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TAXATION AND WELFARE

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Abstract:

The rise of the Welfare State after the Second World War has increased the importance of analyzing the welfare impact of economic and social policies. Despite taxation is one of the most important economic instruments in hands of the governments, the direct effect on welfare has not yet received attention. The difficulties in measuring welfare probably explains the gap existing in the literature. This work contributes to estimating the effect of tax level and tax structure on welfare in European countries over 2004-2014, trough panel data models. Besides, countries are grouped by Nordic, Continental, Anglo-Saxon, Mediterranean and Eastern European models to further evaluate this relationship. Results suggest that fiscal pressure increases help countries improve welfare conditions, being labor taxes the ones with the largest effects. However, differences in such effects between social models imply that these results need to take country-specific particularities into account for adequate policy design.

Key Words: Abbreviated welfare functions, Human Development Index, fiscal pressure, tax structure, panel data models.

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1 INTRODUCTION

The rise of the Welfare State after the Second World War has increased the importance of analyzing the welfare impact of economic and social policies. Particularly, after the difficulties experienced in the last years, efficiency considerations in the provision of public resources have taken special interest. Among the various ways governments affect welfare levels, taxation is considered as one of the most relevant economic instruments, Akay *et al.* (2012). However, as mentioned by the authors, so far, the direct effect of taxation on well-being has not yet received attention.

The review of previous literature shows that taxation studies have mainly focus on the impact on economic growth and income redistribution. One possible reasons attached is that traditionally welfare measures have mainly taken income aspects into consideration. However, today it is widely accepted that welfare englobes a broader definition, Jones and Klenow (2016). Thus, the idea that wellbeing is inherently multidimensional has by now become well established in the academic and policy-oriented literature, Decancq and Lugo (2013). Despite there is not a single way to measure welfare, the ideas provided by Amartya Sen by the *Capability Approach* have contributed to the elaboration of several welfare indicators beyond GDP: *Abbreviated functions of well-being* (Sheshinkski, 1972; Runciman, 1966; Layard, 1980), the *Human Development Index* (United Nations Development Program, 1990), and the *Better Life Index* (OECD, 2011).

The objective of this work is to contribute to filling the gap existing in the literature by the study of the direct effect of taxation on welfare. For that purpose, a panel data model of 30 European countries over the period 2004-2014 is analyzed. This way, it is first evaluated the effect that taxation level (measured by the fiscal pressure) has over welfare conditions in these countries. Then, the welfare differences observed by different tax structures (share of labor, capital and consumption taxes over total taxes) are observed. Finally, countries are categorized into groups by typologies of social models. This helps to explain the results obtained in more detail, providing a narrower picture of the way tax conditions affect welfare levels among the selected countries.

This analysis contributes to filling the gap that exists in the literature, since other aspects than income are considered. Only few papers have studied the effect of taxation on welfare, mainly considering *subjective well-being* (SWB) as a measure of welfare. However, in this paper other proxies for welfare are provided: Sheshinski's *abbreviated function of welfare* and the United

Nations Organization's *Human Development Index*. This helps to check the robustness of the results previously observed.

The results obtained claim that there exists a positive significant effect of increases in fiscal pressure on welfare, when measured by the *HDI*. Moreover, it is observed that labor taxes are the ones affecting the most *HDI*, followed by capital and consumption taxes. In fact, all these effects are significant. The analysis through Sheshinski's *abbreviated welfare function* does not provide significant results. When decomposed, though, it looks that the reason is explained by the effect of taxation level on the GDP per capita (which is not significant), but not by the reduction in income inequality (which is significant). In any case, these results are consistent with those obtained through the alternative welfare measure (*HDI*). Finally, it is concluded that there are significant welfare differences when countries are grouped into typologies of social models (Nordic, Continental, Anglo-Saxon, Mediterranean and Easter-European countries). Hence, a last comment is devoted to providing an overview of welfare and taxation conditions within these groups, as well as evaluating the relationship between tax structure and welfare in each social model.

The analysis is structured in seven sections. This first section provides an introduction of the analysis to be carried out. The second section mentions previous literature on both welfare measures and taxation effects over different dimensions that indirectly affect welfare conditions. For that purpose, the evolution of welfare measures is explained, and the way taxation affects it through economic growth, income redistribution, provision of public goods and tax moral are mentioned. The third section puts welfare and taxation aspects into context by providing a picture of different European countries' situation. The fourth section describes the data sources used for the study, while the fifth section comments the empirical analysis evaluated. The sixth section presents the results obtained, and in the last section a conclusion of the analysis is provided.

2 LITERATURE REVIEW

2.1 Social Welfare: Concept and Measurement

Since the rise of the Welfare State after the World War II the importance of analyzing the welfare impact of economic and social policies has increased. Welfare economics has made use of micro-economic foundations to capture the impact of such policies on the level of individual and social welfare, Wiebke *et al.* (2004). As stated by the authors, individual welfare has historically been represented by the utility, which was understood as the desire fulfilment or preference satisfaction. In fact, they explain that utility has been routinely measured by monetary variables. This tradition has been dominant for the last two centuries, and it has been named *Welfarism*. In that vein, social welfare was understood as an aggregator of the individual welfare by means of an aggregator function which could be interpreted as a social welfare function, Wiebke et al (2004). However, they note that in recent decades several important departures from welfarism have been made, by including non-utility information in the evaluation of individual welfare.

While welfare is highly correlated with GDP per capita, deviations are often large, and it is this way how social welfare has been mostly measured, Jones and Klenow (2016). They claim that GDP is a flawed measure of economic welfare, though. Leisure, inequality, mortality, morbidity, crime and the natural environmental are just some of the major factors affecting living standards within a country that are incorporated imperfectly, if at all, in GDP, Jones and Klenow (2016). Hence, social welfare englobes, today, a broader definition. Midgley (1997) defines this concept as the state or condition of human well-being that exists when social problems are managed, when human needs are met, and when social opportunities are maximized. However, there is not still clear answer about how social welfare should be measured.

In any case, the idea that wellbeing is inherently multidimensional has by now become well established in the academic and policy-oriented literature, Decancq and Lugo (2013). However, there are many impediments to accurately measuring social conditions: there are problems with the accuracy of the data as well as difficulties in deciding which data should be used. In addition, there are disagreements among social scientists about the different methodologies that can be employed to study social well-being. While some believe that statistical information collected by governments is the most useful source of information, others claim that social surveys are more reliable. In general terms, though, social indicators are widely regarded as an effective means of quantifying and measuring global social conditions today, Midgley (1997).

The first attempt to measuring welfare beyond non-monetary variables was carried out by Amartya Sen through the *capability approach*. As explained by Kuklys and Robeyns (2004), the *capability approach* is an evaluative framework for individual welfare and social states. The core concepts are functionings and capabilities. Sen defined functionings and capabilities as follows: "The primitive notion in the approach is that of functioning — seen as constitutive elements of living. A functioning is an achievement of a person: what he or she manages to do or to be, and any such functioning reflects, as it were, a part of the state of that person (outcomes). The capability of a person is a derived notion. It reflects the various combinations of functionings (doings and beings) he or she can achieve. It takes a certain view of living as combinations of various 'doings and beings'. Capability reflects a person's freedom to choose between different ways of living (opportunities), Sen (2003). The implication behind this rational was that welfare levels measured in terms of functionings differed significantly from those measured in terms of income or expenditure. Rankings of welfare levels of countries and regions were different when they were performed according to standard welfare economics or the *capability approach*. Therefore, complementary insights could be provided by measuring welfare in terms of functionings.

Based on Amartya Sen's ideas the United Nations Organization developed the first *Human Development Report* in 1990, Herrero *et al.* (2018). As they explain, the idea was to go further on the way to measure welfare by adding variables other than pure economic ones. Hence, they created an index (*Human Development Index*) which combined material wellbeing (GDP per capita), health (life expectancy at birth) and education (literacy and enrollment) dimensions.

In 2009, Stiglitz, Sen and Fitoussi published a report where they suggested improvements in development, welfare and progress measurement. The *Stiglitz Commission Report* (Stiglitz, *et al.*, 2009) was the latest attempt to sort through the criticisms of GDP and seek practical recommendations for improvement, Jones and Klenow (2016). The authors write: "To define what wellbeing means, a multidimensional definition has to be used. Based on academic research and a number of concrete initiatives developed around the world, the Commission has identified the following key dimensions that should be taken into account. At least in principle, these dimensions should be considered simultaneously: (i) Material living standards (income, consumption and wealth); (ii) Health; (iii) Education; (iv) Personal activities including work; (v) Political voice and governance; (vi) Social connections and relationships; (vii) Environment (present and future conditions); (viii) Insecurity, of an economic as well as a physical nature. All these dimensions shape people's wellbeing, and yet many of them are missed by conventional income measures". The European Commission took part in such initiative to go *Beyond GDP*. Since then, Member States need to elaborate statistics which are necessary for the construction of a life quality multidimensional indicator.

With respect to the *Human Development Index*, the OCDE also incorporated important changes by considering distributional and descriptive changes. Apart from that, it is especially interesting to mention the *Better Life Initiative* developed by the OCDE in 2011. It constructs a table of welfare indicators which take current material and life quality aspects, as well as future possibilities into account. In this case, dimensions are not aggregated. Instead, the relative importance of each dimension can be selected in order to construct customized indexes. These are the variables selected to measure the following dimensions: income and wealth (household net adjusted disposable income, household net financial wealth), labor conditions (long-term unemployment rate, employment rate, labor market insecurity, personal earnings), housing (dwellings without basic facilities, housing expenditure), health (self-reported health, life expectancy), work-life balance (employees working very long hours, time devoted to leisure and personal care), education (student skills, years in education), social connections (quality of support network), civil commitment (voter turnout, stakeholder engagement for developing regulations), environment (air pollution, water quality), safety (feeling safe walking alone at night, homicide rate), satisfaction (life satisfaction).

As for the use of the empirical analyses, abbreviated functions of well-being have been widely used. Sheshinkski (1972) constructed a function combining average income and inequality (expressed throughout the Gini coefficient) by a welfare function $W(\mu, G) = \mu(1 - G)$. Then, Runciman (1966) and Layard (1980) developed further that function by considering a parameter reflecting the aversion to inequality $W(\mu, G) = \mu(1 - kG)$. This parameter would take the value $k = 0$ if inequality had no effect on welfare, and $k = 1$ in case equity aspects are equally valued as efficiency considerations.

2.2 State role in welfare provision: fiscal systems

As stated by Akay *et al.* (2012), "Taxation is the main economic instrument in the hand of governments influencing individual budget constraints and therefore well-being. Given that the effect of income on subjective well-being (SWB) is presently one of the most important questions (see Clark, *et al.*, 2008, for a survey) in the SWB literature, it is surprising that there is no direct evidence for the effect of taxes on SWB. Accepting that income increases SWB, at least in cross-sectional analyses, implies that taxation should reduce it. Clearly, this effect is implicitly accounted for in the existing literature, as income net of taxes is systematically used in SWB regressions. However, so far, the direct effect of taxation on well-being has not yet received attention (an exception is Lubian and Zarri, 2011, who look at the specific relationship between tax moral and SWB). Analyzing the relationship between taxation and SWB – in comparison to net income – not only contributes to the literature on the role of income for SWB, but especially provides a new perspective on a core question in the traditional literature in public and welfare economics: how do tax affect individual well-being? This is important for both the political economy of tax policy (support for tax reforms) and the sustainability and efficiency of public finance (for instance through the level of tax compliance)".

These authors (2012) found a significant and positive effect of tax payments on well-being, conditional on net income. However, the study of the effect of taxes on well-being should be carefully carried out. On the one hand, taxes help to finance institutions, public goods and services, reduce inequality. However, they also imply costs to the private sectors, since they reduce disposable income and generate distortions in their decisions, Boscá *et al.* (2017). The authors claim that there are two aspects to consider when analyzing fiscal systems: tax level and tax structure. The first refers to fiscal pressure, which is defined as the proportion of tax revenues to GDP. In their study, they explained that insufficient levels of taxation levels (hence, making it difficult to finance the adequate provision of public goods and services) can be as harmful as an excessive taxation on welfare, which would distort income, consumption and employment levels. Fiscal structure, on the other hand, is often studied through the study of direct and indirect taxes.

In this vein, there are several channels through which taxation may be affecting welfare conditions within countries. Whichever results are obtained by the empirical analysis, the review of previous literature on factors contributing to this effect provides several insights which are interesting to mention:

First and foremost, the tax effect on economic growth deserves to be explained. The relation of economic growth and tax levels has not a clear answer. Barro (1990, 1991) was the first author who introduced fiscal variables in growth equations for developed countries. It found a negative relationship, as well as Koester and Karmendi (1989) did. However, the analysis performed by other authors in more recent years (Easterly and Robelo, 1993; Levine and Renelt, 1992; Folster and Henrelson, 2001) did not find a significant effect. In contrast, the fiscal structure provides more interesting insights. Kneller *et al.* (1999) observed that taxes over property had a negative effect over economic growth, whereas the effect of consumption taxes was ambiguous. In this line, Johansson *et al.* (2008) showed that corporate taxes were the ones reducing more economic growth, followed by labor taxes. Consumption taxes, and property taxes were the least harmful ones. This result was also concluded by a report dealt by the OCDE (2010).

Regarding tax effects on the provision of public goods and services, several authors (Frey *et al.*, 2009; Luechinger, 2009; Luechinger and Raschky, 2009; Levinson, 2012) claim that the under provision of public goods (and as a consequence the prevalence of terrorism, pollution or flood disasters) has a negative effect on SWB. In this line, Boscá *et al.* (2013) found that the substitution of social security contributions by indirect taxes has positive effects over public revenues, as well as employment and GDP.

Others have studied the relation of taxes with redistribution and insurance through the social security system, Alesina *et al.* (2004). Akay et. al (2012) explained redistribution in two ways: high solidarity or strong belief in the role of the state, or the wiliness to have a tight social security net due to risk aversion (e.g. unemployment shock). Oishi *et al.* (2012) found a positive effect of a fair distribution of wealth increases over a nation's well-being. In fact, the authors stated that progressivity of the tax system increases a nation's SWB. Di Tella *et al.* (2003) concluded that higher unemployment benefits are associated with higher national well-being. Alesina *et al.* (2004) highlighted that inequality has a negative effect on SWB, especially in Europe. An article by Kyriacou *et al.* (2017) highlighted the importance of redistributive efficiency of fiscal policies due to increasing inequality (IMF, 2014; OECD, 2008, 2011) and scare budget resources that characterize recent years. They claim that efficiency allows the attainment of a given level of redistribution at lower levels of spending and taxes or the attainment of more redistribution at given tax and spending levels. In an article by Iosifidi and Mylonidis (2016) the contribution of tax structures (in terms of labor, capital and consumption taxes) to inequality is mentioned. They stated that only labor taxation exerts a significant negative effect on inequality. Hence, increasing the tax burden on labor relative to capital leads to higher income inequality. Similarly, rising the ratio of consumption to capital taxes inequality rises. Indeed, they concluded that income inequality decreases more in economically developed, institutionally stronger countries that have less labor to consumption taxes, IMF (2014).

Additionally to that, the effect of taxes and tax moral (the moral obligation to pay taxes) has also been studied. Lubian and Zarri (2011) claimed that cheating (tax evasion and aversion) generates lower levels of well-being than fiscal honesty. Frey and Stutzen (2001) explained that more intensive participation in a democracy through political institutions is associated with a higher SWB, in the sense of a higher citizenship belonging of belonging to the society.

3 WELFARE AND TAX CONTEXT:

In this part, a brief summary of current social and fiscal conditions in European countries is provided. The nation state is today used as the basic unit for analysis in economics, Midgley (1997). It functions as the unit at which social welfare issues are analyzed and social policies are formulated and implemented. Therefore, this section collects relevant data on welfare and taxation issues in order to provide a picture of trends and current conditions among European countries.

3.1 Welfare Conditions:

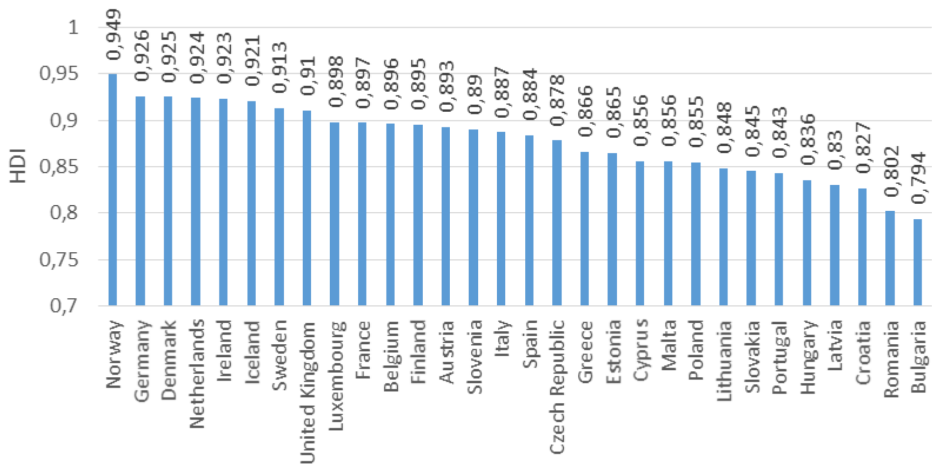
As explained in previous sections, welfare conditions have traditionally been explained by the income levels countries had. Figure 1 below, provided by the World Bank (2018), shows a map of the GDP per capita (constant 2010). As for the last available year (2016), the country with the highest value of the GDP per capita (constant 2010) is Luxembourg (108,600.935 thousands), followed by Norway (90,288.8224 thousands), Ireland (69.974,11309 thousands), and Denmark (60,670.2 thousands). The lowest values correspond to Bulgaria (7,967.7 thousands), Romania (10,065.5 thousands), Croatia (14,452.1 thousands), Latvia (14,724.7 thousands), and Hungary (14,997.2 thousands). The standard deviation of these data, which refers to the variability of the GDP per capita, equals 23,991.5826 thousand constant 2010 dollars.

Figure 1: *GDP per capita (constant 2010 thousand dollars) in 2016.*

Source: World Bank National Accounts Data, and OECD National Accounts Data Files

With the purpose of having a broader picture of welfare conditions among European countries, latest available data on the *Human Development Index* is presented. The United Nations Organization (2018) considers all countries of study with very high human development $HDI\ [0.8-1]$, except Bulgaria which is described as high human development, $HDI\ [0.7-0.8]$. This way, in 2015 (latest available data) it is observed that Norway (HDI=0.949) is the country with the highest welfare level. It is followed by Germany (HDI=0.926), Denmark (HDI=0.925), the Netherlands (HDI=0.925) and Ireland (HDI=0.924). Among the countries with the least welfare conditions are: Bulgaria (HDI=0.794), Romania (HDI=0.802), Croatia (HDI=0.827), Latvia (HDI=0.83) and Hungary (HDI=0.836). The standard deviation of the *Human Development Index* among the selection of the aforementioned European countries (2015) is 0.039 units.

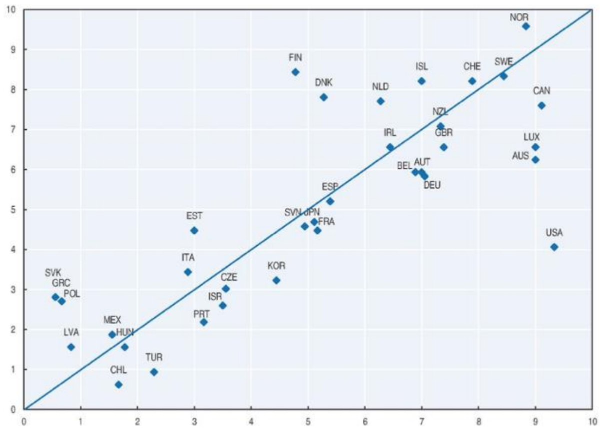
Figure 2: *Human Development Index in European countries, 2015*



Source: United Nations Development Program. Human Development Reports. Data (2018). Own Elaboration

As explained in a report carried out by the OECD (2017), the figure below shows that "countries above the blue diagonal line generally perform better on quality-of-life outcomes, relative to material conditions; the converse is true for those below the diagonal. Finland and Denmark, for example, have very high scores on quality of life, relative to their mid-ranking position on material conditions. By contrast, the United States, Australia, Luxembourg, the United Kingdom and Germany have a high number of comparative strengths on material conditions, compared to their relative position on quality of life indicators. Nevertheless, the top left and bottom right quadrants of the figure are sparsely populated: no OECD country does well on quality of life without achieving a moderate level of material conditions, and vice versa".

Figure 3: *Comparative performance on material conditions (x-axis) and quality of life (y-axis) OECD countries, latest available data*

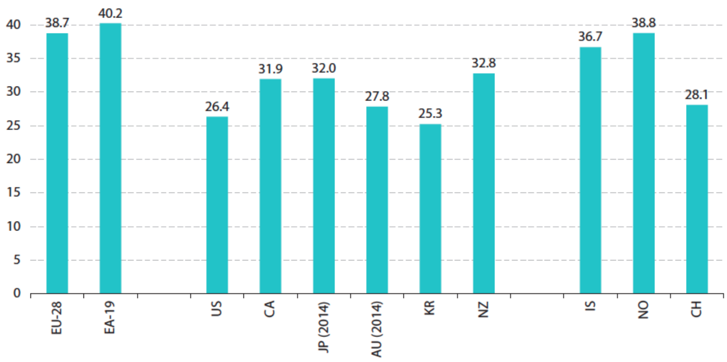


Source: OECD (2017)

3.2 Tax Level:

In a report published in 2017, the European Commission explained that, in general, the EU tax level is high compared to other advanced economies: around 12 percentage points of GDP above the level for the USA and 7 percentage points above the recorded by Japan (in 2014). It is also significantly higher than the level for New Zealand (32,8%), Canada (31,9%), Australia (27,8% in 2014) and South Korea (25,3%).

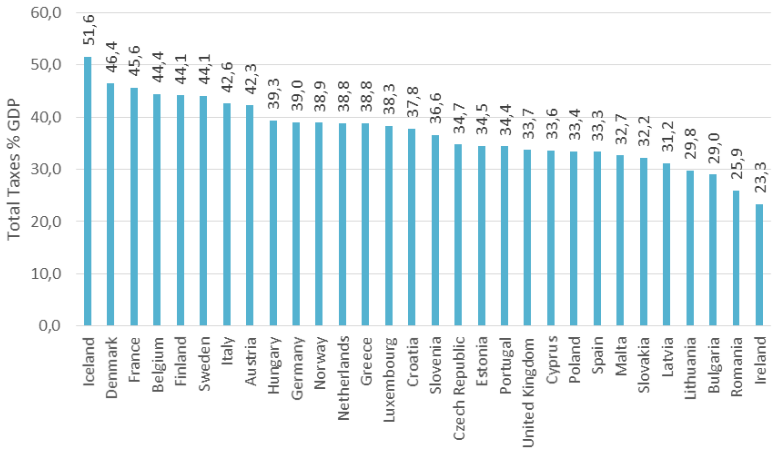
Figure 4: *Tax revenue (including social contributions), EU and selected countries, 2015 (% of GDP).*



Source: DG taxation and Customs Union, based on Eurostat and OECD data, European Commission (2017)

Selected data for the 30 European countries that are furthered studied from section IV on, latest available data show that Iceland (51.6%), Denmark (46.4%), France (45.6%), Belgium (44.4%), Finland (44.1%) experience the highest fiscal pressure. Ireland (23.3%), Romania (25.9%), Bulgaria (29.0%), Lithuania (29.8%), and Latvia (31.2%). Taking this data into account, the standard deviation shows the variation in the taxation level among these countries in 2016, which was 6.38%.

Figure 5: *Tax level: Fiscal pressure in European countries, 2016*



Source: European Commission. Data on Taxation. Indicators (2018). Own Elaboration.

3.3 Tax Structure

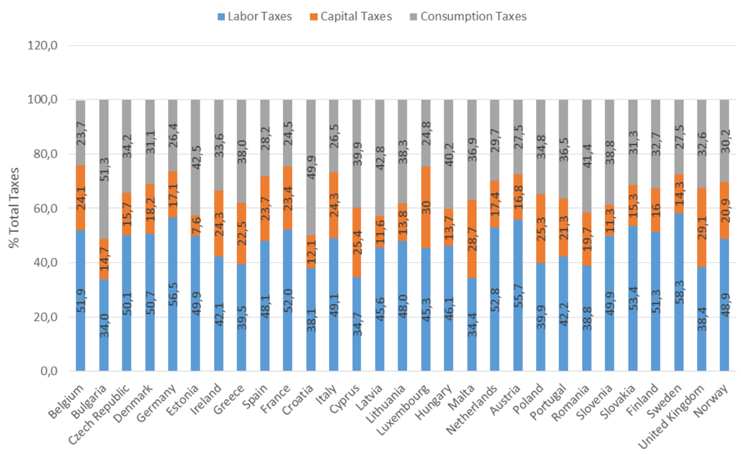
A more detailed view of this data is analyzed by decomposing the taxation level by the way it is structured. The European Commission (2017) explains that the structure of taxation varies quite significantly across Member States of the EU. When it comes to the share of direct taxes in total tax revenues, in 2016, Iceland has the highest share (66.0%) followed by Denmark (65.1%), Ireland (46.0%), Malta (43.2%), United Kingdom (42.6%), as well as Sweden (42.6%) and Norway (40.4%). In general, the shares of social contributions to total tax revenues are correspondingly low in these countries. In Denmark, there is a special reason for the extremely low share of social contributions: most welfare spending is financed out of general taxation. This requires high direct taxation levels and indeed the share of direct taxation to total tax revenues in Denmark is by far the highest in the Union. However, Germany, the Netherlands and France have tax systems that are the mirror image of Denmark's with high shares of social contributions in the total tax revenues, and relatively low shares of direct tax revenues.

A number of Member States have a much lower share of direct taxes. Many of these countries have adopted a flat rate system, which typically induce a stronger reduction in direct tax rates than indirect tax rates. These lower shares of direct taxes are counterbalanced either by relatively higher proportions of indirect taxes (for example Bulgaria (53.6%), Croatia (51.7%) and Hungary (46.6%) or by relatively larger shares of social contributions (for example Slovakia (43.8%), Czech Republic (42.3%) and Lithuania (40.9%)).

Figure 6: *Tax structure: direct taxes, indirect taxes and social security contributions in European countries, 2016*

Source: European Commission. Data on Taxation Indicators (2018). Own Elaboration

Figure 7: *Tax structure: labor, capital and consumption taxes in European countries, 2016*



Source: European Commission. Data on Taxation. Indicators (2018). Own Elaboration

The interest, here, relies on analyzing whether there exists any relationship between both tax levels and structures, and welfare conditions in different countries. The descriptive analysis provided seem to project a positive relationship since the highest welfare performers in the *Human Development Index* are those with the highest tax level. However, this statement needs to be furthered studied in order to reach a reliable conclusion. Besides, in case there exists any relationship, a further analysis on the way fiscal pressure is structured will provide complementary insights.

4 DATA DESCRIPTION

This section explains in detail the data which is later on used for the empirical model which analyses the effect of taxation on welfare. As mentioned in section II, welfare can be represented by the *abbreviated welfare function* of Sheshinkski, which is constructed from the

GDP per capita and Gini Coefficient data, both obtained from The World Bank national accounts (2018). As defined by the institution, GDP per capita is elaborated with the gross domestic product (the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products) divided by midyear population. It is measured in constant 2010 US$, which allows to control for price variations over time. As stated by The World Bank (2018), "Gini index measures the extent to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality. Such data developed by the Development Research Group of the World Bank are based on primary household survey data obtained from government statistical agencies and World Bank country departments".

Additionally, as a way to have an alternative measure for welfare, the model is also estimated through the *Human Development Index* elaborated by the United Nations Organization (2018). As explained by the United Nations Organization, the HDI was created to emphasize that people and their capabilities should be the ultimate criteria for assessing the development of a country, not economic growth alone. The HDI can also be used to question national policy choices, asking how two countries with the same level of GNI per capita can end up with different human development outcomes. These contrast can stimulate debate about government policy priorities. Hence, The *Human Development Index* (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions. The health dimension is assessed by life expectancy at birth, the education dimension is measured by mean of years of schooling for adults aged 25 years and more and expected years of schooling for children of school entering age. The standard of living dimension is measured by gross national income per capita. The HDI uses the logarithm of income, to reflect the diminishing importance of income with increasing GNI. The scores for the three HDI dimension indices are then aggregated into a composite index using geometric mean. The United Nations Organization mentions that the HDI simplifies and captures only part of what human development entails. It does not reflect on inequalities, poverty, human security, empowerment, etc.

Data on taxation comes from the European Commission (2018), which publishes an overview of trends in taxation revenues, tax structures and reforms over recent years (2004-2016) aiming to develop robust and effective tax policies for the future. Regarding the taxation level, the European Commission provides data on the total tax revenue (including social contributions) over GDP; this is, fiscal pressure.

In relation to tax structures, there is also a great variety of data provided by the European Commission. In the Annex B (Methodology and explanatory notes) of "Taxation trends in the European Union", the European Commission explains that, traditionally, taxes have been decomposed by direct and indirect taxes. Direct taxes tax endowment increases, whereas indirect taxes are applied to consumption - which is considered as the ability to pay. Hence, total taxes include taxes (direct and indirect taxes) plus compulsory actual social contributions. Indirect taxes include taxes on consumption (value added taxes, taxes and duties on imports excluding VAT, taxes on products except VAT and import duties such as taxes on tobacco and alcohol, and environmental taxes -energy, transport, pollution and resources taxes-). Direct taxes include labor taxes (personal income tax, employees' social security contributions, employers' social security contributions) and capital taxes (corporate income tax). This data is commonly expressed as a fraction over total taxes in each case.

Hence, data obtained on taxation from the European Commission (2018) note that the sum of all direct taxes, indirect taxes, and social contributions add up total taxes. On the other hand, the methodology and explanatory notes in Annex B, developed by the European Commission (2017), explain that total taxes can also be decomposed by labor taxes, consumption taxes and capital taxes.

As for the use of control variables, that may be significant for the welfare analysis, data on corruption and unemployment levels are considered. The World Bank (2018) elaborates a *Control of Corruption* variable reflects perceptions of "the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests", Kaufmann *et al.* (2010). The authors state that "it combines the views of a number of enterprises, citizens and expert survey respondents in industrial and developing countries. The individual data sources underlying the aggregate indicators are drown form a diverse variety of survey institutes, think tanks, non-governmental organizations and international organizations. The World Bank uses an Unobserved Component Model (UCM) to aggregate the various responses in the six clusters (Violence and Accountability, Political Stability/ Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law and control of Corruption). This model treats the "true" level of governance in each country as unobserved, and assumes that each of the available sources for a country provide noisy "signals" of the level of governance. The UCM then constructs a weighted average of the sources for each country as the best estimate of governance for a country. The weights are proportional to the reliability of each source. This means that more precise sources (in the sense of providing less noisy signals of governance) receive more weight in the aggregate indicators. The resulting estimates of governance have an expected value (across countries) of zero, and a standard deviation (across countries) of one. This implies that virtually all scores lie between -2.5 and 2.5, with higher scores corresponding to better outcomes".

The *Long-Run Unemployment Rate* is obtained from the OECD (2018). "It refers to people who have been unemployed for 12 months or more. The long-term unemployment rate shows the proportion of these long-term unemployed among all unemployed. Unemployment is usually measured by national labor force surveys and refers to people reporting that they have worked in gainful employment for less than one hour in the previous week, who are available for work and who have sought employment in the past four weeks. Long-term unemployment causes significant mental and material stress for those affected and their families. It is also of particular concern for policy makers, as high rates of long-term unemployment indicate that labor markets are operating inefficiently. This indicator is measured as a percentage of unemployed".

Table 1: *Summary statistics of the selected 30 European countries (2004-2014)*

	Welfare	**GDP pc**	**Gini**	**HDI**	**FP**	**DT/TT**	**IT/TT**	**SS/TT**	**LT/TT**	**Ca/TT**	**Co/TT**
Mean	10952,05	15670,46	31,02	0,86	35,60	32,14	39,19	28,79	46,42	19,38	34,24
St. Dev	9314,30	13197,53	4,05	0,04	5,45	10,85	6,66	10,56	7,43	6,51	6,87
Max.	39317,87	54527,29	39,00	0,95	48,90	68,19	56,11	44,78	61,49	36,76	54,34
Min.	508,21	799,07	0,00	0,75	25,33	15,74	26,61	0,13	27,14	6,80	21,19

5 ECONOMETRIC MODELS:

The analysis aims to study of the effect that taxation exerts over welfare levels among European countries (2004-2014). For that purpose two different analysis are carried out:

First, the impact that the taxation level exerts over countries' welfare levels is studied. Then, the way tax structure affects it is analyzed.

In order to do so, panel data models are used. The reason for that is that the same countries (same sample) are analyzed over the 11 different periods (2004-2014). Because the analysis is focused on European countries, all countries for which taxation data is available in the European Commission (2018) are selected (N=30): Belgium, Bulgaria, Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden, United Kingdom, Iceland, and Norway.

A panel data model has been considered more adequate than a cross-sectional model, since the observation of the selected countries in several periods provides a more precise result than a one year evaluation. However, panel data models imply that despite observations are independent from each other (random sample individuals meaning that error terms are not correlated among different observations), they are not identically distributed. This is important to bear in mind, because results obtained from pooled data models are not appropriate.

The estimated panel data model considers the usual panel data models' assumptions, Jeffrey (2010): i) Countries are randomly selected, ii) Perfect linear combinations within the explanatory variables do not exist and they present changes over time (at least in some of them), iii) The estimator is consistent at least when N tends to infinity (the expected value of the idiosyncratic error, given the explanatory variables in all years, and the unobservable effect is zero: $E(u_{it}|x_{is}, \alpha_i) = 0$), iv) homoscedasticity: $cov(\alpha_i, x_{is}) = 0$, v) the explanatory variables are independent and identically and normally distributed.

Different models are studied with the purpose of checking their robustness. Similar results are expected when measurement variations are incorporated in any variable, though. In any case, welfare is considered as the dependent variable of the model, and it is measured both by the *abbreviated welfare function* provided by Sheshinski (1972) and the *Human Development Index* performed by the United Nations Organization (2018). As for the explanatory variables, the interest of the analysis relies both on taxation level (fiscal pressure) and structure (share of labor, capital, and consumption taxes over total taxes). The study of the tax structure could also have been carried out through direct and indirect taxes. However, the obtained results seem to be misleading because direct taxes, indirect taxes and social security contributions corresponding to Belgium do not add up to total taxes. Table 1 below summarizes the data used in the two analyses:

Table 2: *Summary of the variables included in the analysis*

Notation:	**Model:**	**Description**	**Source:**
W_{it}	Dependent variable	Abbreviated Welfare Function	Sheshinski (1972)
HDI_{it}	Dependent variable	Human Development Index	United Nations Organization (1990)
FP_{it}	Explanatory variable	Fiscal Pressure	European Commission (2018)
$\frac{LT_{it}}{TT_{it}}$	Explanatory variable	Labor taxes over total taxes	European Commission (2018)
$\frac{CaT_{it}}{TT_{it}}$	Explanatory variable	Capital taxes over total taxes	European Commission (2018)
$\frac{CoT_{it}}{TT_{it}}$	Explanatory variable	Consumption taxes over total taxes	European Commission (2018)
$Corruption_{it}$	Control variable	Corruption	World Bank (2018)
LRU_{it}	Control variable	Long Run Unemployment	OECD (2018)

As for the error term (u_{it}), the dimensions provided by the Better Life Index of the OECD are considered to be affecting welfare, others than taxation: Income (household net adjusted disposable income, household net financial wealth), work-life balance (employees working very long hours, time devoted to leisure and personal care), housing (dwellings without basic facilities, housing expenditure, rooms per person), jobs (long-term employment rate, employment rate, labor market insecurity, personal earnings), social networks (quality of support network), education (education attainment, student skills, years in education), environment (air pollution, water quality), civic engagement (voter turnout, stakeholder engagement for developing regulations), health (self-reported health, life expectancy), life satisfaction (life satisfaction), safety (feeling safe walking alone at night, homicide rate).

Because panel data are used, the individual and temporal effects of the error term are taken into account. The individual effect (α_i) considers that the error term among individuals varies (while time differences in the error term are taken constant). The temporal effect (v_t) takes error term variations across individuals as constant, while it measures error term differences across time. Because the dimensions considered in the error term vary from country to country, while temporal differences are not that different, it is assumed that individual effects prevail.

In order to conclude whether the model of individual effect has to be estimated by fixed or random effects the Haussmann test is evaluated. Random effects estimation uses the same transformation as fixed effects estimation, but taking into consideration that the term $\propto_i$ is not correlated with any of the explanatory variables for any period. This test (directly provided by Gretl) tests the null hypothesis that the individual effect $\propto_i$ is independent form all the explanatory variables and for any period.

5.1 Effect of Tax Level and Welfare:

The first analysis, aims to study the effect of taxation level (measured by fiscal pressure) on different welfare measures. Some **control variables** are added since it is considered that there are several components, which can be observed, affecting welfare which differ across countries over time and should be controlled in order to obtain a more precise estimate of the explanatory variables of interest. Hence, corruption and long-run unemployment levels are suggested, and the following general models are presented:

$$\boldsymbol{Model\ 1}: lnW_{it} = B_0 + B_1FP_{it} + B_2Corruption_{it} + B_3LRU_{it} + \propto_i + u_{it}$$

$$\boldsymbol{Model\ 2}: HDI_{it} = B_0 + B_1FP_{it} + B_2Corruption_{it} + B_3LRU_{it} + \propto_i + u_{it}$$

Additionally to these models, the effect that fiscal pressure exerts over GDP per capita (constant 2010 dollar) and the Gini coefficient are analyzed. The reason for that is that in case different results are obtained by the two general models, the aforementioned analysis could provide helpful explanations. The *abbreviated welfare function* of welfare is a composition of the GDP per capita and the Gini coefficient. Hence, because the taxation level effect could be counterbalance by the relationship it has on the GDP per capita and the Gini coefficient, these effects are also considered.

$$\boldsymbol{Model\ 1.(A)}: \ln(GDPpc)_{it} = B_0 + B_1FP_{it} + B_2Corruption_{it} + B_3LRU_{it} + \propto_i + u_{it}$$

$$\boldsymbol{Model\ 1.(B)}: \ln(Gini)_{it} = B_0 + B_1FP_{it} + B_2Corruption_{it} + B_3LRU_{it} + \propto_i + u_{it}$$

5.2 Effect of Tax Structure on Welfare:

On the other hand, a second analysis is performed to see whether tax structure is what matters for welfare. This way total taxation is decomposed to conclude whether the effects of the tax structure affects welfare differently. The fact that labor, capital and consumption taxes are provided as a ratio over total taxes by the European Commission implies that these dummy variables present a multicollinearity problem. Because of that reason, control variables are not included. This is the general model of interest:

$$\boldsymbol{Model\ 3}: lnW_{it} = B_0 + B_1 \frac{LT_{it}}{TT_{it}} + B_2 \frac{Ca_{it}}{TT_{it}} + B_3 \frac{Co_{it}}{TT_{it}} + \propto_i + u_{it}$$

$$\boldsymbol{Model\ 4}: HDI_{it} = B_0 + B_1 \frac{LT_{it}}{TT_{it}} + B_2 \frac{Ca_{it}}{TT_{it}} + B_3 \frac{Co_{it}}{TT_{it}} + \propto_i + u_{it}$$

The multicollinearity problem can be solved if the estimation does not include one of those dummy variables. However, there is an important aspect to be mentioned: The estimators obtained cannot be interpreted as the ceteris paribus mean causal effect of the explanatory variable under study on welfare (dependent variable). Instead, differences in the effect on the dependent variable by each of the dummy variables included over the ones which are not included are obtained, as demonstrated below:

$$\boldsymbol{Model\ 3}: lnW_{it} = B_0 + B_1 \frac{LT_{it}}{TT_{it}} + B_2 \frac{Ca_{it}}{TT_{it}} + B_3 \frac{Co_{it}}{TT_{it}} + \propto_i + u_{it}$$

$$lnW_{it} = B_0 + B_1 \frac{LT_{it}}{TT_{it}} + B_2 \frac{Ca_{it}}{TT_{it}} + B_3 \left(1 - \frac{LT_{it}}{TT_{it}} - \frac{Ca_{it}}{TT_{it}}\right) + \propto_i + u_{it}$$

$$lnW_{it} = \widehat{B_0 + B_3} + (\widehat{B_1 - B_3}) \frac{LT_{it}}{TT_{it}} + (\widehat{B_2 - B_3}) \frac{Ca_{it}}{TT_{it}} + \propto_i + u_{it}$$

5.3 Analysis of the Welfare Differences among Typologies of Social Models:

As mentioned by Midgley (1997) in the modern world, nations are often grouped into categories or subsystems in terms of geographic, cultural, economic, and political criteria. As a way to better present the results obtained by this empirical analysis, European nations are categorized in groups of similar characteristics in order to provide a deeper understanding of the way in which social conditions are affected by the particular characteristics their fiscal systems have. This is a powerful tool to narrow down the complex differences between countries to a manageable set of dimensions and indicators, Aiginger *et al.* (2009). In fact, future policy can be benefited from a proper understanding of the drivers that have enabled some countries performed better than others in the recent past. For that purpose, differences between typologies of social models have to be assessed in light of the welfare state challenges that lie ahead, Aiginger and Leoni (2009). The aim of this section is to test whether a "typologies of social models" perspective shows significant differences regarding welfare conditions, so that it is worth it its evaluation.

Andersen (1990) states that different welfare state regimes are encountered within the EU. These are the ones generally identified (Ferrera and Rhodes, 2000) and, therefore, included in the model: Scandinavian countries (Denmark, Finland, Sweden, Norway, Iceland), Anglo-Saxon countries (Ireland, United Kingdom), Continental countries (Germany, France, Belgium, Netherlands, Austria, Luxemburg), Mediterranean countries (Greece, Italy, Portugal, Spain) and Easter European countries (Baltic States, Romania, Poland, Bulgaria, Ukraine, Hungary, Czech Republic, Slovenia).

According to Aiginger and Leoni (2009), the Scandinavian model is the most comprehensive one, with a high degree of emphasis on redistribution, social inclusion and universality. The authors explain, that these countries can be subsumed under this ideal-type and they are characterized by a strong social dialogue and close cooperation of the social partners with the government, with trade unions prominently involved in economic life at large. The Continental model emphasizes employment as the basis of social transfers, benefits are at more moderate level and are linked to income. The liberal or Anglo-Saxon, emphasizes the responsibility of individuals for themselves; social transfers are smaller than in other countries, more targeted and means tested. In the Mediterranean model, the low level of social transfers is partly counterbalanced by the strong supportive role of family networks. As Ferrera (1996) has pointed out, in opposition to the universalistic model of the North, social policies in the Southern model are characterized by particularistic and clienteles traits. Central and Eastern European countries can represent an own group mode. Their post-war history has followed completely distinct path from the rest of Europe, with no need for state and society to develop an institutional framework able to absorb the conflicts between capital and labor, Keune (2006). In spite of its universalistic drive, the state-socialist model was fraught with problems, especially the low quality of services and the dysfunctionalities of the planned economy. In the years after 1989, when state-socialism was replaced by the market system, all CEE countries experienced a profound crises, and it was only by the mid – 1990s that most CEE countries regained stability and started their catching-up process.

In order to empirically analyze whether there are significant welfare differences among the selected European countries, the following model is considered:

$$\boldsymbol{Model\ 5}: HDI_{it} = B_0 + B_1 dA_{it} + B_2 dM_{it} + B_3 dC_{it} + B_4 dE_{it} + B_5 dN_{it} + \alpha_i + u_{it}$$

However, because of a multicollinearity problem the effect of each social model is estimated one by one. This result will provide an explanation of the difference (and its significance) there exist between the estimated social model and the rest of the models. Then, aiming to see the differences observed between each of the social model proposed, the same model is estimated, but one of the dummy variables is not included in the model.

Table 3: *Summary of the dummy variables included in the analysis*

Notation:	Model:	Description
dA_{it}	Explanatory variable	Dummy variable corresponding to Anglo-Saxon countries
dM_{it}	Explanatory variable	Dummy variable corresponding to Mediterranean countries
dC_{it}	Explanatory variable	Dummy variable corresponding to Continental countries
dE_{it}	Explanatory variable	Dummy variable corresponding to Eastern-European countries
dN_{it}	Explanatory variable	Dummy variable corresponding to Nordic countries

The purpose of the above analysis is to conclude whether the way different social models are affected by tax structure deserves to be studied. In such case, a proper analysis to observe the way different tax structures affect welfare levels in different countries' groups would be obtained throughout the following model:

$$\boldsymbol{Model\ 6.1}: HDI_{it} = \beta_0 + \beta_1 \ln(GDPpc) + \beta_2 corruption + \beta_3 LRU + \beta_4 LT + \beta_5 LT * dummy$$

$$\boldsymbol{Model\ 6.2}: HDI_{it} = \beta_0 + \beta_1 \ln(GDPpc) + \beta_2 corruption + \beta_3 LRU + \beta_4 CaT + \beta_5 CaT * dummy$$

$$\boldsymbol{Model\ 6.3}: HDI_{it} = \beta_0 + \beta_1 \ln(GDPpc) + \beta_2 corruption + \beta_3 LRU + \beta_4 CoT + \beta_5 CoT * dummy$$

The interest of these estimations relies on the interpretation of the sum of the coefficients $\beta_4 + \beta_5$ since they represent the effect of increasing either labour, capital or consumption taxes in one million euros on the *Human Development Index* of each social model type described above. This is because data corresponding to labour, capital and consumption taxes are given in million euros by Eurostat (2018). Thanks to having absolute values, instead of shares over total taxes, the effect of them on welfare can be estimated. This model takes as a reference the model provided by Akai *et al.* (2012), which evaluates the effect of taxation on subjective well-being. They took into account income levels and socio-demographic characteristics and used them as control variables in the model. Therefore, the suggested estimation incorporates GDP per capita levels, corruption values and long-run unemployment rates as control variables of the model. Additionally to that, a dummy variable corresponding to one of the social model typologies aforementioned are included and multiplied by each type of tax, to observe the way this effect differs between social models.

6 RESULTS

6.1 Tax Level and Welfare:

The results presented below show that when welfare is measured by the *Human Development Index*, fiscal pressure increases welfare significantly. Indeed, this results holds when control variables are included in the model (corruption and long-run unemployment). In fact, the estimated effect when control variables are included allow observing the partial effect of taxation increases on welfare, which discounts the effect of such control variables. However, the analysis of fiscal pressure effect on welfare, measured by Sheshinski's *abbreviated welfare function*, seem not to be significant. Not even when control variables are added. At least, the result is that fiscal pressure has a positive effect on welfare, which is consistent with the results obtained with the HDI.

Further explanations are obtained by decomposing the *abbreviated welfare function* by GDP per capita and the Gini coefficient. Fiscal pressure increases GDP per capita, but the effect is not significant. In contrast, it happens that inequality is reduced significantly by higher fiscal pressure. Hence, it can be interpreted that there are factors, other than income factors, which may explain why welfare increases when fiscal pressure is higher. It is, indeed, observed that whenever control variables are added into the model, the coefficient corresponding to the *abbreviated welfare functions* decreases, whereas the HDI one rises.

Table 4: *Effect of fiscal pressure on the Abbreviated Welfare Function*

	Model 1.1	**Model 1.2**	**Model 1.3**	**Model 1.4**
Fiscal Pressure	0.0046	0.0270	0.0129	0.0107
Corruption		-0.2081**		-0.1357
LRU			-0.0024*	-0.0031*
n	264	264	243	243
FE/RE	FE (2.7670e-146)	FE (1.3116E-146)	FE (1.4799e-137)	FE (3.3753e-137)

*Note that the coefficients correspond to the ceteris paribus causal effect of the explanatory variable on the dependent variable. The significance level is provided on the right by *** (1%), ** (5%), * (1%). The abbreviated welfare function is included in logarithmic terms to mitigate large variations.*

Table 5: *Effect of fiscal pressure on the Human Development Index*

	Model 2.1	Model 2.2	Model 2.3	Model 2.4
Fiscal Pressure	0.0010**	0.0015***	0.0018***	0.0020***
Corruption		0.0124***		0.0104***
LRU			-7.3586	-4.3270e-05
n	330	319	284	284
FE/RE	RE (8.1166e-05)	RE (1.5816e-12)	RE (0.0042)	RE (4.0224e-08)

*Note that the coefficients correspond to the ceteris paribus causal effect of the explanatory variable on the dependent variable. The significance level is provided on the right by *** (1%), ** (5%), * (1%).*

Table 6: *Effect of fiscal pressure on GDP per capita*

	Model 1(A).1	Model 1(A).2	Model 1(A).3	Model 1(A).4
Fiscal Pressure	0.0041	0.0026	0.0112	0.0092
Corruption		-0.2246**		-0.1664*
LRU			-0.0023	-0.0026*
n	270	270	249	249
FE/RE	FE (8.2511e-151)	FE (2.043e-151)	FE (2.1714e-14)	FE (2.6048e-141)

*Note that the coefficients correspond to the ceteris paribus causal effect of the explanatory variable on the dependent variable. The significance level is provided on the right by *** (1%), ** (5%), * (1%). The GDP per capita is included in logarithmic terms to mitigate large variations.*

Table 7: *Effect of fiscal pressure on the Gini Coefficient*

	Model 1(B).1	Model 1(B).2	Model 1(B).3	Model 1(B).4
Fiscal Pressure	-0.1566**	-0.0995	-0.1589**	0.0590
Corruption		-1.2743**		-0.0859
LRU			0.0550***	0.0523***
n	290	290	266	266
FE/RE	RE (0.0004)	RE (0.0154)	RE (0.0321)	RE (1.4750e-36)

*Note that the coefficients correspond to the ceteris paribus causal effect of the explanatory variable on the dependent variable. The significance level is provided on the right by *** (1%), ** (5%), * (1%).*

6.2 Tax Structure and Welfare:

The analysis of the effect of tax structure (the decomposition of total taxes by labor taxes, capital taxes and consumption taxes) on welfare offers the following interpretation:

Capital taxes are the taxes with the highest effect on welfare, measured by Sheshinkski's *abbreviated welfare function*, followed by labor taxes. The only significant difference in the effect they have on welfare belongs to capital taxes over both labor and consumption taxes, but there does not seem to be significant differences in the effect that labor or consumption taxes have over welfare, when it is measured by an abbreviated function.

Table 7: *Analysis of the differences in the effects of tax structure on the abbreviated welfare function*

lnW_{it}	$\frac{LT_{it}}{TT_{it}}$	$\frac{Ca_{it}}{TT_{it}}$	$\frac{Co_{it}}{TT_{it}}$
$\frac{LT_{it}}{TT_{it}}$		-0.0159017 (B1<B2)**	0.00307021 (B1>B3)
$\frac{Ca_{it}}{TT_{it}}$	0.0158704 (B2>B1)**		0.0189505 (B2>B3)**
$\frac{Co_{it}}{TT_{it}}$	-0.00311069 (B3<B1)	0.0189505 (B2>B3)**	

*<u>Note</u> that this table shows how different is the explanatory variable in the left with respect to the explanatory variable in the right, and represented by the coefficient provided in the table. The significance level of such differences regarding the welfare levels are expressed as *** (1%), ** (5%) and * (1%).*

Table 8: *Analysis of the differences in the effects of tax structure on the human development index*

HDI_{it}	$\frac{LT_{it}}{TT_{it}}$	$\frac{Ca_{it}}{TT_{it}}$	$\frac{Co_{it}}{TT_{it}}$
$\frac{LT_{it}}{TT_{it}}$		0.000977835 (B1>B2)**	0.00225345 (B1>B3)***
$\frac{Ca_{it}}{TT_{it}}$	-0.00097964 (B2<B1)**		0.00127504 (B2>B3)***
$\frac{Co_{it}}{TT_{it}}$	-0.00225013(B3<B1)***	-0.00127233(B3<B2)***	

*<u>Note</u> that this table shows how different is the explanatory variable in the left with respect to the explanatory variable in the right, and represented by the coefficient provided in the table. The significance level of such differences regarding the welfare levels are expressed as *** (1%), ** (5%) and * (1%).*

Alternative measures of welfare (HDI), however, conclude that labor taxes are the ones affecting most welfare conditions in European countries, followed by capital and consumption taxes, respectively. Besides, all differences are significant. Therefore, it can be stated that by taking other dimensions than income and inequality into account, welfare conditions are mostly affected by labor taxes, capital and consumption taxes, respectively. However, if only income and inequality are observed, capital and labor taxes affect welfare the most, respectively; and consumption taxes do not present significant differences on the way they affect welfare compared to other taxes. This results show consistent relationships compared to previous literature, which finds that capital taxes have the largest (negative) effect on economic growth (the most proximate monetary variable to GDP per capita), and as for inequality measures, labor taxes are the ones affecting it negatively (meaning that inequality is reduces) and consumption is either ambiguous or positive. Hence, HDI is probably capturing better all these effect so a more global view of its effect on welfare.

6.3 Analysis of the Welfare Differences among Typologies of Social Models:

The last analysis observes whether it is significant to group different countries in groups of Typologies of Social Models to explain the results in more detail. The results show that Nordic countries are the ones experiencing the highest welfare differences compared to the rest of groups. In fact, they are the countries with the highest welfare. Such differences are only significant compared to Mediterranean and Eastern-European countries welfare levels (measured by the *Human Development Index*). Anglo-Saxon countries come to the second place regarding welfare levels. In the same vein, only differences with Mediterranean and Eastern-European countries are significant. In the third position Continental countries are located, with significant differences with Mediterranean and Eastern-European countries. Mediterranean countries, experience significant welfare differences with all countries, and it only lies above Eastern-European countries.

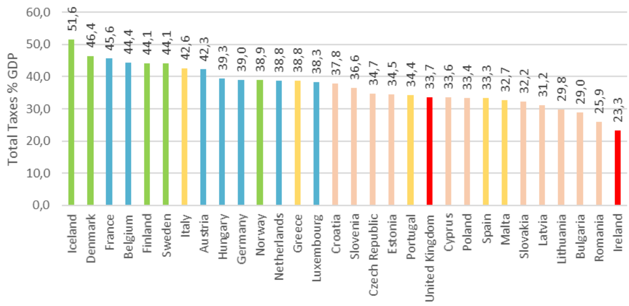
Table 9: *Analysis of the welfare differences by typologies of social models*

HDI_{it}	**Rest**	**dC**	**dE**	**dN**	**dA**	**dM**
dC	0.0384015***		0.0665606***	−0.0156970	−0.0111061	0.0447212***
dE	-0.05973***	−0.0665606***		−0.08226***	−0.077667***	−0.0218394*
dN	0.0557018***	0.0156970	0.0822576***		0.00459091	0.0604182***
dA	0.0448149	0.0111061	0.077667 ***	−0.00459091		0.0558273***
dM	-0.0168000	−0.0447212***	0.0218394*	−0.06042***	−0.055827***	

*Note that this table shows how different is the dummy variable in the left with respect to the dummy variable in the right, and represented by the coefficient provided in the table. The significance level of such differences regarding the welfare levels (measured by the HDI) are expressed as *** (1%), ** (5%) and * (1%).*

Since the suggested groups present significant welfare differences, a brief interpretation is provided below. Figure 8 shows the tax level of each European country in 2016 (latest available data). It is concluded that both Nordic and Continental countries (in green and blue color, respectively) have the highest fiscal pressure. Eastern European and Anglo-Saxon countries have the lowest taxation level, and Mediterranean countries present notable variations within the group.

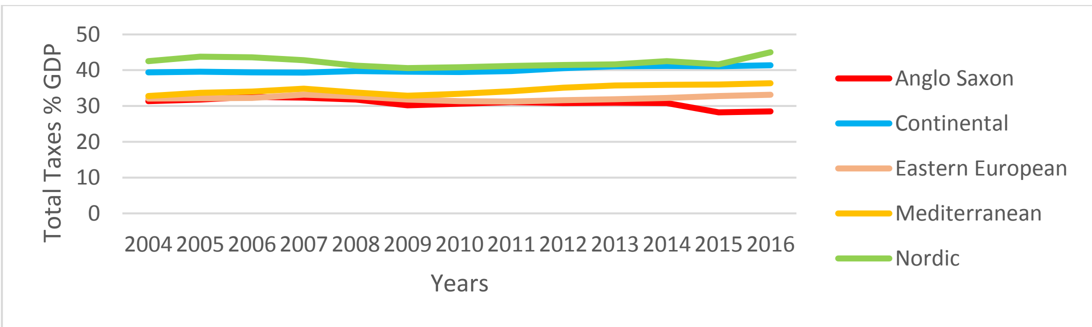
Figure 8: *Tax level: fiscal pressure in European countries, 2016*



Source: European Commission. Data on Taxation Indicators (2018). Own Elaboration

Grouping the fiscal pressure of each country by the average in their type of social model, it is shown that the trend is mostly constant for the period of study (2004-2016). Nordic countries, followed by Continental countries, are the ones presenting the highest taxation levels. On the other hand, although in 2004 Anglo-Saxon, Easter-European and Mediterranean countries had all low values for tax levels, this trend has presented some variations. As for the evolution of the fiscal pressure in Anglo-Saxon countries, figure 9 shows that they have remained constant, which had lead to become the social model with the lowest fiscal pressure. Mediterranean countries have experienced the highest increase within these three social models, but still lies below both Nordic and Continental countries. Finally, Eastern-European countries have maintained low tax levels, but have experienced a slight increase in the last years.

Figure 9: *Tax level: Fiscal pressure evolution by typologies of social models, 2004-2016*



Source: European Commission. Data on Taxation. Indicators (2018). Own Elaboration

With such considerations in mind, taxation components (labor, capital and consumption taxes) have been studies and its relationship with welfare (measured by the HDI) is provided in Tables 8-10. It is observed that considering the effect of GDP per capita, corruption levels and long-run unemployment rates, positive effects when all labor, capital and consumption taxes increase in one million euros are observed. In fact, these effects are significant for the case of labor and consumption tax rises. The differences on the effect these taxes have on welfare, are represented by the last row in the given tables. It is observed that regarding increases in labor taxes, the effect is positive and significant for Nordic and Easter European countries. Continental countries also present a positive relationship, but it is not significant. In contrast, Anglo-Saxon and Mediterranean countries are worst off in welfare terms, when labor taxes are raised. As for increases in capital taxes, it is observed that Continental countries' welfare levels are significantly increases. Nordic countries also present a positive, but not significant relationship. Eastern-European countries' HDI is reduced significantly when capital taxes are increased in one million euros. Finally, both Anglo-Saxon and Mediterranean countries are worsen by increases in capital taxes, but not significantly. On the other hand, consumption taxes show positive and significant results on welfare in the case of Nordic and Eastern-European countries. Continental countries present positive, but not significant results. In contrast, Mediterranean and Anglo-Saxon countries show a negative, but not significant relationship.

Table 8: *Analysis of the effect of labour taxes on HDI by typologies of social models*

Model (6.1) n=249	Continental	Nordic	Anglo-Saxon	Mediterranean	Eastern European
ln (GDP pc)	0.0043087	0.00159750	0.00259301	0.00462594	0.00385813
Corruption	0.00768564*	0.00323811	0.00799977*	0.00715700	0.00764798*
LRU	-0.000183263*	-0.000173327*	−0.00018488*	−0.000176750	−0.000142166
Labor	2.05998e-07	2.4356e-0.7***	2.9296e-07***	2.55050e-07*	2.5266e-07***
Labor * dummy	6.9045e-08***	7.16698e-07***	−1.7253e-07**	−6.121e-08***	9.46930e-07*

Table 9: *Analysis of the effect of capital taxes on HDI by typologies of social models*

Model (6.2) n=238	Continental	Nordic	Anglo-Saxon	Mediterranean	Eastern European
ln (GDP pc)	0.00424276	0.00438435	0.00459649	0.00471586	0.00532267
Corruption	0.00576311	0.00755019	0.00888319*	0.00860501*	0.00891159**
LRU	−0.00024708*	−0.00021657**	−0.00021867**	−0.00022258**	−0.00022714**
Capital	−4.74749e-08	2.6404e-07**	1.19728e-06	3.70865e-07	2.74466e-07
Capital * dummy	6.7885e-06***	2.74469e-05	−1.20743e-06	−6.09239e-07	−0.0001688***

Table 10: *Analysis of the effect of consumption taxes on HDI by typologies of social models*

Model (6.3) n=249	Continental	Nordic	Anglo-Saxon	Mediterranean	Eastern European
ln (GDP pc)	0.00359396	0.00125965	0.00263414	0.00398649	0.00358358
Corruption	0.00703376	0.00328048	0.00672984	0.00556840	0.00723269*
LRU	−0.00020111**	−0.00019495**	−0.00019877**	−0.00019766**	−0.000128385
Consumption	2.6779e-07***	2.7664e-07***	3.0808e-07***	2.9691e-07***	2.8977e-07***
Consumption * dummy	1.4479e-08***	6.3679e-07***	−1.13614e-07	−1.05663e-07	1.0364e-06***

Table 5 below sums up the results obtained by marking in circle the results that seem to be significant., and figures 10-17 provide data by social models on tax structure. In any case, these results should be interpreted with caution, since because of a limited number of countries in each of the groups the results may not fulfill the assumptions properly. However, it is useful to conclude that there may be characteristic factors in each of the groups allowing some increase welfare through tax increases, while others may not present significant changes. This could be explained by cultural reasons, efficiency factors in the provision of public goods and services, and so on.

Table 9: *Summary table of the effects of increases in labor, capital and consumption taxes on welfare (HDI) by types of social models*

	Continental	**Nordic**	**Anglo-Saxon**	**Mediterranean**	**Eastern-European**
Labor taxes	+	+	+	-	+
Capital taxes	+	+	-	-	-
Consumption taxes	+	+	-	-	+

Figure 10

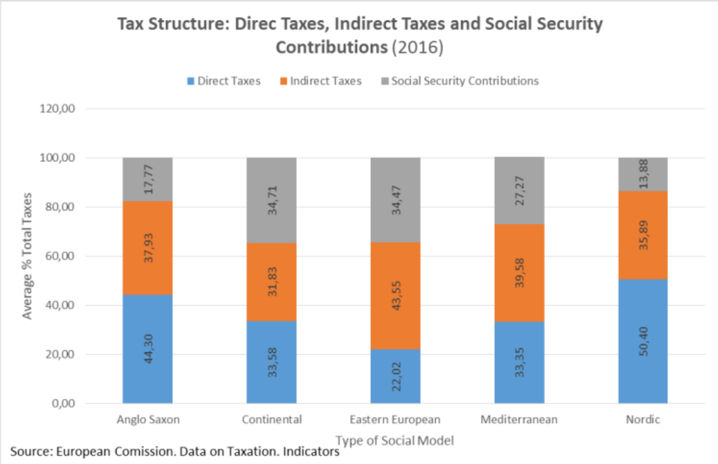


Figure 11

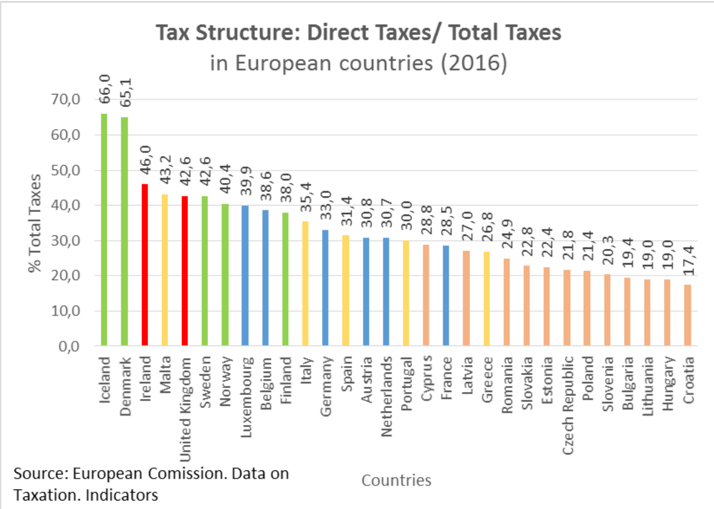


Figure 12

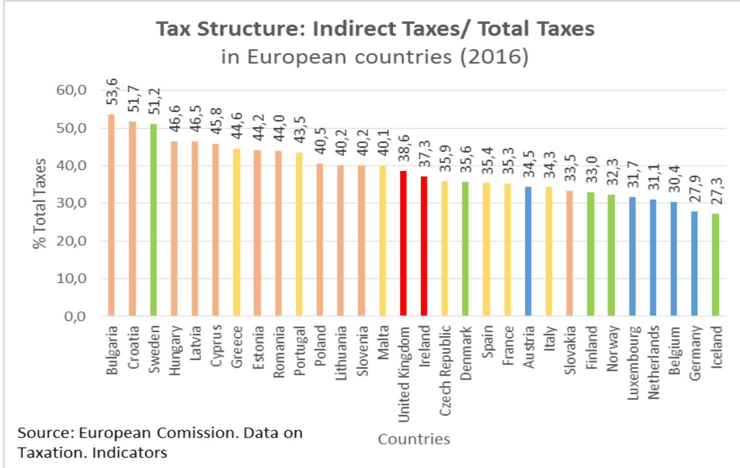


Figure 13

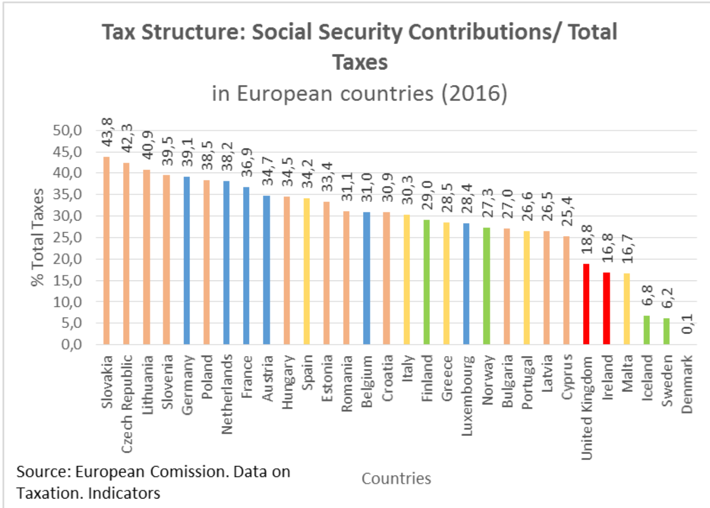


Figure 14

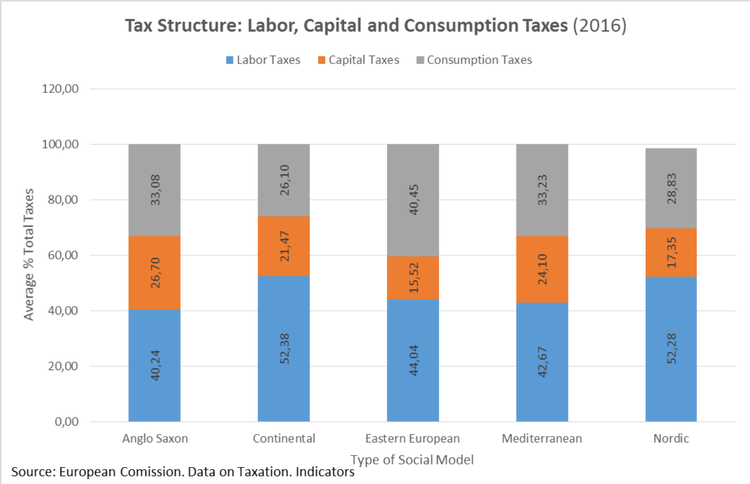


Figure 16

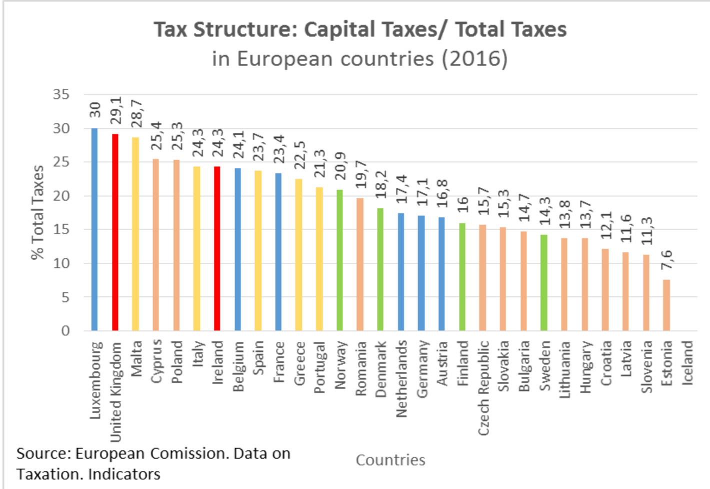


Figure 15

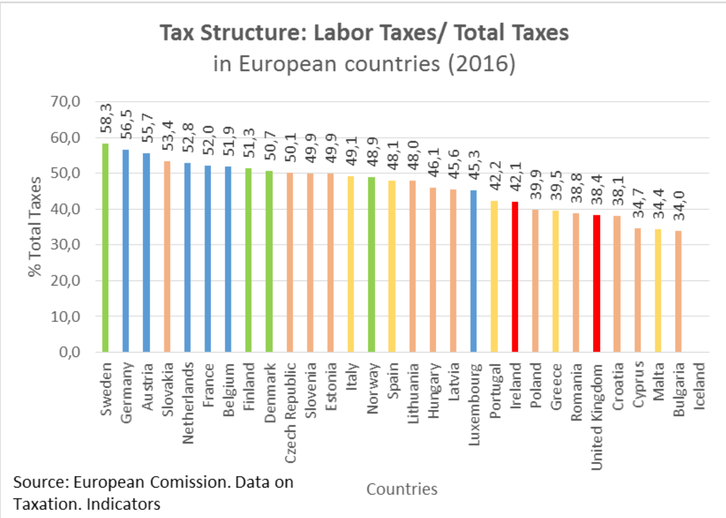
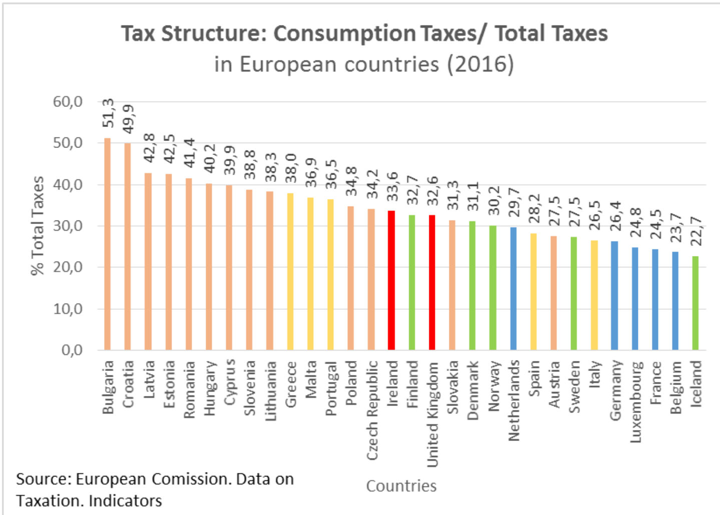


Figure 17



7 CONCLUSION

This work has contributed to filling the gap in the literature by the analysis of the way taxation affects welfare in European countries (2004-2014). Because of increasing needs of analyzing the welfare impact of economic and social policies since the rise of the Welfare State, the study of the relationship with taxation, as one of the most relevant economic instruments in hands of the governments, has gained importance. For that purpose, a panel data model has been estimated considering Sheshinkski's *abbreviated welfare function* and the *Human Development Index* as welfare proxies. Besides, aiming to obtain a deeper understanding of this relationship, the selected countries have been categorized in groups regarding their socio-economic characteristics: Nordic, Continental, Anglo-Saxon, Mediterranean and Eastern European countries.

The most important conclusion extracted is that fiscal pressure increases help European countries raise welfare conditions, measured by the *Human Development Index*, significantly. Despite it does not present significant effects when measuring welfare by Sheshinski's *abbreviated welfare function*, when decomposed, it is observed that higher tax levels reduces inequality significantly, though it does not affect income variables in a significative way. Therefore, it is concluded that a higher fiscal pressure helps countries improving welfare conditions, others than material ones.

With respect to tax structure, the analysis of the share of labor, capital and consumption taxes over total taxes shows that all of them affect significantly the *HDI*. This way, it is observed that labor taxes are the ones affecting the most this welfare proxy, followed by capital and consumption taxes, respectively. When measuring this relationship by the *abbreviated welfare function* it is observed that capital taxes are the ones with the largest effect on welfare. This, in fact, goes in line with previous literature, which claims that capital taxes are the ones affecting the most economic growth (negatively).

Finally, it has been observed that significant differences within different European social models exist. When the effect of tax structure is studied for each of these models, it is observed that the effects on welfare (measured by the HDI) even go in different directions and significance levels vary. The main implication of these results is that other factors, such as efficiency in the administrations and cultural reasons, may affect the relationship found between taxation and welfare. Therefore, particularities in each country or social models should be born in mind when policies are to be implemented.

The study of the relationship between taxation – tax level and tax structure – and welfare can be further studied by developing more comprehensive welfare measures, as well as by focusing it on the analysis of different countries and periods. In any case, this work has been part of a degree final project and it has contributed to developing several competences. Section II has managed to familiarize with concepts related to fiscal systems and its institutional design. Hence, taxation measurement approximations have been evaluated, both by tax level (fiscal pressure) and tax structure (direct vs. indirect taxes, and labor, capital and consumption taxes). Besides, this section has helped to better understand all dimensions which englobe a core concept in public economics; welfare. The empirical analysis, on the other hand, has increase both the knowledge and the practice with econometric tools (panel data models, dummy variables, multicollinearity problems, control variables), which were unknown previous to this first approach.

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9 APPENDIX

Models (1 and 2): *Effect of Tax Level and Welfare*

```
Model 3: Fixed-effects, using 264 observations
Included 27 cross-sectional units
Time-series length: minimum 7, maximum 11
Dependent variable: l_Welfare

             coefficient   std. error   t-ratio   p-value
  ---------------------------------------------------------
  const      8.79865       0.316264     27.82     1.85e-76 ***
  FP         0.00461908    0.00874065    0.5285   0.5977

Mean dependent var   8.965680   S.D. dependent var   0.877614
Sum squared resid    8.008928   S.E. of regression   0.184218
LSDV R-squared       0.960462   Within R-squared     0.001182
LSDV F(27, 236)      212.3329   P-value(F)           1.6e-149
Log-likelihood       86.79199   Akaike criterion    -117.5840
Schwarz criterion   -17.45741   Hannan-Quinn        -77.35009
rho                  0.148470   Durbin-Watson        1.168777

Joint test on named regressors -
  Test statistic: F(1, 236) = 0.27927
  with p-value = P(F(1, 236) > 0.27927) = 0.597677

Test for differing group intercepts -
  Null hypothesis: The groups have a common intercept
  Test statistic: F(26, 236) = 204.26
  with p-value = P(F(26, 236) > 204.26) = 2.76697e-146
```

```
Model 5: Random-effects (GLS), using 330 observations
Included 30 cross-sectional units
Time-series length = 11
Dependent variable: HDI

             coefficient   std. error      z      p-value
  --------------------------------------------------------
  const      0.822264      0.0190185     43.23    0.0000  ***
  FP         0.00101494    0.000505731    2.007   0.0448  **

Mean dependent var   0.858400   S.D. dependent var   0.043133
Sum squared resid    0.527941   S.E. of regression   0.040059
Log-likelihood       593.9977   Akaike criterion    -1183.995
Schwarz criterion   -1176.397   Hannan-Quinn        -1180.965

'Between' variance = 0.00106283
'Within' variance = 0.000161122
theta used for quasi-demeaning = 0.883406
corr(y,yhat)^2 = 0.359129

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(1) = 4.02754
  with p-value = 0.0447633

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 1143.46
  with p-value = 1.18629e-250

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(1) = 15.5309
  with p-value = 8.11662e-05
```

```
Model 7: Fixed-effects, using 264 observations
Included 27 cross-sectional units
Time-series length: minimum 7, maximum 11
Dependent variable: l_Welfare

             coefficient   std. error   t-ratio   p-value
  ---------------------------------------------------------
  const       9.11968      0.345431     26.40     2.97e-72 ***
  FP          0.00257029   0.00871794    0.2948   0.7684
  Corruption -0.208117     0.0937995    -2.219    0.0275   **

Mean dependent var   8.965680   S.D. dependent var   0.877614
Sum squared resid    7.844597   S.E. of regression   0.182705
LSDV R-squared       0.961274   Within R-squared     0.021676
LSDV F(28, 235)      208.3288   P-value(F)           2.0e-149
Log-likelihood       89.52860   Akaike criterion    -121.0572
Schwarz criterion   -17.35467   Hannan-Quinn        -79.38637
rho                  0.120981   Durbin-Watson        1.188698

Joint test on named regressors -
  Test statistic: F(2, 235) = 2.60337
  with p-value = P(F(2, 235) > 2.60337) = 0.0761574

Test for differing group intercepts -
  Null hypothesis: The groups have a common intercept
  Test statistic: F(26, 235) = 207.57
  with p-value = P(F(26, 235) > 207.57) = 1.31156e-146
```

```
Model 12: Random-effects (GLS), using 319 observations
Included 29 cross-sectional units
Time-series length = 11
Dependent variable: HDI

             coefficient   std. error      z      p-value
  --------------------------------------------------------
  const      0.792502      0.0178720     44.34    0.0000  ***
  FP         0.00148356    0.000489636    3.030   0.0024  ***
  Corruption 0.0124402     0.00413971     3.005   0.0027  ***

Mean dependent var   0.859727   S.D. dependent var   0.043120
Sum squared resid    0.324626   S.E. of regression   0.032001
Log-likelihood       646.3570   Akaike criterion    -1286.714
Schwarz criterion   -1275.418   Hannan-Quinn        -1282.203

'Between' variance = 0.000499483
'Within' variance = 0.0001491
theta used for quasi-demeaning = 0.837457
corr(y,yhat)^2 = 0.621719

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(2) = 22.3816
  with p-value = 1.38006e-05

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 765.956
  with p-value = 1.36156e-168

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(2) = 54.3452
  with p-value = 1.58159e-12
```

```
Model 9: Fixed-effects, using 243 observations
Included 25 cross-sectional units
Time-series length: minimum 7, maximum 11
Dependent variable: l_Welfare

             coefficient   std. error   t-ratio   p-value
  ---------------------------------------------------------
  const       8.64279      0.343399     25.17     3.73e-66 ***
  FP          0.0129534    0.00949583    1.364    0.1740
  LRU        -0.00285688   0.00158803   -1.799    0.0734   *

Mean dependent var   8.997539   S.D. dependent var   0.878414
Sum squared resid    6.829942   S.E. of regression   0.177820
LSDV R-squared       0.963423   Within R-squared     0.022059
LSDV F(26, 216)      218.8236   P-value(F)           4.5e-140
Log-likelihood       89.16498   Akaike criterion    -124.3300
Schwarz criterion   -30.01731   Hannan-Quinn        -86.34174
rho                  0.061422   Durbin-Watson        1.214818

Joint test on named regressors -
  Test statistic: F(2, 216) = 2.43615
  with p-value = P(F(2, 216) > 2.43615) = 0.0898982

Test for differing group intercepts -
  Null hypothesis: The groups have a common intercept
  Test statistic: F(24, 216) = 219.309
  with p-value = P(F(24, 216) > 219.309) = 1.47993e-137
```

```
Model 13: Random-effects (GLS), using 284 observations
Included 26 cross-sectional units
Time-series length: minimum 9, maximum 11
Dependent variable: HDI

             coefficient   std. error      z      p-value
  --------------------------------------------------------
  const       0.798008     0.0206601     38.63    0.0000  ***
  FP          0.00175501   0.000545464    3.217   0.0013  ***
  LRU        -7.35858e-05  0.000103840   -0.7086  0.4785

Mean dependent var   0.857187   S.D. dependent var   0.040587
Sum squared resid    0.352103   S.E. of regression   0.035335
Log-likelihood       547.4000   Akaike criterion    -1088.800
Schwarz criterion   -1077.853   Hannan-Quinn        -1084.411

'Between' variance = 0.000894038
'Within' variance = 0.000155142
mean theta = 0.874882
corr(y,yhat)^2 = 0.381197

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(2) = 10.8111
  with p-value = 0.00449147

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 937.402
  with p-value = 7.26425e-206

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(2) = 10.94
  with p-value = 0.00421128
```

```
Model 11: Fixed-effects, using 243 observations
Included 25 cross-sectional units
Time-series length: minimum 7, maximum 11
Dependent variable: l_Welfare

             coefficient   std. error   t-ratio   p-value
  ---------------------------------------------------------
  const       8.88306      0.384294     23.12     3.30e-60 ***
  FP          0.0107466    0.00960964    1.118    0.2647
  Corruption −0.135719     0.0982490    −1.381    0.1686
  LRU        −0.00312393   0.00159645   −1.957    0.0517   *

Mean dependent var   8.997539   S.D. dependent var   0.878414
Sum squared resid    6.769857   S.E. of regression   0.177448
LSDV R-squared       0.963745   Within R-squared     0.030663
LSDV F(27, 215)      211.6757   P-value(F)           2.6e-139
Log-likelihood       90.23859   Akaike criterion    −124.4772
Schwarz criterion   −26.67146   Hannan-Quinn        −85.08198
rho                  0.060379   Durbin-Watson        1.219544

Joint test on named regressors -
  Test statistic: F(3, 215) = 2.267
  with p-value = P(F(3, 215) > 2.267) = 0.0816973

Test for differing group intercepts -
  Null hypothesis: The groups have a common intercept
  Test statistic: F(24, 215) = 219.879
  with p-value = P(F(24, 215) > 219.879) = 3.37534e-137
```

```
Model 14: Random-effects (GLS), using 284 observations
Included 26 cross-sectional units
Time-series length: minimum 9, maximum 11
Dependent variable: HDI

             coefficient    std. error      z        p-value
  -----------------------------------------------------------
  const       0.778249      0.0195970     39.71     0.0000  ***
  FP          0.00195579    0.000526846    3.712    0.0002  ***
  Corruption  0.0103840     0.00452719     2.294    0.0218  **
  LRU        −4.32701e-05   0.000109171  −0.3964    0.6918

Mean dependent var   0.857187   S.D. dependent var   0.040587
Sum squared resid    0.252672   S.E. of regression   0.029986
Log-likelihood       594.5202   Akaike criterion    −1181.040
Schwarz criterion   −1166.444   Hannan-Quinn        −1175.189

'Between' variance = 0.000487225
'Within' variance = 0.000152232
mean theta = 0.833155
corr(y,yhat)^2 = 0.563303

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(3) = 24.4918
  with p-value = 1.97186e-05

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 661.007
  with p-value = 9.02436e-146

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(3) = 37.276
  with p-value = 4.02237e-08
```

Models (1A and 1B): *Effect of Tax Level on GDPpc and Gini*

```
Model 16: Fixed-effects, using 249 observations
Included 25 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: l_GDPpc

             coefficient   std. error   t-ratio   p-value
  ---------------------------------------------------------
  const       9.32576      0.359992     25.91     6.69e-69 ***
  FP          0.00921242   0.00913230    1.009    0.3142
  Corruption −0.166448     0.0929928    −1.790    0.0748   *
  LRU        −0.00259458   0.00154968   −1.674    0.0955   *

Mean dependent var   9.369836   S.D. dependent var   0.853776
Sum squared resid    6.639026   S.E. of regression   0.173323
LSDV R-squared       0.963275   Within R-squared     0.029706
LSDV F(27, 221)      214.6912   P-value(F)           7.2e-143
Log-likelihood       97.93301   Akaike criterion    −139.8660
Schwarz criterion   −41.37734   Hannan-Quinn        −100.2227
rho                  0.068259   Durbin-Watson        1.192386

Joint test on named regressors -
  Test statistic: F(3, 221) = 2.2553
  with p-value = P(F(3, 221) > 2.2553) = 0.0828492

Test for differing group intercepts -
  Null hypothesis: The groups have a common intercept
  Test statistic: F(24, 221) = 226.09
  with p-value = P(F(24, 221) > 226.09) = 2.60475e-141
```

```
Model 18: Fixed-effects, using 249 observations
Included 25 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: l_GDPpc

             coefficient   std. error   t-ratio   p-value
  ---------------------------------------------------------
  const       9.05806      0.329074     27.53     1.65e-73 ***
  FP          0.0111876    0.00911027    1.228    0.2207
  LRU        −0.00230381   0.00154877   −1.488    0.1383

Mean dependent var   9.369836   S.D. dependent var   0.853776
Sum squared resid    6.735270   S.E. of regression   0.174181
LSDV R-squared       0.962742   Within R-squared     0.015640
LSDV F(26, 222)      220.6351   P-value(F)           2.3e-143
Log-likelihood       96.14114   Akaike criterion    −138.2823
Schwarz criterion   −43.31105   Hannan-Quinn        −100.0548
rho                  0.082781   Durbin-Watson        1.179682

Joint test on named regressors -
  Test statistic: F(2, 222) = 1.76357
  with p-value = P(F(2, 222) > 1.76357) = 0.173826

Test for differing group intercepts -
  Null hypothesis: The groups have a common intercept
  Test statistic: F(24, 222) = 224.157
  with p-value = P(F(24, 222) > 224.157) = 2.17137e-141
```

```
Model 20: Fixed-effects, using 270 observations
Included 27 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: l_GDPpc

             coefficient   std. error   t-ratio   p-value
  ---------------------------------------------------------
  const       9.50775      0.325910     29.17     4.88e-81 ***
  FP          0.00260281   0.00831791    0.3129   0.7546
  Corruption −0.224578     0.0891839    −2.518    0.0124   **

Mean dependent var   9.334966   S.D. dependent var   0.856141
Sum squared resid    7.622187   S.E. of regression   0.177841
LSDV R-squared       0.961342   Within R-squared     0.026588
LSDV F(28, 241)      214.0429   P-value(F)           1.3e-153
Log-likelihood       98.48001   Akaike criterion    −138.9600
Schwarz criterion   −34.60578   Hannan-Quinn        −97.05590
rho                  0.101249   Durbin-Watson        1.176535

Joint test on named regressors -
  Test statistic: F(2, 241) = 3.29141
  with p-value = P(F(2, 241) > 3.29141) = 0.0388805

Test for differing group intercepts -
  Null hypothesis: The groups have a common intercept
  Test statistic: F(26, 241) = 216.277
  with p-value = P(F(26, 241) > 216.277) = 2.04316e-151
```

```
Model 22: Fixed-effects, using 270 observations
Included 27 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: l_GDPpc

             coefficient   std. error   t-ratio   p-value
  ---------------------------------------------------------
  const       9.18752      0.303368     30.29     2.75e-84 ***
  FP          0.00407974   0.00838827    0.4864   0.6272

Mean dependent var   9.334966   S.D. dependent var   0.856141
Sum squared resid    7.822738   S.E. of regression   0.179793
LSDV R-squared       0.960325   Within R-squared     0.000977
LSDV F(27, 242)      216.9474   P-value(F)           2.0e-153
Log-likelihood       94.97389   Akaike criterion    −133.9478
Schwarz criterion   −33.19196   Hannan-Quinn        −93.48863
rho                  0.144040   Durbin-Watson        1.148591

Joint test on named regressors -
  Test statistic: F(1, 242) = 0.236548
  with p-value = P(F(1, 242) > 0.236548) = 0.627151

Test for differing group intercepts -
  Null hypothesis: The groups have a common intercept
  Test statistic: F(26, 242) = 211.707
  with p-value = P(F(26, 242) > 211.707) = 8.25113e-151
```

```
Model 23: Random-effects (GLS), using 290 observations
Included 27 cross-sectional units
Time-series length: minimum 7, maximum 11
Dependent variable: Gini

             coefficient   std. error     z      p-value
  ---------------------------------------------------------
  const       36.6636      2.63462      13.92   5.06e-44 ***
  FP          -0.156622    0.0718137    -2.181  0.0292   **

Mean dependent var   31.01552   S.D. dependent var   4.040573
Sum squared resid    3897.417   S.E. of regression   3.672312
Log-likelihood      -788.2295   Akaike criterion     1580.459
Schwarz criterion    1587.799   Hannan-Quinn         1583.400

'Between' variance = 6.99987
'Within' variance = 5.17528
mean theta = 0.745557
corr(y,yhat)^2 = 0.259235

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(1) = 4.75651
  with p-value = 0.0291876

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 413.512
  with p-value = 6.30547e-92

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(1) = 12.5946
  with p-value = 0.000386865
```

```
Model 24: Random-effects (GLS), using 290 observations
Included 27 cross-sectional units
Time-series length: minimum 7, maximum 11
Dependent variable: Gini

              coefficient   std. error     z      p-value
  ----------------------------------------------------------
  const        36.1129      2.63883      13.69   1.24e-42 ***
  FP           -0.0995191   0.0761955    -1.306  0.1915
  Corruption   -1.27433     0.601848     -2.117  0.0342   **

Mean dependent var   31.01552   S.D. dependent var   4.040573
Sum squared resid    3673.890   S.E. of regression   3.571633
Log-likelihood      -779.6654   Akaike criterion     1565.331
Schwarz criterion    1576.340   Hannan-Quinn         1569.742

'Between' variance = 7.1656
'Within' variance = 5.19481
mean theta = 0.747883
corr(y,yhat)^2 = 0.239035

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(2) = 9.12157
  with p-value = 0.0104539

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 411.595
  with p-value = 1.64814e-91

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(2) = 8.34579
  with p-value = 0.0154076
```

```
Model 25: Random-effects (GLS), using 266 observations
Included 25 cross-sectional units
Time-series length: minimum 7, maximum 11
Dependent variable: Gini

             coefficient   std. error     z      p-value
  ---------------------------------------------------------
  const       34.8140      2.96301      11.75   7.10e-32 ***
  FP          -0.158874    0.0775690    -2.048  0.0405   **
  LRU          0.0555672   0.0181741     3.057  0.0022   ***

Mean dependent var   31.33195   S.D. dependent var   4.031591
Sum squared resid    3412.857   S.E. of regression   3.595482
Log-likelihood      -716.8282   Akaike criterion     1439.656
Schwarz criterion    1450.407   Hannan-Quinn         1443.975

'Between' variance = 7.43386
'Within' variance = 5.17519
mean theta = 0.751395
corr(y,yhat)^2 = 0.23076

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(2) = 14.6045
  with p-value = 0.000674006

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 400.091
  with p-value = 5.26107e-89

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(2) = 6.87876
  with p-value = 0.0320845
```

```
Model 28: Fixed-effects, using 266 observations
Included 25 cross-sectional units
Time-series length: minimum 7, maximum 11
Dependent variable: Gini

              coefficient   std. error   t-ratio    p-value
  -----------------------------------------------------------
  const        27.2902      4.70247       5.803    2.06e-08 ***
  FP            0.0589793   0.118068      0.4995   0.6179
  Corruption   -0.0858748   1.15318      -0.07447  0.9407
  LRU           0.0522651   0.0195877     2.668    0.0081   ***

Mean dependent var   31.33195   S.D. dependent var   4.031591
Sum squared resid    1236.841   S.E. of regression   2.279651
LSDV R-squared       0.712846   Within R-squared     0.032159
LSDV F(27, 238)      21.88235   P-value(F)           5.07e-50
Log-likelihood      -581.8346   Akaike criterion     1219.669
Schwarz criterion    1320.007   Hannan-Quinn         1259.979
rho                 -0.043550   Durbin-Watson        2.020859

Joint test on named regressors -
  Test statistic: F(3, 238) = 2.63603
  with p-value = P(F(3, 238) > 2.63603) = 0.0504255

Test for differing group intercepts -
  Null hypothesis: The groups have a common intercept
  Test statistic: F(24, 238) = 15.6657
  with p-value = P(F(24, 238) > 15.6657) = 1.47502e-36
```

Models (3 and 4): *Effect of Tax Structure on Welfare*

```
Model 30: Fixed-effects, using 253 observations
Included 26 cross-sectional units
Time-series length: minimum 7, maximum 11
Dependent variable: l_Welfare

             coefficient   std. error   t-ratio   p-value
  -------------------------------------------------------
  const      8.48958       0.545013     15.58     1.32e-37 ***
  LTTT       0.00307021    0.00860267    0.3569   0.7215
  CaTT       0.0189504     0.00911526    2.079    0.0388   **

Mean dependent var   9.006326   S.D. dependent var   0.873377
Sum squared resid    7.485808   S.E. of regression   0.182401
LSDV R-squared       0.961057   Within R-squared     0.028807
LSDV F(27, 225)      205.6523   P-value(F)           8.5e-143
Log-likelihood       86.33669   Akaike criterion    -116.6734
Schwarz criterion   -17.73848   Hannan-Quinn        -76.86856
rho                  0.011840   Durbin-Watson        1.252788

Joint test on named regressors -
  Test statistic: F(2, 225) = 3.33695
  with p-value = P(F(2, 225) > 3.33695) = 0.0373127

Test for differing group intercepts -
  Null hypothesis: The groups have a common intercept
  Test statistic: F(25, 225) = 214.492
  with p-value = P(F(25, 225) > 214.492) = 3.77638e-142
```

```
Model 32: Fixed-effects, using 253 observations
Included 26 cross-sectional units
Time-series length: minimum 7, maximum 11
Dependent variable: l_Welfare

             coefficient   std. error   t-ratio   p-value
  -------------------------------------------------------
  const      10.3869       0.534707     19.43     5.17e-50 ***
  LTTT       -0.0159017    0.00688954   -2.308    0.0219   **
  CoTT       -0.0189968    0.00911492   -2.084    0.0383   **

Mean dependent var   9.006326   S.D. dependent var   0.873377
Sum squared resid    7.485105   S.E. of regression   0.182393
LSDV R-squared       0.961060   Within R-squared     0.028899
LSDV F(27, 225)      205.6724   P-value(F)           8.4e-143
Log-likelihood       86.34858   Akaike criterion    -116.6972
Schwarz criterion   -17.76225   Hannan-Quinn        -76.89232
rho                  0.011575   Durbin-Watson        1.252968

Joint test on named regressors -
  Test statistic: F(2, 225) = 3.34783
  with p-value = P(F(2, 225) > 3.34783) = 0.0369206

Test for differing group intercepts -
  Null hypothesis: The groups have a common intercept
  Test statistic: F(25, 225) = 214.732
  with p-value = P(F(25, 225) > 214.732) = 3.34758e-142
```

```
Model 34: Fixed-effects, using 253 observations
Included 26 cross-sectional units
Time-series length: minimum 7, maximum 11
Dependent variable: l_Welfare

             coefficient   std. error   t-ratio   p-value
  -------------------------------------------------------
  const      8.79810       0.354512     24.82     2.39e-66 ***
  CoTT       -0.00311069   0.00860006   -0.3617   0.7179
  CaTT       0.0158704     0.00688770    2.304    0.0221   **

Mean dependent var   9.006326   S.D. dependent var   0.873377
Sum squared resid    7.485693   S.E. of regression   0.182400
LSDV R-squared       0.961057   Within R-squared     0.028822
LSDV F(27, 225)      205.6556   P-value(F)           8.5e-143
Log-likelihood       86.33864   Akaike criterion    -116.6773
Schwarz criterion   -17.74237   Hannan-Quinn        -76.87245
rho                  0.011748   Durbin-Watson        1.252837

Joint test on named regressors -
  Test statistic: F(2, 225) = 3.33873
  with p-value = P(F(2, 225) > 3.33873) = 0.0372483

Test for differing group intercepts -
  Null hypothesis: The groups have a common intercept
  Test statistic: F(25, 225) = 214.686
  with p-value = P(F(25, 225) > 214.686) = 3.42576e-142
```

```
Model 35: Random-effects (GLS), using 319 observations
Included 29 cross-sectional units
Time-series length = 11
Dependent variable: HDI

             coefficient   std. error     z      p-value
  -------------------------------------------------------
  const      0.727761      0.0276824     26.29   2.52e-152 ***
  LTTT       0.00225345    0.000438220    5.142  2.71e-07  ***
  CaTT       0.00127504    0.000476921    2.673  0.0075    ***

Mean dependent var   0.857072   S.D. dependent var   0.043207
Sum squared resid    0.393097   S.E. of regression   0.035214
Log-likelihood       615.8317   Akaike criterion    -1225.663
Schwarz criterion   -1214.368   Hannan-Quinn        -1221.152

'Between' variance = 0.000700903
'Within' variance = 0.000155993
theta used for quasi-demeaning = 0.859176
corr(y,yhat)^2 = 0.452394

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(2) = 27.0896
  with p-value = 1.31087e-06

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 917.24
  with p-value = 1.75432e-201

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(2) = 25.6543
  with p-value = 2.68676e-06
```

```
Model 36: Random-effects (GLS), using 319 observations
Included 29 cross-sectional units
Time-series length = 11
Dependent variable: HDI

             coefficient   std. error     z      p-value
  -------------------------------------------------------
  const      0.855182      0.0302868     28.24   2.11e-175 ***
  LTTT       0.000977835   0.000389919    2.508  0.0121    **
  CoTT       -0.00127233   0.000476720   -2.669  0.0076    ***

Mean dependent var   0.857072   S.D. dependent var   0.043207
Sum squared resid    0.393315   S.E. of regression   0.035224
Log-likelihood       615.7432   Akaike criterion    -1225.486
Schwarz criterion   -1214.191   Hannan-Quinn        -1220.975

'Between' variance = 0.000704551
'Within' variance = 0.000155994
theta used for quasi-demeaning = 0.859533
corr(y,yhat)^2 = 0.451607

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(2) = 27.0273
  with p-value = 1.3524e-06

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 920.581
  with p-value = 3.29455e-202

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(2) = 25.3834
  with p-value = 3.07661e-06
```

```
Model 37: Random-effects (GLS), using 319 observations
Included 29 cross-sectional units
Time-series length = 11
Dependent variable: HDI

             coefficient   std. error     z      p-value
  -------------------------------------------------------
  const      0.952988      0.0196176     48.58   0.0000    ***
  CoTT       -0.00225013   0.000437904   -5.138  2.77e-07  ***
  CaTT       -0.000979645  0.000389784   -2.513  0.0120    **

Mean dependent var   0.857072   S.D. dependent var   0.043207
Sum squared resid    0.393404   S.E. of regression   0.035228
Log-likelihood       615.7072   Akaike criterion    -1225.414
Schwarz criterion   -1214.119   Hannan-Quinn        -1220.903

'Between' variance = 0.00070433
'Within' variance = 0.000155975
theta used for quasi-demeaning = 0.85952
corr(y,yhat)^2 = 0.450757

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(2) = 27.0609
  with p-value = 1.32983e-06

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 920.245
  with p-value = 3.89909e-202

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(2) = 25.4048
  with p-value = 3.04375e-06
```

Model 5: *Analysis of the Welfare differences between typologies of social models*

```
Modelo 1: Efectos aleatorios (MCG), utilizando 330 observaciones
Se han incluido 30 unidades de sección cruzada
Largura de la serie temporal = 11
Variable dependiente: HDI

             Coeficiente   Desv. Típica   Estadístico t    Valor p
  ---------------------------------------------------------------
  const       0.850720      0.00810882      104.9        2.14e-254 ***
  DC          0.0384015     0.0181319         2.118      0.0349    **

Media de la vble. dep.  0.858400   D.T. de la vble. dep.   0.043133
Suma de cuad. residuos  0.534224   D.T. de la regresión    0.040296
Log-verosimilitud       592.0456   Criterio de Akaike     -1180.091
Criterio de Schwarz    -1172.493   Crit. de Hannan-Quinn  -1177.060

Varianza 'entre' (between) = 0.00156347
Varianza 'dentro' (Within) = 0.000160593
theta usado para quasi-demeaning (cuasi-centrado de los datos) = 0.903816
corr(y,yhat)^2 = 0.127209

Contraste de Breusch-Pagan -
  Hipótesis nula: Varianza del error específico a la unidad = 0
  Estadístico de contraste asintótico: Chi-cuadrado(1) = 1338.87
  con valor p  = 4.03362e-293

Contraste de Hausman -
  Hipótesis nula: Los estimadores de MCG son consistentes
  Estadístico de contraste asintótico: Chi-cuadrado(0) = NA (falló)
```

```
Modelo 2: Efectos aleatorios (MCG), utilizando 330 observaciones
Se han incluido 30 unidades de sección cruzada
Largura de la serie temporal = 11
Variable dependiente: HDI

             Coeficiente   Desv. Típica   Estadístico t    Valor p
  ---------------------------------------------------------------
  const       0.882293      0.00712352      123.9        1.85e-277 ***
  DE         -0.0597323     0.0112633        -5.303      2.10e-07  ***

Media de la vble. dep.  0.858400   D.T. de la vble. dep.   0.043133
Suma de cuad. residuos  0.329506   D.T. de la regresión    0.031647
Log-verosimilitud       671.7773   Criterio de Akaike     -1339.555
Criterio de Schwarz    -1331.956   Crit. de Hannan-Quinn  -1336.524

Varianza 'entre' (between) = 0.000898802
Varianza 'dentro' (Within) = 0.000160593
theta usado para quasi-demeaning (cuasi-centrado de los datos) = 0.873574
corr(y,yhat)^2 = 0.461669

Contraste de Breusch-Pagan -
  Hipótesis nula: Varianza del error específico a la unidad = 0
  Estadístico de contraste asintótico: Chi-cuadrado(1) = 1161.93
  con valor p  = 1.14666e-254

Contraste de Hausman -
  Hipótesis nula: Los estimadores de MCG son consistentes
  Estadístico de contraste asintótico: Chi-cuadrado(0) = NA (falló)
```

```
Modelo 3: Efectos aleatorios (MCG), utilizando 330 observaciones
Se han incluido 30 unidades de sección cruzada
Largura de la serie temporal = 11
Variable dependiente: HDI

             Coeficiente   Desv. Típica   Estadístico t    Valor p
  ---------------------------------------------------------------
  const       0.849116      0.00740044      114.7        8.22e-267 ***
  DN          0.0557018     0.0181273         3.073      0.0023    ***

Media de la vble. dep.  0.858400   D.T. de la vble. dep.   0.043133
Suma de cuad. residuos  0.469880   D.T. de la regresión    0.037792
Log-verosimilitud       613.2213   Criterio de Akaike     -1222.443
Criterio de Schwarz    -1214.844   Crit. de Hannan-Quinn  -1219.412

Varianza 'entre' (between) = 0.00135456
Varianza 'dentro' (Within) = 0.000160593
theta usado para quasi-demeaning (cuasi-centrado de los datos) = 0.896738
corr(y,yhat)^2 = 0.232331

Contraste de Breusch-Pagan -
  Hipótesis nula: Varianza del error específico a la unidad = 0
  Estadístico de contraste asintótico: Chi-cuadrado(1) = 1298.8
  con valor p  = 2.06457e-284

Contraste de Hausman -
  Hipótesis nula: Los estimadores de MCG son consistentes
  Estadístico de contraste asintótico: Chi-cuadrado(0) = NA (falló)
```

```
Modelo 4: Efectos aleatorios (MCG), utilizando 330 observaciones
Se han incluido 30 unidades de sección cruzada
Largura de la serie temporal = 11
Variable dependiente: HDI

             Coeficiente   Desv. Típica   Estadístico t    Valor p
  ---------------------------------------------------------------
  const       0.855412      0.00778502      109.9        8.38e-261 ***
  DA          0.0448149     0.0301512         1.486      0.1382

Media de la vble. dep.  0.858400   D.T. de la vble. dep.   0.043133
Suma de cuad. residuos  0.570848   D.T. de la regresión    0.041655
Log-verosimilitud       581.1048   Criterio de Akaike     -1158.210
Criterio de Schwarz    -1150.611   Crit. de Hannan-Quinn  -1155.179

Varianza 'entre' (between) = 0.00168238
Varianza 'dentro' (Within) = 0.000160593
theta usado para quasi-demeaning (cuasi-centrado de los datos) = 0.907247
corr(y,yhat)^2 = 0.0673739

Contraste de Breusch-Pagan -
  Hipótesis nula: Varianza del error específico a la unidad = 0
  Estadístico de contraste asintótico: Chi-cuadrado(1) = 1357.86
  con valor p  = 3.01882e-297

Contraste de Hausman -
  Hipótesis nula: Los estimadores de MCG son consistentes
  Estadístico de contraste asintótico: Chi-cuadrado(0) = NA (falló)
```

```
Modelo 5: Efectos aleatorios (MCG), utilizando 330 observaciones
Se han incluido 30 unidades de sección cruzada
Largura de la serie temporal = 11
Variable dependiente: HDI

             Coeficiente   Desv. Típica   Estadístico t    Valor p
  ---------------------------------------------------------------
  const       0.861200      0.00845902      101.8        3.03e-250 ***
  DM         -0.0168000     0.0207203        -0.8108     0.4181

Media de la vble. dep.  0.858400   D.T. de la vble. dep.   0.043133
Suma de cuad. residuos  0.599151   D.T. de la regresión    0.042675
Log-verosimilitud       573.1204   Criterio de Akaike     -1142.241
Criterio de Schwarz    -1134.643   Crit. de Hannan-Quinn  -1139.210

Varianza 'entre' (between) = 0.00177427
Varianza 'dentro' (Within) = 0.000160593
theta usado para quasi-demeaning (cuasi-centrado de los datos) = 0.909661
corr(y,yhat)^2 = 0.0211342

Contraste de Breusch-Pagan -
  Hipótesis nula: Varianza del error específico a la unidad = 0
  Estadístico de contraste asintótico: Chi-cuadrado(1) = 1371.02
  con valor p  = 4.16929e-300

Contraste de Hausman -
  Hipótesis nula: Los estimadores de MCG son consistentes
  Estadístico de contraste asintótico: Chi-cuadrado(0) = NA (falló)
```

```
Modelo 1: Efectos aleatorios (MCG), utilizando 330 observaciones
Se han incluido 30 unidades de sección cruzada
Largura de la serie temporal = 11
Variable dependiente: HDI

             Coeficiente   Desv. Típica   Estadístico t    Valor p
  ---------------------------------------------------------------
  const       0.889121      0.00997861       89.10       1.95e-230 ***
  DE         -0.0665606     0.0122212        -5.446      1.02e-07  ***
  DN          0.0156970     0.0148007         1.061      0.2897
  DA          0.0111061     0.0199572         0.5565     0.5783
  DM         -0.0447212     0.0148007        -3.022      0.0027    ***

Media de la vble. dep.  0.858400   D.T. de la vble. dep.   0.043133
Suma de cuad. residuos  0.212473   D.T. de la regresión    0.025530
Log-verosimilitud       744.1759   Criterio de Akaike     -1478.352
Criterio de Schwarz    -1459.356   Crit. de Hannan-Quinn  -1470.775

Varianza 'entre' (between) = 0.000582836
Varianza 'dentro' (Within) = 0.000160593
theta usado para quasi-demeaning (cuasi-centrado de los datos) = 0.843677
corr(y,yhat)^2 = 0.652872

Contraste de Breusch-Pagan -
  Hipótesis nula: Varianza del error específico a la unidad = 0
  Estadístico de contraste asintótico: Chi-cuadrado(1) = 929.551
  con valor p  = 3.69689e-204

Contraste de Hausman -
  Hipótesis nula: Los estimadores de MCG son consistentes
  Estadístico de contraste asintótico: Chi-cuadrado(0) = NA (falló)
```

Modelo 2: Efectos aleatorios (MCG), utilizando 330 observaciones
Se han incluido 30 unidades de sección cruzada
Largura de la serie temporal = 11
Variable dependiente: HDI

	Coeficiente	Desv. Típica	Estadístico t	Valor p	
const	0.822561	0.00705594	116.6	3.27e-267	***
DC	0.0665606	0.0122212	5.446	1.02e-07	***
DN	0.0822576	0.0130105	6.322	8.50e-010	***
DA	0.0776667	0.0186683	4.160	4.07e-05	***
DM	0.0218394	0.0130105	1.679	0.0942	*

Media de la vble. dep.	0.858400	D.T. de la vble. dep.	0.043133
Suma de cuad. residuos	0.212473	D.T. de la regresión	0.025530
Log-verosimilitud	744.1759	Criterio de Akaike	-1478.352
Criterio de Schwarz	-1459.356	Crit. de Hannan-Quinn	-1470.775

Varianza 'entre' (between) = 0.000582836
Varianza 'dentro' (Within) = 0.000160593
theta usado para quasi-demeaning (cuasi-centrado de los datos) = 0.843677
corr(y,yhat)^2 = 0.652872

Contraste de Breusch-Pagan -
Hipótesis nula: Varianza del error específico a la unidad = 0
Estadístico de contraste asintótico: Chi-cuadrado(1) = 929.551
con valor p = 3.69689e-204

Contraste de Hausman -
Hipótesis nula: Los estimadores de MCG son consistentes
Estadístico de contraste asintótico: Chi-cuadrado(0) = NA (falló)

Modelo 3: Efectos aleatorios (MCG), utilizando 330 observaciones
Se han incluido 30 unidades de sección cruzada
Largura de la serie temporal = 11
Variable dependiente: HDI

	Coeficiente	Desv. Típica	Estadístico t	Valor p	
const	0.904818	0.0109310	82.78	1.77e-220	***
DC	-0.0156970	0.0148007	-1.061	0.2897	
DE	-0.0822576	0.0130105	-6.322	8.50e-010	***
DA	-0.00459091	0.0204501	-0.2245	0.8225	
DM	-0.0604182	0.0154588	-3.908	0.0001	***

Media de la vble. dep.	0.858400	D.T. de la vble. dep.	0.043133
Suma de cuad. residuos	0.212473	D.T. de la regresión	0.025530
Log-verosimilitud	744.1759	Criterio de Akaike	-1478.352
Criterio de Schwarz	-1459.356	Crit. de Hannan-Quinn	-1470.775

Varianza 'entre' (between) = 0.000582836
Varianza 'dentro' (Within) = 0.000160593
theta usado para quasi-demeaning (cuasi-centrado de los datos) = 0.843677
corr(y,yhat)^2 = 0.652872

Contraste de Breusch-Pagan -
Hipótesis nula: Varianza del error específico a la unidad = 0
Estadístico de contraste asintótico: Chi-cuadrado(1) = 929.551
con valor p = 3.69689e-204

Contraste de Hausman -
Hipótesis nula: Los estimadores de MCG son consistentes
Estadístico de contraste asintótico: Chi-cuadrado(0) = NA (falló)

Modelo 4: Efectos aleatorios (MCG), utilizando 330 observaciones
Se han incluido 30 unidades de sección cruzada
Largura de la serie temporal = 11
Variable dependiente: HDI

	Coeficiente	Desv. Típica	Estadístico t	Valor p	
const	0.900227	0.0172835	52.09	8.54e-160	***
DC	-0.0111061	0.0199572	-0.5565	0.5783	
DE	-0.0776667	0.0186683	-4.160	4.07e-05	***
DN	0.00459091	0.0204501	0.2245	0.8225	
DM	-0.0558273	0.0204501	-2.730	0.0067	***

Media de la vble. dep.	0.858400	D.T. de la vble. dep.	0.043133
Suma de cuad. residuos	0.212473	D.T. de la regresión	0.025530
Log-verosimilitud	744.1759	Criterio de Akaike	-1478.352
Criterio de Schwarz	-1459.356	Crit. de Hannan-Quinn	-1470.775

Varianza 'entre' (between) = 0.000582836
Varianza 'dentro' (Within) = 0.000160593
theta usado para quasi-demeaning (cuasi-centrado de los datos) = 0.843677
corr(y,yhat)^2 = 0.652872

Contraste de Breusch-Pagan -
Hipótesis nula: Varianza del error específico a la unidad = 0
Estadístico de contraste asintótico: Chi-cuadrado(1) = 929.551
con valor p = 3.69689e-204

Contraste de Hausman -
Hipótesis nula: Los estimadores de MCG son consistentes
Estadístico de contraste asintótico: Chi-cuadrado(0) = NA (falló)

Modelo 5: Efectos aleatorios (MCG), utilizando 330 observaciones
Se han incluido 30 unidades de sección cruzada
Largura de la serie temporal = 11
Variable dependiente: HDI

	Coeficiente	Desv. Típica	Estadístico t	Valor p	
const	0.844400	0.0109310	77.25	3.40e-211	***
DC	0.0447212	0.0148007	3.022	0.0027	***
DE	-0.0218394	0.0130105	-1.679	0.0942	*
DN	0.0604182	0.0154588	3.908	0.0001	***
DA	0.0558273	0.0204501	2.730	0.0067	***

Media de la vble. dep.	0.858400	D.T. de la vble. dep.	0.043133
Suma de cuad. residuos	0.212473	D.T. de la regresión	0.025530
Log-verosimilitud	744.1759	Criterio de Akaike	-1478.352
Criterio de Schwarz	-1459.356	Crit. de Hannan-Quinn	-1470.775

Varianza 'entre' (between) = 0.000582836
Varianza 'dentro' (Within) = 0.000160593
theta usado para quasi-demeaning (cuasi-centrado de los datos) = 0.843677
corr(y,yhat)^2 = 0.652872

Contraste de Breusch-Pagan -
Hipótesis nula: Varianza del error específico a la unidad = 0
Estadístico de contraste asintótico: Chi-cuadrado(1) = 929.551
con valor p = 3.69689e-204

Contraste de Hausman -
Hipótesis nula: Los estimadores de MCG son consistentes
Estadístico de contraste asintótico: Chi-cuadrado(0) = NA (falló)

Model 6.1: *Analysis of the effect of labour taxes on each type of social model*

Model 7: Random-effects (GLS), using 249 observations
Included 25 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: HDI

	coefficient	std. error	z	p-value	
const	0.824789	0.0336327	24.52	8.31e-133	***
l_GDPpc	0.00159750	0.00345815	0.4620	0.6441	
Corruption	0.00323811	0.00435616	0.7433	0.4573	
LRU	-0.000173327	9.74338e-05	-1.779	0.0753	*
Labour	2.43562e-07	3.78016e-08	6.443	1.17e-10	***
dNLT	7.16698e-07	2.03923e-07	3.515	0.0004	***

Mean dependent var	0.858261	S.D. dependent var	0.040932
Sum squared resid	0.225412	S.E. of regression	0.030394
Log-likelihood	519.0903	Akaike criterion	-1026.181
Schwarz criterion	-1005.076	Hannan-Quinn	-1017.686

'Between' variance = 0.000426052
'Within' variance = 0.000104421
mean theta = 0.843831
corr(y,yhat)^2 = 0.459325

Joint test on named regressors -
Asymptotic test statistic: Chi-square(5) = 70.9527
with p-value = 6.49125e-14

Breusch-Pagan test -
Null hypothesis: Variance of the unit-specific error = 0
Asymptotic test statistic: Chi-square(1) = 485.37
with p-value = 1.44948e-107

Hausman test -
Null hypothesis: GLS estimates are consistent
Asymptotic test statistic: Chi-square(5) = 47.3023
with p-value = 4.9296e-09

Model 8: Random-effects (GLS), using 249 observations
Included 25 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: HDI

	coefficient	std. error	z	p-value	
const	0.800208	0.0335510	23.85	1.00e-125	***
l_GDPpc	0.00430874	0.00344355	1.251	0.2108	
Corruption	0.00768564	0.00426436	1.802	0.0715	*
LRU	-0.000183263	0.000100148	-1.830	0.0673	*
Labour	2.05998e-07	5.31942e-08	3.873	0.0001	***
dCLT	6.90452e-08	6.75966e-08	1.021	0.3071	

Mean dependent var	0.858261	S.D. dependent var	0.040932
Sum squared resid	0.221159	S.E. of regression	0.030106
Log-likelihood	521.4619	Akaike criterion	-1030.924
Schwarz criterion	-1009.819	Hannan-Quinn	-1022.429

'Between' variance = 0.000416933
'Within' variance = 0.000106705
mean theta = 0.840502
corr(y,yhat)^2 = 0.468939

Joint test on named regressors -
Asymptotic test statistic: Chi-square(5) = 58.2398
with p-value = 2.80678e-11

Breusch-Pagan test -
Null hypothesis: Variance of the unit-specific error = 0
Asymptotic test statistic: Chi-square(1) = 470.835
with p-value = 2.10908e-104

Hausman test -
Null hypothesis: GLS estimates are consistent
Asymptotic test statistic: Chi-square(5) = 56.4292
with p-value = 6.62998e-11

Model 9: Random-effects (GLS), using 249 observations
Included 25 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: HDI

	coefficient	std. error	z	p-value	
const	0.814532	0.0340147	23.95	1.01e-126	***
l_GDPpc	0.00259301	0.00350556	0.7397	0.4595	
Corruption	0.00799977	0.00426812	1.874	0.0609	*
LRU	-0.000184875	9.88963e-05	-1.869	0.0616	*
Labour	2.92963e-07	4.40302e-08	6.654	2.86e-11	***
dALT	-1.72528e-07	7.90326e-08	-2.183	0.0290	**

Mean dependent var	0.858261	S.D. dependent var	0.040932
Sum squared resid	0.236651	S.E. of regression	0.031143
Log-likelihood	513.0329	Akaike criterion	-1014.066
Schwarz criterion	-992.9611	Hannan-Quinn	-1005.571

'Between' variance = 0.000425736
'Within' variance = 0.000102761
mean theta = 0.844991
corr(y,yhat)^2 = 0.430697

Joint test on named regressors -
Asymptotic test statistic: Chi-square(5) = 61.2171
with p-value = 6.80927e-12

Breusch-Pagan test -
Null hypothesis: Variance of the unit-specific error = 0
Asymptotic test statistic: Chi-square(1) = 483.155
with p-value = 4.39864e-107

Hausman test -
Null hypothesis: GLS estimates are consistent
Asymptotic test statistic: Chi-square(5) = 60.5881
with p-value = 9.18736e-12

Model 10: Random-effects (GLS), using 249 observations
Included 25 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: HDI

	coefficient	std. error	z	p-value	
const	0.797222	0.0337154	23.65	1.31e-123	***
l_GDPpc	0.00462594	0.00348432	1.328	0.1843	
Corruption	0.00715700	0.00444278	1.611	0.1072	
LRU	-0.000176750	0.000100029	-1.767	0.0772	*
Labour	2.55050e-07	4.19559e-08	6.079	1.21e-09	***
dMLT	-6.12026e-08	9.15146e-08	-0.6688	0.5036	

Mean dependent var	0.858261	S.D. dependent var	0.040932
Sum squared resid	0.219520	S.E. of regression	0.029995
Log-likelihood	522.3880	Akaike criterion	-1032.776
Schwarz criterion	-1011.671	Hannan-Quinn	-1024.281

'Between' variance = 0.00042027
'Within' variance = 0.000107358
mean theta = 0.840648
corr(y,yhat)^2 = 0.473

Joint test on named regressors -
Asymptotic test statistic: Chi-square(5) = 57.4509
with p-value = 4.08249e-11

Breusch-Pagan test -
Null hypothesis: Variance of the unit-specific error = 0
Asymptotic test statistic: Chi-square(1) = 475.429
with p-value = 2.11094e-105

Hausman test -
Null hypothesis: GLS estimates are consistent
Asymptotic test statistic: Chi-square(5) = 55.2246
with p-value = 1.17358e-10

Model 11: Random-effects (GLS), using 249 observations
Included 25 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: HDI

	coefficient	std. error	z	p-value	
const	0.799557	0.0339222	23.57	7.77e-123	***
l_GDPpc	0.00385813	0.00346829	1.112	0.2660	
Corruption	0.00764798	0.00433871	1.763	0.0779	*
LRU	-0.000142166	0.000100946	-1.408	0.1590	
Labour	2.52661e-07	3.90728e-08	6.466	1.00e-10	***
dELT	9.46930e-07	5.55580e-07	1.704	0.0883	*

Mean dependent var	0.858261	S.D. dependent var	0.040932
Sum squared resid	0.246301	S.E. of regression	0.031772
Log-likelihood	508.0566	Akaike criterion	-1004.113
Schwarz criterion	-983.0085	Hannan-Quinn	-995.6182

'Between' variance = 0.000429467
'Within' variance = 9.86318e-05
mean theta = 0.848708
corr(y,yhat)^2 = 0.407361

Joint test on named regressors -
Asymptotic test statistic: Chi-square(5) = 57.6815
with p-value = 3.65907e-11

Breusch-Pagan test -
Null hypothesis: Variance of the unit-specific error = 0
Asymptotic test statistic: Chi-square(1) = 488.371
with p-value = 3.2229e-108

Hausman test -
Null hypothesis: GLS estimates are consistent
Asymptotic test statistic: Chi-square(5) = 73.5498
with p-value = 1.86697e-14

Model 6.2: *Analysis of the effect of capital taxes on each type of social model*

```
Model 12: Random-effects (GLS), using 238 observations
Included 24 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: HDI

               coefficient    std. error      z       p-value
  ------------------------------------------------------------
  const         0.816138      0.0352038     23.18    6.72e-119 ***
  l_GDPpc       0.00424276    0.00360859     1.176   0.2397
  Corruption    0.00576311    0.00453432     1.271   0.2037
  LRU          -0.000247080   0.000107533   -2.298   0.0216    **
  Capital      -4.74749e-08   4.03895e-07   -0.1175  0.9064
  dCCaT         6.78851e-06   1.86574e-06    3.639   0.0003    ***

Mean dependent var   0.859130   S.D. dependent var   0.041533
Sum squared resid    0.281092   S.E. of regression   0.034733
Log-likelihood       464.5128   Akaike criterion    -917.0255
Schwarz criterion   -896.1919   Hannan-Quinn        -908.6292

'Between' variance = 0.000444512
'Within' variance = 0.000104888
mean theta = 0.846347
corr(y,yhat)^2 = 0.342037

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(5) = 25.8178
  with p-value = 9.67976e-05

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 425.481
  with p-value = 1.5646e-94

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(5) = 78.4904
  with p-value = 1.73604e-15
```

```
Model 13: Random-effects (GLS), using 238 observations
Included 24 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: HDI

               coefficient    std. error      z       p-value
  ------------------------------------------------------------
  const         0.815115      0.0360499     22.61    3.40e-113 ***
  l_GDPpc       0.00438435    0.00369681     1.186   0.2356
  Corruption    0.00755019    0.00466267     1.619   0.1054
  LRU          -0.000216572   0.000110147   -1.966   0.0493    **
  Capital       2.64035e-07   4.05607e-07    0.6510  0.5151
  dNCaT         2.74469e-05   2.23520e-05    1.228   0.2195

Mean dependent var   0.859130   S.D. dependent var   0.041533
Sum squared resid    0.276361   S.E. of regression   0.034440
Log-likelihood       466.5323   Akaike criterion    -921.0646
Schwarz criterion   -900.2310   Hannan-Quinn        -912.6683

'Between' variance = 0.000469984
'Within' variance = 0.000113147
mean theta = 0.844834
corr(y,yhat)^2 = 0.486416

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(5) = 13.8749
  with p-value = 0.0164236

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 425.705
  with p-value = 1.39867e-94

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(5) = 71.193
  with p-value = 5.78481e-14
```

```
Model 14: Random-effects (GLS), using 238 observations
Included 24 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: HDI

               coefficient    std. error      z       p-value
  ------------------------------------------------------------
  const         0.811928      0.0358946     22.62    2.77e-113 ***
  l_GDPpc       0.00459649    0.00368271     1.248   0.2120
  Corruption    0.00888319    0.00455793     1.949   0.0513    *
  LRU          -0.000218668   0.000110300   -1.982   0.0474    **
  Capital       1.19728e-06   8.47331e-07    1.413   0.1577
  dACaT        -1.20743e-06   9.61649e-07   -1.256   0.2093

Mean dependent var   0.859130   S.D. dependent var   0.041533
Sum squared resid    0.266599   S.E. of regression   0.033826
Log-likelihood       470.8119   Akaike criterion    -929.6239
Schwarz criterion   -908.7902   Hannan-Quinn        -921.2275

'Between' variance = 0.000456618
'Within' variance = 0.000112916
mean theta = 0.842792
corr(y,yhat)^2 = 0.596455

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(5) = 14.4911
  with p-value = 0.012773

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 437.982
  with p-value = 2.97669e-97

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(5) = 73.1914
  with p-value = 2.21753e-14
```

```
Model 15: Random-effects (GLS), using 238 observations
Included 24 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: HDI

               coefficient    std. error      z       p-value
  ------------------------------------------------------------
  const         0.808343      0.0348829     23.17    8.52e-119 ***
  l_GDPpc       0.00532267    0.00358222     1.486   0.1373
  Corruption    0.00891159    0.00444314     2.006   0.0449    **
  LRU          -0.000227144   0.000109477   -2.075   0.0380    **
  Capital       2.74466e-07   4.02914e-07    0.6812  0.4957
  dECaT        -0.000168752   5.54196e-05   -3.045   0.0023    ***

Mean dependent var   0.859130   S.D. dependent var   0.041533
Sum squared resid    0.232732   S.E. of regression   0.031605
Log-likelihood       486.9789   Akaike criterion    -961.9578
Schwarz criterion   -941.1242   Hannan-Quinn        -953.5615

'Between' variance = 0.000397431
'Within' variance = 0.00011033
mean theta = 0.83369
corr(y,yhat)^2 = 0.654342

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(5) = 25.3631
  with p-value = 0.000118547

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 298.882
  with p-value = 5.77283e-67

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(5) = 76.7512
  with p-value = 4.00855e-15
```

```
Model 16: Random-effects (GLS), using 238 observations
Included 24 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: HDI

               coefficient    std. error      z       p-value
  ------------------------------------------------------------
  const         0.812331      0.0360579     22.53    2.18e-112 ***
  l_GDPpc       0.00471586    0.00369747     1.275   0.2022
  Corruption    0.00860501    0.00459022     1.875   0.0608    *
  LRU          -0.000222580   0.000110539   -2.014   0.0441    **
  Capital       3.70865e-07   4.48884e-07    0.8262  0.4087
  dMCaT        -6.09239e-07   1.04539e-06   -0.5828  0.5600

Mean dependent var   0.859130   S.D. dependent var   0.041533
Sum squared resid    0.274480   S.E. of regression   0.034322
Log-likelihood       467.3452   Akaike criterion    -922.6903
Schwarz criterion   -901.8567   Hannan-Quinn        -914.2940

'Between' variance = 0.000466052
'Within' variance = 0.000113101
mean theta = 0.844228
corr(y,yhat)^2 = 0.57847

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(5) = 12.8033
  with p-value = 0.0252931

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 418.659
  with p-value = 4.778e-93

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(5) = 73.3134
  with p-value = 2.09145e-14
```

Model 6.3: *Analysis of the effect of consumption taxes on each type of social model*

```
Model 17: Random-effects (GLS), using 249 observations
Included 25 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: HDI

                coefficient    std. error      z       p-value
  --------------------------------------------------------------
  const         0.805181      0.0336990     23.89     3.60e-126 ***
  l_GDPpc       0.00359396    0.00345924     1.039    0.2988
  Corruption    0.00703376    0.00429998     1.636    0.1019
  LRU          -0.000201107   9.87556e-05   -2.036    0.0417     **
  Consumption   2.67787e-07   5.89239e-08    4.545    5.50e-06  ***
  dCCo          1.44794e-08   7.22119e-08    0.2005   0.8411

Mean dependent var   0.858261   S.D. dependent var   0.040932
Sum squared resid    0.258016   S.E. of regression   0.032518
Log-likelihood       502.2715   Akaike criterion    -992.5430
Schwarz criterion   -971.4382   Hannan-Quinn        -984.0480

'Between' variance = 0.000427982
'Within' variance = 9.96933e-05
mean theta = 0.847658
corr(y,yhat)^2 = 0.386254

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(5) = 59.2439
  with p-value = 1.74158e-11

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 468.976
  with p-value = 5.35418e-104

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(5) = 69.5174
  with p-value = 1.29136e-13
```

```
Model 18: Random-effects (GLS), using 249 observations
Included 25 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: HDI

                coefficient    std. error      z       p-value
  --------------------------------------------------------------
  const         0.827012      0.0339575     24.35     5.22e-131 ***
  l_GDPpc       0.00125965    0.00349074     0.3609   0.7182
  Corruption    0.00328048    0.00437455     0.7499   0.4533
  LRU          -0.000194947   9.66939e-05   -2.016    0.0438     **
  Consumption   2.76644e-07   4.10809e-08    6.734    1.65e-11  ***
  dNCoT         6.36785e-07   2.16662e-07    2.939    0.0033    ***

Mean dependent var   0.858261   S.D. dependent var   0.040932
Sum squared resid    0.262007   S.E. of regression   0.032769
Log-likelihood       500.3605   Akaike criterion    -988.7209
Schwarz criterion   -967.6162   Hannan-Quinn        -980.2259

'Between' variance = 0.000445407
'Within' variance = 9.87082e-05
mean theta = 0.851322
corr(y,yhat)^2 = 0.384505

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(5) = 69.0548
  with p-value = 1.6117e-13

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 499.98
  with p-value = 9.60002e-111

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(5) = 59.0372
  with p-value = 1.92141e-11
```

```
Model 21: Random-effects (GLS), using 249 observations
Included 25 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: HDI

                coefficient    std. error      z       p-value
  --------------------------------------------------------------
  const         0.803144      0.0338018     23.76     8.58e-125 ***
  l_GDPpc       0.00398649    0.00348630     1.143    0.2528
  Corruption    0.00556840    0.00443019     1.257    0.2088
  LRU          -0.000197655   9.83441e-05   -2.010    0.0444     **
  Consumption   2.96910e-07   4.48546e-08    6.619    3.61e-11  ***
  dMCo         -1.05663e-07   9.60426e-08   -1.100    0.2713

Mean dependent var   0.858261   S.D. dependent var   0.040932
Sum squared resid    0.262607   S.E. of regression   0.032806
Log-likelihood       500.0757   Akaike criterion    -988.1513
Schwarz criterion   -967.0466   Hannan-Quinn        -979.6563

'Between' variance = 0.000438338
'Within' variance = 9.96037e-05
mean theta = 0.849493
corr(y,yhat)^2 = 0.377119

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(5) = 60.2608
  with p-value = 1.07362e-11

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 483.49
  with p-value = 3.71893e-107

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(5) = 66.9149
  with p-value = 4.48778e-13
```

```
Model 22: Random-effects (GLS), using 249 observations
Included 25 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: HDI

                coefficient    std. error      z       p-value
  --------------------------------------------------------------
  const         0.813385      0.0340849     23.86     7.34e-126 ***
  l_GDPpc       0.00263414    0.00351179     0.7501   0.4532
  Corruption    0.00672984    0.00431855     1.558    0.1191
  LRU          -0.000198774   9.79507e-05   -2.029    0.0424     **
  Consumption   3.08082e-07   4.67873e-08    6.585    4.56e-11  ***
  dACoT        -1.13614e-07   8.89453e-08   -1.277    0.2015

Mean dependent var   0.858261   S.D. dependent var   0.040932
Sum squared resid    0.278551   S.E. of regression   0.033788
Log-likelihood       492.7373   Akaike criterion    -973.4745
Schwarz criterion   -952.3698   Hannan-Quinn        -964.9795

'Between' variance = 0.000438485
'Within' variance = 9.56408e-05
mean theta = 0.852474
corr(y,yhat)^2 = 0.348142

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(5) = 60.1134
  with p-value = 1.15162e-11

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 486.835
  with p-value = 6.95947e-108

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(5) = 77.1383
  with p-value = 3.32754e-15
```

```
Model 23: Random-effects (GLS), using 249 observations
Included 25 cross-sectional units
Time-series length: minimum 8, maximum 11
Dependent variable: HDI

                coefficient    std. error      z       p-value
  --------------------------------------------------------------
  const         0.796662      0.0339779     23.45     1.44e-121 ***
  l_GDPpc       0.00358358    0.00344461     1.040    0.2982
  Corruption    0.00723269    0.00437536     1.653    0.0983    *
  LRU          -0.000128385   9.77033e-05   -1.314    0.1888
  Consumption   2.89766e-07   4.21874e-08    6.869    6.49e-12  ***
  dECoT         1.03641e-06   3.13733e-07    3.303    0.0010    ***

Mean dependent var   0.858261   S.D. dependent var   0.040932
Sum squared resid    0.323632   S.E. of regression   0.036419
Log-likelihood       474.0616   Akaike criterion    -936.1231
Schwarz criterion   -915.0184   Hannan-Quinn        -927.6281

'Between' variance = 0.000448589
'Within' variance = 8.52214e-05
mean theta = 0.862122
corr(y,yhat)^2 = 0.257771

Joint test on named regressors -
  Asymptotic test statistic: Chi-square(5) = 69.7499
  with p-value = 1.15526e-13

Breusch-Pagan test -
  Null hypothesis: Variance of the unit-specific error = 0
  Asymptotic test statistic: Chi-square(1) = 498.659
  with p-value = 1.86146e-110

Hausman test -
  Null hypothesis: GLS estimates are consistent
  Asymptotic test statistic: Chi-square(5) = 95.5353
  with p-value = 4.60677e-19
```