STUDY OF THE RELATIONSHIP BETWEEN INCOME INEQUALITY AND THE POVERTY RISK THRESHOLD AT THE EUROPEAN UNION COUNTRIES

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Abstract. *The relationship between income inequality and poverty is an intensely studied issue, because it is important to determine whether and how it can influence income distribution combating poverty. Thus in this study we investigated the existence of Kuznets curve type relation between income inequality, expressed by GINI coefficient, and risk of poverty threshold on three data panels for European Union (EU) countries (all EU, rich, and emerging EU countries, respectively), over the period 2006-2017. Empirical estimations, using panel data techniques on three different data panels, confirm the Kuznets hypothesis that GINI index values increase with increasing the risk of poverty threshold until it reaches the critical point, followed by a drop of it, for the emerging countries. Also, we found a U-shaped form of this curve for the EU panel countries, consistent with the one for the rich countries panel. The risk of poverty threshold for the EU countries has the same type of influence on income inequality as for the rich countries, while for the emerging countries the influences are opposite. We may conclude that at EU level, the influence of risk of poverty threshold on income inequality is strongly determined by developed countries.*

Keywords: income inequality, poverty, risk of poverty threshold, GINI, data panel, GINI index, Kuznets curve hypothesis, risk of poverty threshold
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1. Introduction

The relationship between income inequality and poverty is an intensely studied issue, and it is important to determine whether and how the distribution of income may influence poverty.
The latest European Union (EU) decisions on poverty and income inequality have resulted in cumulative efforts to combat poverty and reduce the number of people suffering from or at risk of suffering from poverty by at least 20 million, producing remarkable improvements in the equal access of all citizens to the opportunities and resources available [1]. Achieving this goal involves raising revenues above the poverty threshold.

Darvas [2] has proved that the "poverty risk" indicator set out in the Europe 2020 Strategy mainly measures income inequality or relative poverty. However, although poverty declined globally, revenue dynamics did not follow the same trend, their uneven distribution influencing development policy [3].
The Gini coefficient determines the extent to which the distribution of income among individuals (households) in a country's economy deviates from a perfectly equal distribution.
Poverty is related to a threshold calculated in relation to the average income of each country, the "poverty threshold", which is estimated at 60% of the average income. The poverty threshold refers to the level of economic resources needed to ensure the way of life considered acceptable, thus it represents the amount of money incomes under which a person may be considered poor [4].
According to Laurinavičius and Galinienė [5], inequality and poverty influence each other directly and indirectly through their link with economic growth. The effect of the relationship between income inequality (measured by the Gini index) and the poverty threshold may be positive or negative, depending on the level of wealth of the countries [6]. Chemli and Smida [7] analyzed the effect of inequality on poverty in times of crisis, on a sample of eight countries (Algeria, Egypt, Iran, Jordan, Morocco, Tunisia, Syria and Yemen) from 1990 to 2009, and the results showed that income inequality is in a reverse relation to poverty.
According to Bourguignon [8], poverty and inequality (the Gini index) can interact in a bidirectional way. According to Marx et al. [9], the same rate of risk of poverty could correspond to different values of income inequality, and a certain value of the Gini coefficient may correspond to different poverty risk rates.
In a previous study using data for the EU countries and a linear regression model, we found that the influence of the poverty risk threshold on income inequality is strongly determined by their trend in the emerging EU countries [10].
In this context, in this paper we aimed to analyze the influence of the risk of poverty threshold on income inequality (expressed by the Gini coefficient), by means of a quadratic regression model, using available data for the EU member states, for the period 2006-2017.

2. Data, model, methodology

2.1 Data

The annual values of the macroeconomic indicators used in this study, namely the Gini index (denoted below by GINI) and per capita risk of poverty threshold (denoted by RPT and measured in Euro) for the 28 EU members from 2006–2017 period, were taken from Eurostat database [11]. The data series are organized in a data panel.
As there are major differences between per capita gross domestic products (GDP) for the countries in the panel, we also constructed two other partial data panels. Thus, Panel-1 includes 12 EU countries (Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherland, Sweden, United Kingdom) with GDP superior to the EU mean. Panel-2 includes 9 countries of EU (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania and Slovakia) with the lowest GDP that are also emerging European countries. A graphic representation of the data in these panels in (LRPT, GINI) coordinate frame is given in Figure 1.
Although there was generally a slight decrease in the overall income inequality among Panel 2 citizens, between 2006-2017 it is obvious that the income inequality in panel 2 is higher than that of the EU28 panel and Panel 1 (where the smaller gaps between rich and poor incomes). Reducing income inequality at EU level shows that the income gap between people living in developed and developing countries is decreasing. Countries with low income inequality

indicators also have the risk of poverty threshold above the European average, and countries with high income inequality indicators also have a very low risk of poverty threshold.

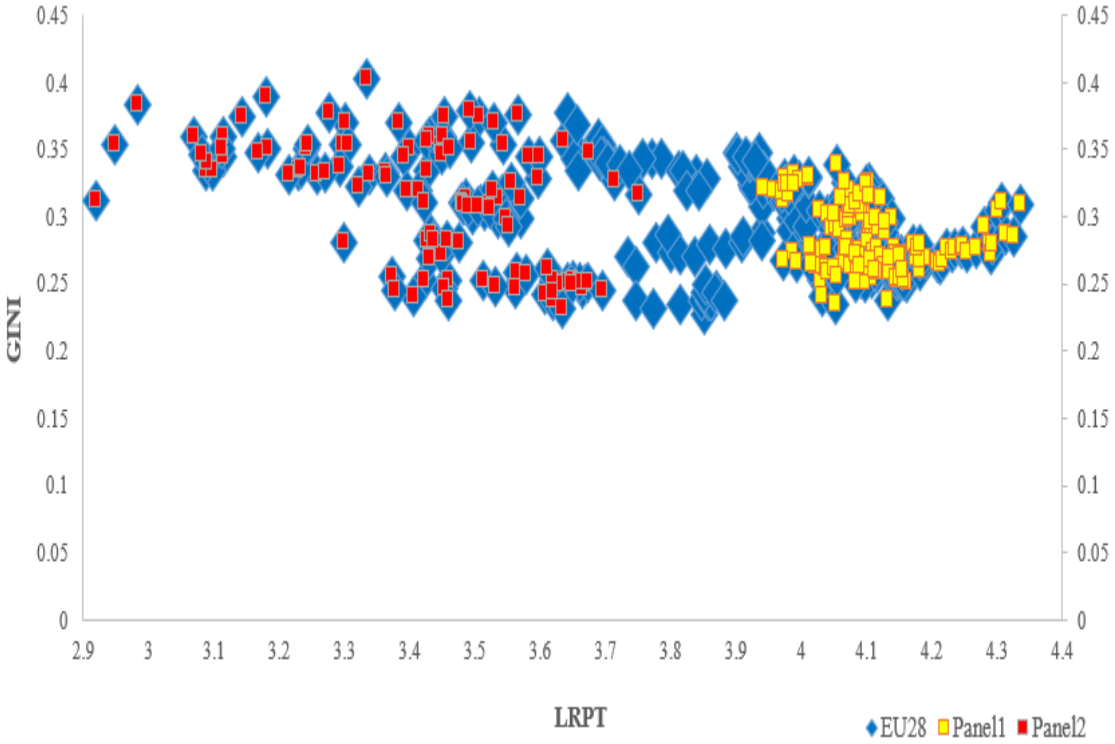

Figure 1. LRPT and, GINI for the data panels

2.2. Model

We used the following quadratic model in order to investigate the existence of a Kuznets curve type relation between *GINI* and *RPT*:

$$GINI_{it} = \alpha_0 + \alpha_1 LRPT_{it} + \alpha_2 LRPT_{it}^2 + u_{it}\,, \tag{1}$$

where u_{it} is the error term, i symbolizes the countries, t is time, while LRPT represents the logarithmic form of the independent variable RPT.

The signs of the regression coefficients in the above equation determine the shape of the approximating curve. Thus, the relation between GINI and RPT follows an inverted U-shaped curve if $\alpha_2 < 0$. The critical value of RPT is $-\frac{\alpha_1}{2\alpha_2}$, it is positive if $\alpha_1 > 0$, and it corresponds to a maximum value of the dependent variable GINI.

2.3. Econometric methodology

The theoretical model (1) was empirically estimated using panel data techniques for these three data panels. The panel cointegration approach involves first the examination of the stationarity properties, by means of unit root tests. Second, the existence of a cointegration relationship between the variables is tested. Finally, if the variables are cointegrated, estimation of the coefficients of the regression relation is determined.

The data analysis was realized within EViews9 (2015) software product.

3. Empirical findings and results

The results of the unit root test performed on the three panels, and displayed in Table 1, show that the null hypothesis of the existence of a common unit root can be rejected for the RPT and GINI variables, so that these processes are stationary at a specific confidence level. For these tests, we have selected individual effect options and automatic lag selection.

Table 1. Results of the unit roots tests, 2006 - 2017. Variables GINI, LRPT, LRPT^2

	Variable	Levin, Lin & Chu t*		ADF-Fisher Chi-square		PP-Fisher Chi-square	
		Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Panel-EU28	GINI	-5.36956	0.0000	88.5088	0.0037	114.295	0.0000
	LRPT	-9.12032	0.0000	105.884	0.0001	158.568	0.0000
	LRPT^2	-8.73779	0.0000	101.390	0.0002	154.540	0.0000
Panel-1	GINI	-3.37963	0.0004	32.7222	0.1101	54.7335	0.0003
	LRPT	-5.11591	0.0000	33.0022	0.1040	55.3929	0.0003
	LRPT^2	-5.00866	0.0000	32.1957	0.1222	53.5551	0.0005
Panel-2	GINI	-3.83201	0.0001	38.8576	0.0030	38.0810	0.0038
	LRPT	-8.19534	0.0000	39.5203	0.0024	75.6559	0.0000
	LRPT^2	-7.66579	0.0000	36.9431	0.0053	73.7488	0.0000

To test the cointegration hypothesis we used Kao and Pedroni panel and group statistics tests (Table 2). Applying residual cointegration tests, we found that the values for the panels we obtained the null hypothesis “no cointegration” can be rejected, indicating the existence of a long-run equilibrium relationship among the three variables (GINI, LRPT, LRPT^2).

Table 2. Results of the cointegration tests, 2006 - 2017. Variables GINI, LRPT, LRPT^2

		Panel-EU28		Panel-1		Panel-2	
Test		Std-Error	Prob.	Std-Error	Prob.	Std-Error	Prob.
Pedroni	Panel PP-Statistic	-3.03780	0.0012	-2.43587	0.0074	-1.69713	0.0448
	Panel ADF-Statistic	-3.63066	0.0001	-4.25040	0.0000	-1.78388	0.0372
	Group PP-Statistic	-7.04994	0.0000	-5.44036	0.0000	-5.44634	0.0000
	Group ADF-Statistic	-6.01360	0.0000	-5.95879	0.0000	-2.77412	0.0028
Test		t-Statistic	Prob.	t-Statistic	Prob.	t-Statistic	Prob.
Kao	ADF	-1.90027	0.0287	-4.80790	0.0000	-4.28464	0.0000

In order to estimate coefficients in Equation (1) we applied panel Least Square method within EViews. To decide between fixed or random effects for data, we performed the Hausman and the Redundant Fixed Effects tests. Thus, the fixed effects model is appropriate for our panels. The parameter estimates for the regression Equation (1), their standard errors are reported in Table 3, while the critical values and some statistics are reported in Table 4.

Table 3. Panel-EU28, Panel-1 and Panel-2 results for coefficients estimates of Equation (1)

Variable	Coefficient	Std-Error	t-Statistic	Prob.
Panel-EU28				
C	0.625077	0.220194	2.838751	0.0048
LRPT	-0.194080	0.124409	-1.560030	0.1198
LRPT^2	0.028280	0.017508	1.615304	0.1073

Panel-1				
C	7.355234	2.948838	2.494282	0.0139
LRPT	-3.539409	1.438807	-2.459962	0.0152
LRPT^2	0.442356	0.175468	2.521002	0.0129
Panel-2				
C	-0.260820	0.567469	-0.459610	0.6468
LRPT	0.347182	0.336233	1.032563	0.3044
LRPT^2	-0.052260	0.049785	-1.049640	0.2965

For Panel-EU28 and Panel-1, the estimated coefficients in Table 3 show that the variation of GINI with respect to LRPT follows a U-shaped, i.e. the GINI values decrease until the LRPT reaches the point critical, followed by an increase after LRPT exceeds the critical value, given in Table 4.

For Panel-2, the graph has an inverted U-shaped, which means that the GINI values increase with the poverty threshold until the LRPT reaches the critical point, followed by a decrease.

Table 4. Panel-EU28, Panel-1 and Panel-2: regression related results and critical values

	Panel-EU28	Panel-1	Panel-2
R-squared	0.902	0.873	0.881
Critical value for RPT	3.431	4.001	3.322
Shape	„U”	U	inverted-U
Min LRPT value	2.919	3.941	2.919
Max LRPT value	4.335	4.335	3.751
Mean LRPT value	3.810	4.107	3.424
Estimated Critical value for GINI	0.292	0.275	0.316
Mean GINI	0.299	0.283	0.313

The results indicate that the increase in income inequality has a negative and statistically significant impact on global poverty and inequality in the region.

Also, we remark that, for all three panels, the critical values for LRPT are situated inside the corresponding data intervals.

4. Conclusions

Although in the period 2006-2017 there was generally a slight decrease in the overall income inequality among Panel-2 countries, it is obvious that the income inequality in Panel-2 is higher than that of the Panel-EU28 and Panel-1 (where the smaller gaps between wealthy and poor income are noticed). Reducing income inequality at EU level indicates that the income gap between people living in developed and developing countries is decreasing. Countries with low income inequality indicators also have the poverty threshold above the European average, and countries with high income inequality indicators also have a very low poverty threshold.

We have found that the estimated empirical coefficients of GINI are positive, and those of the RPT variable are negative. This means, as expected, that the increase in GINI increases the poverty line in the long run and thus stagnates strongly the process of poverty eradication.

The level of EU states poverty continues to remain a big issue, being closely linked to income inequality (with the highest GINI index and the lowest poverty threshold).

Using panel cointegration techniques, we investigated whether the Kuznetz curve hypothesis is satisfied for the relationship between the income inequality index and the poverty threshold. The quadratic model we have used shows that, at EU level, the risk of poverty threshold has

the same type of influence on income inequality as for the rich countries in panel 1, while for the emerging countries in panel 2 the influences are opposite.
At EU level, the influence of RPT on income inequality is strongly determined by developed countries.
According to the study, we can say that the goal set by the EU 2020 strategy, which is anti-poverty, can't (or would be difficult to) be achieved, because the income inequality in the period 2006-2017 has constantly grown in more than half of the EU member states (16 states). From a political point of view, it is very important for each country to adopt the best measures to mitigate inequality in order ultimately to support the reduction of poverty among the population.

References

[1] European Commission. Europe 2020 strategy. https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/european-semester/framework/europe-2020-strategy_en
[2] Z. Darvas, "Why is it So Hard to Reach the EU's Poverty Target?" Social Indicators Research, 1-25, 2018, Available: https://doi.org/10.1007/s11205-018-1872-9.
[3] A.K. Fosu, "Inequality and the growth–poverty nexus: specification empirics using African data", Applied Economics Letters, vol.15, no.7, pp.563-566, 2008, Available: https://doi.org/10.1080/13504850600706669
[4] S. Chang, R. Gupta and S.M. Miller, "Causality Between Per Capita Real GDP and Income Inequality in the U.S.: Evidence from a Wavelet Analysis", Social Indicators Research, vol. 135, no.1, pp. 269–289, 2018, Available: https://doi.org/10.1007/s11205-017-1792-0.
[5] A. Laurinavičius and B. Galinienė, "Asset-Based Approach to Poverty Reduction in Lithuania", Technological and Economic Development of Economy, vol.19, no.2, pp. 203–223, 2013, Available: https://doi.org/10.3846/20294913.2013.796609.
[6] A. Mihi-Ramírez, V. Kumpikaitė-Valiūnienė and E. Cuenca-García, "An Inclusive Analysis of Determinants of International Migration. The Case of European Rich and Poor Countries", Technological and Economic Development of Economy, vol. 23, no.4, pp. 608–626, 2017, Available: https://doi.org/10.3846/20294913.2017.1306726.
[7] L. Chemli and M. Smida, "Interaction between Poverty, Growth, and Inequality during the Crisis: A Panel Data Study", International Journal of Economics and Finance, vol.5, no.5, pp.120-130, 2013, Available: http://dx.doi.org/10.5539/ijef.v5n5p120.
[8] F. Bourguignon, "The Poverty-Growth-Inequality Triangle". Conference on Poverty, Inequality and Growth in Paris on November 13, 2003.
[9] I. Marx, B. Nolan and J. Olivera, "The welfare state and antipoverty policy in rich countries", Handbook of income distribution 2, 2015, Available: http://www.sciencedirect.com/science/article/pii/B9780444594297000248
[10] G. Soava, A. Mehedintu and M. Sterpu, "Relations between income inequality, economic growth and poverty threshold: new evidences from EU Countries Panels", submitted at Technological and Economic Development of Economy, 2018.
[11] Eurostat Database, 2018. Available: https://ec.europa.eu/eurostat/data/database (accessed 5 November 2018).