INCOME INEQUALITY AND ECONOMIC DEVELOPMENT IN THE EUROPEAN UNION: IS THE KUZNETS CURVE VALID?

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ABSTRACT: *The aim of the present paper is to test the Kuznets hypothesis, regarding the quadratic dependence of income inequality (Gini index) on the economic development (Gross Domestic Product per capita) in the European Union. Using data from World Income Inequality Database (WIID) and World Bank in a panel data approach, the findings show that the Kuznets curve is validated in the panel of 25 European Union countries, but the results are not maintained in different countries groups. When Gini index is positively correlated with GDP per capita, the Kuznets hypothesis is validated but in the group of countries with a negative correlation between these variables, the hypothesis is not valid. Also, in the countries with higher income inequality (above the EU's average) the hypothesis is valid, while in countries with lower income inequality (under the EU's average), this is not the case. The findings are valuable for policy makers in order to conceive public measures, differentiated by the level of income inequality.*

Key words: *economic development, income distribution, Kuznets Curve, European Union*

JEL Classification: *O11, O15, O52*

1. INTRODUCTION

Income inequality has become a concern in all countries of the world, due to its increasing trend in recent decades. This has influenced not only economies with a history of relatively high inequality, but also countries where traditionally there has been low inequality. International organizations, researchers and world leaders around the globe recognize the threat that inequality poses to the prosperity of nations. In general, an unequal distribution of any kind of resources, for example income or wealth, is associated with lower confidence, lower life and/or work satisfaction, lower happiness, leading in turn to lower growth. However, despite governments seeking to address inequality of all kinds, the problem is still persistent in both developed and developing countries.

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Income inequality raised in almost of the European Union countries in the period of 1990 -2022 (WIID, 2023). The highest growth is registered in Bulgaria (14.48 percentage points), followed by Romania (10.09 percentage points). The average level of the Gini Index increased from 28.46% in 1990 to 30.86% in 2022. Above the average EU level of the income inequality (for the period of 1990-2022)

The European Union is committed to reducing economic, social, political and environmental inequality by 2030, which is Goal 10 under the 17 Sustainable Development Goals set out in the United Nations 2030 Agenda (United Nations, 2015). The main directions for action at European level concern: increasing inclusion, decent work and income growth, improving social services and access to social protection, creating opportunities for women, young people and disadvantaged communities, pro-poor fiscal policies and transparent and fair tax systems, stimulating private sector development in the economy.

The considerations for placing income inequality at the centre of the European Union's social policies are the following: (1) *from a moral perspective* - inequality can be seen from the perspective of the Universal Declaration of Human Rights; thus, it is morally wrong that a wide gap persists between rich and poor, between those in the centre and those on the margins, the moral and political duty of governments is to ensure that every individual has equal access to opportunities; (2) *from a poverty perspective* - inequality is an obstacle to poverty elimination: 'less' inequality means that the benefits of economic growth reach the poorest members of society; conversely, when resources are unequally distributed in the economy, investment favours the rich and the benefits of economic growth are harder to reach the poor and marginalized communities; (3) *from an efficiency perspective* - policy interventions often face trade-offs between efficiency and equity. However, several studies show that even if some policy measures favour the already wealthy on the one hand, the distribution of firms and communities that perform better economically is more equitable on the other hand; (4) *from the Kuznets perspective* – of the economist Simon Kuznets (1955), who sees inequality as an inevitable part of the development process. In the early stages of development inequality is expected to increase and then, over time, to decrease; Kuznets predicted that inequality would decrease in rich societies, but he was contradicted by reality, as recent changes in the labour market and new technologies have generated a new wave of inequality that seems to be difficult to manage; (5) *from a 'political economy' perspective* - inequality is a barrier to economic growth and a 'poison' for democracy; resources are captured by elites, leading to market and government failure; rising inequality implies social instability and threatens what economists call 'social capital' or the ability of communities to share common values and coordinate local action to improve their lives; inequality also undermines public trust in governments and politicians in general (European Commission, 2022).

Literature focused on the relationship between the income inequality and economic growth is extremely extensive, and somewhat inconclusive, being a debate that is far from settled. First of all, the basic studies of Lewis (1954), Kuznets (1955) and Kaldor (1956) suggest that income inequality is, mainly, determined by the level of economic development. They analysed how the economic development influences the income distribution on the long term, by demonstrating the growth potential of the income inequality in the first stages of the economic development and after, a decreasing effect in the further stages (the U-inversed hypothesis). The neoclassical growth model provides the theoretical basis on which Kuznets and his followers built their model.

The economist Simon Kuznets, winner of the 1971 Nobel Prize in economics, developed the hypothesis regarding how income inequality is affected by economic growth. According to his hypothesis (Kuznets, 1955), the relationship between income inequality and economic growth has the form of an inverted U-curve. Thus, in the initial stages of economic development (the pre-industrialization stage) income inequality increases up to a maximum

corresponding to a threshold of economic development. When the threshold is exceeded, income inequality starts to decrease, so that the unequal distribution of income in the economy improves as a result of public policy measures in the industrialization and post-industrialization stage.

The aim of the present paper is to test the Kuznets hypothesis, regarding the quadratic dependence of income inequality (Gini index) on the economic development (Gross Domestic Product per capita) in the European Union. Using data from World Income Inequality Database (WIID) and World Bank in a panel data approach, the findings show that the Kuznets curve is validated in the panel of 25 European Union countries, but the results are not maintained in different countries groups. When Gini index is positively correlated with GDP per capita, the Kuznets hypothesis is validated but in the group of countries with a negative correlation between these variables, the hypothesis is not valid. Also, in the countries with higher income inequality (above the EU's average) the hypothesis is valid, while in countries with lower income inequality (under the EU's average), this is not the case. The findings are valuable for policy makers in order to conceive public measures, meant to reduce inequality in income distribution, differentiated by the level of income inequality.

The article is structured as follows. After a brief literature review, data and methodology are described. This is followed by a section outlining the main findings, and finally, conclusions are presented.

2. THE KUZNETS HYPOTHESIS: A SHORT LITERATURE REVIEW

A plethora of empirical studies have focused on investigating the existence of the Kuznets curve, using both panel and cross-sectional data. However, the results are not uniform, some support the hypothesis and others contradict it.

For example, Paukert (1973) confirmed Kuznets' hypothesis on the basis of data from 56 countries, 40 of which were developing countries, concluding that income inequality increases in countries with low levels of GDP per capita and decreases in those with high levels of GDP per capita.

Ahluwalia (1976) concluded the same for a sample of 60 countries. Later, two other studies (Anand and Kanbur, 1993; Deininger and Squire, 1998) could not provide complete information to support the validation of the Kuznets hypothesis. Similar conclusions were reported by Ram (1997) as well as Bruno et al. (1996).

A group of studies have shown the link between the Gini coefficient and real GDP per capita in the form of an inverted U-curve, as hypothesized by Kuznets (Nielsen et al., 1995; Forbes, 2000; Barro, 2000; Thornton, 2001; Bhandari et al., 2010).

Kiatrungwilaikun and Suriya (2015) conclude that the relationship between economic growth and income inequality is in the form of a U-shaped curve for a panel dataset of 91 countries thus invalidating the Kuznets hypothesis. Jovanovic (2018) also found that the Kuznets curve is not valid for a sample of 26 former socialist countries from the former Eastern Bloc. Kavya and Shijin (2020) could not identify a valid inverted U-curve relationship for a panel of countries including 28 high-income, 41 middle-income and 16 low-income countries. Similar results are reported by Erauskin and Turnovsky (2022) for a panel dataset including 80 countries.

Recently, in their study of Canadian provinces, Breau and Lee (2023) identified an S-shaped curve between economic growth and income inequality. In the initial stages of development of the provinces, the inverted U-shaped Kuznets curve is confirmed, but as one moves to higher levels of development, the curve has transformed into a U-shaped one, resulting in an overall S-shaped graphical representation.

The Kuznets curve hypothesis is less studied in the European Union economies, the present study intending to fill this gap.

3. METHODOLOGY AND DATA

Given the aim of the present study to analyse the Kuznets Curve hypothesis regarding the dependence of income inequality on the development level, the panel data approach is used with based on time series on the European Union economies, for the period of 1996-2022. Malta and Cyprus were excluded due to incomplete data series. Income inequality is expressed by the Gini index, its values have been extracted from the World Inequality Income Database (WIID). The Gini index is calculated in this database taking into account annual household disposable income. Gross Domestic Product per capita data series are extracted from the World Bank database for the same period.

The model used in our study is as follows:

$$\text{Gini=f } (GDP_{pc}, GDP_{pc}^2) \quad (1)$$

where: Gini is the income inequality index, and GDPpc is Gross Domestic Product per capita.

In order to mitigate the multicollinearity between variables and to avoid heteroscedasticity of errors in the regression equations, the model variables will be converted to natural logarithms.

The methodological strategy will consist of the following steps:

- descriptive analysis of the variables included in the study;
-verification of the stationarity of the time series, with Levin, Lin &Chu (LLC, 2002);
-estimating the econometric models using the Least Squares method, in the two variants (with fixed effects and with random effects);
-applying the Hausman test to select the appropriate model;
-interpretation and discussion of the estimation results of the selected model;
-applying the Dumitrescu-Hurlin (2012) test to identify causality relationships between variables.

The model 1 is translated into the regression equation below:

$$lnGini_{i,t} = \propto + \beta_1 \cdot lnGDPpc_{i,t} + \beta_2 \cdot (lnGDPpc)_{i,t}^2 + \epsilon_{i,t} \quad (2)$$

where: *i* stands for section (country), *t* stands for time, β_1,β_2 are regression parameters, and $\varepsilon_{i,t}$ e is the error.

In order to confirm the Kuznets hypothesis, it is expected that β_2 has a negative value.

The variables considered for the study are detailed in the Table 1.

Table 1 The study's variables

Variable	Name	Description	Source
Gini	Gini index	The Gini index is an expression of the distribution of the population by disposable income per equivalent adult. It takes values between 0 and 100.	World Database on Income Inequality (The World Income Inequality Database - WIID)

Variable	Name	Description	Source
GDPpc	Gross Domestic Product per capita	Gross Domestic Product per capita is a macroeconomic indicator that reflects the sum of the market value of all goods and services for final consumption produced in all branches of the economy within a country in a given year, relative to the number of inhabitants. Unit of measure: Purchasing Power Parity (PPP), international $, 2017 constant	World Bank

Source: World Income Inequality Database (WIID), World Bank

The descriptive statistics of the variables displayed in Table 2 shows that the standard deviation is relatively small, between 3% and 16% of their maximum, suggesting dynamics without large deviations from the mean.

Table 2. Descriptive statistics of variables

	lnGini	*lnPIBpc*	$(lnPIBpc)^2$
Mean	3.3669	10.4237	108.8721
Median	3.3655	10.4596	109.4048
Maximum	3.6558	11.7006	136.9048
Minimum	3.0864	9.2062	84.7549
Standard deviation	0.1223	0.4666	9.7221
Skewness	-0.0119	-0.0578	0.1055
Kurtosis	1.9739	3.4096	3.5328

Source: data processing with EViews 12.0

4. MAIN FINDINGS

The application of the Levin, Lin & Chu test (Table 3) shows that, for all three variables, the Prob value is less than 0.05 (the chosen significance level), thus rejecting the null hypothesis of a unit root, and concluding that the data series are stationary, at their first level.

Table 3. Results of the variable stationarity test (LLC)

Variable	Statistics	Prob. value	Observations
lnGini	-2.17149	0.0149	The series is stationary
lnGDPc	-3.14200	0.0008	The series is stationary
$(lnGDPpc)^2$	-2.76655	0.0028	The series is stationary

Source: data processing with EViews 12.0

As a result of Hausman test we selected the random effects model as appropriate.

Table 4 Estimation of equation 2

Dependent variable *lnGini*
Method: Panel EGLS cross-section random effects
Sample: 1996-2022

Variable	Coefficient	Standard Error	t-statistic	Prob.
lnGDPpc	1.09354	0.2235	4.8613	0.0000
$lnGDPpc)^2$	-0.05615	0.0119	-4.9685	0.0000
C	-1.84624	1.1852	-1.8203	0.0692
R squared	0.09463			
F-statistic	2.4093			
Prob (F-statistic)	0.0001			

Source: data processing with EViews 12.0

Thus, the equation obtained is:

$$lnGini = -1.8462 + 1.09354 * lnGDPpc - 0.05615 * lnGDPpc^2$$

The equation reveals the quadratic dependence of the income inequality index on the level of GDP per capita. The Prob values for the coefficients *lnPIBpc* and $lnPIBpc^2$ are less than 0.05, and the free term (-1.8464), the Prob value is less than 0.1. Thus, for a significance level of 0.1, the coefficients of the regression parameters are statistically validated. Also, the model is statistically validated for a significance threshold of 0.01 (Prob F-statistic=0.0001).

In order to check the stability of the estimated model, we identified the type of distribution of the errors series as well as their stationarity. By applying the Jarque-Bera test we found a normal distribution of errors. The LLC test for the residuals concluded their stationarity.

In order to test the robustness of the obtained results, the regression equation 2 will be estimated for two types of EU countries groups, as follows: a) three sub-groups of countries, according to the values of the correlation coefficient between the Gini index and GDP per capita data series; b) two sub-groups of countries, according to the level of the Gini index of each country compared to the EU average.

We calculated the correlation coefficient between GDPpc and the Gini coefficient for each country over the period considered (1996-2022). Thus, we divided the panel of 25 European countries into three sub-panels: 1) countries with a high positive correlation between GDPpc and Gini (greater than 0.5); 2) countries for which this correlation is lower and 3) countries for which the correlation is negative. The first group includes: Austria, Bulgaria, Germany, Denmark, Finland, France, Lithuania, Luxembourg, Latvia, the Netherlands, Romania, Slovenia, Sweden, and the Netherlands. In the second group are: Belgium, Spain, Croatia, Hungary, and Poland. The third group includes: the Czech Republic, Estonia, Greece, Ireland, Italy, Portugal, Slovakia, and Spain.

For each of them we estimated the regression equation 2 and selected the appropriate model according to the results of the Hausman test.

Table 5 Estimation results of equation 2, by three groups of countries, according to the correlation between the Gini index and GDP per capita

Group 1: strong and positive correlation between Gini and GDP per capita
Dependent variable *lnGini*
Method: Panel Least Squares fixed effects
Sample: 1996-2022

Variable	Coefficient	Standard Error	t-statistic	Prob.
lnGDPpc	1.411283	0.38226	3.6918	0.0003
$lnGDPpc)^2$	-0.07199	0.01986	-3.6246	0.0003
C	-3.43694	1.18231	-1.8852	0.0603
R squared	0.90563			
F-statistic	74.3746			
Prob (F-statistic)	0.0000			

Group 2: weak and positive correlation between Gini and GDP per capita
Dependent variable *lnGini*
Method: Panel Least Squares random effects
Sample: 1996-2022

Variable	Coefficient	Standard Error	t-statistic	Prob.
lnGDPpc	2.919397	0.780967	3.73818	0.0003
$lnGDPpc)^2$	-0.15106	0.038505	-3.92317	0.0003
C	-10.58193	3.95867	-2.67309	0.0088
R squared	0.8636			
F-statistic	20.1926			
Prob (F-statistic)	0.0000			

Group 3: negative correlation between Gini and GDP per capita
Dependent variable *lnGini*
Method: Panel Least Squares fixed effects
Sample: 1996-2022

Variable	Coefficient	Standard Error	t-statistic	Prob.
lnGDPpc	0.09390	0.278421	0.337276	0.7364
$lnGDPpc)^2$	-0.0089	0.013362	-0.673176	0.5018
C	3.45844	1.454843	2.67309	0.0187
R squared	0.9533			
F-statistic	92.460			
Prob (F-statistic)	0.0000			

Source: data processing using EViews 12.0

For the first two groups of countries (for which the correlation coefficient between the Gini index and GDP per capita is positive) the Kuznets curve is validated, the coefficient for $(lnPIBpc)^2$ (lnPIBpc sq) is negative and the value of Prob for all estimated coefficients is less than 0.1. Thus, for a 1% significance level the models are statistically valid. Also, the Prob value associated with the F-statistic is 0.000, which indicates model validity. For the third group of countries for which the correlation between the Gini index and GDP per capita is negative, the Prob. value of the estimated coefficients being greater than 0.1 (the chosen significance threshold), the Kuznets curve is not validated.

The group of countries with a Gini index above the EU average includes: Bulgaria, Spain, Estonia, France, Greece, Ireland, Italy, Lithuania, Latvia, Poland, Portugal and

Romania, while the other group (with a Gini index under the EU average) includes: Austria, Belgium, Czech Republic, Germany, Denmark, Finland, Croatia, Hungary, Luxembourg, the Netherlands, Slovakia, Slovenia, Spain, Sweden, the Czech Republic, Finland, Hungary, Luxembourg, the Netherlands, Slovakia and Slovenia.

Table 6 Estimation of equation 2, in two groups of countries

Group 1: Gini index above the EU's average
Dependent variable *lnGini*
Method: Panel Least Squares fixed effects
Sample: 1996-2022

Variable	Coefficient	Standard Error	t-statistic	Prob.
lnGDPpc	2.63176	0.203064	12.96027	0.0000
$lnGDPpc)^2$	-0.127983	0.0110176	-12.57633	0.0000
C	-10.03554	1.014244	-9.894511	0.0000
R squared	0.7920			
F-statistic	29.10672			
Prob (F-statistic)	0.0000			

Group 2: Gini index under the EU's average
Dependent variable *lnGini*
Method: Panel Least Squares random effects
Sample: 1996-2022

Variable	Coefficient	Standard Error	t-statistic	Prob.
lnGDPpc	-1.919753	0.287173	-6.68500	0.0000
$lnGDPpc)^2$	0.085953	0.014271	6.02277	0.0000
C	13.94030	1.446145	9.639631	0.0000
R squared	0.5307			
F-statistic	12.9864			
Prob (F-statistic)	0.0000			

Source: data processing with EViews 12.0 software

According to the results shown in Table 6, the Kuznets curve hypothesis is valid only in the group of countries with a level of income inequality above the EU's average. In countries with a Gini index below the EU's average, the Kuznets hypothesis is not confirmed, the coefficient of the GDP per capita has a negative value, the quadratic dependence between the Gini index and GDP per capita being U-shaped. Income inequality decreases as GDP per capita increases, until the Gini index reaches a minimum level. After this minimum of the Gini index, increasing GDP per capita leads to increasing income inequality levels.

Table 7 Causal relationships between variables (Dumitrescu-Hurlin test)

Pairwise Dumitrescu Hurlin Panel Causality Tests
Sample: 1996 2022
Lags: 2

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
LNPIBPC does not homogeneously cause LNGINI	7.36075	10.3411	0.0000
LNGINI does not homogeneously cause LNPIBPC	1.55526	-1.34223	0.1795

Source: data processing with Eviews 12.0

As we notice in Table 7, the causality relationship between GDP per capita and the Gini index is validated for a significance level of 0.01, directed from GDP per capita to the Gini index, with a time lag of 2 years.

5. CONCLUSIONS

We validated the Kuznets hypothesis, meaning the dependence of income inequality on the dynamics of GDP per capita, in a panel of 25 European Union countries, for the period of 1996 to 2022. Income inequality increases as GDP per capita increases, until GDP per capita reaches a value from which the dynamics of income inequality reverses, i.e. income inequality begins to decrease, as GDP per capita further increases. This turning point reflects the situation when the level of development of the economy supports the existence of the necessary means (policies, norms and institutions) to prevent the increase of inequality in the distribution of income. For the 25 EU countries panel data, the turning point corresponds to the value of lnGDPpc= 9.74, respectively to a value of 16983.4 USD.

Analysing the robustness of the results, we discuss two aspects: (i) if the results are maintained when we divide the panel of the 25 EU countries into groups based on the correlations between Gini index and GDP per capita, and (ii) when we split the panel into groups according to the level of Gini index (above /under the EU's average).

In the first situation, when the Gini index is negatively correlated with GDPpc, the Kuznets hypothesis is not validated. In the countries with a positive correlation between the two variables, the findings are nuanced. When the correlation is strong and positive, the turning point is reached later (within the economic development process) than in the panel of the 25 EU countries. When the correlation is positive and moderate, the turning point is earlier reached as in the 25 EU panel and previous group. Thus, the weaker positive correlation between income inequality and economic growth, the faster the level of economic development is reached at which income inequality starts to fall.

In the second situation, of grouping countries according to level of the Gini index, we found that in the group of countries with a Gini index above the EU's average, the maximum level of income inequality is reached for lnGDPpc=10.95. This turning point corresponds to a higher level of development compared ti the panel of 25 EU countries, suggesting that these countries need to reach a higher threshold in economic development, where they have the required capacity to act for reducing the inequality of income distribution in the economy. Countries with high income inequality are those with development levels under the EU' average. In this respect, the results of our study are in line with the studies of Bhandari et al. (2010). In countries with income inequality under the EU's level, high-income countries, the

inverted Kuznets Curve is validated. This result is similar to Kiatrungwilaikun &Suriya (2015), and Erauskin & Turnovsky (2022), and is in line with that Breu and Lee (2023) had found for the Canadian provinces, namely that in the early stages of development, the Kuznets curve hypothesis was validated, and then, at higher levels of development the curve reverses. Finally, it should be noted that in both groups of countries, as Lyubimov (2017) and Thomas Piketty (2014) emphasize, the solution to reduce income inequality consists of appropriate fiscal and redistributive policies.

The identified causal relationship, where the evolution of GDP per capita is the cause of the change in the Gini index, with a time lag of two years, suggests that the process of economic growth induces changes in income inequality, the effects manifesting with a delay of two years.

The study's results must be placed in the European context of social and cohesion policies, specifically regarding the inequality of income distribution in the European Union. The persistence of income inequality jeopardizes the economic growth, can lead to social conflict, reduced participation of citizens in the public life, reduced trust in public institutions and policies, and extension of social exclusion. The concept of inclusive growth is at heart of the EU policy on income inequality and its decrease is a clear priority. Employment incentive policies need to be further developed, in order to support the level of GDP per capita, effective labour market institutions and measures targeting low and very low-income groups and workers. Much more effective tax and redistributive policies are required in order to reduce income inequality, with a particular focus on pre-distributive and less on the redistributive side.

The paper's findings highlighting the invalidation of the Kuznets Curve hypothesis in countries with lower income inequality suggest the public policies targeted on reducing income inequality must be tailored on the specific economic and social context of a country, and also framed in the European Union social and cohesion policies. Moreover, the increase in income inequality cannot be seen only as a result of economic growth, as it was predicted by Kuznets (1955), the complexity of other factors that can influence inequality, such as: investment in the economy, government spending, institutional and public policy factors, equal access to opportunities, population growth, urbanization, financial development, trade openness or globalization.

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