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# INCOME INEQUALITIES AND FISCAL POLICIES. EVIDENCE FROM EU MEMBER STATES

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**Abstract**

The main aim of our empirical analysis is to quantify the social impact of fiscal policies on income redistribution throughout the EU Member States on a database of fiscal, social and economic factors. Our research is conducted by using the Gini coefficient as the indicator of income redistribution, as well as the dependent variable, and the following influencing variables: taxes, index of perception of corruption, tax burden, education level, human development index, private property protection, unemployment rate, GDP per capita, private and public expenditure. Hence, by employing both the 'Least squares' method and the 'Generalized Method of Moments' we have identified significant results which highlight important social and economic development discrepancies throughout the EU Member States, as well as different fiscal policies and legislative frameworks. Moreover, by testing the robustness of the variables, we have identified that taxes exert more negative effects according to the degree of their regressivity. Our results offer strong empirical evidence supporting the idea that beyond designing more balanced fiscal systems (by the use or weight of direct/indirect taxes), public authorities should target the reduction of income inequalities using other instruments and reforms beside the fiscal ones (education, rule of law, legislative systems quality).

**Keywords:** Gini coefficient, social impact, fiscal policies, Least Squares method, Generalized Method of Moments, poverty, income inequalities.

## 1. Introduction

In general, income or wealth inequalities, along with other types of inequalities or forms of discrimination, are rejected by a large part of societies and individuals, being treated as shortcomings of the economic systems that should be addressed through public policies. Nowadays, the objective of a fair distribution of wealth and income within society became a largely accepted goal, globally assumed. Thus, the 10th objective of the United Nations' Sustainable Development Agenda (Reduce inequality within and among countries) is aiming to ensure that 'no one is left behind', considering that inequality within and among countries is a persistent cause for concern and noticing that in the context of the pandemic crisis between-country inequality rose by 1.2% between 2017 and 2021 (the first such increase in a generation), while before the pandemic inequality was expected to have fallen by 2.6% over the same period (United Nations, 2015). In our view, it is crucial to identify and understand the triggers of income and wealth inequalities, in order to address this issue through effective public policies. On the same note, the European Commission affirms that 'causes and consequences of inequalities can be complex and deeply rooted in social, economic, political and environmental systems and resources', requesting a multifold approach through public policy (European Commission, 2022).

The extent of the inequality degree of wealth redistribution or of individuals' income has been initially quantified in the year 1912 by the Italian sociologist and statistician, Corrado Gini. From a graphical point of view, Gini's coefficient or indicator is represented by a Lorenz curve which considers the share of income received by individuals in respect to the number of citizens who benefit from them, starting from the poorest to the richest. More specifically, the Gini coefficient is measured as the area between the Lorenz curve and an imaginary line of absolute equality, expressed as percentage of the maximum area under the line, quantified by values from 0 (perfect equality) to 100 (perfect inequality). Considering the Gini coefficient as the dependent variable, we performed an empirical analysis intended to quantify the social impact of fiscal policies on income redistribution throughout the EU Member States, using three main categories of independent variables (fiscal, social and economic factors). Our results suggest that income inequalities should be addressed also using other components of public policy (e.g., better education, enhancing the rule of law, improving the legislative framework), beside fostering pro-poor fiscal policies or developing more balanced and transparent tax systems.

The structure of the paper comprises the following sections: review of the previous studies which considered the Gini coefficient altogether with fiscal policies, while the main body of the paper describes the data we used, research methodology, results, conclusions and policy recommendations.

## 2. Literature review

At the beginning of the 20th century, namely the year of 1912, the Italian sociologist and statistician, Corrado Gini, developed an indicator to quantify the degree of income inequality (Yitzhaki and Schechtman, 2013). The reference literature is focused on testing

the effects of both taxation and social factors on the personal income of individuals. Thus, in the last twenty years, the problem of income inequality and social segregation has proven to be one of the biggest shortcomings of the modern economic systems, being visible in many of the developing countries. For this reason, an outstanding example is observed in Macedonia (Kozuharov, Pektovski and Ristovska, 2015), a country facing a serious problem in reducing income inequalities, which recorded an average annual growth of about 4% of the coefficient. The authors' empirical approach considers the Gini coefficient as the dependent variable, in South-Eastern Europe and the Balkan Peninsula area, over a period of ten years (2003–2014). Moreover, the authors believe that indirect taxes increase social segregation because people, regardless of their income, are similarly affected by the burden of indirect taxes; also, personal income taxes exert the strongest impact on income inequality.

On the same note, Haughton and Khandker (2009) have published a handbook that includes a series of elaborate studies on poverty and income inequality at world level as well as a series of recommendations addressed to researchers who wish to approach these topics in future empirical analyses. More specifically, the authors aim to determine who bears the tax burden and who benefits more from government spending. The authors note that the progressivity of taxes could be represented by using Lorenz curves and quantified with the Kakwani indicator (Kakwani, 1977a; Kakwani, 1977b; Pellegrino and Vernizzi, 2017) or with the Reynolds-Smolensky indicator measuring redistributive capacity (Avram *et al.*, 2014; Lambert, 2001; Mantovani, 2018). Also, other studies demonstrate that income inequality can negatively influence economic growth as it deprives the poorest of keeping themselves healthy (Galor and Moav, 2004).

Other outstanding research conducted by Karabulut (2020) demonstrates that personal income and profit taxes are much more effective in the process of income redistribution. Karabulut is of the opinion that indirect taxes such as value added taxes and special consumption taxes are applied in such a way that they negatively affect income redistribution because they are regressive. In this regard, the author tests the effects of indirect taxes on the redistribution of income in Turkey between 1990 and 2017. The author's econometric model is structured on the basis of two variables such as: the Gini coefficient (Kozuharov, Pektovski and Ristovska, 2015) as dependent variable while the explanatory variable comprises the total of indirect taxes as share of the gross domestic product. Karabulut is of the opinion that indirect taxes exert a high fiscal burden on the poorest, the results being consistent with the reference literature (Albayrak, 2011; Demirgil, 2018; Drucker, Krill and Geva, 2017; Vintilă, Gherghina and Chiricu, 2021; Martinez-Vazquez *et al.*, 2012; Oboh and Eromonsele, 2018; Prasad, 2008). Within the same Turkish economical context, Albayrak (2011) and Bilgiç (2015) analyze the effects of fiscal policies on income redistribution considering indirect taxes as fundamental variables and the Gini coefficient as the dependent variable.

In the same context, Prasad (2008) states that income inequality is seen as a combination of taxes, services and social transfers. The author looks in retrospective at the evolution of income inequality and how it was affected by changes in national tax systems and

government expenditures in Latin America and OECD Member Countries. The results demonstrate that direct taxes led to a decrease in the Gini coefficient, while indirect taxes led to its increase. Also, Karakotsios *et al.* (2020) examine the link between income inequality, taxation and economic freedom using an empirical analysis of causality between variables for 58 countries, for the period between 1995 to 2016. Furthermore, the regression equation underlying the study of Karakotsios *et al.* (2020) includes, in addition to the Gini coefficient as dependent variable, the following explanatory variables: total tax revenues as share of GDP and the indicator of economic freedom (tax burden). The results show that there is a long-term causal link between taxation, economic freedom and income inequality.

Drucker, Krill and Geva (2017) test the impact of taxes on income redistribution by using a panel data analysis for 25 OECD Member Countries and setting as reference period 1975 to 2011. Through their analysis, the authors demonstrate that consumption taxes increase income inequality and have a positive impact on economic growth. On the same note, Oboh and Eronmonsele (2018) establish that indirect taxes led to increased income inequality in Nigeria between 1980 and 2014.

Additionally, Martinez-Vazquez *et al.* (2012) approach a panel data model with the aim of highlighting the effects that fiscal policies and government spending exert on the distribution of income in 150 countries, related to the period 1970–2009. According to the authors, the taxes applied to personal income have positive effects, while general consumption taxes and custom duties have negative effects on income redistribution. Also, Martinez-Vazquez *et al.* (2012) note that personal income taxes are usually assumed to be progressive, social contributions (as they depend on individuals' salaries) are regressive, while taxes on corporate income are progressive given they are usually paid by equity holders. As for indirect taxes, considering they are supported by the final consumers, they are regressive.

The interest in the analysis of the impact that taxation exerts on income redistribution was priory approached by Meltzer and Richard (1981), who brought forward the hypothesis that when average income increases at the same time with the income computed as the relative mean values of income redistribution, then more of the individuals with low income will tend to bear the burden of the higher direct or indirect taxes.

In the same context, Ray (2019) analyzes the possible correlation between the level of economic inequality within a country and the percentage of resident households that cannot afford adequate home heating, considering the latter factor as a dependent variable in his empirical study for all EU Member States between 2009 and 2017. Thus, the author specifies that in the last three to four decades, a wide increase in economic inequality has been observed even in countries with high standards of living (Atkinson, 2005; Atkinson and Pikkety, 2007; Vintilă, Gherghina and Chiricu, 2021; Dorling, 2018; Piketty, 2014; Piketty and Saez, 2003; Savage, 2015; Stiglitz, 2013; Winters, 2014). The econometric model approached by Ray includes as independent variables the Gini coefficient, GDP per capita, the number of cold days requiring home heating and other determinants of poverty resulting from electricity consumption. The estimation method is the Least Squares, while the results demonstrate there is a strong link between the Gini coefficient, GDP per capita

and the number of cold days needing house heating. Thus, the higher the Gini coefficient, the higher the number of households in European countries which cannot afford to heat their homes in frosty winters.

Baer and Galvão (2008) explain the paradox observed in Brazil where there is a high tax burden and a continuing concentration of income redistribution. The empirical analysis is focused on the impact of government spending on the Gini coefficient and the results demonstrate a relatively low link between these two variables.

In the light of the above detailed literature review, the findings of other authors were thoroughly assessed in our research by improving the methodologies and comparing our results with the ones already published in the reference literature.

## 3. Research methodology

### *3.1. Database and variables used*

The empirical model approached within the quantitative analysis of the social impact of taxes in the European context is based on the Gini coefficient as a dependent variable. According to the information available on the OECD website, the Gini coefficient considers the income available to a household within a year. The income values include individuals' wages, money earned by freelancers, income from holding securities and various social benefits such as allowances, special pensions, social allowances for the poor or disabled; such values are net of taxes. Furthermore, household income is associated with each family member and adjusted to reflect each need of every household based on its size and number of members.

As regards the availability of data for Gini coefficient, the World Bank publishes estimated values on a yearly basis. The values under which the Gini coefficient is expressed vary from 0 – absolute equality to 100 – absolute inequality. However, the values of 0 and 100 are only theoretical since an equality of 0 would mean that all individuals or households would receive the same income, while an inequality of 100 would mean that only one individual or household would receive all the income from the economy so that an increase in the values of this indicator is not beneficial.

The independent variables are divided into three categories as follows: fiscal, social and economic control variables (Table 1). The reasoning in using fiscal variables is to test the effects of the fiscal policies on the income of individuals, considering that most of the taxes are applied to the indispensable household consumption.

In respect to social variables, we have considered the Fiscal burden or Fiscal freedom, which includes direct taxes and other taxes expressed in any form (both direct and indirect), as a share of the GDP. The Workforce with higher education represents the percentage of the working population with an advanced level of education such as short-term education, bachelor's degree, master's degree, doctorate or any other levels of education equivalent to those listed; this variable is considered as an important element in being highly paid and thus by creating a higher standard of living. Another social variable used in the analysis is

the Human Development Indicator (HDI) which summarizes the social achievements of human development in three dimensions, as follows: a long and healthy life, being recognized and having a decent standard of living. The HDI is the geometric mean of the values of indicators for each of these three dimensions. The countries with the highest HDI are those with the highest life expectancy, education and GDP.

The Property Right is a social indicator that encompasses the degree to which the state laws protect the ownership rights to private real estate of individuals. This indicator reflects the possibility of private properties to be expropriated and analyzes judicial independence, possible corruption in the real estate field as well as the liberty of owners to conclude contracts. The indicator is gradually measured, namely from 0 to 100, so that the values closest to 100 provide the highest degree of protection of private property. Any value below 50 expresses an ineffective legislative system where corruption is visible and a degree of 0 reflects a society where all property is in the state's patrimony. On the other hand, Government Integrity reflects the level of corruption in a country and is based on the International Corruption Perception Index (CPI), which measures the level of corruption in 183 countries.

The economic variables include the Unemployment Rate (as a share of individuals without a job, looking for work or who have lost their job due to various circumstances). Another economic indicator is the GDP per capita, followed by Household Final Expenditure with Food and Non-Alcoholic Beverages and Government Expenditure.

### *3.2. Empirical models description*

The empirical study of the social impact that fiscal policies exert on income inequality in the EU is based on the econometric estimation of a Panel data model (Drucker, Krill and Geva, 2017; Karakotsios *et al.*, 2020; Kozuharov, Pektovski and Ristovska, 2015; Martinez-Vazquez *et al.*, 2012) with 30 regression equations which include a fiscal variable and then a combination of fiscal variables, depending on the correlation degree. The dependent variable is the Gini coefficient, measured on a yearly basis, while the analyzed period is 2003 to 2019.

The basic equation of regression is the following:

$$Gini_{it} = \alpha + \beta_1 \cdot VAR1_{it} + \beta_2 \cdot VAR2_{it} + \beta_3 \cdot VAR3_{it} + ... + \beta_n \cdot VARn_{it} + \varepsilon_{it} \quad (1)$$

Where 'i' stands for the analyzed country (EU-28, UK included), VAR is the name of the explanatory variable (i.e., as described in Table 1) and 't' corresponds to the analyzed year (2003–2019).

The parameters of the econometrical testing hypothesis are:

$$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = ... = \beta_n = 0 \quad (2)$$

$$H_1: \text{there is at least one } \beta_i \neq 0 \quad (3)$$

The testing methods of the analysis include the Least Squares Method – OLS (Galvin, 2019; Bilgiç, 2015) and the Generalized Method of Moments – GMM for robustness check (Vintilă, Gherghina and Chiricu, 2021). According to the correlation matrix of the

**Table 1:** Variables used in the study of the social impact of taxes on income inequality

| Variable | Description | Source |
|---|---|---|
| | Dependent Variable | |
| *Gini Indicator (GINI)* | Values vary between 0 – perfect equality and 100 – perfect inequality. | OECD, Worldbank and Eurostat online databases; Karakotsios *et. al.* (2020) |
| | Independent Variables | |
| | *Fiscal Variables* | |
| Value Added Tax (VAT)<br>*Equation 19, 20, 21, 28, 29, 30* | Consumption tax applied to the added value of goods and services purchased by individuals (*) | Eurostat online database |
| Excises and other consumption taxes (EXCISES)<br>*Equation 1, 2, 3, 22, 23, 24* | Total revenues of excises and other consumption taxes, except VAT (*) | |
| Vehicle taxes (AUTO_TAX)<br>*Equation 4, 5, 6, 25, 26, 27* | Taxes applied to the registration of the cars purchased by individuals (*) | |
| Taxes on lotteries, betting and casino activities (LOTO_TAX)<br>*Equation 10, 11, 12, 28, 29, 30* | Indirect taxes applied to lottery, betting and casino activities (*) | |
| Real estate taxes (OWN_TAX)<br>*Equation 13, 14, 15, 25, 26, 27* | Taxes on the ownership of real estate (*) | |
| Taxes on personal gains (PERSGAIN_TAX)<br>*Equation 16, 17, 18, 28, 29, 30* | Includes taxes on personal income and capital gains of individuals (*) | |
| Social net contributions (SOC_CONTRIB)<br>*Equation 7, 8, 9, 22, 23, 24, 25, 26, 27* | Compulsory and optional social contributions paid by employers, employees, freelancers or unemployed (*) | |
| | *Social Variables* | |
| Tax Burden (TAX_BURD)<br>*All equations* | Tax burden exerted by governments through fiscal policies. It comprises of three quantitative factors: personal income margin tax rate, corporate income margin tax rate and effective tax burden as share of GDP. | The Heritage Foundation online database |
| High educated workforce (HIGH_ED)<br>*All equations* | Share of active population having a high level of education bachelor/master/PhD, etc.) | World Bank online database |
| Human Development Index (HDI)<br>*Equations 4, 7, 10, 13, 16, 19, 22, 25, 28* | Values as follows: 0.8 to 1 (higher human development); 0.7 to 0.799 (high human development); 0.550 to 0.699 (medium human development) and between 0.350 to 0.549 (low human development). | Human Development Reports online database |

| | | |
|---|---|---|
| Ownership right (OWN_RIGHT)<br>*Equations 2, 5, 8, 11, 14, 17, 20, 23, 26, 29* | The indicator is measured gradually from 0 to 100, increasing/decreasing by 10 units. The value 100 stands for the highest degree of protection. | The Heritage Foundation online database |
| Corruption Perception Index (CORRUPT)<br>*Equations 1, 4, 7, 10, 13, 16, 19, 22, 25, 28* | It measures the level of corruption on a scale from 0 to 10, whereas 0 highlights a very corrupt government. | |
| | *Control Economic Variables* | |
| Unemployment rate (UNEMPL)<br>*All equations* | Share of unemployed population. | World Bank online database |
| GDP per capita (GDP_CAPITA)<br>*Equations 3, 6, 9, 12, 15, 18, 21, 24, 27, 30* | Share of GDP in the total number of one country's population. Logarithm values are expressed in Euro. | Eurostat online database |
| Final expenditure of households on food and non-alcoholic beverages (SPEND)<br>*Equations 1, 2, 4, 5, 7, 8, 10, 11, 13, 14, 16, 17, 19, 20, 22, 23, 25, 26, 28, 29* | Amount of final consumption expenditure of households on daily food needs. Measured as a share of GDP. | |
| Government expenditure (GOV_EXP)<br>*All equations* | Public expenditure performed by governments. Measured as a share of GDP. | The Heritage Foundation online database |

**Source**: Authors' own processing; (*) The values are expressed in bn. Euro and HICP updated.

variables, we have found several strong links between the values; in this respect, some of the variables could not be estimated together and thus have resulted in thirty different equations. The instrumental variables used in the GMM method are the control economic variables. The econometric testing software is EViews 10.

Considering the prior studies in which social variables were used (Karakotsios *et al.*, 2020, who estimate tax burden as social indicator), as well as indirect taxes (Albayrak, 2011; Demirgil, 2018; Drucker, Krill and Geva, 2017; Martinez-Vazquez *et al.*, 2012; Oboh and Eromonsele, 2018; Prasad, 2008), our quantitative analysis brings as new elements a combination of fiscal variables (i.e., lottery or vehicle registration taxes) and social variables (HDI, tax burden) with the aim of highlighting as effective as possible the influencing factors of the income of households and individuals. The reason for using these variables in our analysis is that it provides an overview at microeconomic level of the social impact that tax policies exert on consumers while quantifying the perception of individuals in the context of a high tax burden.

### *3.3. Correlation degree of the econometric variables*

In order to set our regression equations, we ran a correlation test to verify which of the independent variables are highly associated. For this reason, we considered a threshold value of 0.8 up to which our variables are correlated and thus, cannot be estimated together in the same regression equation. Moreover, as we intended to obtain accurate results and have a broader view of the social impact that taxes exert on the income redistribution, we estimated the correlated variables in different equations. Consequently, we identified the following correlations between variables:

1. *Fiscal variables:* EXCISE highly correlated to LOTO_TAX, PERSGAIN_TAX and VAT; while VAT is highly correlated to OWN_TAX and SOC_CONTRIB.
2. *Social variables:* CORRUPT highly correlated to OWN_RIGHT, HDI and GDP_CAPITA.
3. *Economic variables:* GDP_CAPITA highly correlated to SPEND.

The strong correlation, between the social indicators especially, is explained by the common influences captured by the variables. Moreover, tax indicators such as excise duties and VAT are applied together to the goods' prices (i.e., tobacco products, alcoholic beverages, fuels, electricity), so their values can either decrease or increase at the same time and in the same direction. As regards the dependent variable, our test demonstrated that Gini coefficient is not correlated to any other variables used in our empirical analysis.

## 4. Results of the econometric analysis

### *4.1. Comparative graphical structures of the Gini Coefficient*

The average Gini coefficient reported during the year 2020 for the EU-28 (UK included) is around 31.1%, keeping the same value during the year 2021. According to Figure 1, the income inequality did not undergo major changes during the years 2003 to 2021.

However, during 2013 there was a slight greater income inequality compared to the analyzed years.

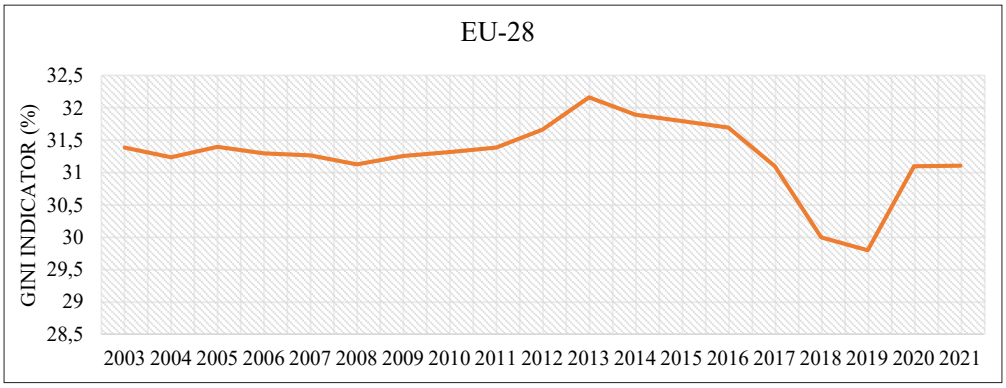


**Figure 1:** Average values of Gini coefficient in the EU-28

**Source**: Authors' own processing

Furthermore, considering the values of the Gini coefficients reported during the last five years by each of the EU Member States, in Table 2 we have computed average values of the data for every Member State and then we have compared these with the EU average value. The data is sorted in descending order, for the period 2017–2021.

As per Table 2, we noticed that the general tendency across the EU is the decrease of income inequality. However, the leading Member States which reported rather large income inequalities are Bulgaria (with an average of 40.1%), followed by Lithuania, Latvia and Romania. On the opposite, the Czech Republic, Slovenia and Slovakia, reported lower average values of the Gini coefficients, but with a slight growing trend.

Given the structure of Table 2 above, we have sorted the Member States in four categories, according to their last five years' average Gini coefficients, between: 40% and 35% – Bulgaria, Lithuania and Latvia; 35% and 30% – Romania, Spain, Italy, Greece, Portugal, Great Britain, Luxembourg, Cyprus, Estonia and Germany; 30% and 25% – France, Malta, Croatia, Ireland, Hungary, Poland, Denmark, Austria, The Netherlands, Sweden, Finland and Belgium; 25% and 20% – Czech Republic, Slovenia and Slovakia.

Between the years 2017 to 2021, Romania has reported average values of the Gini coefficient from 36% to 34.3%, thus Romania is the fourth state reporting the highest values of income inequality in the EU.

### *4.2. Comments on the results of the estimation of the regression equations*

Bilgiç (2015) and Galvin (2019) analyzed the social impact of fiscal policies with the help of a regression model whose dependent variable was the Gini coefficient, estimated with the least squares method. In this respect, our results obtained from estimating the regression equations are to a large extent conclusive and statistically significant. However, we note that the interpretation of the values obtained should be considered in the opposite

**Table 2:** Evolution of income inequality measured by Gini coefficient in EU-28

| Year | 2017 | 2018 | 2019 | 2020 | 2021 | Average | Increase/ Decrease |
|---|---|---|---|---|---|---|---|
| **EU AVERAGE** | **31.1** | **30** | **29.8** | **31.1** | **31.1** | **30.62** | |
| Bulgaria | 40.40 | 39.60 | 40.80 | 40 | 39.7 | **40.1** | Increase |
| Lithuania | 37.30 | 36.90 | 35.40 | 35.1 | 35.4 | **36.02** | |
| Latvia | 35.60 | 35.60 | 35.20 | 34.5 | 35.7 | **35.32** | |
| Romania | 36.00 | 35.10 | 34.80 | 33.8 | 34.3 | **34.8** | |
| Spain | 34.70 | 33.20 | 33.00 | 32.1 | 33 | **33.2** | |
| Italy | 35.90 | 33.40 | 32.80 | 32.5 | 32.9 | **33.5** | |
| Greece | 34.40 | 32.30 | 31.00 | 31.4 | 32.4 | **32.3** | |
| Portugal | 33.80 | 32.10 | 31.90 | 31.2 | 33 | **32.4** | |
| Great Britain | 33.10 | 33.50 | 33.30 | 35.4 | 34.4 | **33.94** | |
| Luxembourg | 34.90 | 31.30 | 32.30 | 31.2 | 29.6 | **31.86** | |
| Cyprus | 31.40 | 29.10 | 31.10 | 29.3 | 29.4 | **30.06** | Decrease |
| Estonia | 30.40 | 30.60 | 30.50 | 30.5 | 30.6 | **30.52** | |
| France | 31.60 | 28.50 | 29.20 | 29.2 | 29.3 | **29.56** | |
| Germany | 29.10 | 31.10 | 29.70 | 30.5 | 30.9 | **30.26** | |
| Ireland | 30.60 | 28.90 | 28.30 | 28.3 | 26.9 | **28.6** | |
| Croatia | 30.40 | 29.70 | 29.20 | 28.3 | 29.2 | **29.36** | |
| Poland | 29.70 | 27.80 | 28.50 | 27.2 | 26.8 | **28** | |
| Hungary | 30.60 | 28.70 | 28.00 | 28 | 27.7 | **28.6** | |
| Austria | 29.70 | 26.80 | 27.50 | 27 | 26.7 | **27.54** | |
| Malta | 29.20 | 28.70 | 28.00 | 30.3 | 31.2 | **29.48** | |
| Sweden | 28.80 | 27.00 | 27.60 | 26.9 | 26.8 | **27.42** | |
| Denmark | 28.70 | 27.80 | 27.50 | 27.3 | 27 | **27.66** | |
| The Netherlands | 28.50 | 27.40 | 26.80 | 28.2 | 26.4 | **27.46** | |
| Finland | 27.40 | 25.90 | 26.20 | 26.5 | 25.7 | **26.34** | |
| Belgium | 27.40 | 25.70 | 25.10 | 25.4 | 24.1 | **25.54** | |
| Czech Republic | 24.90 | 24.00 | 24.00 | 24.2 | 24.8 | **24.38** | |
| Slovenia | 24.20 | 23.40 | 23.90 | 23.5 | 23 | **23.6** | |
| Slovakia | 23.20 | 20.90 | 22.80 | 20.9 | 21.9 | **21.94** | |

**Source**: Authors' own processing

way, since a result indicating a positive impact demonstrates that an increase in the coefficient related to the independent variable increases the Gini indicator by a few units and implicitly increases income inequality. Otherwise, the negative impact decreases the value of the Gini indicator towards constant household income.

According to the results obtained and presented in Tables 3 and 4, the estimated coefficients of the fiscal variables have a positive impact on income inequality. In this regard, VAT and EXCISE have positive impact on the Gini coefficient (Drucker, Krill and Geva,

2017; Kozuharov, Pektovski and Ristovska, 2015; Oboh and Eronmonsele, 2018; Prasad, 2008) highlighting that these are regressive and affect individuals with lower income. Another tax variable with the effect of increasing the income inequality is TOT_TAX, which includes public revenues from all types of taxes applied by governments. Also, AUTO_TAX and LOTO_TAX contribute positively to income inequality. On the other hand, the estimated indicators of the variable OWN_TAX demonstrates positive impact on the Gini coefficient when this variable is estimated as the only fiscal variable in a regression equation; instead, when the indicators were estimated together with AUTO_TAX, LOTO_TAX and SOC_CONTRIB, the impact on the dependent variable became negative.

The main variable comprising amounts related to direct taxes is PERSGAIN_TAX, which highlighted positive impact only for three of the regression equations. Thus, our results are consistent with the observations developed by Martinez-Vazquez *et al.* (2012).

**Table 3:** Significant results of the estimation of the independent variables – OLS

| Variable | No. of significant equation | Impact |
|---|---|---|
| VAT | 19, 20, 21 | + |
| EXCISE | 1, 2, 3, 22, 23, 24 | + |
| AUTO_TAX | 4, 5, 6, 25, 26, 27 | + |
| LOTO_TAX | 10, 11, 12, 25, 26, 27, 28, 29, 30 | + |
| OWN_TAX | 13, 14, 15, 25, 26, 27 | +/- |
| PERSGAIN_TAX | 16, 17, 18 | + |
| SOC_CONTRIB | 7, 8, 9, 22, 23, 24, 25, 26, 27 | + |
| TAX_BURD | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30 | + |
| HIGH_ED | ALL | + |
| HDI | 1, 4, 7, 10, 13, 16, 19, 22, 25, 28 | - |
| OWN_RIGHT | 8, 17, 20, 23 | - |
| CORRUPT | 1, 4, 10, 16, 22, 25, 28 | + |
| UNEMPL | ALL | + |
| GDP_CAPITA | 3, 6, 9, 12, 15, 18, 21, 24, 27, 30 | - |
| SPEND | 1, 2, 4, 5, 8, 10, 11, 14, 17, 20, 22, 23, 25, 26, 28 | + |
| GOV_EXP | ALL | + |

**Source**: Authors' own processing

The estimated values of the variable SOC_TAX underline an increasing trend in income inequality. As a result, considering that social contributions and personal income taxes are directly applied to individuals, the positive effects are mainly explained by the progressivity trait emphasized by direct taxes and social contributions. As also stated by Martinez-Vazquez *et al.* (2012), personal income taxes can be progressive while net social contributions can become regressive, which means that the tax burden will be focused

more on individuals who have a low monthly income even if the burden resulting from social contributions is also supported by the employer.

Furthermore, social variables have a very important role in determining the level of income distribution as they encompass many of the qualitative traits of the social indicators. In this respect, the reference studies noted that the tax burden has a positive effect on income inequality, a fact also confirmed by the conclusions published by Karakotsios *et al.* (2020).

Another variable which has a positive impact on income inequality is HIGH_ED, given the increased number of higher educated graduates. Thus, a continuous number of highly educated individuals would generate an imbalance in the labor market, which should provide enough jobs paid according to the level of professional education.

Moreover, the estimated results of the CORRUPT shows positive effects on the Gini coefficient and thus confirms the conclusions presented by Gupta, Davoodi and Alonso-Terme (1998), who argue that the impact of corruption on income inequality is considerable because corruption affects the basic functions of governments such as resource allocation, economic stability and income redistribution. The higher the level of corruption in a country, the more unequal income will be redistributed and poverty will be perpetuated, thus reducing the economic potential of that country. In this regard, it is recommended the adoption of fiscal policies that reduce the level of corruption and poverty resulting from the inefficient redistribution of income.

The HDI summarizes the main living conditions for people so, the estimated results show that a very good standard of human development is efficient towards a good and equal redistribution of income. Also, considering that the OWN_RIGHT highlights an increasingly high degree of protection of private property, then the income redistribution tends to become efficient.

From the control economic variables used in our estimation, we found that only the GDP per capita exerts a negative impact on the Gini coefficient values, also confirmed by Ray (2019). Thus, this negative correlation shows the beneficial impact of the increase of GDP per capita on the income redistribution.

As regards the UNEMPL, the estimated results showed that when the share of population without a job increases, income inequality will also increase, so that the largest share of income will be redistributed to a smaller number of individuals.

The estimated results of SPEND suggest that the EU population is highly oriented towards consumption. Much more, GOV_EXP variable has a positive impact on the Gini coefficient (Martinez-Vazquez *et al.*, 2012).

**Table 4:** Estimated values with Least Squares Method

| | | | OLS – FIXED EFFECTS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Independent variables | | | | | | | | | | | | | | | |
| | Adj $R^2$ | F-stat | VAT | EXCISE | AUTO_ TAX | LOTO_ TAX | OWN_TAX | PERSGAIN_ TAX | SOC_ CONTRIB | TAX_ BURD | HIGH_ED | HDI | OWN_ RIGHT | COR-RUPT | UNEMPL | GDP_ CAPITA | SPEND | GOV_EXP |
| **1** | 0.46 | 53.45 | | 0.0882*** | | | | | | 0.0320** | 0.2334*** | -26.0183*** | | 0.0296** | 0.2518*** | | 0.1089** | 0.0449*** |
| **2** | 0.44 | 55.39 | | 0.0798*** | | | | | | 0.0300** | 0.2742*** | | -0.0169 | | 0.2386*** | | 0.1606*** | 0.0446*** |
| **3** | 0.41 | 58.16 | | 0.0723*** | | | | | | 0.0344** | 0.2534*** | | | | 0.2638*** | -0.9104*** | | 0.0509*** |
| **4** | 0.43 | 47.33 | | | 2.5662*** | | | | | 0.0477*** | 0.2086*** | -16.9639*** | | 0.0347*** | 0.2449*** | | 0.0853* | 0.0451*** |
| **5** | 0.42 | 51.27 | | | 2.4081*** | | | | | 0.0413*** | 0.2473*** | | -0.0083 | | 0.2268*** | | 0.1000** | 0.0439*** |
| **6** | 0.42 | 58.67 | | | 2.4794*** | | | | | 0.0393** | 0.2411*** | | | | 0.2315*** | -0.7772*** | | 0.0474*** |
| **7** | 0.45 | 51.26 | | | | | | | 0.0131*** | 0.0494*** | 0.3560*** | -27.6230*** | | 0.0203 | 0.2620*** | | 0.0641 | 0.0317*** |
| **8** | 0.43 | 53.81 | | | | | | | 0.0119*** | 0.0482*** | 0.3958*** | | -0.0330*** | | 0.2397*** | | 0.1078** | 0.0315*** |
| **9** | 0.41 | 56.84 | | | | | | | 0.0110*** | 0.0468*** | 0.3533*** | | | | 0.2749*** | -1.0298*** | | 0.0405*** |
| **10** | 0.47 | 55.29 | | | | 0.9009*** | | | | 0.0457*** | 0.2510*** | -25.3461*** | | 0.0515*** | 0.2685*** | | 0.1095** | 0.0434*** |
| **11** | 0.44 | 56.15 | | | | 0.7853*** | | | | 0.0363** | 0.2930*** | | -0.0046 | | 0.2493*** | | 0.1456*** | 0.0430*** |
| **12** | 0.43 | 62.51 | | | | 0.7724*** | | | | 0.0363** | 0.2884*** | | | | 0.2550*** | -0.8669*** | | 0.0469*** |
| **13** | 0.42 | 44.91 | | | | | 0.1052*** | | | 0.0244 | 0.2116*** | -20.1622*** | | 0.0204 | 0.2553*** | | 0.0697 | 0.0574*** |
| **14** | 0.41 | 48.62 | | | | | 0.0998*** | | | 0.0240 | 0.2487*** | | -0.0187 | | 0.2407*** | | 0.1064** | 0.0560*** |
| **15** | 0.39 | 53.42 | | | | | 0.0973*** | | | 0.0261 | 0.2295*** | | | | 0.2628*** | -0.7921*** | | 0.0614*** |
| **16** | 0.47 | 55.53 | | | | | | 0.0241*** | | 0.0466*** | 0.2858*** | -31.3180*** | | 0.0250** | 0.2608*** | | 0.0738 | 0.0362*** |
| **17** | 0.44 | 55.56 | | | | | | 0.0208*** | | 0.0444*** | 0.3225*** | | -0.0241** | | 0.2482*** | | 0.1452*** | 0.0374*** |
| **18** | 0.42 | 58.93 | | | | | | 0.0193*** | | 0.0434*** | 0.2947*** | | | | 0.2742*** | -1.1053*** | | 0.0450*** |
| **19** | 0.46 | 51.84 | 0.0304*** | | | | | | | 0.0362** | 0.2854*** | -28.8221*** | | 0.0204 | 0.2594*** | | 0.0741 | 0.0368*** |
| **20** | 0.43 | 53.08 | 0.0267*** | | | | | | | 0.0362** | 0.3216*** | | -0.0259** | | 0.2462*** | | 0.1376*** | 0.0375*** |
| **21** | 0.40 | 55.90 | 0.0243*** | | | | | | | 0.0369** | 0.2902*** | | | | 0.2757*** | -1.0284*** | | 0.0454*** |
| **22** | 0.47 | 49.44 | | 0.0571*** | | | | | 0.0062*** | 0.0427*** | 0.2915*** | -28.0190*** | | 0.0283** | 0.2556*** | | 0.0977** | 0.0387*** |
| **23** | 0.45 | 50.11 | | 0.0504*** | | | | | 0.0058*** | 0.0405*** | 0.3340*** | | -0.0238** | | 0.2380*** | | 0.1469*** | 0.0385*** |
| **24** | 0.42 | 51.40 | | 0.0452*** | | | | | 0.0054*** | 0.0425*** | 0.3041*** | | | | 0.2679*** | -1.0023*** | | 0.0460*** |
| **25** | 0.51 | 46.90 | | | 1.2166*** | 0.6164*** | -0.0571*** | | 0.0094*** | 0.0718*** | 0.3322*** | -28.8745*** | | 0.0537*** | 0.2625*** | | 0.1145*** | 0.0282** |
| **26** | 0.48 | 44.95 | | | 1.2253*** | 0.4652*** | -0.0430*** | | 0.0082*** | 0.0595*** | 0.3683*** | | -0.0128 | | 0.2354*** | | 0.1441*** | 0.0300** |
| **27** | 0.46 | 47.61 | | | 1.4703*** | 0.4675*** | -0.0475*** | | 0.0074*** | 0.0569*** | 0.3498*** | | | | 0.2428*** | -1.0461*** | | 0.0351*** |
| **28** | 0.49 | 47.06 | 0.0047 | | | 0.5247*** | | 0.0098 | | 0.0492*** | 0.2721*** | -29.5952*** | | 0.0426*** | 0.2651*** | | 0.1012** | 0.0395*** |
| **29** | 0.45 | 45.78 | 0.0112 | | | 0.5179*** | | 0.0020 | | 0.0405*** | 0.3121*** | | -0.0118 | | 0.2481*** | | 0.1574 | 0.0402*** |
| **30** | 0.44 | 48.12 | 0.0078 | | | 0.5760*** | | 0.0018 | | 0.0401** | 0.2971*** | | | | 0.2601*** | -0.9798*** | | 0.0459*** |

**Source**: Authors' own processing; Significance: *** (1%); ** (5%); * (10%);

### *4.3. Robustness check of the social impact of fiscal policies*

The tests conducted in order to check the robustness of the econometrical models were carried out by applying the GMM method and using as instrumental variables the UNEMPL, GDP per capita, SPEND. The results are shown in Tables 5 and 6.

**Table 5:** Significant results of the estimation of the independent variables – GMM

| Variable | No. of significant equation | Impact |
|---|---|---|
| VAT | 19, 20, 21 | - |
| EXCISE | 1, 2, 3, 23, 24 | - |
| AUTO_TAX | 4, 5, 6, 25, 26, 27 | - |
| LOTO_TAX | 10, 11, 12, 26, 27, 28, 29, 30 | - |
| OWN_TAX | 14, 15 | +/- |
| PERSGAIN_TAX | 17, 18 | - |
| SOC_CONTRIB | 8, 9, 23, 24, 27 | - |
| TAX_BURD | 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30 | + |
| HIGH_ED | 1, 6, 7, 8, 9, 10, 11, 12, 13, 16, 19, 22, 28 | +/- |
| HDI | 1, 4, 7, 10, 16, 19, 22, 28 | - |
| OWN_RIGHT | 2, 8, 17, 23 | - |
| CORRUPT | 1, 4, 7, 10, 16, 19, 22, 28 | + |

**Source**: Authors' own processing

As a result of the estimations, the results show the impact exerted by some of the fiscal variables is different compared to the results obtained following the application of the OLS method. As such, the estimated coefficients of the fiscal variables (except OWN_TAX) reveal negative effects on income inequality (Karabulut, 2020; Kozuharov, Pektovski and Ristovska, 2015; Prasad, 2008).

Moreover, the discrepancies are explained by the differences in social and economic development in the analyzed countries but also by the fiscal policies applied around European level. The robustness checks point out in detail that there are differences only at the level of fiscal variables because taxes have different progressivity and regressivity traits from one country to another.

Another inconsistent estimation result, compared to the results obtained through the OLS method, is HIGH_ED which demonstrates a negative impact when estimated within the same model with fiscal variables such as EXCISE, SOC_TAX, LOTO_TAX and OWN_TAX. Lastly, the TAX_BURD, HDI, OWN_RIGHT and CORRUPT report similar impact as compared to the estimation with the OLS method.

**Table 6:** Estimated values with Generalized Method of Moments

| | Adj $R^2$ | J-stat | GMM | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | INDEPENDENT VARIABLES | | | | | | | | | | | |
| | | | VAT | EXCISE | AUTO_TAX | LOTO_TAX | OWN_TAX | PERSGAIN_ TAX | SOC_ CONTRIB | TAX_BURD | HIGH_ED | HDI | OWN_RIGHT | CORRUPT |
| **1** | 25.54 | 0.27 | | -0.0659* | | | | | | 0.1056*** | -0.1607** | -20.4960*** | | 0.0259* |
| **2** | 26.82 | 0.26 | | -0.1151*** | | | | | | 0.0782*** | 0.0292 | | -0.0243** | |
| **3** | 26.91 | 0.30 | | -0.1226*** | | | | | | 0.0866*** | 0.0194 | | | |
| **4** | 24.59 | 0.31 | | | -3.2862*** | | | | | 0.0920*** | -0.1047 | -18.8216** | | 0.0375** |
| **5** | 24.02 | 0.40 | | | -3.2298*** | | | | | 0.0262 | 0.1095 | | -0.0119 | |
| **6** | 25.88 | 0.35 | | | -4.2280*** | | | | | 0.0392** | 0.1685*** | | | |
| **7** | 25.71 | 0.26 | | | | | | | -0.0090 | 0.1228*** | -0.1462*** | -20.9555*** | | 0.0357*** |
| **8** | 27.57 | 0.23 | | | | | | | -0.0171*** | 0.0927*** | 0.0060 | | -0.0204* | |
| **9** | 26.62 | 0.32 | | | | | | | -0.0217*** | 0.1019*** | -0.0415 | | | |
| **10** | 25.27 | 0.28 | | | | -2.0101*** | | | | 0.0974*** | -0.1263** | -14.4656** | | 0.0382*** |
| **11** | 27.35 | 0.24 | | | | -1.9735*** | | | | 0.0813*** | -0.0035 | | -0.0075 | |
| **12** | 27.13 | 0.29 | | | | -2.1537*** | | | | 0.0780*** | -0.0090 | | | |
| **13** | 22.33 | 0.43 | | | | | -0.2372 | | | 0.0676 | -0.2119** | -13.3265 | | 0.0198 |
| **14** | 25.71 | 0.31 | | | | | -0.1827*** | | | 0.0626*** | -0.0095 | | -0.0243 | |
| **15** | 26.95 | 0.30 | | | | | 0.1927*** | | | 0.0703** | -0.0153 | | | |
| **16** | 26.17 | 0.29 | | | | | | -0.0120 | | 0.1036*** | -0.1396*** | -20.2009** | | 0.0358*** |
| **17** | 26.39 | 0.28 | | | | | | -0.0311*** | | 0.0950*** | -0.0251 | | -0.0295* | |
| **18** | 26.45 | 0.33 | | | | | | -0.0289*** | | 0.1068*** | -0.0196 | | | |
| **19** | 25.53 | 0.32 | -0.0221* | | | | | | | 0.1175*** | -0.1352** | -18.4956** | | 0.0330*** |
| **20** | 27.45 | 0.23 | -0.0374*** | | | | | | | 0.0797*** | -0.0272 | | -0.0137 | |
| **21** | 26.17 | 0.34 | -0.0411*** | | | | | | | 0.0870** | -0.0417 | | | |
| **22** | 25.59 | 0.22 | | -0.0535 | | | | | -0.0051 | 0.1136*** | -0.1513** | -18.0166*** | | 0.0277* |
| **23** | 26.67 | 0.22 | | -0.0784* | | | | | -0.0107* | 0.0960*** | -0.0139 | | -0.0228* | |
| **24** | 26.18 | 0.29 | | -0.0756** | | | | | -0.0133** | 0.1054*** | -0.0311 | | | |
| **25** | 22.44 | 0.31 | | | -2.1767*** | -0.8361 | 0.0716 | | 0.0007 | 0.1136*** | -0.0738 | -14.5548 | | 0.0239 |
| **26** | 24.57 | 0.21 | | | -2.2461*** | -2.1758** | 0.2835 | | -0.0241 | 0.0926*** | 0.0235 | | 0.0069 | |
| **27** | 26.04 | 0.20 | | | -2.4347*** | -2.1163*** | 0.2574 | | -0.0203* | 0.0973*** | 0.0614 | | | |
| **28** | 24.52 | 0.22 | 0.0161 | | | -2.7861*** | | 0.0105 | | 0.0822** | -0.1436* | -24.3273*** | | 0.0505*** |
| **29** | 24.36 | 0.27 | 0.0225 | | | -2.1497*** | | -0.0290 | | 0.0885*** | 0.0039 | | 0.0055 | |
| **30** | 24.17 | 0.33 | 0.0101 | | | -2.1504** | | -0.0222 | | 0.0867*** | -0.0082 | | | |

**Source**: Authors' own processing; Significance: *** (1%); ** (5%); * (10%);

## 5. Conclusions and policy recommendations

Following the econometric analysis of the independent variables on the Gini coefficient, a series of statistically significant results were obtained. Firstly, according to the graphical representation of the average evolution of the Gini coefficient in the EU, a general trend of continuous increase in income inequality could be observed. Thus, in the case of Romania, there are significant discrepancies between individuals. This fact is highlighted by the existence of a large share of disadvantaged people and another one of rich individuals, who concentrate the highest income. These results should be interpreted as signals and inputs when governments (re)design public policies, especially the fiscal ones, targeting more directly through fiscal instruments (e.g., tax deductions, progressive taxation, social benefits) the reduction of income inequalities. Increasing the financial burden for spending targeted on reducing income inequalities could be supported by increased public revenues that could be obtained by consolidating the fiscal tax base. In this respect, our results suggest that a low tax burden is associated with a high investment potential (in countries such as Bulgaria, Romania and the Baltic States), which means that fiscal policy should include more incentives in this direction (relaxing the fiscal burden/pressure), in order to attract more foreign or domestic investments.

Furthermore, the estimations performed by applying two econometric methods demonstrated that some of the fiscal variables have different effects. Moreover, the reference literature includes studies (Karabulut, 2020; Kozuharov, Pektovski and Ristovska, 2015; Prasad, 2008) whose results are in opposition to the findings demonstrated by other researchers (Drucker, Krill and Geva, 2017; Kozuharov, Pektovski and Ristovska, 2015; Oboh and Eronmonsele, 2018; Prasad, 2008). Thus, such discrepancies could be explained by the presence of significant differences in social and economic development at the level of the EU, as well as different fiscal policies and legislative systems. Also, the robust results highlight the presence of differences only at the level of fiscal variables, as taxes have different progressive and regressive traits.

According to our findings, the positive correlation between the independent variables and the Gini coefficient demonstrates an increase in income inequality, while the negative correlation highlights an equalization of individuals' income. In this regard, the positive effect exerted by indirect taxes (Prasad, 2008) is due to a regressive character of such taxes that affects households with low income. Contrarily, personal income taxes can be progressive (Martinez-Vazquez *et al.*, 2012) while net social contributions can become regressive because the tax burden is concentrated on households with a low monthly income.

With a very important role in determining the social impact of taxes on income redistribution, social variables demonstrate positive effects. More precisely, the positive impact of the tax burden reveals a 'compromise balance' (Karakotsios *et al.*, 2020) as a result of changes at the level of institutions and liberalization policies.

The rise of the population with higher education generates an imbalance in the labor market, resulting in income inequality, given that the labor market should provide enough jobs and wages according to the professional or academic degree of the individuals.

Also, the level of corruption in EU affects the redistribution of income (Gupta, Davoodi and Alonso-Terme, 1998) because the higher the corruption, the more income will be concentrated towards a thin layer of newly rich people while poverty will be perpetuated so that new fiscal policy reforms would be required.

In a nutshell, our results suggest that public authorities could mitigate income inequalities following at the same time both the 'classic' approach (of the fiscal instruments) and complementary reforms, since the identified discrepancies are also being fueled by other factors. With respect to the fiscal means, the main directions of reforms should be focused on the weight of indirect taxes comprised by the tax systems and the effects of the incentives granted for investments. Regarding the other means, governments should act complementary and at the same time through other components of public policies: education (by offering more opportunities to a better education to disadvantaged individuals or groups), enforcing the rule of law (by strengthening the fight against corruption and making public administration more transparent) or improving the quality of the legislative systems (more stable, clear and effective). Despite the traditional association of income redistribution as an administrative task with central governments, we consider that on the background of decentralization and subsidiarity, local public authorities should both be involved in designing the new policies and implementing them at their jurisdiction level.

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