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# Has Economic Growth in Balkan Countries Been Pro-Poor in the 2012-2017 period?

**Abstract**
The study investigates whether economic growth in the Balkan countries was pro-poor in the most recent period. We also try to establish to what extent various measures of pro-poorness of economic growth produce consistent and comparable results. Firstly, concepts of pro-poor growth are defined and corresponding approaches toward measuring pro-poor growth are presented. We distinguish between measures based on a general class of pro-poor indices and a dominance-based techniques. In the empirical part of the study, we verified whether economic growth in six Balkan countries (Greece, Bulgaria, Romania, Slovenia, Croatia and Serbia) was pro-poor in the 2012-2017 period. The analyses is based on the latest available panel data of the European Union Survey on Income and Living Conditions (EU-SILC). Growth was pro-poor in Croatia, Romania and Slovenia during the whole analysed period. The growth pattern was non pro-poor in Bulgaria, Greece and Serbia in certain years, mainly during periods of economic downfall. Various measures of pro-poor growth patterns do not produce consistent results in all instances. The results of the conducted comparative analysis suggest that the level of social benefits does not directly influence the pro-poor nature of the economic growth.

**Keywords**
economic growth | poverty | inequality

**JEL Codes**
D31, D63, I32

## 1. Introduction

During recent years, among many approaches to analyzing and combating poverty, the approach known as pro-poor growth, has gained popularity. This approach assumes that high economic growth may not be a sufficient condition for poverty reduction. Whether economic growth is favourable to the poor is determined by the participation of various groups in the generation and distribution of national income.

Over a dozen years, the impact of economic growth on poverty reduction has been analysed and discussed in numerous theoretical and empirical papers (Araar et al., 2009; Bibi et al., 2012; Dollar & Kraay, 2002; Duclos, 2009; Essama-Nssah & Lambert, 2009; Grimm, 2007 Kakwani, et al., 2004; Kakwani & Pernia, 2000; Lo Bue & Palmisano, 2019; Ravallion, 1994; Ravallion & Chen, 2003; Son, 2004; Son & Kakwani, 2008; Tebaldi & Kim, 2015; Zeman & Shamsuddin, 2017; Panek & Zwierzchowski 2021). If economic growth leads to poverty reduction, then macroeconomic policy should focus on actions supporting growth while also possibly limiting funds for programs aimed at direct poor support. However, if economic growth does not reduce poverty, state policy should put more emphasis on direct financial support for the poor. The research conducted thus far does not give an unambiguous answer to the question of whether economic growth favours the poor. Results largely depend on the definition of pro-poor economic growth, the scope of the study, and the statistical methods used. Moreover, it is believed that the level of economic development and general welfare and pension regimes all play roles

in this process (Ashley, 2007; Dollar & Kraay, 2002; Harmáček, et al., 2017; Lo Blue & Palmisano, 2019; Kośny & Yalonetzky, 2015; Lopez 2006; Ruiz-Castillo, 2009Son & Kakwani, 2008; ).

The aim of this article is to evaluate whether economic growth was pro-poor in the Balkan countries between 2012 and 2017. Moreover, we investigate how different definitions of pro-poor growth affect conclusions drawn from an empirical analysis and to what extent results obtained for various measures remain comparable.

We included Bulgaria, Croatia, Greece, Romania, Slovenia, and Serbia in the empirical analysis. All six countries analysed experienced an overall increase in GDP in the 2012-2017 period. A temporary decrease in GDP per capita took place only in Greece, Croatia and Slovenia in 2013 due to the financial crisis. The mean personal income also increased in almost all countries in the analysed time frame (except for Bulgaria and Greece in 2014 and 2015). The question arises: how the GDP growth and general increase in mean personal incomes translate into the financial situation of impoverished individuals?

The paper attempts to answer whether the positive (negative) economic growth in these countries stimulates a decrease (increase) in poverty and whether it was favourable to the poor according to the various definitions of 'being favourable' introduced in the literature (more on this in Section 2.1.).

In the theoretical part of the study, various approaches to the analysis of the growth patterns and basic measures of pro-poor growth are presented. Next, theoretical foundations for the construction of these measures are defined, and their basic advantages and limitations are discussed. We propose certain modifications of these measures. In the empirical part of the study, we try to verify whether the economic growth in the Balkan countries between 2012 and 2017 was favourable to the poor. The empirical analysis is based on the latest available panel data taken from the European Union Survey on Income and Living Conditions (EU-SILC) and Eurostat data on GDP growth and inflation.

The outline of the paper is as follows. Section 2 is devoted to the conceptual framework. Section 3 presents various approaches to the analysis of the growth pattern. Section 4 provides statistical sources and the assumptions of the study. Section 5 contains the empirical part of the study. Section 6 discusses the empirical results. Section 7 concludes the paper.

## 2. Concepts of Pro-Poor Economic Growth

International institutions (United Nations [UN], 2000; Organisation for Economic Co-operation and Development [OECD], 2007 define pro-poor growth as growth that benefits the poor and enables them to improve their economic situation. This definition is very vague and imprecise and therefore provides little guidance to its measurement or to formulate pro-poor policies. In recent years, there have been many proposals for a more specific definition of pro-poor growth (Essama & Lambert, 2009; Kakwani, et al., 2004; Klasen, 2008; Kraay, 2006; Ravallion & Chen, 2003; Son & Kakwani, 2008).

The proposed definitions can be classified under two basic approaches to pro-poor growth: namely, absolute and relative. The distinction is related to the general concept of measuring poverty and inequality. According to the absolute approach, the process of growth is considered favourable to the poor if the wealth (measured by incomes) of the poor increases (Klasen, 2008). This approach does not compare the distribution of benefits of growth between the poor and the non-poor. Furthermore, Klasen distinguishes between 'strong' and 'weak' absolute growth favoring the poor. The strong absolute growth favouring the poor occurs when the growth income gains of the poor are larger than the income gains of the non-poor. The weak absolute growth favouring the poor occurs when the incomes of the poor increase in absolute terms; however, the incomes of the non-poor increase even more (growth rate of the poor's incomes is greater than 0). The weak absolute pro-poor growth implies that growth is pro-poor if it reduces poverty (Ravallion & Chen, 2003). Most of the growth processes can be classified as weakly pro-poor in absolute terms.

Duclos (2009) argues that the absolute approach should be applied in underdeveloped countries, where a significant part of the population obtains incomes below the subsistence level. In these countries, the income redistribution policy should focus on poverty reduction in absolute terms to provide for the most basic needs.

The relative approach focuses on distribution of growth benefits between the poor and the non-poor population. Within the relative approach, growth is considered to be favourable to the poor if the wealth of the poor grows faster than wealth of the non-poor (Klasen, 2008), i.e., when economic growth reduces

income inequality. Within the relative approach Kakwani and Son (2008) recognize two kinds of the relative pro-poor growth: a relatively pro-poor growth and an absolutely pro-poor growth. Both approaches verify whether the distribution of the benefits of growth favours the poor as compared to the non-poor, However, growth relatively pro-poor leads to a decline in a relative inequality, whereas growth absolutely pro-poor leads to a decline in an absolute inequality (Grosse, et al., 2008). The relative approach should be applied as a supplement to the absolute approach in developed countries (Layard et al., 2010). Although the income redistribution policies should always be mainly focused on ensuring the physical existence of the poorest groups of the society, in the case of developed countries, their secondary goal should focus on preventing too much income inequality. Within the relative approach, changes in the poverty sphere are analysed on the basis of both growth and distribution of incomes among the poor and the non-poor. Consequently, growth is described as pro-poor in relative terms only if it leads to reduction of both poverty and income inequality.

# 3. Analysis of the Growth Pattern

Kakwani, et al. (2004) provide classification of the growth pattern analysis methods distinguishing partial and full methods. Within the partial approach, the analysis does not require defining any poverty indices or poverty lines. Analysis of the nature of growth is based on stochastic domination curves (Panek, 2011). When stochastic dominance conditions are not met, the pro-poorness of growth cannot be assessed; hence, the approach is called 'partial'. The full approach needs to be based on poverty measures. As a result, it allows for the relevant assessment in every situation.

## 3.1 Assessing the Growth Pattern under the Full Approach

The growth pattern indicators under the full approach are based on the elasticity of poverty measures with respect to economic growth. Kakwani & Subarrao (1990) proposed decomposing the changes in poverty into growth and inequality components. The poverty elasticity is estimated using the Lorenz curve. Similarly, Kakwani & Pernia (2000) proposed comparing the changes in poverty indices resulting from changes in income inequality with hypothetical changes, which would occur if the shape of income distribution remained constant and only the mean income changed.

Poverty indices can be characterized by the poverty line ($z$), the mean income of individuals ($\mu$) and the Lorenz function ($L(q)$):

$$P(z, \mu, L(q)). \tag{1}$$

Changes in a poverty index between the initial period $t = 1$ and the final period $t = 2$ can be described using two components:

- the growth component ($G_{12}$) – changes resulting from the change in the mean income,
- the inequality component ($I_{12}$) – changes resulting from the change in the inequality of incomes.

The change in poverty index ($P_{12}$) can be presented as

$$P_{12} = P_2 - P_1 = Ln\left[P\left(z, \mu_{2,}, L_2(q)\right)\right] - Ln[P(z, \mu_1, L_1(q))], \tag{2}$$

and furthermore, decomposed into growth and inequality components:

$$P_{12} = G_{12} + I_{12}. \tag{3}$$

Kakwani (2000) defined the two components as follows:

$$G_{12} = \frac{1}{2}\left\{Ln[P(z, \mu_2, L_1(q))] - Ln\left[P\left(z, \mu_{1,} L_1(q)\right)\right] + Ln\left[P\left(z, \mu_{2,} L_2(q)\right)\right] - Ln[P(z, \mu_1, L_2(q))]\right\}, \tag{4}$$

and

$$I_{12} = \frac{1}{2}\left\{Ln[P(z, \mu_1, L_2(q))] - Ln\left[P\left(z, \mu_{1,} L_1(q)\right)\right] + Ln\left[P\left(z, \mu_{2,} L_2(q)\right)\right] - Ln\left[P\left(z, \mu_{2,} L_1(q)\right)\right]\right\}. \tag{5}$$

where $P(z, \mu_2, L_1(q))$- poverty index at the level of income from the final period and the distribution of income from the initial period, $P(z, \mu_1, L_2(q))$– poverty index at the level of income from the initial period and the distribution of income from the final period.

The total growth elasticity of poverty is defined as the ratio of the proportional change in poverty to the proportional change in the mean income. We can estimate it as the total differential of the expression,

$$\eta = \frac{dLnP(z,\mu,L(q))}{g_{12}}, \tag{6}$$

where $g_{12}=dLn(\mu)=Ln(\mu_2)-Ln(\mu_1)$ – growth rate of mean income, and $g_{12}(q)$ – growth rate of the income at the $q$-th quantile of income distribution, while $g_{12}=dLn(y(q))=Ln(y_2(q))-Ln(y_1(q))$,

$$Ln(y_2(q)) - Ln(y_1(q)), \tag{7}$$

where $y_1(q)$, $(y_2(q)$ – $q$-th quantiles of income distribution in the initial and final periods.

The decrease in the poverty index is influenced by both the increase in mean income and the decrease in the inequality. Hence, the total growth elasticity of poverty can be presented as the sum of the relative growth elasticity of poverty ($h_g$) and the relative inequality elasticity of poverty ($h_i$) (Kakwani & Son, 2008):

$$\eta = \eta_g + \eta_i. \tag{8}$$

The components of Equation (8) can be expressed as

$$\eta_g = \frac{G_{12}}{g_{12}}, \tag{9}$$

and .

$$\eta_i = \frac{I_{12}}{g_{12}}. \tag{10}$$

Generally, the total growth elasticity of poverty ($\eta$) in the relative sense is neutral if the increase in income of individuals is proportionally the same for the poor and the non-poor. The growth elasticity of poverty ($h_g$) describes the proportional change in the poverty index as a result of a 1% increase in mean income, assuming that relative income inequality does not change.

The growth elasticity of poverty ($h_g$) is generally negative – mean income should reduce poverty given constant income distribution. On the other hand, changes in income inequality resulting from economic growth may have both a negative and positive impact on poverty changes.

Ultimately, when growth is pro-poor (not pro-poor) in relative terms, the total growth elasticity of poverty is lower (greater) than the neutral growth elasticity of poverty. Based on the decomposition of the poverty index, Kakwani and Pernia (2000) defined the pro-poor growth index (PPGI), in the relative sense, as the ratio of the total growth elasticity of poverty to the relative growth elasticity of poverty:

$$PPGI = \frac{\eta}{\eta_g}. \tag{11}$$

When the PPGI is greater than 1, the inequality elasticity of poverty is negative ($\eta_i<0$) and both poverty and inequality decrease because of the increase in mean income. Growth is called relatively pro-poor (it is also called strictly relatively pro-poor), as the poor benefit proportionally more than the non-poor. If the PPGI is less than 0 (i.e., if $\eta_i>0$ and $|\eta_i|>|\eta_g|$), growth is nonpro-poor, as it leads to both increased poverty and inequality (it is also called immiserizing growth). Finally, when $0<PPGI<1$ (i. e., if $\eta_i>0$ and $|\eta_i|<|\eta_g|$), poverty decreases due to an increase in mean income. However, the decrease is mitigated by an increase in income inequality. This type of growth is classified as trickle-down growth favouring the poor. However, while the average income of the poor grows, the non-poor benefit proportionally more.

During a recession, the mean income growth rate is negative ($g_{12}<0$) and poverty usually increases, as both $P_{12}$ and $G_{12}$ are negative. If income inequality does not change, a recession is called pro-poor if $P_{12}<G_{12}$ and favorable to the non-poor if $P_{12}>G_{12}$. In this case, *PPGI* is defined as (Kakwani & Pernia, 2000)

$$PPGI = \frac{\eta_g}{\eta}. \tag{12}$$

The recession will be described as favouring the poor when $PPGI>1$ and not favouring the poor when $PPGI<1$.

For assessing whether growth is absolutely pro-poor (sometimes called strong absolute pro-poor growth) Kakwani and Son (2008) proposed the absolute pro-poor growth index (*PPGI**). The absolute growth elasticity of poverty ($\eta_g^*$) is described as neutral if the increase in mean income leads to equal absolute income growth for both poor and non-poor individuals. The absolute PPGI is given by

$$PPGI^* = \frac{\eta}{\eta_g^*}. \tag{13}$$

In order to assess the extent to which growth reduces poverty, Kakwani et al. (2004) proposed a modified measure that includes the actual incomes growth rate. They defined the poverty equivalent growth rate (*PEGR*) as a hypothetical growth rate of mean income ($g_{12}^*$), which would affect the level of poverty in the same way as the actual growth rate ($g_{12}$), given constant relative income inequality. The proportional reduction in poverty is equal to $\eta g_{12}$. If the changes in income distribution were neutral in the relative sense, then an increase in mean income $g_{12}^*$ would cause a proportional reduction in poverty equal to $\eta_g g_{12}^*$, which should be equal to $\eta g_{12}$. The *PEGR* in the relative sense is defined as

$$PEGR = \frac{\eta}{\eta_g} g_{12} = PPGI * g_{12}. \tag{14}$$

A positive *PEGR* value implies a decrease in corresponding poverty index, and larger values indicate even stronger reduction. Growth is relatively pro-poor (strictly relatively pro-poor) when *PEGR* is greater than the mean income growth rate ($PEGR>g_{12}$). If *PEGR* is greater than zero but less than the rate of growth of mean income ($0<PEGR<g_{12}$) poverty is still reduced; however, the inequality increases (trickle-down growth). It is also possible that an increase in mean income is accompanied by an increase in poverty ($PEGR<0$) as increasing inequality outweighs economic growth (immiserizing growth).

During recession ($g_{12}<0$), poverty generally increases. However, a strong income inequality decline may still lead to poverty reduction. Such a recession is called relatively strictly pro-poor and corresponds to $PEGR>0$. On the other hand, when $g_{12}<PEGR<0$, the recession will favour the poor, as they lose proportionally less than the non-poor; however, the relevant poverty index will increase. Recession will be unfavourable to the poor when $PEGR<g_{12}<0$. In this case, poverty grows, and the poor lose proportionally more than the non-poor (Kakwani et al., 2004).

To determine whether growth is pro-poor in the relative sense, we can rewrite *PEGR* as

$$PEGR = g_{12} + (PPGI - 1)g_{12}. \tag{15}$$

Growth is pro-poor (strictly pro-poor) in the relative terms if $g_{12}>0$ and $PPGI>1$ or when $g_{12}<0$ and $PPGI<1$. Therefore, the second element of the right-hand side of Equation (15) is positive. It follows that growth will be relatively pro-poor if $PEGR>g_{12}$.

*PEGR* in the absolute sense (*PEGR**) is defined similarly to *PEGR* in the relative sense using *PPGI** (12). Therefore, Equation (15) can be rewritten as (Kakwani & Son, 2008)

$$PEGR^* = g_{12}[1 + (PPGI - PPGI^*)] + [PPGI^* - 1]g_{12}. \tag{16}$$

Growth is pro-poor in the absolute terms (strictly absolutely pro-poor) if $g_{12}>0$ and $PPGI^*>1$ (or recession is strictly pro-poor if $g_{12}<0$ and $PPGI^*<1$). In that case, the second element of the right-hand side of Equation (16) is positive. Thus, growth will favour the poor in absolute terms (growth is strictly absolutely pro-poor) if $PEGR^*>g_{12}$, with higher values indicating faster poverty reduction. Both categories introduced by Kakwani (growth relatively pro-poor, growth absolutely pro-poor) compare the distribution of income growth among the poor and the non-poor, the only difference being that comparisons are conducted using relative or absolute differences.

The directions of changes in the values of the *PEGR* and related poverty measures should be consistent. However, for these relations to hold, the poverty indices should satisfy the monotonicity axiom. The monotonicity axiom states that, holding all else constant, when the income of a poor individual who is below the poverty line increases, the poverty index should decrease. This axiom is not met by the poverty headcount ratio[1], which is the basic measure of poverty and, consequently, the *PEGR* changes may not

1 The headcount ratio, which is a share of individuals with incomes falling below the poverty line, measures poverty incidence.

be consistent with the direction of poverty incidence changes in some situations (Subramanian, 2004; Zheng, 1997). On the other hand, the monotonicity axiom is fulfilled by the poverty gap index[2] and the Watts poverty index[3].

## 3.2. Measuring the Growth Pattern under a Partial Approach

The partial approach allows for determining whether growth patterns reduce poverty in the absence of formal poverty measures. Ravallion and Chen (2003) introduced a framework for measuring pro-poorness of growth using growth incidence curves (GICs). The GIC is a graphical tool that visualizes the rate of income growth for each percentile of the non-decreasing income distribution. The income $y$ of an individual corresponding to the $q$th quantile in the income distribution can be presented as the inverse of the cumulative distribution function of income $F(y)$:

$$y(q) = F^{-1}(q) = L'(q)\mu. \tag{17}$$

Letting $q$ vary from 0 to 1, we get the so-called 'quantile function' (Moyes, 1999), which is a version of the Pen's parade (Pen, 1971).

The quantile growth rate ($g_{12}(q)$) traces out the GIC and shows how the increase in incomes is distributed among the quantiles ranked by income. It follows from Equations (7) and (17) that

$$g_{12}(q) = \frac{F_2^{-1}(q) - F_1^{-1}(q)}{F_1^{-1}(q)} = \frac{L_2'(q)}{L_1'(q)}(g'_{12} + 1) - 1, \tag{18}$$

where

$F_1^{-1}(q), F_2^{-1}(q)$ is the inverse of the cumulative distribution function at the $q$th quantile of income distribution in the initial and final periods:

$$g'_{12} = \frac{\mu_2 - \mu_1}{\mu_1}. \tag{19}$$

Identification of the growth pattern based on the GIC uses the concept of the first-order stochastic dominance (Atkinson, 1987; Foster & Shorrocks, 1988; Panek, 2011; Ravallion, 1994). Let $F_1(y)$ and $F_2(y)$ be the cumulative distribution functions of incomes in the two analysed periods. The first-order dominance of $F_2$ over $F_1$ can be defined as

$$F_2 {}_{FOD} F_1 \Leftrightarrow \forall_y F_2(y) \leq F_1(y). \tag{20}$$

When the quantile growth rates for the entire population are monotonically decreasing, the growth is favourable to the poor in the relative sense, regardless of whether it is positive or negative. It follows from Equation (18) that if the Lorenz curve does not change, then $g_{12}(q) = g_{12}^*$ for all $q$. Moreover, $g_{12}(q) = g_{12}^*$ only when $(y_2(q))/\mu_2$ increases in the analysed period. If $g_{12}(q)$ is a decreasing (increasing) function for all $q$, income inequalities (measured by inequality measures satisfying the Pigou–Dalton transfer axiom[4]) falls (rises). If the GIC is situated strictly above zero ($g_{12}(q) > 0$ for all $q$), then the first-order dominance occurs, i.e., income increased for each quantile in the analysed period.

However, usually GIC has a different sign for various values of $y$, and it does not identify the nature of the growth pattern. Therefore, Ravallion and Chen (2003) introduced a measure called rate of pro-poor growth (*RPPG*). The *RPPG* is equal to the normalized area under the GIC curve from $q=0$ to the value of the poverty headcount ratio[5] at the initial period ($H_1$)[6], i.e., the area under the GIC curve for the poor in the initial period:

$$RPPG = \frac{1}{H_1}\int_0^{H_1} g_{12}(q)dq \cong \frac{1}{H_1 Q}\sum_{q=1}^{q_{H_1}} g_{12}(q), \tag{21}$$

where $q_{H_1}$ is the quantile corresponding to the percentage of the poor for the initial period and $Q$ is the number of quantiles.

2 The poverty gap index measures poverty depth and is defined as an average shortfall of the total population from the poverty line.

3 The Watts index measures poverty severity, taking into account together poverty incidence, poverty depth, and income inequality between the poor.

4 This axiom states that the transfer of income from a poorer individual to a richer individual should increase income inequality.

5 Headcount ratio ($H_1$) is a proportion of the poor in the total population.

6 The *RPPG* is functionally related to the Watts poverty index, i.e. $RPPG = -dW$, where $W = \frac{1}{n}\sum_{i=1}^{Hn} \ln\left(\frac{z}{y_i}\right)$. This index meets the monotonicity axiom. (Panek, 2011; Subramanian, 2012).

The *RPPG* can be used to assess the pattern of growth both in absolute and relative terms. If $RPPG > 0$ growth is pro-poor in the weak sense (poverty reducing pro-poor growth). If $RPPG < 0$ the growth is not poverty-reducing. In relative terms, the growth is pro-poor if $RPPG > g_{12}^{*}$ (strictly pro-poor) and not pro-poor if $PG < g_{12}^{*}$.

In the empirical research, the *RPPG* is often compared with the growth rate of mean income (cf. Grimm, 2007; Harmáček, et al., 2017). This is a certain inconsistency, as the *RPPG* is the average of the quantile growth rates for all quantiles up to $q_{H_1}$ (for the poor). Thus, a more appropriate solution is to compare its value with the mean of quantile growth rates for all quantiles (for the entire population), i.e. with the value $\overline{g_{12}(q)}$ ($q$ = 1,...,n) rather than growth rate of mean income.

# 4. Data Source and Assumptions

The empirical analyses are based on the data from the EU-SILC. EU-SILC started in 2003 and was fully implemented in all European Union (EU) countries by 2005. Serbia joined the research in 2012. Therefore, we use EU-SILC data for six Balkan countries from 2012 to 2017.

EU-SILC is conducted using a rotational panel method in a four-year cycle. In every country, an initial sample is divided into four subsamples with the same size and structure. Starting from the second year, one of the four subsamples is removed and another subsample with the same size and structure is drawn. Ultimately, each subsample is meant to last four years.

The survey results are weighted to represent the size and structure of the entire population for each EU member state. The sample size differs across countries, as it can be equal to as low as 4,000 households or as high as 20,000 households. Missing data on incomes is imputed using various methods of data imputation in different countries.

The assessment of the growth pattern based within the axiom of anonymity does not require observation of the same individuals in two analysed periods. Nevertheless, we used a sequence of two-year panels from the 2012–2017 period. This allows for mitigation of the sampling error, which is higher for cross-sectional data. Since we based our analyses on panel data, the *RPPG* index was applied under the stochastic dominance approach.

The empirical analysis is based on individuals' equivalent incomes. Income is defined as yearly household equivalent disposable income in the last year preceding the survey. All incomes were adjusted using relevant CPI indices with 2012 as the base. The equivalent disposable incomes were calculated by dividing disposable household income by the OECD modified equivalence scale. The modified OECD scale assigns a value of 1 to the first household member, 0.5 to every additional household adult member, and 0.3 to each child. The disposable income is defined as a sum of net monetary income gained by all households' members. It does not take into account any fringe benefits (with exception of the company car) and other non-monetary incomes. Each individual is assigned a value of his household's equivalent income. Negative incomes were changed to zero.

In our empirical analysis, some modification of the *PPGI* and *PEGR* measures have been introduced. They involved the application of various methods of calculating the inequality elasticity of poverty in the relative and absolute approaches (see Appendix). Furthermore, in the empirical analyses of the growth pattern, the *RPPG* estimates were compared with the mean of quantile growth rates for the entire population ($\overline{g_{12}(q)}$) instead of comparing them with the growth rate of mean income ($g_{12}^{*}$). Standard errors were calculated using bootstrapping.

To identify the impoverished and calculate poverty indices, poverty lines need to be defined. The national poverty lines were calculated for 2012 as 60% of the national median equivalent income. This corresponds to the poverty lines' definition implemented by Eurostat. However, for the following years we used the same 2012 poverty lines. Poverty indices used in the study focus on the three basic poverty aspects, e. g. on its incidence (headcount ratio[7]), depth (poverty gap index), and severity (Watts index).

7 The headcount ratio was applied. although the *PEGR* changes may not be consistent with the direction of poverty incidence changes in some situations, as it is the basic measure of poverty.

**Table 1.** Annual Growth Rate of Incomes and Changes in Poverty Indices for Balkan Countries during 2012–2017

| Country and period | Annual growth rate in mean income | Changes in poverty indices (t=2 – t=1) | | |
|---|---|---|---|---|
| | | poverty incidence | poverty depth | poverty severity |
| Bulgaria | | | | |
| 2012–2013 | 0.123* | -0.053* | -0.012* | -0.016* |
| 2013–2014 | -0.011 | 0.012* | -0.002 | -0.006 |
| 2014–2015 | -0.027* | 0.008* | 0.006* | 0.009* |
| 2015–2016 | 0.152* | 0.003 | 0.002 | 0.004 |
| 20162017 | 0.017 | -0.016* | -0.012* | -0.031* |
| Greece | | | | |
| 2012–2013 | -0.067* | 0.043* | 0.005* | -0.039* |
| 2013–2014 | -0.023 | -0.002 | 0.002 | 0.056* |
| 2014–2015 | -0.008* | 0.005 | 0.002 | 0.002 |
| 2015–2016 | 0.034* | -0.035* | -0.017* | -0.044* |
| 2016–2017 | 0.041* | -0.027* | -0.020* | -0.065* |
| Croatia | | | | |
| 2012–2013 | 0.012* | -0.005 | -0.002 | -0.007 |
| 2013–2014 | 0.022 | -0.003 | -0.001 | 0.003 |
| 2014–2015 | 0.027* | -0.024* | -0.008* | -0.018* |
| 2015–2016 | 0.064* | -0.018* | -0.009* | -0.014* |
| 2016–2017 | 0.077* | -0.017* | -0.009* | -0.012* |
| Romania | | | | |
| 2012–2013 | 0.077* | -0.021* | -0.004* | -0.007 |
| 2013–2014 | 0.016 | -0.012* | -0.006* | -0.011* |
| 2014–2015 | 0.018* | -0.016* | -0.008* | -0.002 |
| 2015–2016 | 0.085* | -0.034* | -0.015* | -0.040* |
| 2016–2017 | 0.218* | -0.040* | -0.013* | -0.022* |
| Slovenia | | | | |
| 2012–2013 | 0.019* | -0.004 | -0.001 | -0.001 |
| 2013–2014 | 0.013* | -0.006* | -0.003* | -0.004* |
| 2014–2015 | 0.006* | -0.011* | -0.003* | -0.004* |
| 2015–2016 | 0.045* | -0.027* | -0.007* | -0.009* |
| 2016–2017 | 0.060* | -0.021* | -0.006* | -0.008* |
| Serbia | | | | |
| 2012–2013 | 0.030* | -0.016* | 0.006* | 0.021 |
| 2013–2014 | 0.008 | 0.021* | 0.011* | 0.060* |
| 2014–2015 | 0.006 | -0.016* | -0.004 | -0.042* |
| 2015–2016 | 0.055* | -0.029* | -0.019* | -0.001 |
| 2016–2017 | 0.067* | -0.039* | -0.012* | -0.039* |

Source. Own analysis based on EU-SILC (2012–2017).

Note. * indicates that the estimates are significant at the 0.05 level.

# 5. Growth, Inequality and Poverty Trends in the Balkan Countries

Economic growth (an increase in GDP per capita) was generally accompanied by an increase in mean equivalent income in all six Balkan countries (Table 1). However, in Bulgaria and Greece in the 2013–2015 period, a significant decrease in mean income occurred despite an increase in GDP per capita. Moreover, in Croatia and Slovenia, the mean equivalent income increased despite the decline in GDP per capita in the 2012–2013 period.

A significant increase in mean income was generally accompanied by a significant decrease in poverty or the lack of significant changes in poverty incidence in all the analysed countries and for all periods. The notable exception is the significant increase of poverty incidence in Serbia in the 2012–2013 period. On the other hand, a significant decrease in equivalent income resulted in a significant increase in poverty or no significant changes for all countries and periods. Only in Greece during the 2012–2013 period did poverty severity decrease because of a decline in income inequality among the poor despite the decline in mean income for the whole population.

**Table 2.** Annual Growth Rate in Income and PEGRs for Balkan Countries during 2012–2017

| Country and period | Annual growth rate in mean income | *PEGR* | | | | | |
|---|---|---|---|---|---|---|---|
| | | relative terms | | | absolute terms | | |
| | | poverty incidence | poverty depth | poverty severity | poverty incidence | poverty depth | poverty severity |
| Bulgaria | | | | | | | |
| 2012–2013 | 0.123* | 0.068* | 0.166* | 0.051* | 0.045* | 0.115* | 0.031* |
| 2013–2014 | -0.011 | -0.013 | 0.226* | 0.006 | -0.017 | 0.230* | -0.001 |
| 2014–2015 | -0.027* | -0.058 | -0.025* | -0.039* | -0.108 | -0.025* | -0.055* |
| 2015–2016 | 0.152* | -0.009 | 0.059 | -0.037 | -0.004 | 0.052 | -0.013 |
| 2016–2017 | 0.017 | 0.015 | 0.019 | 0.018 | 0.009 | 0.022 | 0.016 |
| Greece | | | | | | | |
| 2012–2013 | -0.067* | -0.116* | -0.068* | -0.036* | -0.149* | -0.063* | -0.011 |
| 2013–2014 | -0.023* | 0.478* | -0.018 | -0.024* | 0.86* | -0.016 | -0.026* |
| 2014–2015 | -0.008* | -0.015 | -0.008 | -0.013 | -0.018 | -0.007 | -0.017 |
| 2015–2016 | 0.034* | 0.024* | 0.033* | 0.028* | 0.020* | 0.032* | 0.025* |
| 2016–2017 | 0.041* | 0.024* | 0.044* | 0.036* | 0.018* | 0.049* | 0.033* |
| Croatia | | | | | | | |
| 2012–2013 | 0.012* | 0.005 | 0.004 | 0.009 | 0.004 | 0.011 | 0.006 |
| 2013–2014 | 0.022* | 0.006 | 0.023 | 0.036 | 0.004 | 0.025 | -0.021 |
| 2014–2015 | 0.027* | 0.020* | 0.034 | 0.021* | 0.016* | 0.018 | 0.018* |
| 2015–2016 | 0.064* | 0.028* | 0.101* | 0.038* | 0.018* | 0.012* | 0.026* |
| 2016–2017 | 0.077* | 0.036* | 0.087* | 0.044* | 0.021* | 0.080 | 0.028* |
| Romania | | | | | | | |
| 2012–2013 | 0.077* | 0.034* | 0.097* | 0.021 | 0.022* | 0.092* | 0.013 |
| 2013–2014 | 0.016 | 0.011 | 0.021 | 0.012 | 0.008 | 0.021 | 0.010 |
| 2014–2015 | 0.018* | 0.013* | 0.022 | 0.005 | 0.010 | 0.021 | 0.002 |
| 2015–2016 | 0.085* | 0.050* | 0.183 | 0.064* | 0.034* | -0.403 | 0.049* |
| 2016–2017 | 0.218* | 0.106* | 0.125* | 0.102* | 0.058* | 0.091* | 0.053* |
| Slovenia | | | | | | | |
| 2012–2013 | 0.019* | 0.066 | 0.018 | 0.005 | 0.005 | 0.012 | 0.004 |
| 2013–2014 | 0.013* | 0.007* | 0.013* | 0.009* | 0.005* | 0.011 | 0.007* |
| 2014–2015 | 0.006* | 0.005 | 0.052 | 0.005 | 0.004 | 0.002 | 0.005 |
| 2015–2016 | 0.045* | 0.028* | 0.031 | 0.029* | 0.022* | 0.027 | 0.022* |
| 2016–2017 | 0.060* | 0.034* | 0.042* | 0.036* | 0.023* | 0.034* | 0.025* |
| Serbia | | | | | | | |
| 2012–13 | 0.030* | 0.021* | 0.032* | 0.008* | 0.015* | 0.031* | 0.009 |
| 2013–14 | 0.008 | 0.012 | 0.001 | 0.009 | 0.017 | 0.002* | 0.009 |
| 2014–15 | 0.006 | 0.010 | 0.011 | 0.010 | 0.008 | 0.006 | 0.010 |
| 2015–16 | 0.055* | 0.031* | 0.117 | -0.021* | 0.021* | 0.070 | -0.012* |
| 2016–17 | 0.067* | 0.049* | 0.055* | 0.052* | 0.035* | 0.041* | 0.039* |

Source. Own analysis based on EU-SILC (2012-2017).

Note. * indicates that the estimates are significant at the 0.05 level.

Table 2 summarizes estimation of *PEGR* measures for poverty incidence, poverty depth, and poverty severity (Watts index). Growth is considered pro-poor if the *PEGR* is greater than the mean income growth rate ($PEGR > g_{12}$). With respect to poverty incidence, economic growth can be considered pro-poor only in:

- Greece in 2013–2014 (both in the relative and the strong absolute senses);
- Slovenia in 2012–2013 (only in the relative sense);
- Serbia in 2013–2014 and 2014–2015 (both the relative and the strong absolute senses).

Interesting to note, during a 2013–2014 recession in Greece, the mean incomes of the poor fell less as compared to the non-poor.

In most countries, economic growth had a much more positive impact on reducing poverty depth than poverty incidence. With respect to poverty depth, economic growth turned out to be pro-poor in Bulgaria, Croatia, Romania, and Serbia for the majority of analysed time frames. This means that the growth benefited the poorest of the poor in these countries and periods as the inequality between the poor decreased. The only exceptions to this rule were

Greece in 2013–2014 and Serbia in 2014–2015, where growth was beneficial for the poor in terms of both poverty incidence and poverty depth.

We have observed pro-poor growth (both in the relative and the absolute senses) associated with poverty severity (Watts index) only for five countries/periods:

– Bulgaria, Croatia and Serbia in 2013–2014;
– Greece in 2012–2013;
– Serbia in 2014–2015.

Moreover, growth was pro-poor with respect to poverty severity in Bulgaria in 2016–2017, but only in the relative sense.

Analysing the nature of growth in terms of combinations of different aspects of poverty, we find that in Bulgaria, Croatia, and Serbia in 2013–2014, growth was pro-poor with respect to poverty depth and severity (in Serbia only in the relative sense). Furthermore, in Serbia in the 2014–2015 period, where *PEGR* values indicate pro-poor changes, in both the relative and the absolute senses for all poverty indicators.

Table 3 compares the values of the *RPPG* and income growth rates in the Balkan countries. *RPPG* indicates a poverty reducing pro-poor growth (weak absolute pro-poor growth) if is greater than zero. However, when comparing the *RPPG* to the mean of quantile growth rates for all quantiles ($\overline{g_{12}(q)}$), one will also get information on changes in inequality between the poor and the non-poor. If the *RPPG* is greater than $\overline{g_{12}(q)}$, then the income of the poor grows faster and the inequality between the poor and the non-poor declines – the growth is strictly pro-poor in the relative terms.

According to this measure, growth was in general pro-poor during the whole analysed period (Table 3). It was not beneficial to the poor in weak absolute terms only in Greece, Croatia, and Serbia in 2013–2014 and in Bulgaria in the 2014–2016 period. The economic growth was pro-poor in Romania and Slovenia over the whole period considered. Moreover, during the 2013–2014 period in Bulgaria, a positive value of the *RPPG* was observed, while the mean income decreased.

The *RPPG* is also greater than $\overline{g_{12}(q)}$ for Greece, Croatia, and Slovenia in most of the periods under review. Therefore, inequality between the poor and the non-poor must have decreased – growth was strictly pro-poor in the relative sense. It is worth pointing out that during the substantial fall in the mean of quantile growth rates for all quantiles in Bulgaria during the 2015–2016 period, the inequality between the poor and the non-poor declines (*RPPG* was greater than $\overline{g_{12}(q)}$.), which means that the recession favoured the poor, as they lost proportionally less than the non-poor.

**Table 3.** Annual Growth Rates in Income and RPPG for Balkan Countries during 2012–2017

| Country and period | Annual mean of quantile growth rates ($\overline{g_{12}(q)}$) | *RPPG* |
|---|---|---|
| Bulgaria | | |
| 2012–2013 | 0.131* | 0.110* |
| 2013–2014 | -0.001 | 0.063* |
| 2014–2015 | -0.034* | -0.070* |
| 2015–2016 | -0.105* | -0.014 |
| 2016–2017 | 0.043* | 0.227* |
| Greece | | |
| 2012–2013 | 0.005 | 0.269* |
| 2013–2014 | -0.023* | -0.040 |
| 2014–2015 | 0.000 | 0.012 |
| 2015–2016 | 0.076* | 0.201* |
| 2016–2017 | 0.079* | 0.207* |
| Croatia | | |
| 2012–2013 | 0.012* | 0.026 |
| 2013–2014 | 0.017* | -0.003 |
| 2014–2015 | 0.045* | 0.111* |
| 2015–2016 | 0.074* | 0.105* |
| 2016–2017 | 0.086 | 0.114* |
| Romania | | |
| 2012–2013 | 0.068* | 0.055* |
| 2013–2014 | 0.027* | 0.030* |
| 2014–2015 | 0.036* | 0.069* |
| 2015–2016 | 0.091* | 0.077* |
| 2016–2017 | 0.226* | 0.194* |
| Slovenia | | |
| 2012–2013 | 0.018* | 0.010 |
| 2013–2014 | 0.017* | 0.038* |
| 2014–2015 | 0.011* | 0.038* |
| 2015–2016 | 0.056* | 0.089* |
| 2016–2017 | 0.066* | 0.091* |
| Serbia | | |
| 2012–2013 | 0.048* | 0.088* |
| 2013–2014 | -0.033* | -0.139* |
| 2014–2015 | 0.258 | 1.023 |
| 2015–2016 | 0.074* | 0.023 |
| 2016–2017 | 0.191* | 0.635* |

Source. Own analysis based on EU-SILC (2012-2017).
Note. * indicates that the estimates are significant at the 0.05 level.

## 6. Discussion

Table 4 summarizes all the obtained empirical results (compare Tables 2 and 3). Intuitively, we would expect that various pro-poor growth measures

**Table 4.** Patterns of Growth in Balkan Countries during 2012–2017

| Country and period | Poverty reducing pro-poor growth measured by *PEGR* for Watts index and *RPPG* | |
|---|---|---|
| | ***PEGR*** | ***RPPG*** |
| Bulgaria | | |
| 2012–2013 | +* | +* |
| 2013–2014 | + | +* |
| 2014–2015 | –* | –* |
| 2015–2016 | – | – |
| 2016–2017 | + | +* |
| Greece | | |
| 2012–2013 | –* | +* |
| 2013–2014 | –* | – |
| 2014–2015 | – | + |
| 2015–2016 | +* | +* |
| 2016–2017 | +* | +* |
| Croatia | | |
| 2012–2013 | + | + |
| 2013–2014 | + | – |
| 2014–2015 | +* | +* |
| 2015–2016 | +* | +* |
| 2016–2017 | +* | +* |
| Romania | | |
| 2012–2013 | + | +* |
| 2013–2014 | + | +* |
| 2014–2015 | + | +* |
| 2015–2016 | +* | +* |
| 2016–2017 | +* | +* |
| Slovenia | | |
| 2012–2013 | + | + |
| 2013–2014 | +* | +* |
| 2014–2015 | + | +* |
| 2015–2016 | +* | +* |
| 2016–2017 | +* | +* |
| Serbia | | |
| 2012–2013 | +* | +* |
| 2013–2014 | + | –* |
| 2014–2015 | + | + |
| 2015–2016 | –* | + |
| 2016–2017 | +* | +* |

Source. Own analysis based on Tables 2 and 3.

Note. + indicates a pro-poor growth, - indicates a non-pro-poor growth and * indicates that the estimates are significant at the 0.05 level.

should indicate the same character of growth for each analysed country and period. However, as different measures stress different aspects of pro-poor growth, their values may lead to different conclusions.

In order to establish the comparability of the results, we need to recall the assumptions of the applied measures. First, values of both *RPPG* and *PEGR* indices can be compared with 0 to verify whether growth is poverty reducing pro-poor. Both these indicators mark growth pattern as pro-poor when the poor benefit from growth, even proportionally much less than the non-poor, i.e., adopting the least restrictive definition of pro-poor growth. However, the above comparisons do not necessarily lead to an identical assessment of the nature of growth. This is mostly caused by the fact that the *RPPG* is based on the average growth rate of incomes for percentiles up to the poverty headcount ratio. While estimating *RPPG*, we assess changes in incomes between two periods, for each percentile up to the poverty headcount ratio at the initial period. In other words, the incidence of poverty is fixed. In contrast, when measuring *PEGR* for the Watts index, we take into account changes in the poverty incidence on top of the assessment of the income distribution among the poor.

This difference is well illustrated by the assessment of changes in income distribution that occurred in Greece during the recession of the 2012–2013 period, as values of *RPPG* and *PEGR* contradict each other. This was caused by the fact that the relative material situation of the poor in the initial period improved, as the recession mostly hit the non-poor, who often lost their jobs. As a result, the *RPPG* value was positive. However, the *PEGR* values were negative, as the poverty incidence increased substantially.

Second, the values of *RPPGs* should be compared with *PEGRs* measured for the Watts poverty index, as it takes into account poverty depth and income inequality between the poor, similar to the *RPPG*. Comparisons of values of *RPPG* and *PEGR* calculated for poverty incidence are meaningless, as the two indices measure different aspects of poverty.

Third, comparative analysis should focus primarily on the estimates of pro-poor growth measures that are statistically significant. During our empirical analysis, while calculating relevant measures for bootstrap subsamples, we found that not-significant estimates of both *PEGR* and *RPPG* can randomly assume positive or negative values.

Considering these three remarks, the results presented in Tables 2 and 3 show that the assessment of the growth pattern is generally consistent for both applied measures in terms of poverty reducing growth. Summing up, significant poverty reducing pro-poor growth was observed for the following countries and periods:

- Bulgaria in 2012–2013;
- Greece and Romania in 2015–2017;
- Croatia in 2014–2017;
- Slovenia in 2013–2014 and 2015–2017;
- Serbia in 2012–2013 and 2016–2017.

It is often speculated that the higher extent of social benefits should favour the pro-poor growth as part of incomes is directly transferred to the poor. In order to empirically verify this notion, we define social benefits to the poor ($SB_{P,1}$) as a ratio of direct social transfers received by the poor to their total incomes in the initial period:

$$SB_{P,1} = \frac{ST_{P,1}}{I_{P,1}}, \tag{22}$$

where $ST_{P,1}$ are direct social transfers received by the poor in the initial period[8], and $I_{P,1}$ are total incomes of the poor in the initial period.

We estimated the average social benefits to the poor using the EU-SILC database. Figure 1 presents the relation between the social benefits to the poor and the *PEGR* values for the Watts index in relative terms. The solid line denotes a nonparametric kernel regression function of the *PEGR* values on average social benefits to the poor for all data points. The dashed line represents the same relation restricted to the observations with the statistically significant *PEGR* estimates (compare Table 2).

Considering all data points, it seems that there is no evident relation between social benefits and pro-poor growth, as the regression line is approximately horizontal across the whole range of social benefits values and a linear correlation coefficient is negligible ($r$=0.07). However, restricting the regression function to data points with the statistically significant *PEGR* estimates, we can observe a regression line with a positive slope, and consequently, the linear correlation coefficient is slightly higher (r=0.21). This may suggest that higher social transfers promote the poor to participate in the effects of economic growth. However, the effect is not as strong and evident as one might intuitively expect.

Contrary to intuition, countries with the highest levels of social benefits to the poor (Slovenia, Croatia) did not experience the highest values of the *PEGR* indices. On the other hand, countries with the lowest level of social benefits experienced a wider range of the *PEGR* values. The lowest values of social benefits were estimated for Greece and Romania. Of the two countries, Greece has the lower *PEGR* values across the analysed period. Interestingly, the estimated *PEGR* values for Romania were one of the highest in the whole group, despite relatively low values of social transfers to the poor.

It is possible that the effectiveness of social transfers in poverty eradication depends on the development level, general wealth, and the poverty level in any given country. It may be easier to combat poverty using social transfers in countries with relatively high poverty rates (Romania, Bulgaria) as compared to countries with lower poverty rates (Slovenia, Croatia).

As the *PEGR* measures both pro-poorness of the growth and the level of growth itself, we additionally analysed the relationship between the *PPGI* and total social benefits to the poor. The *PPGI*, however, was modified for instances of negative income growth – the values of *PPGI* were inverted, so that higher values indicate more pro-poor nature of economic recession.

It turned out that the relationship between the social benefits and *PPGIs* is very similar to the previously analysed relationship of social benefits with *PEGRs* (r=0.14). The main difference is the slightly negative slope of the regression line on the right-hand side of the graph. Increasing social benefits ameliorate the material status of the poor while they are at relatively low levels. However, at higher levels of social benefits, their further increase does not make the poor better-off. The positive relationship shown in the previous figure (compare Figure 1) could have been caused by the relation between income growth and social benefits (as the *PEGR* values capture income growth on top of the material situation of the poor) rather than social benefits and pro-poorness of the growth. The exact reasons and determinants of the variation of pro-poor growth measures require further empirical research.

**8** We used a mean difference between total household incomes (HY020) and total household incomes before social transfers other than old-age benefits (HY022) as an estimate for mean direct social transfers.

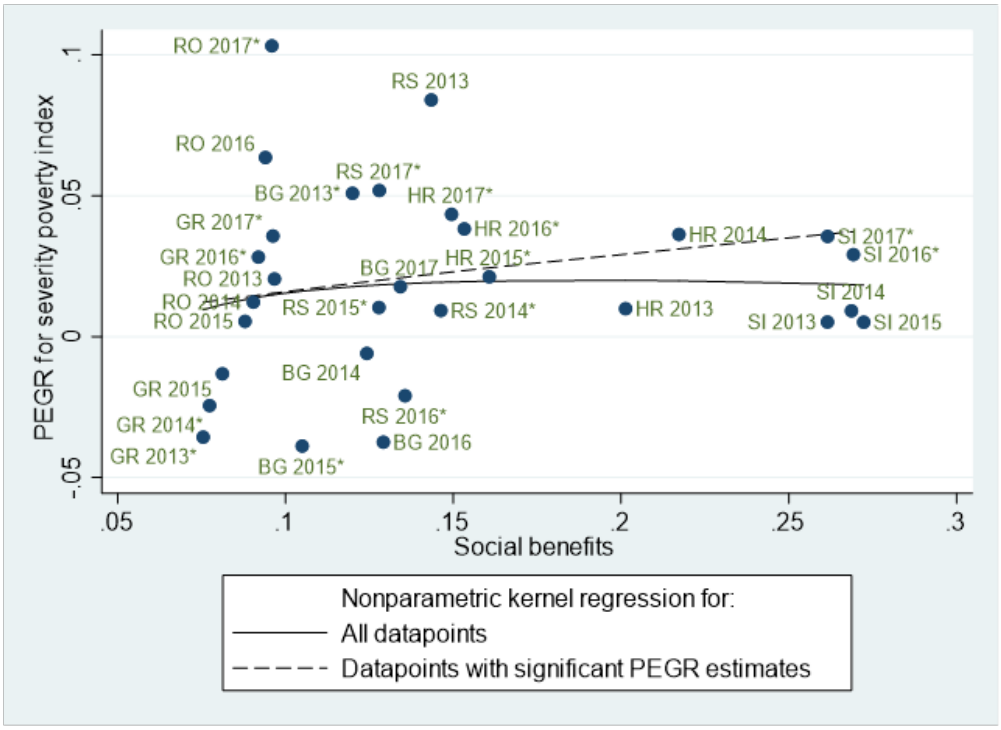


**Figure 1.** Relationship between PEGR for Watts Index and Social Benefits to the Poor in the Balkan Countries
Source. Own estimates based on EU-SILC.
Note. * denotes data points with the statistically significant *PEGR* estimates.

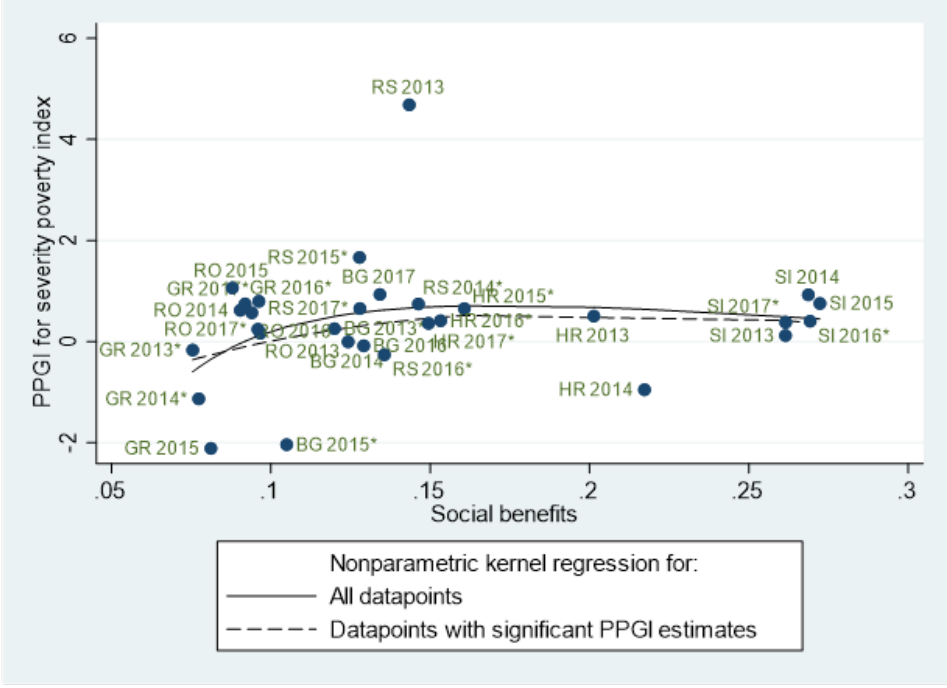


**Figure 2.** Relationship between Modified PPGI Values for Watts Index and Social Benefits to the Poor in the Balkan Countries
Source. Own estimates based on EU-SILC.
Note, * denotes data points with the statistically significant PPGI estimates.

# 7. Conclusion

Designers of policies aimed at combating poverty should consider the relationship between economic growth and income distribution. Particularly, the impact of economic growth on the incomes of the poor should be investigated and understood so that the social policies facilitate the poor to participate in the fruits of economic growth. This study presents and implements a set of statistical measures that are designed to inform policymakers on whether the economic growth favour the impoverished.

The theoretical part of the study provides the definition of the pro-poor growth and distinguishes between pro-poor growth in absolute and in relative terms. Moreover, the theoretical foundations of the construction of pro-poor growth measures were presented, and their basic advantages, limitations, and potential comparability were discussed.

In order to answer our research question of whether growth in the Balkan countries was pro-poor, we calculated and analysed the wide range of pro-poor growth measures using the most up-to-date panel data sets available. These were the poverty equivalent growth rates (*PEGR* and *PEGR**) for various poverty indices and the *RPPG*. The results were compared across the measures for six Balkan countries, and considerable differences were observed. This was due to various assumptions adopted in the applied measures, the construction of which is furthermore derived from different definitions of pro-poor growth.

Generally, growth was significantly poverty-reducing only in Greece and Romania in 2015–2017, Croatia in 2014–2016, Slovenia in 2013–2017, and Serbia in 2016–2017. The growth pattern was significantly non-poverty-reducing only in Bulgaria in 2014–2015. Different indicators of growth patterns yielded similar results; however, in the case of Greece in 2012–2013, values of *RPPG* and *PEGR* contradict each other, as they measure slightly different aspects of poverty.

Throughout all analysed countries, growth patterns tend to be more poverty-reducing or pro-poor in times of faster economic growth. It was also shown that the level of social benefits to the poor does not directly influence the pro-poor nature of the economic growth. The reasons for which countries differ with respect to the pro-poor nature of economic growth require further theoretical and empirical research.

# Appendix

## Pro-Poor Growth Indices Estimation

The *PEGR* and the *PEGR** indices were estimated according to Equation (13), using the relative and the absolute *PPGI*, respectively. To estimate the *PPGI*, we used the growth and inequality decomposition of poverty index (Equations 4 and 5).

However, the poverty indices $P(z,\mu_2,L_1(q))$and $P(z,\mu_1,L_2(q))$ were estimated in this survey by adjusting the poverty line instead of adjusting the mean income, as was proposed by Kakwani and Son (2008). When estimating the poverty index, $P(z,\mu_1,L_2(q))$, we use the distribution of household income from the final period, adjusting the poverty line appropriately. Similarly, when estimating $P(z,\mu_2,L_1(q))$, we use the distribution of household incomes from the initial period and adjust the poverty line accordingly. This adjustment takes different forms, depending on whether we estimate the *PPGI* in the relative sense or in the absolute sense.

*PPGI* in the relative sense is estimated as the ratio of the total growth elasticity of poverty ($\eta$) to the neutral growth elasticity of poverty ($\eta_g$)[9]:

$$PPGI = \frac{\eta_g+\eta_i}{\eta_g}, \tag{A.1}$$

The estimation of the growth poverty elasticity and inequality poverty elasticity when calculating *PPGI* in the relative sense was made as follows:

$$\eta_g = \frac{\{Ln[P(z\mu_1/\mu_2,y_1)]-Ln[P(z,y_1)]+Ln[P(z,y_2)]-Ln[P(z\mu_2/\mu_1,y_2)]\}}{2g_{12}}, \tag{A.2}$$

$$\eta_i = \frac{\{Ln[P(z\mu_2/\mu_1,y_2)]-Ln[P(z,y_1)]+Ln[P(z,y_2)]-Ln[P(z\mu_1/\mu_2,y_1)]\}}{2g_{12}}. \tag{A.3}$$

When calculating *PPGI** (*PPGI* in the absolute sense) the growth poverty elasticity and inequality poverty elasticity were estimated as

$$\eta_g^* = \frac{\{Ln[P(z-\mu_1+\mu_2,y_1)]-Ln[P(z,y_1)]+Ln[P(z,y_2)]-Ln[P(z+\mu_2-\mu_1,y_2)]\}}{2g_{12}}, \tag{A.4}$$

$$\eta_i^* = \frac{\{Ln[P(z+\mu_2-\mu_1,y_2)]-Ln[P(z,y_1)]+Ln[P(z,y_2)]-Ln[P(z-\mu_1+\mu_2,y_1)]\}}{2g_{12}}. \tag{A.5}$$

In every instance, statistical significance was assessed based on standard errors estimated using bootstrapping for 200 subsamples. For each indicator, a z-type statistic was calculated using estimated standard errors and statistical significance was assessed considering a difference of the estimated value from 0.

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