2844404	0.5074648
_Iyear_2012	-0.0045834	0.2359575	-0.02	0.985	-0.5143385	0.5051718
_Iyear_2013	0.0062833	0.1925252	0.03	0.974	-0.4096421	0.4222088
_Iyear_2014	-0.1143624	0.2311666	-0.49	0.629	-0.6137674	0.3850427
_Iyear_2015	-0.2540559	0.2546965	-1	0.337	-0.8042942	0.2961825
_Iyear_2016	-0.5035334	0.3701399	-1.36	0.197	-1.303172	0.2961052
_Iyear_2017	-0.9793728	0.4431037	-2.21	0.046	-1.93664	-0.0221054
_Iyear_2018	-1.040959	0.6702939	-1.55	0.144	-2.489041	0.4071228
_Iyear_2019	-1.264388	0.7180684	-1.76	0.102	-2.81568	0.2869049
_Iyear_2020	-1.386013	0.8221584	-1.69	0.116	-3.162178	0.3901526
_Iyear_2021	-1.892006	0.8800794	-2.15	0.051	-3.793302	0.0092901
_Iyear_2022	-1.672202	1.03148	-1.62	0.129	-3.900579	0.556176
_cons	60.44803	16.84034	3.59	0.003	24.06667	96.82938
sigma_u	1.565354					
sigma_e	0.71792354					
rho	0.82621102 (fraction of variance due to u_i)					

Source: Author's estimations, results from the model

Based on the results from this model, we use equations (1.7) and (1.8) to estimate the income and inequality elasticities for the CESEE region:

$$E_y = -0.28 \quad (1.9)$$

$$E_g = 1.07. \quad (1.10)$$

From equation 1.7, we conclude that income elasticity depends on, among other things, the initial inequality and the ratio of the poverty line to income. Despite the initial inequality, the diverse level of income has an essential role in the responsiveness of poverty reduction to income growth. The level of income (ratio of poverty line/income) is an important factor that contributes to higher responsiveness of poverty reduction to income and inequality. Differences in initial income inequality and disparities in income levels determine the responsiveness of poverty reduction to inequality and income changes in many countries. Accordingly, countries with lower initial levels of income inequality and higher mean incomes relative to the poverty threshold perform better in poverty responsiveness to income changes. Likewise, from equation 1.8, we observe that countries with larger initial inequality and lower incomes relative to the poverty threshold would enjoy larger values of inequality elasticity. Higher-income countries showed higher responsiveness to transform a given growth rate to poverty reduction, while at the same time, larger inequality elasticities in these countries suggest that increased inequality would have a detrimental effect on poverty. The results for the income elasticity are negative, implying that, on average, income growth reduces poverty rates for the CESEE region as a whole. The results for the inequality estimates are positive for the CESEE region as a whole, suggesting that inequality increases poverty.

Elasticity estimates for each of the CESEE countries based on the FE model are presented in Table 4. We analyse the extent to which the poverty changes are decomposed into income and inequality factors. Negative results for the income elasticity indicate that mean income growth reduces poverty rates for practically all the countries in the region. On the other hand, positive results for the inequality estimates imply that inequality increases poverty in all the CESEE countries. However, the obtained values of the coefficients suggest that, in terms of poverty, the impact of the positive effects of the mean income growth is lower than the influence of the negative effects of the income distributions in all the countries and the CESEE region as a whole. We cannot conclude that a large cross-country variation of responsiveness of poverty to both income and

inequality growth exists. Lower-inequality and higher-income countries exhibited greater abilities to transform a given growth rate into poverty reduction. According to the results obtained, the largest responsiveness of poverty to income is detected in Bulgaria and Lithuania. In terms of inequality elasticity, a comparison of the countries' results suggests that Bulgaria and Lithuania exhibit the largest values as well, implying that the positive effects of income responsiveness are neutralised by the negative effects of inequality elasticity.

Table 4: Income elasticity (E_y) and inequality elasticity (E_g), CESEE region, by country, 2010s

	E_y	E_g
Bulgaria	-0.3115	1.2092
Czechia	-0.2706	1.0368
Estonia	-0.2846	1.0960
Croatia	-0.2660	1.0173
Latvia	-0.2991	1.1572
Lithuania	-0.3074	1.1920
Hungary	-0.2703	1.0356
Poland	-0.2759	1.0590
Romania	-0.2771	1.0642
Slovenia	-0.2509	0.9536
Slovakia	-0.2476	0.9397
Montenegro	-0.2916	1.1250
North Macedonia	-0.2763	1.0606
Serbia	-0.2854	1.0991
CESEE region	-0.2796	1.0747

Source: Author's estimations, results from the model

Countries with a higher value of income elasticity also tend to show a higher value of inequality elasticity primarily because the level of income (ratio poverty line/income) influences both elasticities. As elaborated in the theory, higher-income countries will need lower income growth to achieve an expected reduction of poverty, and vice versa. Inequality tends to increase poverty relatively easily and with a higher intensity than the opposite influence of income growth.

Estimates of the relative contributions of income and inequality changes to poverty reduction are presented in Table 5. Column A predicts poverty growth by income (despite estimated income elasticity, the log of the average mean income for the analysed period is taken into consideration), Column B predicts poverty growth by inequality (despite estimated inequality elasticity, the log of the average Gini coefficient is taken into consideration), and Column A + Column B predict poverty growth by both income and inequality.

The obtained coefficient of -1.11 for the poverty growth as a result of the mean income indicates that a 1% increase in growth leads to a 1.11% decrease in poverty, on average, in the CESEE region. At the same time, a 1% increase in the Gini coefficient leads to a 1.61% increase in poverty, on average, in the CESEE region. As we can see, at the level of the region, the relative contribution of changes in inequality to poverty changes is higher in comparison with the relative contribution of income growth. While income growth contributes to a poverty decrease, inequality works to increase poverty in all the CESEE countries. Our results show that, on average, mean income growth is responsible for the predicted poverty decline in all the CESEE countries and the CESEE region as a whole, no matter whether countries are experiencing increasing or decreasing poverty. The estimations for inequality work in the opposite direction. Positive values of inequality estimates have thwarted the efforts to reduce poverty as a result of the increasing income in the countries. More specifically, inequality decreases the rates of predicted poverty reduction.

Unlike past analyses conducted before the COVID years⁹, which showed sub-regional differences in income inequality elasticities between non-EU CESEE countries and EU CESEE countries, the above discussion suggests that differences in regional experiences in poverty reduction may not be attributable to a considerable extent to disparities in inequality elasticity in the CESEE region. Knowing that Bulgaria is a Balkan country and Lithuania is a Baltic country and that the behaviour of a non-EU country is similar to that of the EU countries can be an additional argument that the negative influence of inequality is a challenge

⁹ Stankov, D. (2021). The influence of economic growth and inequality on poverty in the transition countries, with particular reference to the Macedonian economy. University American College Skopje.

for all CESEE countries and does not depend on the sub-region within the CESEE region.

Poverty decreased in half of the analysed countries in the analysed period (2010s), which is mainly, if not exclusively, attributable to the growth of mean equivalised income, and not to the changes in income distribution. For the CESEE countries, income growth exerts a reasonable impact on poverty reduction. Income inequality has the opposite role in changes in the poverty picture. The results obtained imply that inappropriate changes in income distribution are the primary driver of poverty change in all CESEE countries. In this respect, the variation of the inequality effect, in comparison with the income effect, demonstrates a larger influence on poverty changes. In other words, differences in the magnitude of changes in poverty are more a consequence of the effect of distribution than the effect of mean income growth.

Table 5: Contribution of mean income growth and inequality to poverty reduction, 2010s

	A	B	A+B
	$Ey*lnY$	$Eg*lnG$	$Pred Povg$
Bulgaria	-1.23	1.90	0.67
Czechia	-1.12	1.44	0.32
Estonia	-1.17	1.65	0.48
Croatia	-1.07	1.50	0.44
Latvia	-1.20	1.79	0.58
Lithuania	-1.25	1.85	0.60
Hungary	-1.07	1.49	0.42
Poland	-1.13	1.55	0.42
Romania	-1.05	1.63	0.58
Slovenia	-1.06	1.31	0.25
Slovakia	-0.99	1.29	0.29
Montenegro	-1.12	1.75	0.63
N.Macedonia	-1.03	1.63	0.60
Serbia	-1.08	1.72	0.63
CESEE (mean)	-1.11	1.61	0.49

Source: Author's estimations, results from the model

The elasticity estimates for the CESEE countries lead to the expected poverty reduction mainly as a result of rising mean income growth or improving income distribution. Therefore, for the purposes of creating public policy, these estimates would be the most applicable. CESEE countries should be concerned about the high level of inequality, which is seen from the positive value of income elasticity. Changes in income distribution have significant effects on poverty reduction; consequently, the pace of income growth should be of less concern in comparison to the rate of inequality.

There are certain differences between the countries in the transformation of growth to poverty reduction, mainly depending on their inequality and income profiles. Even if positive income growth has a bearing on poverty reduction, an appropriate income distribution could be an important factor for achieving additional progress. An analysis of these individual profiles is crucial for creating suitable public policies for reducing poverty. It is reasonable, therefore, for CESEE countries to go beyond income growth as a factor for poverty reduction, creating public policies directed to a more favourable income distribution.

6. CONCLUSION

The current study examines poverty reduction performance based on the latest data available for the CESEE countries. Using the most recent comparable data from Eurostat, we first presented evidence on average GDP per capita growth, mean income and inequality growth and average poverty rate change since 2010. To calculate income and inequality elasticities and to determine the contribution of mean income growth and inequality to poverty reduction, we followed the subsequent improvement and evolution of the four models developed by Bourguignon (2002). Namely, the first model corresponds to the simple view that there is a constant elasticity between growth and poverty reduction. In the second model, Bourguignon included an additional explanatory variable for income inequality. In the third model, he added the coefficient poverty line/mean income and the initial degree of inequality. The fourth model is based on the lognormal approximation, where two explanatory variables are the growth and inequality elasticities. Following the past findings, based on linear regressions, we estimate the relative contributions of income and inequality changes to poverty reduction in the CESEE countries. For this purpose, we use a panel data model combining time-series of cross-section observations. Calculated elasticity estimates suggest

that income elasticity is negative for all the countries, implying that income growth influences poverty alleviation in all the CESEE countries. The estimations for inequality work in the opposite direction. The estimates of the relative contributions of income and inequality changes to poverty reduction show that a 1% increase in growth leads to a 1.11% decrease in poverty, and at the same time, a 1% increase in the Gini coefficient leads to a 1.61% increase in poverty, on average, in the CESEE region. In terms of intensity, income inequality tends to increase poverty to a larger degree than the opposite influence of income growth. The relative contribution of changes in inequality to poverty impedes efforts to achieve more significant poverty reduction as a result of the relative contribution of income growth. More specifically, inequality decreases the rates of predicted poverty reduction. The study finds that mean income growth is an important factor behind poverty changes, but still, income distribution has a crucial role in poverty behaviour in the CESEE countries. More precisely, it has been shown that inequality growth is the major driving force behind poverty change. Generally, high initial levels of inequality restrict the effectiveness of growth in reducing poverty, while improved income distribution decreases poverty for a given level of growth. Inequality works to increase poverty in all the CESEE countries, without sub-regional differences. The results obtained from the fixed effect panel data model confirm the hypothesis that economic growth contributes to poverty reduction, while the contribution of inequality is stronger and in the opposite direction.

Overall, the results obtained highlight the important role income inequality can play in reducing poverty despite prior beliefs of poverty changes being, in large part, a consequence of economic growth. Changes in income distribution, which have significant effects on poverty reduction, should be of greater concern than average growth acceleration. Even though mean income growth is the main driver of poverty reduction, further progress could be achieved under relatively favourable income distribution. It would seem reasonable, therefore, to give special attention to reducing inequality in all the CESEE countries.

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