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INCOME INEQUALITY AND ECONOMIC GROWTH AT THE EUROPEAN UNION

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Abstract

Economic growth has several determinants, however, there is little research on the effect of income inequality on economic growth. In the case of the European Union, there are countries with different varieties of capitalism, which leads a significant variation in the levels of inequality between countries. The paper aims to estimate the effect of income inequality on the economic growth of the Member States of the European Union, considering different types of income inequality: Gini index, top 1% share and top 10% share. We used a dynamic and static panel that models which measure the effect of inequality on the economic growth of the Member States of the European Union. The results show that the type of inequality variable affects the relationship between the income inequality and economic growth, in addition to the fact that the indicators that measure income inequality have a negative and positive impact on the economic growth on the Member States of the European Union.

Keywords: Inequality, economic growth, European Union

1. INTRODUCTION

Several studies show that inequality has been increasing in recent decades in the European Union member states (Piketty, 2014). Although compared to other regions of the planet, Europe does not show high income inequality, the rises in recent years put at the center of the discussion what to do to reduce inequality. On the other hand, the economic growth of the European Union member states has not been high in recent decades, which coincides with the rise in inequality in the European continent. The foregoing makes it clear that income inequality could have had an impact on the low economic growth of the region. Additionally, the great recession of 2009 and the economic effects of the COVID19 pandemic have had considerable effects both in the decline in economic activity and in the increase in income inequality.

The relationship between inequality and economic growth is complex, because there can be bi-directionality in the previous relationship: economic growth can affect inequality, but inequality can also affect economic growth. This shows that it is important to consider endogeneity in estimating the relationship of the above variables.

The paper aims to estimate the effect of inequality on economic growth. A priori, and following Stiglitz (2013), the effect of inequality should be negative on economic growth, but

studies that quantify this relationship find mixed results, that is, some show negative relationships and others positive ones, which depend on the income level of countries.

The argument of the paper is that inequality has a negative effect on the economic growth of the countries of the European Union, however, the effect may vary depending on the variable that is used as inequality, because the results of the Gini index do not necessarily coincide with the results given by top 1% share and top 10% share.

The text has two original contributions: (i) the top 1% share and top 10% share are used as an inequality variable, and these indicators were not available until a few years ago. The use of these variables is based on the analysis of Pikety (2014); (ii) The relationship between inequality and GDP per capita in the European Union is estimated in the period after the great recession and before the COVID19 pandemic, a period between crises.

After the introduction, the text includes a review of the literature: it focuses on the relationship between inequality and economic growth. Subsequently, the methodology is included: a static panel and a dynamic one. Next section shows the results obtained, and finally, the discussion and conclusion are included.

2. LITERATURE REVIEW

The relationship between income inequality and economic growth has been studied from two perspectives: (i) Some studies focus on the effect of economic growth on inequality; (ii) while others focus on the effect of the income gap on the economic growth.

2.1. Effect of income inequality on economic growth

Kuznets (1955) showed income inequality and economic development capita have an inverted U-shaped relationship. He used the Gini index as a measure of income inequality and economic growth as a proxy for economic development. When the economy begins to grow, wage differentials among sectors increase, because sectors with greater dynamism pay higher wages than traditional sectors, which increases wage inequality up to a maximum point, from there economic growth starts to have a negative impact on inequality. Piketty (2014) criticized the U-inverted shape of the relationship between GDP per capita and income inequality, due to such estimation was elaborated for inter-wars period, so the drop in inequality was due to external factor, in this case, the wars destroyed a lot of capital. Milanovich (2016) highlights that the relationship between inequality and economic growth does not take an inverted U-shape, but rather this relationship is more similar to cycles, which Milanovich called Kuznets cycles. Such cycles depend on technological revolutions: the first revolution was at the end of XIX and beginning of XX century, and the second one started at the 1980's.

There have been several empirical estimations of the Kuznets curve. Some studies find the U-inverted shape (Huynh, 2022; Tung, 2022; Le, Nguyen, Su, & Tran-Nam, 2020), while others show that there is no such relationship (Ravallion & Chen, 2022; Maneejuk, Yamaka., & Sriboonchitta, 2021).

2.2. Effect of income economic growth on inequality

Income inequality has multiple determinants (Acemoglu, Aghion & Violante, 2001; Stiglitz, 2013; Piketty, 2014). According to Acemoglu, Aghion & Violante (2001), technical change causes a deunionization and increases the wage gap, due to the fact that high-skilled workers will leave labor unions and will receive higher wages relative to less skilled or unskilled workers. Stiglitz (2013) pointed out inequality is due to rent seekers, who are people from higher percentiles that use institutions to promote laws which make markets less competitive, in addition to a lax

application of competition laws. Piketty (2014) highlighted income inequality has increased since the 1980s because the profit rate has been higher than economic growth during the same period, this is because the economic growth has been low.

Papers that quantify the effect of inequality on economic growth can be divided into two groups: (i) the first group finds that inequality has a negative impact on economic growth, and such relationship is found mainly in countries with low per capita income (Barro, 2000; Castelló-Climent, 2010; Halter, Oechslin & Zwemuller, 2014) ; (ii) the second group finds a positive relationship between income inequality and economic growth, which occurs among countries with high per capita income (Forbes, 2000; Barro, 2000; Castelló-Climent, 2010; Halter, Oechslin & Zwemuller, 2014). Other studies include countries with different level of per capita income find inequality negatively affects GDP per capita (Cingano, 2014; Berg et al, 2018).

Most of the recent studies use dynamic panel data models correcting for endogeneity, due to the bi-directional relationship between GDP per capita and income inequality. Besides, such studies use the following inequality variables: Gini index, the ratios 90/75, 50/10, top inequality and bottom inequality.

3. METHODOLOGY

3.1. Data and methodology

The paper aims to quantify the effect of income inequality on economic growth in the European Union member states. Two time periods were used. The first is a series running from 2000 to 2019, while the second is a shorter series running from 2010 to 2018. The first series captures the effects of the 2009 Great Recession, while the second series does not fully capture the effects of that recession. Longitudinal data with different time periods were used. We use a balanced panel with the 27 countries of the European Union.

Table 1 shows the databases of the series that were used. For GDP per capita from the World Economic Outlook of the International Monetary Fund was used. For the top 1% share and top 10% share from the World Inequality Data Base was used, while for the Gini index the Standardized World Income Inequality Data Base, and for the Human capital and Capital stock variables from the Penn World Table was used.

Table 1 Variables, periods and data bases

Variable	Periods	Data base	Definition
Gross domestic product (GDP)	-2000-2019 -2010-2018	World Economic Outlook (WEO), International Monetary Fund (April, 2023)	Gross domestic product, constant prices (national currency).
Top 10% share	-2000-2019 -2010-2018	World Inequality Data Base	Top 10% national income share
Top 1% share	-2000-2019 -2010-2018	World Inequality Data Base	Top 1% national income share
Gini index	-2010-2018	The Standardized World Income Inequality Database	Gini index (1-100): index of income inequality
Human capital index (hc)	-2000-2019 -2010-2018	Penn World Table version 10.01	Human capital index, based on years of schooling and returns to education.
Capital stock (cs)	-2000-2020 -2010-2018	Penn World Table version 10.01	Capital stock at current PPPs (2017, US$).

The independent variable was the Gross Domestic Product per capita at constant prices. As independent inequality variables we use: (i) top 1% share, (ii) top 10 % share and (iii) the Gini index. Additionally, the Human capital index and the Capital stock were used as control variables.

3.2. Econometric model

Two types of models were applied to measure the effect of inequality on GDP per capita: the first was a static panel data model, estimated by fixed effects which the individual effects are related to the independent variables, the endogeneity isnot considered; the second is a dynamic model, where endogeneity is corrected. The methodology for the dynamic model was Arellano-Bond.

Two time periods were used. In the first, 2000-2019, a static panel data models were estimated, while in the second, 2010-2018, a static and dynamic panel data models were considered.

In the first period of time, top 1% share and top 10% share were used as inequality variables. This was done because in most of the studies analyzed the Gini index is used, since top 1% share and top 10% share are, relatively, of more recent use for a greater number of countries. In the second period of time, the three aforementioned variables were used as income inequality variables, with the aim of analyzing the effects on GDP per capita in dynamic and static models.

With the pane data, the following model was run.

$$Y_{it} = \mu_{it} + X_{it}\beta_{it} + u_{it}... \quad (1)$$

The use of the panel data model allows capturing the heterogeneity of time and cross section. The model seeks to estimate the effect of inequality on GDP per capita.

There is literature that analyzes this effect. In addition, control variables (human capital and capital stock), that have already been analyzed in the literature. We included.2 models:

$$GDPpc_{it} = \beta_0 + \beta_1 1Y + \beta_2 hc + \beta_3 nc + \mu_{it}... \quad (2)$$

$$GDPpc_{it} = \beta_0 + \beta_1 10Y + \beta_2 hc + \beta_3 nc + \mu_{it}... \quad (3)$$

Where:

GDPpc: Gross Domestic Product per capita

1Y: Top 1% share

10Y: Top 10% share

Hc: Human capital index

Cs: Capital stock

μ: error term

Models 2 and 3 were run with fixed effects, due to Hausman test. The natural logarithm was applied to variables in models 2 and 3. With the data panel from 2010 to 2018, it was possible to run both static and dynamic models.

The following models were run (static panel):

$$GDPpc_{it} = \beta_0 + \beta_1 1Y + \beta_2 hc + \beta_3 nc + \mu_{it}... \quad (4)$$

$$GDPpc_{it} = \beta_0 + \beta_1 10Y + \beta_2 hc + \beta_3 nc + \mu_{it}... \quad (5)$$

$$GDPpc_{it} = \beta_0 + \beta_1 Gini + \beta_2 hc + \beta_3 nc + \mu_{it}... \quad (6)$$

Models 4, 5, and 6 were run with fixed effects, due to Hausman test. The natural logarithm was applied to the variables.

Dynamic models were used, since they allow us to correct the possible endogeneity that exists in the model. We start from an empirical model similar to those that explain economic growth, through an economic convergence equation:

$$GDPpc_{i,t} - GDPpc_{i,t-1} = \alpha GDPpc_{i,t-1} + \beta_1 Ine_{i,t} + \beta_2 X_{i,t} + \epsilon_{i,t}... \quad (7)$$

Equation (7) was transformed as follows:

$$GDPpc_{i,t} = (1+\alpha)GDPpc_{i,t-1} + \beta_1 Ine_{i,t-1} + \beta_2 X_{i,t-1} + \epsilon_{i,t}... \quad (8)$$

From equation (8), three dynamic models were run with the Arellano-Bond methodology, with the objective of correcting the existing endogeneity and the natural logarithm was applied.

$$GDPpc_{it} = (1+\alpha)GDPpc_{it-1} + \beta_1 1Y + \beta_2 hc + \beta_3 nc + \mu_{it}... \quad (9)$$

$$GDPpc_{it} = (1+\alpha)GDPpc_{it-1} + \beta_1 10Y + \beta_2 hc + \beta_3 nc + \mu_{it}... \quad (10)$$

$$GDPpc_{it} = (1+\alpha)GDPpc_{it-1} + \beta_1 Gini + \beta_2 hc + \beta_3 nc + \mu_{it}... \quad (11)$$

Where:

GDPpc: Gross Domestic Product per capita

$GDPpc_{it-1}$: Gross Domestic Product per capita, lagged one period

1Y: Top 1% share income

10Y: Top 10% share income

hc: Human capital index

Cs: Capital stock

μ: error term

4. RESULTS

The table 2 shows the statistics summary of the variables. The values of the Gini index goes from 20.9 (Slovak Republic) to 41.3 (Bulgaria) which means a high rank, and also high variability (Standard Deviation: 3.97). Top 1% share goes from 0.11(Netherlands) to 0.19 (Bulgaria). The top 10% share has high rank, which goes from 0.27 (Slovak Republic) to 0.44 (Bulgaria) and the GDP per capita ranks from 5,080 (Bulgaria) to 84,750 (Luxembourg) with a high standard deviation. The Human capital index ranks from 2.36 (Portugal) to 3.82 (Slovak Republic) with low variability and Capital stock has a lot of variability.

Table 2 Statistics summary

Variable	Obs	Mean	Std Dev.	Min.	Max.
Gini	238	30.38	3.97	20.9	41.3
Top 1% share	243	0.11	0.02	0.06	0.19
Top 10% share	243	0.34	0.03	0.27	0.44
GDP per capita	243	25,132	16,662	5,080	84,750
Human capital index	243	3.24	0.28	2.36	3.82
Capital stock	243	3.74e+06	5.67e+06	46240	2.07e+07

Table 3 shows the results of models (2) and (3), which quantify the effect of inequality on GDP per capita. Top 1% share and top 10% share income were used as inequality variables. These variables have rarely been used in the literature, because they have been elaborated more recently, unlike the Gini index, which has been used more frequently. The results show that inequality has a positive effect on GDPpc, due to in almost all models, both the top 1% share and top 10% share variables are significant and have a positive coefficient. The control variables (capital stock and human capital) have a positive sign and are significant.

Table 3 Fixed effects (robust): 2000-2019
Dependent variable: lngdppc
Models

Variable	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
Ln1Y	0.52*	0.23*	0.29	0.23*				
ln10Y					0.92	0.60*	0.80*	0.61*
Lnsc		0.74***		0.67***		0.72***		0.67***
Lnhc			4.53***	0.37			5.81***	0.48

*, ** & *** show variables with 10%, 5% y 1% of significance.

All the models where used with heteroskedasticity robust standard errors.

Table 4 shows the effect of inequality on GDP per capita for the period 2010-2018. The Gini index coefficient is significant and negative, while top 1% share and top 10% share were not significant.

Table 4 Fixed effects (robust): 2010-2018
Dependent variable: lngdppc
Models

Variable	(I)	(II)	(III)
Lngini	-0.35*		
ln1Y		-0.02	
ln10Y			-0.11
Lnsc	0.079***	1.17***	1.20***
Lnhc	1.21	0.26	0.21

*, ** y *** show variables with 10%, 5% y 1% of significance.

All the models where used with heteroskedasticity robust standard errors.

Next, three dynamic models were run with the Arellano-Bond methodology. In each of them, the Gini index, top 1% share and top 10% share were used as inequality variables. We applied the dynamic model, in order to correct endogeneity problems, which does not occur with static models.

Table 5 shows the effect of the Gini index on GDP per capita. All the variables were significant, in addition to the fact that the Gini index has a negative coefficient. The Sargan and abond tests were applied, resulting in no over-identification of the instruments, nor auto-correlation.

Table 5 Dynamic model (Arellano-Bond): 2010-2018
Dependent variable: lngdppc

Variable	Coef.	Prob.
lnPIBpcL1	0.60	0.00
Lngini	-0.15	0.00
Lncs	0.30	0.00
Lnhc	0.93	0.00
Test Sargan	Chi2 (27) = 25.24 Prob. > chi2 = 0.56	
	Test abond	
Order	Z	Prob. > z
1	-1.05	0.29
2	-1.05	0.29

Table 6 shows the effect of income inequality on GDP per capita. The results show that there is a positive and significant relationship between top 1% share and GDP per capita. The control variables show a positive and significant coefficient.

Table 6 Dynamic model (Arellano-Bond): 2010-2018
Dependent variable: lngdppc

Variable	Coef.	Prob.
lnPIBpcL1	0.69	0.00
Ln1Y	0.01	0.00
Lncs	0.16	0.00
Lnhc	1.11	0.00
Test Sargan	Chi2 (27) = 25.59 Prob. > chi2 = 0.54	
	Test abond	
Order	Z	Prob. > z
1	-1.07	0.28
2	-1.68	0.10

The table 7 shows the relationship between inequality and GDP per capita. As an inequality variable, the top 10% share was used. A positive and significant relationship between inequality and GDP per capita is shown, in addition to the fact that the coefficients of the control variables are positive and significant.

Table 7 Dynamic model (Arellano-Bond): 2010-2018
Dependent variable: lngdppc

Variable	Coef.	Prob.
lnPIBpcL1	0.69	0.00
Ln10Y	0.01	0.04
Lncs	0.16	0.00
Lnhc	1.15	0.00
Test Sargan	Chi2 (27) = 25.78 Prob. > chi2 = 0.53	
	Test abond	
Order	Z	Prob. > z
1	-1.07	0.28
2	-1.55	0.12

4. DISCUSSION AND CONCLUSIONS

The objective of the paper was to estimate the effect of income inequality on GDP per capita for the countries of the European Union. The results show that inequality affects the per capita income of the Member States of the European Union. If we use the Gini index, its effect on GDP per capita is negative, while if we use the top 1% share and top 10% share, the effect of inequality is positive. We consider that the top 1% share and top 10% share positively affect economic growth, since the 100th percentile and decile consume luxury products, which can boost economic activity, while the differences between deciles (percentiles) that are captured by the Gini index can counteract it.

Previous studies found that the effect of inequality on economic growth is positive in high-income countries, while in low-income countries, the sign of the coefficient is negative. If we compare our results with those of previous studies, the sign of the inequality coefficient differs, because when the Gini index is used, the econometric results show a negative value, however, the top 1% share and 10% share agree with previous studies.

The top 1% share and top 10% share variables are relatively new, since it was not until a few years ago that they became available for a relatively large group of countries. Most of the previous studies used the Gini index, the Theil index, and some others.

The relationship between income inequality and GDP per capita is complex, since there may be bi-directionality between them. Additionally, the Gini index and the top 1% share and top 10% share do not necessarily show the same thing. Therefore, when analyzing the relationship between inequality and GDP per capita, the results must be relativized.

If we consider that, in societies with high inequality, the economic system is perceived as unfair, which affects the productivity of individuals and the economic growth. The review of the literature showed that this relationship goes from negative to positive when going from low income countries to high income countries. The foregoing goes in the opposite direction to what the Kuznets curve indicates, because in the initial stages of development inequality tends to increase, and then decreases. However, in that case GDP per capita is used as explanatory variable, while in the studies reviewed inequality is what affects national income.

When we going from a static model to a dynamic one, the signs of the inequality variable coefficients are not affected, that is, the Gini index coefficient is negative in the static and dynamic models, the same happens with the top 1% share and top 10% share, where the sign remains positive.

One of the delimitations of the text is its temporality, because the study has two relatively short periods of time: 2000-2019 and 2010-2018. The above is mainly due to the availability of homogeneous data between the variables. Another limitation is that the paper fails to capture the effects of the COVID-19 pandemic.

Regardless of the result that is taken, inequality should be reduced by the governments of the European Union, because it is not only an economic problem, but also a social one. In most European countries, inequality is not as high as in other regions of the world, the trend has been upwards in recent decades, so both the European and national governments should apply public policies to mitigate rise in recent years.

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