

## JOURNAL OF SECURITY AND SUSTAINABILITY ISSUES

ISSN 2029-7017 print/ISSN 2029-7025 online

2018 June Volume 7 Number 4

[https://doi.org/10.9770/jssi.2018.7.4\(19\)](https://doi.org/10.9770/jssi.2018.7.4(19))

### INVESTIGATION OF THE ECONOMIC GROWTH, POVERTY AND INEQUALITY INTER-LINKAGES IN THE EUROPEAN UNION COUNTRIES

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*Received 10 December 2017; accepted 20 April 2018*

**Abstract.** This paper has aimed to explore the inter-linkages of economic growth, poverty and inequality in the context of the European Union (EU) countries during the period of 2005 – 2016. Descriptive statistics analysis and econometric methods have been applied for this purpose. Research results have revealed statistically significant interrelationships between growth and poverty in half of the European Union countries. Moreover, in majority of these countries poverty has been elastic of economic growth. It should be noted, that the countries with higher level of economic development have relatively smaller share of population living below the national poverty lines. However, we cannot say the same about the growth – inequality relationships, which have varied across the EU countries. There are economically strong countries with relatively high income inequality and economically weaker countries with lower income distribution coefficients. However, in many cases poverty and income inequality tend to move in the same direction, i.e. as one increases, the other as well and vice versa. Finally, the insights of the research could be useful in developing a common strategy for smart, sustainable and inclusive growth and achieving the goals for Europe 2020.

**Keywords:** economic growth, poverty, income inequality, European Union.

**Reference** to this paper should be made as follows: Dudzevičiūtė, G.; Prakapienė, D. 2018. Investigation of the economic growth, poverty and inequality inter-linkages in the European Union countries, *Journal of Security and Sustainability Issues* 7(4): 839-854.  
[https://doi.org/10.9770/jssi.2018.7.4\(19\)](https://doi.org/10.9770/jssi.2018.7.4(19))

**JEL Classification:** I30, I32, O40.

## 1. Introduction

Combating poverty is the central goal of development of economies all over the world. Economic growth is the most powerful instrument for reducing poverty. The primary lesson from the past 50 years of development research is that economic growth is the most effective way to pull people out of poverty (DFID, 2008). Much of the economic development studies (Fukuda, 2008; Odhiambo, 2009; Akanbi & Toit, 2011; Strulik, 2012; Uddin et al., 2014; Imai et al., 2014; Jencova et al., 2015; Kiaušienė, 2015; Limanli, 2015; Devarajan et al., 2015; Hassan et al., 2015; Bagchi & Svejnar, 2015; Moore et al., 2016; Fosu, 2017; Rakotondramaro & Andriamasy, 2016; Traverso, 2016; Škare & Družeta, 2016; Ozturk, 2016; Thorat et al., 2017; Iceland & Hernandez, 2017; Maksimov et al., 2017; Mikucka et al., 2017; Pietrzak et al. 2017; Tvaronavičienė, Gatautis, 2017; Diržytė et al., 2017) deal with how do poverty, on the one hand, and relative inequality, on the other hand, change with economic growth and how are these variables impacted by the characteristics of growth. A wide range of empirical studies on the relationships between economic growth and poverty have revealed that the growth is

associated with poverty reduction. Improving the quality of life, growth promotes to transform society, create jobs, drive human development, and generates virtuous circles of prosperity and opportunity (DFID, 2008). However, there is much less consensus supporting the empirical evidence for poverty having a causal impact on economic growth. Despite this, there are several theoretical arguments that link poverty to growth. On the one hand, citizens living below the poverty line have less money to spend, and this impacts on aggregate demand. On the other hand, that has negative effects on supply, which means less money for production, distribution and selling. Moreover, Rehorn (2014) has indicated five effects of poverty to growth. They are education, child development, crime, low social mobility and extra social spending. Through such channels poverty reduction may support economic growth. In turn, economic growth may effect on poverty reduction. So, the causality between growth and poverty can run in both directions. This means that efforts to reduce poverty can create virtuous cycles that raise economic growth, in turn reinforcing poverty reduction (Lustig et al., 2002). While economic growth has been cited as one of the main drivers behind the reduction of poverty, the increasing poverty in many countries has raised doubts about the efficiency of economic growth in its reduction (Perera & Lee, 2013). Economic research on the relationships among growth, poverty and inequality has held an important place. Some studies suggest that unequal distribution of income promotes economic growth. While others reveal that inequality hinders economic growth and contributes to increase poverty (Jihene & Ghazi, 2013). According to Barro (2000), income inequality in rich countries promotes economic growth, while in poor countries retards growth. High income inequality can slow the rate of poverty reduction and create social problems. Various studies have revealed different elasticities of poverty with respect to economic growth (Perera & Lee, 2013). Many authors have argued that income inequality is among the most pressing current problems (Rajan, 2010; Ncube et al., 2014). In addition, leading economists have considered growing inequality as one of the main causes of financial crisis. According to Ncube et al. (2014), the International Monetary Fund has published evidence that inequality led to the huge debts behind the 2008 banking crisis.

The European 2020 strategy promotes social inclusion, in particular through the reduction of poverty (Eurostat, 2017). In this strategy for smart, sustainable and inclusive growth, the fight against poverty has been one of the five measurable targets for 2020 (European Commission, 2010). The number of the European Union citizens living below the national poverty lines should be reduced by 25%, by aiming to lift at least 20 million people out of the risk of poverty and social exclusion (European Commission, 2010).

*Statement of the problem:* analyzing the relationships among economic growth, poverty and inequality, majority of the studies have been focused on poor and less developed countries. This study has attempted to fill in this gap by studying the relationships among these variables in the European Union countries.

*The object of the research:* inter-linkages of economic growth, poverty and inequality in the European Union countries. *The aim of the research:* this research attempts to provide more reliable estimates of the relationships among economic growth, poverty and inequality in the European Union countries during the period of 2005 – 2016. *Limitation of the research:* this study has been bounded by three indicators, such as economic growth (real GDP per capita), poverty (share of people living below the national poverty lines) and inequality (GINI coefficient). Other variables and relationships among them have not been considered in this paper. Moreover, this research has covered annual data from 2005 to 2016, i.e. available data presented by Eurostat. So, the period under review is not long and the results of the study reveal the situation in the short term. The actual results should be interpreted with some caution since the limited availability of data has impeded the systematic study of relationships among economic growth, poverty and inequality. However, despite the limitations, the results may be used as a first indication of the relationships among variables and provide general insights for sustainable economic development of the EU countries. The paper is divided into sections. Introduction presents theoretical background of relationships among economic growth, poverty and inequality. Section 2 reviews main approaches and studies on relationships among variables, also research methodology. Section 3 estimates relationships among indicators across the countries observed. The last section concludes summarizing the main insights.

## 2. Empirical evidence and research methodology

### 2.1. The overview of the studies on relationships among economic growth, poverty and inequality

The issue of inclusive growth has been on the top not only for the economically poor countries, such as India, Africa or Asia, but for the European countries as well. In the strategy Europe 2020, the fight against poverty has been one of the five measurable targets. Over the last ten years, many scientists (Odhiambo, 2009; Akanbi & Toit, 2011; Strulik, 2012; Imai et al., 2014; Jencova et al., 2015; Devarajan et al., 2015; Bagchi & Svejnar, 2015; Moore et al., 2016; Traverso, 2016; Fosu, 2017) have explored the links among economic growth, poverty and inequality. Policy-makers in many countries wish to know whether a policy focused on growth is consistent with the goal of reducing poverty. Does economic growth impact on poverty reduction? (War, 2015). According to Škare & Družeta (2016), despite advances in research, scientists have come up with different views at different times due to complexity of the subject-matter. The extent to which growth reduces poverty depends upon pace and pattern of growth, how the poverty is measured, and upon absorptive capacity of the poor. Also, the analysis has revealed, that as growth occurs poverty reduces, no matter the level of inequality. The scientists have concluded, that growth is good for poverty alleviation but it is not enough. Poverty reduction will not happen simply if the economy is growing (Škare & Družeta, 2016).

According to Ncube et al. (2014), the results of empirical studies on the impact of income inequality on economic growth have shown remarkable disparities, resulting in three dominant view today: 1) inequality plays a central role in determining the rate of growth and associates with lower growth rates; 2) inequality does lead to growth. It has a positive effect on growth; 3) there is no correlation at all or find inconclusive evidence of any correlation between inequality and economic growth. Attitudes on economic growth, poverty and inequality have changed over time, especially during the last decade. Škare & Družeta (2016) summarized all approaches and their changes over time. Referring to Škare & Družeta (2016), a chronological review of some important theoretical approaches have been revealed in Table 1.

**Table 1.** Previous theoretical approaches

Year	Authors	Approaches
1953	Nurkse, R.	<i>System of useful or evil circles.</i> Countries are poor because they have low savings and investments and they have low savings and investments because they are poor.
1955	Kuznets, S.	<i>Kuznets' inter-binding U-curve.</i> In the earlier stages of development, at middle-income levels, income inequality would grow until a turning point, when income distribution would become more even again and poverty would rapidly disappear under the influence of fairer distribution.
1960	Rostow, W.	<i>Rostow's upswing phase.</i> In the initial phases, when basic preconditions for growth are created and the various elements are aligned and completed, the economy will be able to begin its take-off.
1974	Chenery, H. et al.	<i>Redistribution with growth; policies to improve income distribution in developing countries.</i> Although the average income per capita of developing countries has increased since 1960, it is obvious that such rapid growth has been of little benefit to a third of their population.
1992	Datt, G. & Ravallion, M.	Effects of inequality and income on poverty.
2001	Hoff, K. & Stiglitz, E.	Modern economic theory, growth, poverty and inequality.
2004	Bourguignon, F.	The poverty growth-inequality triangle.
2011	Fosu, A. K.	Growth, inequality, and poverty reduction in developing countries.
2013-2017	Thorbecke, E., Devarajan, S. et al., Bagchi & Svejnar, Moore, J. D. et al., Traverso, S., Fosu, A.K.	Growth, inequality-poverty nexus.

Source: table based on Škare & Družeta (2016)

In the second half of the 20th century, two contentious approaches on the relationship between economic growth and poverty prevailed in the literature (Nindi & Odhiambo, 2015). The “trickle-down” view confirms that economic growth plays an essential role in poverty reduction in any country and it automatically eliminates poverty. In this case, the benefits of economic growth in a country trickle down to the poor and poverty reduction policies should be aimed at promoting economic growth. The “trickle-up” view states that economic growth does not improve the lives of the very poor, but tends to “trickle-up” to the middle classes and the very rich. This impacts on income inequality, which then increases poverty (Nindi & Odhiambo, 2015; Škare & Družeta, 2016). According to Meier & Stiglitz (2001), today as billions of citizens still live in poverty, it becomes obvious that the “trickle-down” theory must be supplemented by policies of inclusion that lessen sharp inequality in incomes, enhancing human capital accumulation and employment opportunities, which help in providing safety for the more vulnerable part of society (Škare & Družeta, 2016).

Over the last decade, three methodological approaches can be found in the scientific literature regarding relationship between economic growth and poverty (Warr, 2015). A first approach – general equilibrium modeling – focuses on causal relationships between variables and their impacts on ones. A second approach relies on household survey data in order to construct the distribution of real expenditures across households and to examine the relationships among variables. A third approach includes statistical data on changes in poverty and growth and its composition (Warr, 2015).

The main insights of the most important recent studies have been revealed below. Odhiambo (2009) examined the dynamic causal relationship between financial development, economic growth and poverty reduction in South Africa. The empirical results of the study have shown that both financial development and economic growth Granger cause poverty reduction. The study also has found that economic growth Granger causes financial development and leads in the process of poverty reduction in South Africa. The study has recommended that policies geared towards increasing economic growth should be intensified in order to reduce the high level of poverty prevailing in the country. According to Ncube et al. (2014), the empirical results have revealed that income inequality reduces economic growth and increases poverty in the Middle East and North Africa (MENA) regions. Using time series data of MENA countries for the period of 1985 – 2009, the researchers have found that income inequality levels significantly reduce economic growth that is one percentage change in income inequality would translate into a 0.57 percentage in economic growth. Thus, income inequality is very bad for the goal of higher and sustained economic growth (Ncube et al., 2014). Moreover, the study has indicated that income inequality levels significantly increase poverty that is one percentage change of income inequality would translate into a 0.78 percentage increase in poverty levels. In addition, among other factors increasing the poverty include foreign direct investment, population growth, inflation rate and primary education.

The study of Warr (2015) combined time-series and cross-country data for seven Mekong economies to examine the causes of poverty reduction, particularly the role of aggregate economic growth. The results of the study has confirmed that poverty reduction in the Mekong economies is strongly related to growth of real GDP per capita. In addition, it has been found that the sectoral composition of this growth affects the rate of poverty reduction. The author has revealed that services growth is an important source of poverty reduction in rural as well as urban areas. The study has concluded, that growth of value added in the most labor-intensive sectors may be the most poverty reducing. The services sector in the Mekong economies has been the most labor intensive, hence the most poverty reducing. The paper of Jencova et al. (2015) analyzed the problem of poverty from the statistical perspective of connections with unemployment and migration in the regions of Slovakia. The results have shown the significant dependencies in some regions, namely between the number of citizens living below the poverty line, the number of Slovak citizens working abroad and the number of unemployed persons. The authors have concluded poverty has been primarily an ethical problem with a large number of ethical issues at the macroeconomic context. While poverty is a general problem for the EU as a whole, it has an even greater impact on the overall development of the Slovak economy.

Kiaušienė (2015) performed comparative assessment of women unemployment and poverty in the EU coun-

tries. Although in many cases, it is most frequently highlighted that unemployment is one of the main reasons of poverty, but this study has shown that there exist strong direct interrelationships between variables not in all 28 countries of the European Union. Finally, women unemployment rate in the EU has been lower than men. However, women risk of poverty rate outweighs the indicator of men. Rakotondramaro and Andriamasy (2016) examined the causal relationships among tourism development, economic growth and poverty in Madagascar within a Granger framework. Findings have indicated the Granger causality running from tourism development and poverty to growth and from growth and poverty to tourism development. The authors have concluded, that neither growth nor tourism development Granger cause poverty in the case of Madagascar.

The study of Mikucka et al. (2017) analyzed the indicators of economic growth and income inequality for 46 countries, observed from 1981 to 2012. The results have indicated that in the long run economic growth improves subjective well-being when social trust does not decline and, in richer countries, when income inequality reduces. The researchers have concluded, that policy-makers should promote economic growth, protect and promote social trust, and reduce income inequality. Fosu (2017) presented comparative global evidence on the transformation of economic growth to poverty reduction in developing countries, with emphasis on the role of income inequality. The study has revealed that high initial levels of inequality limit the economic growth in reducing poverty while growing inequality increases poverty directly for a given level of growth. The author has recommended to accord special attention to reducing inequality in certain countries where income distribution is especially unfavorable. To conclude, the relationships among economic growth, poverty and inequality have been examined extensively in the scientific literature, but with contradicting results. The overview of the studies on relationships among variables has shown that majority of the investigations have focused on poor and less developed countries. Besides, only a few studies have examined the situation in some EU countries. Therefore, this research has attempted to fill in this gap by studying the relationships among the variables in the European Union countries.

## **2.2. Research methodology**

In recent studies, various methodologies have been applied for the research of inter-linkages of economic growth, poverty and inequality. In the scientific studies, *three groups of methods* can be distinguished. *The first group* has been based on correlation and regression analysis (Hasan et al., 2009; Ncube et al., 2014; Kiaušienė, 2015; Jencova et al., 2015; Warr, 2015; Mikucka et al., 2017; Fosu, 2017), *the second group* has applied Granger causality techniques (Odhiambo, 2009; Akanbi, Toit, 2011; Jihene, Ghazi, 2013; Uddin et al., 2014; Nindi, Odhiambo, 2015; Rakotondramaro, Andriamasy, 2016) and *the third one* has employed other economic methods (elasticity; indexes, Generalized method of Moments, macro-economic modelling and others) (Hasan et al., 2009; Lenagala & Ram, 2010; Perera, Lee, 2013; Limanli, 2015; Fosu, 2017).

The study on inter-linkages of economic growth, poverty and inequality in the EU countries has been organized as follows:

*Stage 1.* The analysis of the descriptive statistics of economic growth, poverty and inequality indicators across the EU countries. Linkage analysis has been carried out among groups of countries by the level of economic development.

*Stage 2.* The investigation of the correlations between poverty and economic growth across the EU countries. Taking into consideration Jarque-Bera statistics (Jarque, Bera, 1987) confirming the normal distribution of the variables, the authors have used the Pearson's correlation.

In order to be sure that the variables have been normally distributed, we have to check null hypothesis and alternative hypothesis:

*Null hypothesis: normal distribution;*  
*Alternative hypothesis: not normal distribution.*

If probability value is  $\leq 5\%$ , null hypothesis should be rejected and accepted alternative hypothesis. Conversely, the null hypothesis is accepted if probability value is  $> 5\%$ . All calculations have been based on Eviews v. 8.0

*Stage 3.* Calculations of growth elasticity of poverty. Growth elasticity of poverty is a measure of responsiveness that calculates how much poverty varies/changes for each percentage point in economic growth. The elasticity coefficient has been calculated as follows (Lenagala, Ram, 2010):

$$E_{jt} = \frac{d(PR_{jt})}{d(RYPC_{jt})} \quad (1)$$

Where:  $d(PR_{jt})$  is the annual percentage change in poverty in country  $j$  over the period  $t$ , and  $d(RYPC_{jt})$  denotes the annual rate of change of GDP per capita in country  $j$  during the period  $t$ .

*Stage 4.* Regression analysis has been focused on relationship between dependent variable and one or more independent variables.

*Data.* The analysis has focused on a sample of the 28 EU countries covering the period from 2005 to 2016. Analyzing the tendencies and the relationships among variables, there have been used the indicators of poverty and inequality, such as a share of citizens living at risk of poverty and GINI coefficient respectively; and the indicator of economic growth, such as real GDP per capita.

This research has been based on Eurostat annual data. It has provided a possibility to compare the European countries by the variables under consideration. The research consists of some steps which are presented in Fig. 1. All calculations have been made applying econometric software Eviews v. 8.0.

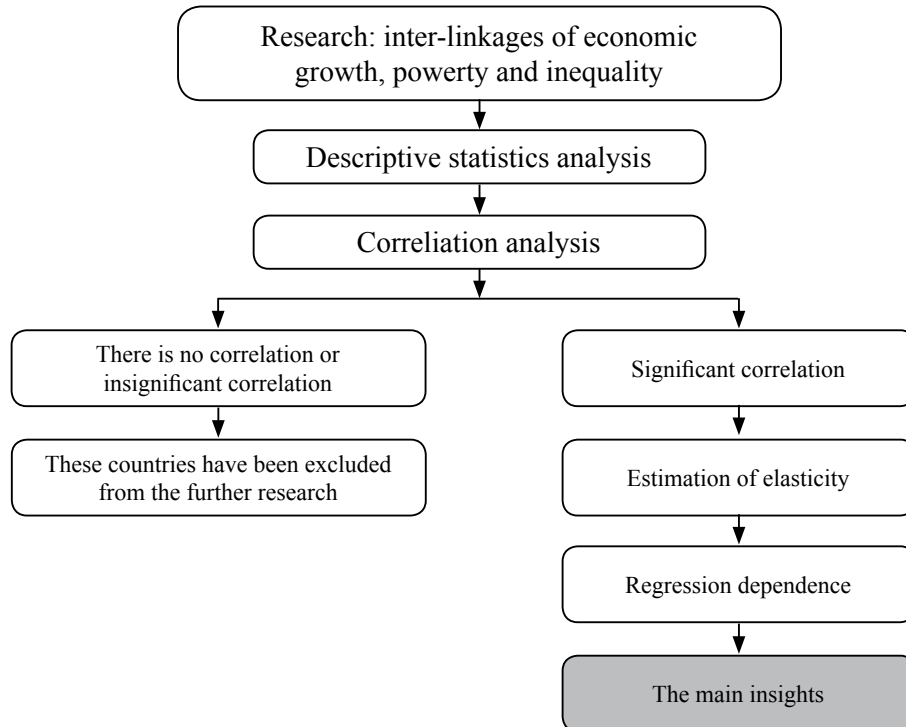


Fig. 1. The framework of the research

Next section has examined the tendencies of economic growth, poverty and inequality in the EU countries.

### 3. The analysis of the relations among economic growth, poverty and inequality

#### 3.1. The examination of the main tendencies

In this section, the authors have investigated the main tendencies of poverty, inequality and economic growth indicators in the EU countries. The analysis covers the years 2005 – 2016.

*Poverty and inequality in the context of economic growth.* By average data of real GDP per capita, the EU countries have been grouped into six categories, such as countries with very high economic development level, high, upper middle, lower middle, low and very low (Table 2).

**Table 2.** Poverty and inequality in the context of economic development

Groups by the level of economic development /countries	Average, 2005-2016		
	Real GDP per capita, Eur.	People at risk of poverty, %	GINI, %
<i>Very high level</i>	<u>79 683</u>	<u>17.6</u>	<u>28.4</u>
Luxembourg	79 683	17.6	28.4
<i>High level</i>	<u>40 961</u>	<u>18.9</u>	<u>27.0</u>
Denmark	44 842	17.4	26.2
Ireland	40 900	26.5	30.6
Sweden	39 900	16.0	24.8
Netherlands	38 200	15.8	26.4
<i>Upper middle level</i>	<u>33 075</u>	<u>19.8</u>	<u>28.4</u>
Austria	35 700	18.5	27.1
Finland	35 075	17.1	25.8
Belgium	33 608	21.2	26.6
Germany	32 617	19.9	29.1
France	31 125	18.7	29.2
United Kingdom	30 325	23.4	32.4
<i>Lower middle level</i>	<u>24 214</u>	<u>26.4</u>	<u>32.1</u>
Italy	26 833	27.2	32.2
Spain	23 267	26.1	33.4
Cyprus	22 542	25.9	30.8
<i>Low level</i>	<u>17 138</u>	<u>22.6</u>	<u>29.1</u>
Greece	19 475	31.6	33.9
Slovenia	17 758	18.7	23.9
Portugal	16 675	25.7	35.2
Malta	16 650	21.4	27.6
Czech Republic	15 133	15.4	25.1
<i>Very low level</i>	<u>9 637</u>	<u>32.6</u>	<u>32.1</u>
Slovakia	12 583	21.4	25.2
Estonia	12 383	23.5	32.9
Croatia	10 642	30.4	30.7
Hungary	10 342	30.6	27.3
Lithuania	10 008	31.7	35.2
Latvia	9 617	36.5	36.1
Poland	9 517	29.6	31.6
Romania	6 442	41.8	35.1
Bulgaria	5 200	48.2	34.9

Source: authors' calculations based on Eurostat (2016a,b,c)

Using linkage analysis among groups of countries, some general tendencies have been revealed. Generally, it should be noted, on the one hand, the countries with higher level of economic development have relatively smaller share of population living below the national poverty lines. However, on the other hand, we cannot say the same about the GINI coefficient, which is a measure of income inequality. The relationships between economic development and GINI have varied across the EU countries. There are economically strong countries such as Luxembourg, Ireland, Germany, France, and United Kingdom with relatively high income inequality and economically weaker countries, such as Hungary, Slovakia, Slovenia, and Malta with lower income distri-

bution coefficient. Moreover, in majority of the EU countries poverty and income inequality tend to move in the same directions, i.e. as one decreases, the other also tends to decrease and vice versa.

*Descriptive statistics.* Table 2 supplements the information in Table 1 and at the same time shows that the most homogeneous group of the EU countries in terms of economic development is the group of countries with low level of GDP per capita. Greece, Slovenia, Portugal, Malta and Czech Republic belong to this group. However, in terms of poverty and inequality the most homogeneous groups of countries are with very high and lower middle level of economic development.

**Table 2.** Descriptive statistics of economic growth, poverty and inequality variables

Groups of countries by the level of economic development	Variables	Min	Max	Average	Standard deviation
<i>Very high level</i> (Luxembourg)	Real GDP per capita, Eur.	76500	84400	79683	2377
	People at risk of poverty, %	15.5	19.7	17.6	1.32
	GINI, %	26.5	31.0	28.4	1.31
<i>High level</i> (Denmark, Ireland, Sweden, Netherlands)	Real GDP per capita, Eur.	36300	53600	40960	3798
	People at risk of poverty, %	13.9	30.3	18.8	4.61
	GINI, %	23.4	31.9	26.9	2.41
<i>Upper middle level</i> (Austria, Finland, Belgium, Germany, France, United Kingdom)	Real GDP per capita, Eur.	29100	37300	33075	2166
	People at risk of poverty, %	16.0	24.8	19.8	2.18
	GINI, %	25.2	34.6	28.4	2.43
<i>Lower middle level</i> (Italy, Spain, Cyprus)	Real GDP per capita, Eur.	20400	28700	24214	2240
	People at risk of poverty, %	23.3	29.9	26.4	1.94
	GINI, %	28.7	34.8	32.1	1.71
<i>Low level</i> (Greece, Slovenia, Portugal, Malta, Czech Republic)	Real GDP per capita, Eur.	13600	22700	17138	1988
	People at risk of poverty, %	13.3	36.0	22.5	6.03
	GINI, %	22.7	38.1	29.1	4.72
<i>Very low level</i> (Slovakia, Estonia, Croatia, Hungary, Lithuania, Latvia, Poland, Romania, Bulgaria)	Real GDP per capita, Eur.	4200	14600	9637	2477
	People at risk of poverty, %	18.1	61.3	32.4	9.13
	GINI, %	23.7	38.9	32.1	4.01

Source: author's calculations based on Eurostat (2016a, b, c)

In order to assess the economic growth – poverty relationships, the Pearson's correlation has been used. Before applying this, we need to make sure the variables are normally distributed. To this end, Jarque-Bera statistics has been employed.

*Jarque-Bera statistics: checking of distribution.* Jarque-Bera statistics has shown that the variables are normally distributed (Annex A). We have checked two hypotheses: null hypothesis that variables are normally distributed and alternative hypothesis that variables are not normally distributed. The null hypothesis is rejected if probability associated to Jarque-Bera statistics is  $\leq 0.05$ . Conversely, the null hypothesis is accepted if the associated probability is  $> 0.05$ . All calculations have been based on Eviews v. 8.0. As the variables under consideration are normally distributed, we can use the Pearson's correlation.

*Correlation analysis.* The results of correlation analysis across the EU countries have been presented in Table 3.



**Table 3.** Pearson's correlation between poverty and economic growth

Groups of countries	Correlation coefficient	t <sup>stat</sup>	t <sup>cr</sup>	Groups of countries	Correlation coefficient	t <sup>stat</sup>
<i>Very high level</i> Luxembourg	-0.25	0.81	2.23	<i>Lower middle level</i> <u>Italy</u>	-0.69	3.02
				<u>Spain</u>	-0.73	3.37
				<u>Cyprus</u>	-0.89	6.11
<i>High level</i> <u>Denmark</u>	-0.71	3.18		<i>Low level</i> <u>Greece</u>	-0.93	8.16
<u>Ireland</u>	-0.21	0.67		<u>Slovenia</u>	-0.30	1.01
<u>Sweden</u>	0.66	2.77		<u>Portugal</u>	-0.54	2.04
<u>Netherlands</u>	-0.13	0.42		<u>Malta</u>	0.36	1.24
				<u>Czech Republic</u>	-0.78	3.94
<i>Upper middle level</i> <u>Austria</u>	0.38	1.30		<i>Very low level</i> <u>Estonia</u>	0.13	0.41
<u>Finland</u>	0.48	1.74		<u>Slovakia</u>	-0.89	3.91
<u>Belgium</u>	-0.39	1.35		<u>Croatia</u>	-0.55	2.08
<u>United Kingdom</u>	-0.02	0.07		<u>Hungary</u>	-0.60	2.34
<u>Germany</u>	0.43	1.51		<u>Lithuania</u>	-0.69	2.99
<u>France</u>	-0.35	1.18	<u>Latvia</u>	-0.89	6.30	
			<u>Poland</u>	-0.95	9.42	
			<u>Romania</u>	-0.77	3.80	
			<u>Bulgaria</u>	-0.87	5.49	

Source: author's calculations based on Eurostat (2016a,b,c)

As Table 3 has presented, a negative statistically significant relationship between poverty and economic growth has been detected in thirteen EU countries, such as Denmark, Italy, Spain, Cyprus, Greece, Czech Republic, Slovakia, Hungary, Lithuania, Latvia, Poland, Romania and Bulgaria. It has shown that as the economy of certain country grows, poverty decreases and vice versa. Besides, a positive statistically significant relationship between variables has been identified in Sweden. It means that as economy grows, the share of population living below the national poverty line tends to increase. The remaining countries have had statistically insignificant correlation between poverty and economic growth. These countries have been excluded from the further investigation. Summarizing these results, it can be stated that across the European Union countries correlation varies from a very weak (United Kingdom) to a very strong (Poland), however, only half of the countries have had statistically significant relationships between poverty and economic growth. In the next section, these countries have been analyzed in more detail.

### 3.2. The dependence of the variables

Growth elasticity of poverty. To measure the responsiveness how much poverty changes for each percentage point in economic growth, we have calculated elasticity of poverty with respect to economic growth. Table 4 contains the elasticities.

**Table 4. Growth elasticities of poverty**

Countries	Average annual change in 2005-2016		Elasticity
	Poverty, %	GDP per capita, %	
Bulgaria	4.14	2.88	1.44
Czech Republic	3.52	1.78	2.00
Denmark	0.27	0.28	0.96
Greece	1.74	1.82	0.96
Spain	1.26	0.12	10.5
Italy	1.41	0.71	1.99
Cyprus	0.82	0.65	1.26
Latvia	4.41	2.78	1.59
Lithuania	2.80	3.69	0.76
Hungary	1.81	1.20	1.51
Poland	6.60	3.64	1.81
Romania	2.13	2.44	0.87
Slovakia	5.17	3.53	1.46
Sweden	2.18	1.11	1.96

*Source:* author’s calculations based on Eurostat (2016a,b)

To make the table self-contained, rates of poverty have been shown along with the rates of real GDP per capita and the corresponding elasticities for each country examined. The table suggests several significant points. First, it is interesting to note that in majority of the countries poverty has been elastic of economic growth. In general, the growth of GDP per capita has effect on poverty reduction. Second, elasticities have varied across the countries. Growth elasticity of poverty in Spain is considerably higher than this in other countries. Third, the lower elasticities (inelastic poverty) may suggest growth to have been less pro-poor during the period studied. The estimates reveal the low response of poverty to GDP per capita growth in Denmark, Greece, Lithuania and Romania.

Fourth, the calculation has not hold income inequality constant, but assumes that projected changes will be the same as those observed over the period analyzed. However, the growth elasticity of poverty also depends on other variables, among them the level of income inequality. Many scientific studies have revealed that countries with a more equal distribution of income experience a greater reduction in the poverty rate for a given increase in GDP per capita. Another step of the analysis is to assess the impact of income inequalities on poverty.

*The effect of income inequality on poverty.* The regression statistics has shown that not in all cases the dependence between poverty and income inequalities can be expressed by linear regression. Statistically significant effect of inequality on poverty has been detected in Bulgaria, Czech Republic, Denmark, Spain, Greece, Italy, Poland and Sweden (Table 5). In the cases of Cyprus, Latvia, Lithuania, Hungary, Romania and Slovakia, the regression coefficients turned out to be insignificant. Moreover, the results have indicated that income inequality levels indeed significantly increase poverty in Czech Republic, Greece, Italy and Poland.

**Table 5.** The effect of income inequality on poverty

Regression statistics	Coefficients/values	Regression statistics	Coefficients/values
<b><u>Bulgaria</u></b>		<b><u>Spain</u></b>	
Multiple R	0.65	Multiple R	0.97
R Square	0.43	R Square	0.94
F	6.70**	F	168.64*
Intercept /p -value	132.38*	Intercept	-35.03*
Income inequality	-2.41**	Income inequality	1.83*
<b><u>Czech Republic</u></b>		<b><u>Italy</u></b>	
Multiple R	0.74	Multiple R	0.70
R Square	0.55	R Square	0.49
F	11.87*	F	9.73*
Intercept	-76.96**	Intercept	-58.35**
Income inequality	3.68*	Income inequality	2.65*
<b><u>Denmark</u></b>		<b><u>Poland</u></b>	
Multiple R	0.55	Multiple R	0.98
R Square	0.30	R Square	0.96
F	4.42***	F	240.38*
Intercept	10.61*	Intercept	-109.36*
Income inequality	0.26***	Income inequality	4.39*
<b><u>Greece</u></b>		<b><u>Sweden</u></b>	
Multiple R	0.73	Multiple R	0.93
R Square	0.53	R Square	0.86
F	11.26*	F	59.92*
Intercept	-118.22**	Intercept	-9.85*
Income inequality	4.42*	Income inequality	1.04*

Note: \*, \*\*, \*\*\* indicate significance at 1%, 5% and 10% respectively.

Source: authors' calculations based on Eviews v. 8.0

We have found that a one percentage point change in income inequality would increase poverty levels in Czech Republic (3.68 percentage points), Greece (4.42 percentage points), Italy (2.65 percentage points) and Poland (4.39 percentage points). Besides, the analysis has revealed opposite effect of income inequality on poverty in Bulgaria. In this case, increase in income inequality impacts on poverty reduction. Moreover, 94 percent, 96 percent and 86 percent of the variation in poverty can be explained by income inequality in Spain, Poland and Sweden respectively.

Next section summarizes and discusses the main results of the research.

## Conclusions and discussion

The main objective of this research is to examine inter-linkages of economic growth, poverty and inequality in the European Union countries. Analyzing the relationships among economic growth, poverty and inequality, majority of the studies have been focused on poor and less developed countries. This study has attempted to fill in this gap by studying the relationships among these variables in the European Union countries. The actual results should be interpreted with some caution since the limited availability of data has impeded the systematic study of relationships among variables. However, despite the limitations, the results may be used as a first indication of the relationships among variables and provide general insights for sustainable economic development of the EU countries.

Using linkage analysis among groups of countries by the level of economic development, some general tendencies have been revealed. Generally, it should be noted, on the one hand, the countries with higher level of economic development have relatively smaller share of population living below the national poverty lines. However, on the other hand, we cannot say the same about the income inequality. The relationships between economic growth and income inequality have varied across the EU countries. However, in majority of the EU countries poverty and income inequality tends to move in the same directions, i.e. as one decreases, the other also tends to decrease and vice versa. Research results have revealed statistically significant interrelationships between growth and poverty in half of the European Union countries. Moreover, in majority of these countries poverty has been found elastic of economic growth. This has confirmed that poverty reduction in majority of the EU countries is strongly related to growth of real GDP per capita. This finding supports earlier studies. Regression statistics has indicated that income inequality levels indeed significantly increase poverty in Czech Republic, Greece, Italy and Poland. Moreover, from 86 percent to 96 percent of the variation in poverty can be explained by income inequality in Spain, Poland and Sweden. These findings point to some key policy recommendations for higher economic growth and poverty reduction in the EU countries.

First, given the insight that inequality and poverty have been positively correlated in many countries, policy makers need to tackle this challenge head-on. Second, given the finding that real GDP per capita reduces poverty in majority of EU countries, achieving higher national income must remain an active goal of governments. To increase per capita income, these countries must deepen macroeconomic and structural reforms.

Finally, it should be noted that the EU countries, while pursuing smart, sustainable and inclusive growth policies, must focus on poverty and inequality reduction. More importantly, increasing income inequality will hinder economic growth, and this could erode public trust in the country's institutions.

To sum up, the previous scientific studies on the relationships among growth, poverty and inequality have shown remarkable disparities across the countries. Scientists have come up with different views at different times and countries. On the one hand, our results have been in line with other studies, such as Lenagala & Ram (2010), Ncube et al. (2014), Warr (2015), Mikucka et al. (2017). On the other hand, this research has extended the inter-linkages analysis among variables at the European Union level and revealed some insights into differences in the growth process.

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Annex A. Jarque-Bera statistics

Countries	Variables	Jarque-Bera statistics	Probability	Test results (Null hypothesis)
Luxembourg	Real GDP per capita	0.521733	0.770384	Accepted
	Poverty	0.648244	0.723162	Accepted
Denmark	Real GDP per capita	0.680043	0.711755	Accepted
	Poverty	0.625241	0.731527	Accepted
Ireland	Real GDP per capita	5.166049	0.075545	Accepted
	Poverty	1.031059	0.597184	Accepted
Sweden	Real GDP per capita	0.052265	0.974206	Accepted
	Poverty	0.537035	0.764512	Accepted
Netherlands	Real GDP per capita	0.298766	0.861239	Accepted
	Poverty	1.024041	0.599283	Accepted
Austria	Real GDP per capita	3.023455	0.220529	Accepted
	Poverty	0.026867	0.986656	Accepted
Finland	Real GDP per capita	0.262023	0.322707	Accepted
	Poverty	0.737250	0.691685	Accepted
Belgium	Real GDP per capita	0.635619	0.727741	Accepted
	Poverty	1.780494	0.410554	Accepted
UK	Real GDP per capita	0.584133	0.746719	Accepted
	Poverty	0.601825	0.740143	Accepted
Germany	Real GDP per capita	0.724843	0.695989	Accepted
	Poverty	0.624233	0.731896	Accepted
France	Real GDP per capita	1.016169	0.601647	Accepted
	Poverty	0.659609	0.719064	Accepted
Italy	Real GDP per capita	1.206173	0.547120	Accepted
	Poverty	1.238749	0.538281	Accepted
Spain	Real GDP per capita	0.582800	0.747217	Accepted
	Poverty	0.977550	0.613377	Accepted
Cyprus	Real GDP per capita	0.958628	0.619208	Accepted
	Poverty	0.793263	0.672582	Accepted
Greece	Real GDP per capita	1.468452	0.479877	Accepted
	Poverty	1.642377	0.439908	Accepted
Slovenia	Real GDP per capita	0.495012	0.780746	Accepted
	Poverty	0.570624	0.751780	Accepted
Portugal	Real GDP per capita	0.573760	0.750602	Accepted
	Poverty	1.263301	0.531713	Accepted
Malta	Real GDP per capita	1.868200	0.392939	Accepted
	Poverty	1.225132	0.541958	Accepted
Czech Republic	Real GDP per capita	0.030911	0.984664	Accepted
	Poverty	3.804026	0.149268	Accepted
Estonia	Real GDP per capita	0.989650	0.609678	Accepted
	Poverty	0.813557	0.665792	Accepted
Slovakia	Real GDP per capita	0.492351	0.781785	Accepted
	Poverty	0.878886	0.644395	Accepted
Croatia	Real GDP per capita	1.569281	0.456284	Accepted
	Poverty	0.543199	0.762159	Accepted
Hungary	Real GDP per capita	1.292497	0.218481	Accepted
	Poverty	0.524008	0.896515	Accepted
Lithuania	Real GDP per capita	0.596701	0.742041	Accepted
	Poverty	2.881289	0.236775	Accepted
Latvia	Real GDP per capita	0.622738	0.732444	Accepted
	Poverty	0.315934	0.853878	Accepted
Poland	Real GDP per capita	0.573552	0.750680	Accepted
	Poverty	2.794175	0.247316	Accepted
Romania	Real GDP per capita	1.149565	0.562827	Accepted
	Poverty	0.122546	0.940567	Accepted
Bulgaria	Real GDP per capita	0.018522	0.990782	Accepted
	Poverty	1.188961	0.551849	Accepted

Source: authors' calculations based on Eviews v. 8.0.

Note: the level of significance is 5%.

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