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Two-way relationship between inequality and growth within fiscal policy channel: an empirical assessment for European countries*

José Carlos Coelho [$] José Alves[#]

Abstract

We investigate the role of fiscal policy, through several measures of government revenues and expenditures and redistribution, on disposable and market income inequality and economic growth as well as the interaction between inequality and growth for 31 European countries from 1995 to 2019. In this article, we employ SUR regressions and SEM models, and we conclude that: i) while post-tax and transfers inequality has a negative impact on public expenditure variables and redistribution, pre-tax and transfers inequality has a positive impact; ii) public expenditure variables and direct taxation negatively influence economic growth; iii) average post-tax and transfers inequality has a negative effect on growth and average pre-tax and transfers inequality has a positive impact; iv) growth contributes to the reduction of average post-tax and transfers inequality and to the increase in average pre-tax and transfers inequality; and v) fiscal policy allows for the attenuation of disposable income inequality. The different results between the role of pre and post-tax and transfers inequality levels lead us to suggest tax progressivity as an important feature to take into account when analyse the trivariate relationship between fiscal policy, growth, and inequalities.

Keywords: inequality; economic growth; fiscal policy; seemingly unrelated regressions; three-stage least squares
JEL codes: D63; E62; O47

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1. Introduction

The outbreak of the recent pandemic of COVID-19 has led to enormous challenges that all economies are facing, independently their stage of development. The individuals within a society do not present the same degree of resilience to face the challenges imposed by the arising of the new coronavirus. In fact, those who are more economically deprived face additional obstacles to overcome the negative impact derived from the economic depression. In this sense, the link between unequal income distribution, that is, economic inequalities, and the resilience of a given society's economic performance has become even more evident.

The subject of inequalities and those effects on economic growth have been much debated, particularly among scholars. We can yet affirm that the inequality analysis has regain an even more devotion since the publication of the Thomas Piketty's Capital in the Twenty-First Century (Piketty, 2014). Most of the existing investigations on the inequality topic have relied on the inequality-growth nexus. From the seminal work of Kuznets (1955), it is known that not only exists a linkage between economic growth and the distribution of income, but there is also a non-linear relationship between those two variables, depending on the development stage of an economy. Between income inequality and the evolution of economic activity there are causal effects in both directions. Therefore, we should analyse how income disparities may indeed impact on growth and also how growth may cause effects on inequality. In this context, a deeper analysis of the transmission mechanisms that lead inequalities to influence growth (and vice-versa) is of utmost importance to enable a better design of economic policies that efficiently promote growth without exacerbating income concentration.

Most studies on the relationship between inequality and economic growth examine the link between inequality and growth as well as the impact of growth on inequality. However, there are few studies that investigate the simultaneous relationship between both variables. As noted by Lundberg and Squire (2003), many researchers tend to analyse both domains separately and they do not reflect on the jointly outcome of their analysis. This fact could lead to a less efficient design of policies to promote growth and less unequal distribution of income. In this regard, Huang *et al.* (2009) study the joint impact of inequality and economic growth. Muinelo-Gallo and Roca-Sagalés (2011, 2013), in turn, study the causal interrelationship between income inequality and economic growth through the fiscal policy channel, which is the object of this article.

The fiscal policy channel has two perspectives. The traditional perspective, developed by authors such as Alesina and Rodrik (1994) and Persson and Tabellini (1994), states that in unequal societies and with a political regime based on majority vote, there is a greater demand for redistributive policies, using taxation and transfers (political link), which translates into lower incentives to work, saving and investment, and, consequently, lower economic growth (economic link). Bénabou's (2000) perspective combines elements of the fiscal policy channel and credit market imperfections channel and generally supports that, in rich countries with a democratic regime, greater inequality results in less redistribution, not greater redistribution.

In a first step of our empirical analysis, we perform SUR (Seemingly Unrelated Regressions) regressions of two orthogonal equations of the fiscal policy variables and economic growth, in which the measure of inequality is one of the determinants of the fiscal policy variable and this is one of the explanatory factors of the economic growth, combined with a limited set of control variables commonly used in the literature. The aim of this analysis is to investigate the impact of the inequality measure on the fiscal policy variable and its effect on economic growth, assessing the verification of political and economic links from the traditional perspective and also from the perspective of Bénabou (2000) of the fiscal policy channel.

As inequality and economic growth are interdependent, that is, they influence each other, we then develop simultaneous equation models (SEM), in which inequality is an explanatory factor of economic growth and this appears as a determinant of inequality (structural equations), within a framework of the fiscal policy channel. This exercise allows us to investigate the interaction between both variables and study the role of fiscal policy in this interaction.

The contribution of this article to the literature is based on the following elements. First, we consider a sample consisting of European countries in a recent time horizon (1995-2019) and we study the interrelationship between inequality and economic growth and fiscal policies. Second, we use two measures of inequality, namely the Gini coefficient of disposable income and the Gini coefficient of market income, and several fiscal policy variables on both the government revenue and expenditure sides as well as redistribution. Third, we empirically examine the fiscal policy channel according to the traditional and Bénabou's (2000) perspectives.

The article is structured as follows. Section 2 reviews the relevant literature. Section 3 describes the data used in the empirical analysis. Section 4 explains the

methodological framework. Section 5 reports and discusses the empirical results obtained. Section 6 presents the concluding remarks of the article.

2. Literature Review

The literature on the inequality/growth relationship is vast and not consensual on the nexus between both variables. Neves and Silva (2014) and Neves *et al.* (2016) argue that the multiplicity of the found results are due the choice of economies under analysis, timespans, the measures of inequalities employed in the different studies, resorted econometric techniques, among other factors. In fact, while there have been studies that points out the negative effect of income concentration on economic growth (Alesina and Rodrik, 1994; Persson and Tabellini, 1994; Perotti, 1996; Lee and Son, 2016), other strand of the literature has been concluding for a positive causality between income disparities and GDP growth (Li and Zou, 1998; Forbes, 2000). Barro (2000), in turn, finds an inconclusive impact of inequality on growth, negative for poor countries and positive for rich countries, a result partially supported by Castelló-Climent (2010).

As highlighted by Chen (2003) and Banerjee and Duflo (2003), the link between inequality and economic growth is not linear and evidence an inverted U-shaped relationship. In fact, and as affirmed by the authors, the found concave relationship may help to explain why there are apparently contradictory results on the inequality-growth analyses and misinterpretations on the results obtained.

Voitchovsky (2005) suggests that the distribution of income within a society indeed matters for the dynamics of economic growth. More specifically, the author discovered that while income disparities in the richest share of population is positively linked to economic growth, a higher concentrated income degree in the bottom of a society is associated with a negative economic performance. These results are very important since it shows how the existing literature is fragile in considering a monotonous inequality-growth relationship.

More recently, Brueckner and Lederman (2018) reach to the conclusion that for low-income countries the linkage between income disparities and growth rates are found to be positive and for higher-income economies the impact is negative. Gründler and Scheuermeyer (2018) conclude by a negative influence of inequality on growth in developing countries and in middle-income economies and no correlation between both

variables for high-income countries. Consequently, these findings show that distribution of income does not influence growth evenly.

In turn, Lopez (2006) and Chambers (2007) study the impact of economic growth on income inequality. Lopez (2006) found that, in the 1970s and 1980s, economic growth translated into a reduction in income inequality. In the 1990s, the impact was positive, that is, growth resulted in greater inequality. In Chambers (2007), the non-linear results found for the inequality-growth relationship are different for countries displaying different economic growth paths. In detail, this article points that for economies experiencing past higher economic growth rates are associated with lower inequality levels for the current period. On the other hand, past smaller economic performance in the long-run are coupled with higher income disparity levels today.

Furthermore, several authors highlight the role of political systems in explaining the dynamics of income distribution and the economic development (see the literature survey of the effects of democracy on the inequality-growth relationship in Sirowy and Inkeles, 1990). In fact, and as concluded in Perotti (1996), higher income-concentrated societies tend to be more unstable, both political and social terms, which, in turn, led to lower economic development. Therefore, fiscal policy emerges as an important economic agent to prevent the instability caused by income concentration. There are studies that conclude that fiscal policy as an important transmission channel between inequalities and growth (García-Peñalosa and Turnovsky, 2007; Tamai, 2015; Turnovsky 2015; Gächter *et al.*, 2017, among others).

Muinelo-Gallo and Roca-Sagalés (2011) demonstrate that fiscal policy, through an increase on current expenditures and direct taxation, impacts negatively on growth and, at the same time, reduces income inequality. On the other hand, increases on public investment reduces inequality without harming growth. These results are found by analysing a set of upper-middle and high-income economies between 1972 and 2006. Muinelo-Gallo and Roca-Sagalés (2013), using a panel data of 21 high-income OECD countries from 1972 to 2006, find that: (i) gross income inequality is a determinant of fiscal policy; (ii) distributive expenditure and direct taxes have a negative effect on GDP growth and net income inequality; and (iii) non distributive expenditure has a negative impact on GDP growth and a positive impact on net income inequality.

Islam *et al.* (2018) show how income inequalities strongly influence the macroeconomic structure of taxation. These authors demonstrate that higher inequalities reduce the share of direct taxation on GDP for 21 OECD countries for a longer timespan

under analysis (1870-2011). In addition, redistribution is found to be an important pillar on how fiscal policy can influence income disparities and growth. From the study conducted in Berg *et al.* (2018), the redistribution resulted from taxes is found to be positively related with higher and sustainable growth path. Nevertheless, Gründler and Scheuermeyer (2018) found different results. In what concerns the role of redistribution on growth performance, higher redistribution is found to be detrimental to growth through lower investment and an increasing in fertility rates. Although for the sample of developing economies, redistribution policies may present a positive effect on economic growth.

3. Data

The sample considered in this study consists of 31 European countries, namely: Austria (AUT), Belgium (BEL), Bulgaria (BGR), Croatia (HRV), Cyprus (CYP), the Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hungary (HUN), Iceland (ISL), Ireland (IRL), Italy (ITA), Latvia (LVA), Lithuania (LTU), Luxembourg (LUX), Malta (MLT), the Netherlands (NLD), Norway (NOR), Poland (POL), Portugal (PRT), Romania (ROU), Slovakia (SVK), Slovenia (SVN), Spain (ESP), Sweden (SWE), Switzerland (CHE), and the United Kingdom (GBR), between 1995 and 2019. In order to maximize the number of observations per country, we allow eight periods of three-year economic growth: 1995-1998, 1998-2001, 2001-2004, 2004-2007, 2007-2010, 2010-2013, 2013-2016 and 2016-2019.

One of the variables to explain is the growth rate of real GDP per capita (*GR*), and it is calculated based on the data of GDP per capita measured as expenditure-side real GDP at chained PPPs in 2017 USD millions and population, taken from the Penn World Table (PWT) version 10.0 (Feenstra et al., 2015). As is commonly used in the literature, we include in growth regressions the following explanatory variables: (i) the natural logarithm of initial GDP per capita (*lnGDPpc*), (ii) the human capital index, based on years of schooling and returns to education (*HC*), and (iii) the price level of capital formation, price level of United States expenditure-side GDP at chained PPPs in 2017 USD millions in 2017=1 (*PI*), from Feenstra *et al.* (2015). In addition, we use two measures of inequality: the Gini index of inequality, equivalized (square root scale) households disposable (post-tax, post-transfer) income (*GINID*) as well as market (pre-tax, pre-transfer) income (*GINIM*), from Solt (2020) database (version 9.0 of SWIID). In

order to capture the effect of population ageing on fiscal policy variables, we add the share of the elderly population, the population ages 65 and above as the percentage of the total population (*POP65*), retrieved from the World Bank database, as an explanatory variable.

Finally, the fiscal policy variables considered in this investigation are the following: (i) the share of distributive expenditure on GDP (*DISTEXP*), (ii) the share of public consumption on GDP (*GOVC*), (iii) the share of public expenditure with social protection on GDP (*SOCPROT*), (iv) the share of direct taxes on GDP (*DTAXES*), and (v) the redistribution (*REDIST*). In particular, distributive expenditure corresponds to public expenditure in education, health, social protection and housing and amenities, and is calculated based on data from the Eurostat website (Economy and finance, Government statistics, Government finance statistics, Annual government finance statistics, General government expenditure by function (COFOG)). Direct taxes are taxes on income, profits and capital gains, social contributions, payroll and workforce and property and are obtained based on data from the OECD (Public Sector, Taxation and Market Regulation, Taxation, Global Revenue Statistics Database, from OECD.Stat). The redistribution is obtained as the difference between the market Gini coefficient and the Gini coefficient of disposable income, based in Solt (2020). Data referring to the share of public consumption on GDP are taken from the World Bank website. In Appendix, we report the usual descriptive statistics and the correlation matrix between the variables under study.

4. Methodology

As there is interdependence between inequality, growth and fiscal policy and to avoid errors of specification, we apply two empirical methods that consider the mutual influence between variables. The first methodology corresponds to a SUR system whose objective is to empirically test the political link and the economic link from the traditional perspective of the fiscal policy channel and also the approach put forward by Bénabou (2000)[1]. For this purpose, two equations are estimated, namely: (i) the first equation assesses the impact of the inequality measure on the fiscal policy variable; and (ii) the second equation examines the effect of the fiscal policy variable on economic growth. The perturbations from the different regressions are correlated to some extent due to common unobservable factors. One of the main advantages of the SUR model is the

[1] For more details about SUR methodology, see Zellner (1962, 1963) and Zellner and Huang (1962).

possibility of studying the interdependence of the variables under analysis, thus obtaining efficiency gains.

The SUR system we estimate is as follows:

$$FP_{it} = \alpha_0 + \alpha_1\, ln(y_{it-1}) + \alpha_2\, POP65_{it-1} + \alpha_3\, Inequality_{it-1} + \varepsilon_{it} \quad (1)$$

$$GR_{it} = \beta_0 + \beta_1\, ln(y_{it-1}) + \beta_2\, HC_{it-1} + \beta_3\, PI_{it-1} + \beta_4\, FP_{it} + \omega_{it} \quad (2)$$

where FP_{it} is the fiscal policy variable in country *i* (*i* = 1, …, *N*) and period *t* (t = 1, …, *T*); $ln(y_{it-1})$ is the natural logarithm of real GDP per capita in country *i* lagged one period; $POP65_{it-1}$ is the share of the elderly population in country *i* lagged one period; $Inequality_{it-1}$ is the measure of income inequality in country *i* lagged one period; GR_{it} is the growth rate of real GDP per capita in country *i* and period *t*; HC_{it-1} is the human capital index in country *i* lagged one period; PI_{it-1} is the price level of capital formation in country *i* lagged one period; and ε_{it} and ω_{it} are the random disturbance errors of country *i* and period *t*.

The second methodology developed in the empirical work is a simultaneous equations model. In this context, three equations are considered, namely: (i) the first equation examines the effect of the inequality measure on the fiscal policy variable; (ii) the second equation studies the impact of the fiscal policy variable on economic growth, with the presence of the inequality measure; and (iii) the third equation assesses the influence of economic growth and the fiscal policy variable on average inequality. The aim of the SEM is to analyse the interdependence between inequality, economic growth and fiscal policy variables. Thus, we investigate the relationship in both directions between inequality and economic growth and, at the same time, we study the role of fiscal policy in their relationship.

The simultaneous equation model is estimated using three-stage least squares (3SLS).[2] Since exploiting non-zero cross-equation covariation, this method is asymptotically more efficient than two-stage least squares (Belsley, 1988). Even when pairwise correlations are small, 3SLS can have greater small-sample efficiency. This method uses all the information provided by the exogenous right-hand-side variables to instrument the endogenous left-hand-side variables. One of the advantages of 3SLS resides in the fact that it allows incorporating the intercorrelation between the errors of

[2] For more details about 3SLS method, see Zellner and Theil (1962).

the different equations in the system. Therefore, it is more appropriate to study the relationship between the three relevant endogenous variables.

The simultaneous equation model we estimate has the following form:

$$FP_{it} = \alpha_0 + \alpha_1 \, ln(y_{it-1}) + \alpha_2 \, POP65_{it-1} + \alpha_3 \, Inequality_{it-1} + \varepsilon_{it} \quad (3)$$

$$GR_{it} = \beta_0 + \beta_1 \, ln(y_{it-1}) + \beta_2 \, HC_{it-1} + \beta_3 \, PI_{it-1} + \beta_4 \, AInequality_{it} + \beta_5 \, FP_{it} + \omega_{it} \quad (4)$$

$$AInequality_{it} = \gamma_0 + \gamma_1 \, HC_{it-1} + \gamma_3 GR_{it} + \gamma_4 \, FP_{it} + \varphi_{it} \quad (5)$$

where $AInequality_{it}$ is the measure of average income inequality in country *i* and period *t*; and ε_{it}, ω_{it} and φ_{it} are the random disturbance errors of country *i* and period *t*. The remainder variables already have a known meaning.

To reduce eventual endogeneity problems with right hand side regressors, the explanatory variables of both SUR and SEM systems have been included as measured at the start of each three-year period. In addition, the estimated SUR and SEM models do not include both sectional and period fixed effects since the use of fixed effects eliminates the sectional information from the data and most of the inequality differences are cross-country and not within-country.

5. Empirical analysis

5.1. SUR Estimates

Tables 1 and 2 present the results obtained within SUR regressions and these suggest that disposable Gini coefficient and market Gini coefficient impact heterogeneously on fiscal policy variables considered. In fact, while disposable Gini coefficient translate a reduction in all fiscal policy measures, market Gini coefficient has a positive impact on redistribution, a negative impact on direct taxes and a non-significant impact on distributive expenditure, government consumption and social protection. On the one hand, the economic link from the traditional perspective of the fiscal policy channel is verified since the market Gini coefficient has a positive impact on redistribution. On the other hand, as the disposable Gini coefficient has a negative effect on the several fiscal policy variables, the hypothesis put forward by Bénabou (2000) is corroborated. Even the result found that points to a negative influence of the market Gini coefficient on direct taxes supports this hypothesis. Comparatively, Muinelo-Gallo (2011) find a negative impact of disposable Gini coefficient on direct taxes and Muinelo-Gallo (2013) conclude by a negative impact of market Gini coefficient on direct taxes and

distributive expenditure. Islam *et al.* (2018), in turn, report a negative effect of market Gini coefficient on income tax.

In addition, these results lead us to propose that the different magnitudes provoked by the pre-tax and transfers vs the post-tax and transfers inequalities can be explained by the tax system progressivity. This hypothesis is advanced given the positive impact that pre-tax and transfers income disparities and the negative impact that post-tax and transfers income disparities have on redistribution. This possible explanation, which deserves a follow-up analysis in the future, is somehow substantiated in the increasing detrimental impact that post-tax and transfers inequalities (measured by disposable Gini coefficient) against the positive impact of pre-tax and transfers inequalities (measured by market Gini coefficient) have on the share of revenues the government can collect from direct tax sources. To illustrate this aspect, we can see and compare the estimated coefficients of disposable Gini coefficient and market Gini coefficient in specifications (4A) from Tables 1 and 2, respectively.

Furthermore, from analysis of both Tables 1 and 2, we reach to the conclusion that fiscal policy variables, with the exception of redistribution, are found to be harmful for economic growth. This result in line with some literature as Muinelo-Galo and Roca-Sagalés (2011, 2013), for instance. Consequently, and combining the obtained results, a rising in post-tax and transfers inequalities lead to a reduction of fiscal policy variables, namely, distributive expenditure, government consumption, social protection and direct taxes, which will promote economic growth. Also a rising in pre-tax and transfers inequalities results in a reduction of direct taxes, which has a positive impact on economic growth. In sum, an increasing in income disparities positively influence economic growth through the fiscal policy channel, i.e., by reducing the government spending and direct taxation levels on the economy. These our conclusion is in line with the results found in the literature that analyses the impact of inequality levels and economic performance for developed economies (Forbes, 2000; Barro, 2000; Castelló-Climent, 2010).

Unsurprisingly, in most specifications (1A)-(5A) in both Tables 1 and 2, the initial per capita income level and the percentage of elderly population have a positive impact on fiscal policy variables. In richer countries and with a higher proportion of elderly people, there is greater recourse to public spending, especially on social security, welfare and health, and a higher level of taxation, necessary to finance redistributive policies. The process of population ageing, by demanding higher levels of public spending and taxation, can hamper economic growth. In this way, fiscal policy can be a transmission

channel between population ageing and economic growth. Relating to inequality, Miyazawa (2006) and Mierau and Turnovsky (2014) demonstrate that the population ageing process contributes to a negative effect of inequality on economic growth.

Lastly, while we find a negative and highly significant impact of a rising in the price level of investment on growth, we do not find any significant impact of the human capital index on short-run economic dynamics. Albeit, the sign of the variable be positive. This result may be explained since investments in human capital require a long gestation period and generate significant returns that may not be captured in short period intervals.

Table 1: SUR Models, with disposable Gini coefficient

Regressors/Specification	(1A)	(2A)	(3A)	(4A)	(5A)
	DISTEXP	*GOVC*	*SOCPROT*	*DTAXES*	*REDIST*
$lnGDPpc_{it-1}$	0.020***	-0.004	0.016***	0.031***	0.025***
	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)
$POP65_{it-1}$	0.766***	0.280***	0.674***	0.672***	0.157**
	(0.095)	(0.072)	(0.079)	(0.088)	(0.074)
$GINID_{it-1}$	-0.760***	-0.418***	-0.519***	-0.847***	-0.400**
	(0.077)	(0.058)	(0.064)	(0.068)	(0.060)
Obs.	246	246	246	216	245
R-squared	0.448	0.191	0.406	0.592	0.329
Regressors/Specification	(1B)	(2B)	(3B)	(4B)	(5B)
	GR	*GR*	*GR*	*GR*	*GR*
$lnGDPpc_{it-1}$	-0.013***	-0.018***	-0.014***	-0.013***	-0.017***
	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)
HC_{it-1}	0.005	0.004	0.005	0.003	0.005
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
PI_{it-1}	-0.015***	-0.014***	-0.014***	-0.014***	-0.014***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
$DISTEXP_{it}$	-0.150***				
	(0.036)				
$GOVC_{it}$		-0.206***			
		(0.054)			
$SOCPROT_{it}$			-0.179***		
			(0.045)		
$DTAXES_{it}$				-0.099**	
				(0.042)	
$REDIST_{it}$					-0.067
					(0.055)
Obs.	246	246	246	216	245
R-squared	0.224	0.208	0.213	0.168	0.163

Table 2: SUR Models, with market Gini coefficient

Regressors/Specification	(1A)	(2A)	(3A)	(4A)	(5A)
	DISTEXP	*GOVC*	*SOCPROT*	*DTAXES*	*REDIST*
$lnGDPpc_{it-1}$	0.038***	0.005	0.027***	0.055***	0.029***
	(0.006)	(0.004)	(0.005)	(0.006)	(0.004)
$POP65_{it-1}$	0.435***	0.093	0.445***	0.367***	-0.213***
	(0.111)	(0.078)	(0.088)	(0.114)	(0.066)
$GINIM_{it-1}$	0.103	0.067	0.076	-0.171**	0.530***
	(0.080)	(0.056)	(0.063)	(0.080)	(0.048)
Obs.	246	246	246	216	245
R-squared	0.236	0.027	0.252	0.315	0.470
Regressors/Specification	(1B)	(2B)	(3B)	(4B)	(5B)
	GR	*GR*	*GR*	*GR*	*GR*
$lnGDPpc_{it-1}$	-0.012***	-0.018***	-0.014***	-0.014***	-0.019***
	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)
HC_{it-1}	0.006	0.004	0.005	0.002	0.005
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
PI_{it-1}	-0.015***	-0.014***	-0.014***	-0.014***	-0.014***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
$DISTEXP_{it}$	-0.162***				
	(0.036)				
$GOVC_{it}$		-0.205***			
		(0.054)			
$SOCPROT_{it}$			-0.181***		
			(0.045)		
$DTAXES_{it}$				-0.090**	
				(0.042)	
$REDIST_{it}$					-0.000
					(0.055)
Obs.	246	246	246	216	245
R-squared	0.225	0.208	0.213	0.170	0.162

5.2. SEM Estimates

As previously mentioned in Methodology section, we have performed SEM estimations in order to analyse the interdependence between income inequality, fiscal policy and economic growth. The results, reported by Tables 3 and 4, are obtained considering the disposable Gini coefficient and the market Gini coefficient, respectively. Moreover, as an additional exercise – the results are available in appendix –, we have run SEM estimations taking the level of inequality measure in growth regressions, and not the average inequality measure. In our perspective, employing SEM technique provides a better understanding on the mechanisms behind the causal effects among each measures under study.

In what concerns to the role of the post-tax and transfers inequality, the results of Table 3 show that the disposable Gini coefficient has a negative and highly significant impact on all fiscal policy variables, as shown by Table 1, which verifies the Bénabou´s (2000) approach. In turn, all fiscal policy variables negatively affects growth, which

supports the economic link from the traditional perspective of the fiscal policy channel. Combining both evidences, we advance again that in European countries disposable Gini coefficient promotes economic growth, through fiscal policy. On the other hand, the higher the average disposable Gini coefficient, the lower are the GDP growth rates (specifications (1B)-(5B)). At the same time, according to specifications (1C) and (5C), higher GDP growth rates translate into a downward impact on average post-tax and transfers income inequality, and all fiscal policy variables contribute to reducing disparities in disposable income. Given these results, and from the point of view of the economic policy decision maker, it would be pertinent to find the limit that for each fiscal policy variable minimizes disparities in disposable income and promotes, at the same time, higher levels of economic growth.

The role of the pre-tax and transfers inequality is highlighted in Table 4 and the results reported point to different conclusions compared to Table 3. In particular, the market Gini coefficient has a positive and highly significant effect on distributive expenditure, government consumption, social protection and redistribution, and a negative effect on direct taxes, as shown by Table 2. Therefore, the political link from the traditional perspective of the fiscal policy channel is partially supported. Fiscal policy measures, with exception of redistribution, whose obtained result is non-significant, has a negative impact on the economic performance, through the reduction of the GDP growth rate. Combining these results, we can advance that the market Gini coefficient hampers economic growth, because pre-tax and transfers income inequalities result in increased public expenditure. In turn, market Gini coefficient fosters growth, by a reduction on direct taxation. Moreover, average market Gini coefficient has a positive influence on growth, when we consider the fiscal policy measures related to public expenditure. Already when we consider direct taxation and redistribution, the impact is non-significant. Based on specifications (1C), (3C) and (5C), economic growth has a positive and highly significant impact on average pre-tax and transfers Gini coefficient. Wondrously, distributive expenditure, government consumption, social protection and redistribution leads to an increase in pre-tax and transfers income disparities.

In most of the specifications in Tables 3 and 4, the initial per capita income level and the percentage of elderly population have a positive impact on fiscal policy variables. In all growth regressions, the price level of investment has a negative effect, and in some growth regressions of Table 4, instead the results in Tables 1 and 2, the human capital index positively influences economic growth. These results are in line with expectations.

Thus, an important result emerges, namely, the human capital index contributes to alleviating average pre-tax and transfers and post-tax and transfers inequality.

Table 3: SEM Models, with disposable Gini coefficient

Regressors/Specification	(1A)	(2A)	(3A)	(4A)	(5A)
	DISTEXP	*GOVC*	*SOCPROT*	*DTAXES*	*REDIST*
$lnGDPpc_{it-1}$	0.016***	0.001	0.012***	0.027***	0.015***
	(0.005)	(0.002)	(0.004)	(0.004)	(0.003)
$POP65_{it-1}$	0.381***	-0.007	0.368***	0.501***	0.082*
	(0.079)	(0.041)	(0.069)	(0.076)	(0.044)
$GINID_{it-1}$	-1.016***	-0.458***	-0.795***	-0.934***	-0.566***
	(0.069)	(0.056)	(0.056)	(0.064)	(0.046)
Obs.	245	245	245	215	245
Regressors/Specification	(1B)	(2B)	(3B)	(4B)	(5B)
	GR	*GR*	*GR*	*GR*	*GR*
$lnGDPpc_{it-1}$	-0.011***	-0.019***	-0.012***	-0.001	0.002
	(0.004)	(0.004)	(0.004)	(0.003)	(0.007)
HC_{it-1}	-0.002	0.001	-0.000	-0.010*	0.003
	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)
PI_{it-1}	-0.012***	-0.014***	-0.013***	-0.005*	-0.011***
	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
$AGINID_{it}$	-0.344***	-0.262***	-0.254***	-0.633***	-0.719***
	(0.069)	(0.102)	(0.064)	(0.063)	(0.104)
$DISTEXP_{it}$	-0.369***				
	(0.080)				
$GOVC_{it}$		-0.731***			
		(0.227)			
$SOCPROT_{it}$			-0.370***		
			(0.096)		
$DTAXES_{it}$				-0.653***	
				(0.072)	
$REDIST_{it}$					-1.369***
					(0.270)
Obs.	245	245	245	215	245
Regressors/Specification	(1C)	(2C)	(3C)	(4C)	(5C)
	AGINID	*AGINID*	*AGINID*	*AGINID*	*AGINID*
HC_{it-1}	-0.007	-0.004	-0.010*	-0.007	0.001
	(0.005)	(0.004)	(0.005)	(0.008)	(0.006)
GR_{it}	-0.454**	0.008	-0.295	-1.063	-0.571**
	(0.210)	(0.165)	(0.223)	(0.320)	(0.270)
$DISTEXP_{it}$	-0.787***				
	(0.086)				
$GOVC_{it}$		-2.074***			
		(0.251)			
$SOCPROT_{it}$			-0.855***		
			(0.119)		
$DTAXES_{it}$				-0.961***	
				(0.112)	
$REDIST_{it}$					-1.501***
					(0.212)
Obs.	245	245	245	215	245

Table 4: SEM Models, with market Gini coefficient

Regressors/Specification	(1A)	(2A)	(3A)	(4A)	(5A)
	DISTEXP	GOVC	SOCPROT	DTAXES	REDIST
$lnGDPpc_{it-1}$	0.032***	0.001	0.025***	0.055***	0.019***
	(0.005)	(0.002)	(0.004)	(0.006)	(0.003)
$POP65_{it-1}$	0.293***	0.014	0.299***	0.356***	-0.039
	(0.091)	(0.037)	(0.076)	(0.114)	(0.048)
$GINIM_{it-1}$	0.411***	0.150***	0.313***	-0.211***	0.607***
	(0.065)	(0.039)	(0.052)	(0.081)	(0.046)
Obs.	245	245	245	215	245
Regressors/Specification	(1B)	(2B)	(3B)	(4B)	(5B)
	GR	GR	GR	GR	GR
$lnGDPpc_{it-1}$	-0.007	-0.014***	-0.009**	0.016	-0.039***
	(0.005)	(0.004)	(0.004)	(0.017)	(0.011)
HC_{it-1}	0.014***	0.010*	0.013**	0.002	0.008
	(0.005)	(0.006)	(0.005)	(0.005)	(0.009)
PI_{it-1}	-0.007**	-0.011***	-0.006**	-0.014***	-0.008**
	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)
$AGINIM_{it}$	0.340***	0.346***	0.331***	0.049	-0.260
	(0.040)	(0.073)	(0.040)	(0.072)	(0.217)
$DISTEXP_{it}$	-0.501***				
	(0.116)				
$GOVC_{it}$		-2.348***			
		(0.707)			
$SOCPROT_{it}$			-0.557***		
			(0.124)		
$DTAXES_{it}$				-0.599**	
				(0.272)	
$REDIST_{it}$					0.600
					(0.397)
Obs.	245	245	245	215	245
Regressors/Specification	(1C)	(2C)	(3C)	(4C)	(5C)
	AGINIM	AGINIM	AGINIM	AGINIM	AGINIM
HC_{it-1}	-0.016	-0.000	-0.016	-0.016**	-0.014**
	(0.011)	(0.015)	(0.011)	(0.007)	(0.006)
GR_{it}	1.290***	0.114	1.261***	0.143	0.727***
	(0.430)	(0.450)	(0.441)	(0.343)	(0.201)
$DISTEXP_{it}$	1.164***				
	(0.251)				
$GOVC_{it}$		6.051**			
		(2.750)			
$SOCPROT_{it}$			1.379***		
			(0.304)		
$DTAXES_{it}$				-0.004	
				(0.159)	
$REDIST_{it}$					1.392***
					(0.119)
Obs.	245	245	245	215	245

Taking into account the abovementioned patterns, we may conclude that given the detrimental impact of fiscal policy on economic growth and the different impacts of fiscal policy on average income inequality measures, there may be optimal values of government burden shares that help to explain the results we reach. In that way, these results provide important clues on the study of different fiscal policy transmission

channels and optimal thresholds of the government size in the economy that promote not only economic growth but also a reduction in inequality.

6. Conclusions

Income inequality is one of the research topics that has received the most attention in the recent past. In this context, the relationship between income disparities and economic growth is analyzed and the literature puts forward different links between inequality and economic performance. Given the existence of different conclusions in the empirical literature, this article intends to contribute to the discussion by considering the role of the fiscal policy channel in the inequality/growth relationship. More specifically, we assess the impact of inequality on several fiscal policy measures as well as its impact on economic growth, assuming interdependence between the variables under study.

In the empirical analysis, we perform SUR regressions and SEM models to explain how inequalities and growth are interconnected and how fiscal policy explains such linkages, for a set of European countries between 1995 and 2019. We consider two different income inequality measures, namely, the Gini coefficient of disposable income and the Gini coefficient of market income. The use of both measures of inequality makes it possible to desintangle different relations between the variables under examination.

Depending on the inequality measure, some results obtained lead to different conclusions. Then, while the Gini coefficient of disposable income has a negative effect on public expenditure variables and redistribution as well as on economic growth, the Gini coefficient of market income has a positive impact on these variables. In turn, growth translates into a reduction in average disposable income inequality and an increase in average market income inequality. Additionally, we find that fiscal policy, through public expenditure and direct taxation, is a detrimental determinant of economic growth. Finally, fiscal policy can be an instrument for reducing disposable income inequality.

In conclusion, the empirical results obtained suggest that fiscal progressivity can play an important role as a transmission mechanism between inequality and economic growth. Furthermore, one aspect that could be examined in future research is the finding of non-linear relationships between inequality, growth and fiscal policy. As we have found that fiscal policy has a negative effect on economic growth and, at the same time, allows for a reduction in disposable income inequality, it may be desirable, from the perspective of the policy maker, to find thresholds for the several fiscal policy variables

that would allow for reduction of post-tax and transfers inequality, without significantly compromising the dynamics of economic growth.

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Appendix

Table A1: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Max	Min
GR	248	0.032	0.031	0.170	-0.056
lnGDPpc	279	10.362	0.497	11.635	8.982
HC	279	3.147	0.373	3.849	0.334
PI	279	0.701	0.473	7.884	0.262
GINID	247	0.290	0.036	0.371	0.220
GINIM	247	0.467	0.039	0.560	0.368
POP65	279	0.162	0.030	0.328	0.101
DISTEXP	248	0.276	0.052	0.403	0.146
GOVC	248	0.197	0.033	0.329	0.114
SOCPROT	248	0.158	0.042	0.338	0.077
DTAXES	216	0.239	0.052	0.357	0.122
REDIST	246	0.178	0.037	0.257	0.095

Table A2: Correlation matrix

	GR	*lnGDPpc*	*HC*	*PI*	*GINID*	*GINIM*	*POP65*	*DISTEXP*	*GOVC*	*SOCPROT*	*DTAXES*	*REDIST*
GR	1											
lnGDPpc	-0.146	1										
HC	-0.094	0.239	1									
PI	-0.126	0.708	0.361	1								
GINID	0.123	-0.355	-0.372	-0.337	1							
GINIM	-0.032	0.005	-0.152	-0.049	0.520	1						
POP65	-0.205	0.055	-0.198	-0.014	0.303	0.327	1					
DISTEXP	-0.361	0.371	0.115	0.375	-0.489	0.189	0.250	1				
GOVC	-0.237	-0.004	-0.171	0.168	-0.342	0.097	0.200	0.614	1			
SOCPROT	-0.329	0.335	-0.036	0.266	-0.401	0.191	0.439	0.891	0.506	1		
DTAXES	-0.217	0.524	0.108	0.475	-0.613	-0.040	0.191	0.786	0.515	0.759	1	
REDIST	-0.138	0.354	0.214	0.283	-0.453	0.524	0.040	0.679	0.445	0.590	0.564	1

Table A3: SEM Models, with disposable Gini coefficient

Regressors/Specification	(1A)	(2A)	(3A)	(4A)	(5A)
	DISTEXP	*GOVC*	*SOCPROT*	*DTAXES*	*REDIST*
$lnGDPpc_{it-1}$	0.016***	0.001	0.012***	0.027***	0.015***
	(0.005)	(0.002)	(0.004)	(0.004)	(0.003)
$POP65_{it-1}$	0.381***	-0.007	0.368***	0.501***	0.082*
	(0.079)	(0.041)	(0.069)	(0.076)	(0.044)
$GINID_{it-1}$	-1.016***	-0.458***	-0.795***	-0.934***	-0.566***
	(0.069)	(0.056)	(0.056)	(0.064)	(0.046)
Obs.	245	245	245	215	245
Regressors/Specification	(1B)	(2B)	(3B)	(4B)	(5B)
	GR	*GR*	*GR*	*GR*	*GR*
$lnGDPpc_{it-1}$	-0.010**	-0.018***	-0.012***	0.001	0.006
	(0.004)	(0.004)	(0.004)	(0.003)	(0.007)
HC_{it-1}	-0.002	0.001	-0.000	-0.009*	0.003
	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)
PI_{it-1}	-0.012***	-0.014***	-0.013***	-0.005*	-0.011***
	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
$GINID_{it-1}$	-0.337***	-0.262***	-0.248***	-0.622***	-0.735***
	(0.068)	(0.101)	(0.062)	(0.063)	(0.105)
$DISTEXP_{it}$	-0.377***				
	(0.081)				
$GOVC_{it}$		-0.755***			
		(0.232)			
$SOCPROT_{it}$			-0.377***		
			(0.097)		
$DTAXES_{it}$				-0.670***	
				(0.074)	
$REDIST_{it}$					-1.468***
					(0.282)
Obs.	245	245	245	215	245
Regressors/Specification	(1C)	(2C)	(3C)	(4C)	(5C)
	AGINID	*AGINID*	*AGINID*	*AGINID*	*AGINID*
HC_{it-1}	-0.007	-0.004	-0.010*	-0.007	0.001
	(0.005)	(0.004)	(0.005)	(0.008)	(0.006)
GR_{it}	-0.454**	0.008	-0.295	-1.063***	-0.571*
	(0.210)	(0.165)	(0.223)	(0.320)	(0.270)
$DISTEXP_{it}$	-0.787***				
	(0.086)				
$GOVC_{it}$		-2.074***			
		(0.251)			
$SOCPROT_{it}$			-0.855***		
			(0.119)		
$DTAXES_{it}$				-0.961***	
				(0.112)	
$REDIST_{it}$					-1.501***
					(0.212)
Obs.	245	245	245	215	245

Table A4: SEM Models, with market Gini coefficient

Regressors/Specification	(1A)	(2A)	(3A)	(4A)	(5A)
	DISTEXP	GOVC	SOCPROT	DTAXES	REDIST
$lnGDPpc_{it-1}$	0.032***	0.001	0.025***	0.055***	0.019***
	(0.005)	(0.002)	(0.004)	(0.006)	(0.003)
$POP65_{it-1}$	0.293***	0.014	0.299***	0.356***	-0.039
	(0.091)	(0.037)	(0.076)	(0.114)	(0.048)
$GINIM_{it-1}$	0.411***	0.150***	0.313***	-0.211***	0.607***
	(0.065)	(0.039)	(0.052)	(0.081)	(0.046)
Obs.	245	245	245	215	245
Regressors/Specification	(1B)	(2B)	(3B)	(4B)	(5B)
	GR	GR	GR	GR	GR
$lnGDPpc_{it-1}$	-0.007	-0.015***	-0.009**	0.016	-0.038***
	(0.005)	(0.004)	(0.004)	(0.017)	(0.011)
HC_{it-1}	0.013**	0.010*	0.012**	0.002	0.009
	(0.005)	(0.006)	(0.005)	(0.005)	(0.009)
PI_{it-1}	-0.007**	-0.011***	-0.006**	-0.014***	-0.007**
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
$GINIM_{it-1}$	0.330***	0.338***	0.322***	0.049	-0.246
	(0.039)	(0.071)	(0.038)	(0.070)	(0.213)
$DISTEXP_{it}$	-0.502***				
	(0.116)				
$GOVC_{it}$		-2.354***			
		(0.704)			
$SOCPROT_{it}$			-0.558***		
			(0.124)		
$DTAXES_{it}$				-0.600***	
				(0.272)	
$REDIST_{it}$					0.589
					(0.401)
Obs.	245	245	245	215	245
Regressors/Specification	(1C)	(2C)	(3C)	(4C)	(5C)
	AGINIM	AGINIM	AGINIM	AGINIM	AGINIM
HC_{it-1}	-0.016	-0.000	-0.016	-0.600**	-0.014**
	(0.011)	(0.015)	(0.011)	(0.007)	(0.006)
GR_{it}	1.290	0.114	1.261***	0.143	0.727***
	(0.430)	(0.450)	(0.441)	(0.343)	(0.201)
$DISTEXP_{it}$	1.164				
	(0.251)				
$GOVC_{it}$		6.051			
		(2.750)			
$SOCPROT_{it}$			1.379***		
			(0.304)		
$DTAXES_{it}$				-0.004	
				(0.159)	
$REDIST_{it}$					1.392***
					(0.119)
Obs.	245	245	245	215	245