

# Could the perception of benefit fraud shape attitudes towards taxation?:

## An empirical analysis in Europe

Ana I. Moro-Egido<sup>1</sup>

Universidad de Granada. Dpto. Teoría e Historia Económica. Facultad de Ciencias Económicas y Empresariales. Campus Cartuja s/n. 18071 Granada. Spain. E-mail: aimoro@ugr.es.

Ángel Solano-García García<sup>2</sup>

Universidad de Granada. Dpto. Teoría e Historia Económica. Facultad de Ciencias Económicas y Empresariales. Campus Cartuja s/n. 18071 Granada. Spain. E-mail: asolano @ugr.es

### Abstract

After the negative effect of the recent financial crisis on public finances in many countries, it is of a great interest to study attitudes towards taxation to identify effective measures to enhance public support for taxation and welfare programs. In this paper, we analyze empirically people's attitudes towards taxation in European countries. In particular we test whether the perception about benefit fraud may produce different effects on preferences over the size of the welfare state along the income distribution. Moreover, we test if contextual variables are relatively more relevant than individual characteristics in determining attitudes towards taxation. Using different data sources for many EU countries in 2008, we contrast those hypotheses taking advantage of multilevel techniques. Our results suggests that, differently to the standard models of political competition based in pure economic self-interest, negative attitudes towards taxation of the rich are mainly explained by their perception about benefit fraud. We also find that contextual characteristics explain a larger variance of attitudes toward taxation than individual characteristics.

*Keywords:* Attitudes toward taxation, welfare state, benefit fraud, multilevel techniques.

*JEL Codes:* H3, H26

---

<sup>1</sup> Financial support from the Government of Spain (grants ECO2016-76789-P, ECO2015-63734-P) and the IEF is gratefully acknowledged.

<sup>2</sup> *Corresponding Author:* Angel Solano-Garcia. Universidad de Granada. Dpto. Teoría e Historia Económica. Facultad de Ciencias Económicas y Empresariales. Campus Cartuja s/n. 18071 Granada. Spain. E-mail: aimoro@ugr.es.

## 1. Introduction

Most developed countries are ruled by democracies in which decisions are taken by elected representatives. Voters' attitudes toward taxation are important for representatives as they care about being re-elected. In fact, the salient issue in the 2012 US Presidential Election was income tax. Moreover, in the context of the recent financial crisis, public finances have been a hot topic in the parliaments of many European countries. In this scenario, benefit fraud and other unveiled cases of waste of public resources (see the case of the Panama papers and Falciani's list for some examples) have helped sow doubt about the size of the welfare state and the effectiveness of taxation in redistributing income from the rich to the poor. Therefore, it is of a great interest to study attitudes towards taxation to identify effective measures to enhance public support for taxation and, consequently, welfare programs.

In this paper we revise the existing results concerning different determinants of people's attitudes towards the size of the welfare state. More precisely, we analyze how the perception about benefit fraud may shape individuals' attitudes towards taxation. Based on new empirical findings showing that preferences for taxation depends on who the welfare recipients are (Barnes, 2015; Ballard-Rosa *et al.*, 2016; Roosma *et al.*, 2016 and Berens and Gelepithis, 2018), we study the relationship between individuals' preferences for taxation and their personal income level. In particular, we test whether the concern about the presence of benefit fraud is the main determinant of the negative attitude towards tax rate among the rich, and whether this effect varies by country.

Our analysis relies on multilevel methods, the most appropriate way of analyzing multi-stage samples, since they allow for estimation of robust standard errors and clustering of the sample. This methodology also allows us to measure country-level variation in relation to individual-level variation and to control for country-level influences. Therefore, this approach will allow us to compare the relative importance of country characteristics with respect to individual characteristics to explain such attitudes toward taxation.

For this aim, we conduct an extensive comparative analysis in different European countries to determine the sources of heterogeneity in preferences over the size of the welfare state and seek to identify to what extent individual- and contextual-level variables account for systematic differences at the individual and aggregate levels. Using data from

the European Social Survey (ESS) (2008 wave), EUROSTAT, World Bank and the Worldwide Governance Indicators, we study the effect of personal income and benefit fraud on attitudes towards taxation for a group of European countries taking advantage of multilevel techniques. We choose the ESS instead of other surveys such as *International Social Survey Program (ISSP)*, the *World Values Survey (WVS)* or the *European Values Survey (EVS)* because, as pointed out by Lago-Peñas and Lago-Peñas (2010), "given that the *ESS* is designed to provide methodological consistency, and information at the individual, regional and national level is provided, cross-national comparisons are particularly precise".

The relationship between attitudes towards the progressivity of taxes and the size of the welfare state has been recently addressed in, among others, Barnes (2015), Ballard-Rosa *et al.*, (2016), Roosma *et al.*, (2016) and Berens and Gelepithis (2018). All these studies consider a distinction between preferences over the level of taxation and preferences over its level of progressivity. In particular they find that while higher tax levels are politically unpopular, greater tax progressivity is not. This is because it is assumed that individuals' preferences on the progressivity of the tax scheme depend on the distribution of benefits financed with tax revenue. Similarly to these papers, we also consider how it is distributed public expenditure as a key factor to explain attitudes towards taxation. However, we focus on how the presence of benefit fraud may affect preferences for the size of the welfare state.

Although we are not the first in using multilevel analysis in this area of research (see Halla *et al.*, 2010; Lago-Peñas and Lago-Peñas, 2010; Jaime-Castillo and Saez-Lozano, 2016; Pitau *et al.*, 2013 and Pitau *et al.*, 2016), our scope and goals do not overlap with previous studies. While Halla *et al.* (2010) focus on economic factors such as income and prices to explore differences between benefit fraud and tax evasion in OECD member countries, and Lago-Peñas and Lago-Peñas (2010) developed a multilevel econometric approach on the basis of several sources of subjective heterogeneity in tax morale at the individual- and contextual-level in European countries; we cover the issue of preferences over the size of the welfare state. Jaime-Castillo and Saez-Lozano (2016) studied the effect of both individuals' ideology and the importance of direct versus indirect taxation on preferences over taxation. In contrast, our study focuses on the effect of benefit fraud.

While Pittau *et al.*, (2013) compare the determinants of attitudes towards redistribution between Europe and US, Pittau *et al.* (2016) focus on those determinants in US within a chronological perspective.

Our main findings show, first, that the standard theory of redistributive politics that predicts a negative relationship between attitudes towards taxation and individuals' income is not supported empirically when we control for the perception of benefit fraud. Controlling for the latter, and according with some theoretical literature (see Ronie, 2006; Borck, 2007b, 2009; and Solano-García, 2017), we find that top income individuals prefer higher taxes and a large welfare state than middle-income ones in all countries. Finally, we conclude that the perception about the level of benefit fraud is the main factor to explain the negative attitude towards tax rate among the rich.

The rest of the paper is organized as follows. In section 2, we describe the theoretical background and we provide the main hypotheses we aim to test. We present the description of the data sets and the main variables used in the analysis in section 3. In section 4, we present the econometric model we estimate. We present our estimation results in section 5, and finally offer some concluding remarks in section 6.

## **2. Theoretical Background**

In terms of redistributive politics, the first theoretical economic models assuming pure self-interested individuals show that preferences for higher taxes and higher public expenditure decrease with growing income. Romer (1975), Roberts (1977) and Meltzer and Richard (1981) model the choice of a flat tax rate and a lump sum transfer to all voters in a democracy. These studies rely mainly on the median voter theorem. They obtain that the tax rate chosen by majority voting rule is the optimal one for the voter with the median income. The poorer is the median voter, the higher is her optimal level of tax rate and consequently, the higher the level of income redistribution. Moreover, some models show that poor individuals prefer a larger provision of public goods than rich individuals do under proportional cost sharing (Persson and Tabellini, 2002). Therefore, independently of the purpose of the taxation, self-interested individuals' preferences for taxes seem to decrease as income increases, even if we consider more realistic tax schemes (Corneo and

Grüner, 2002).<sup>3</sup>

However, there is consistent evidence that contradicts the more redistributive predictions of standard models (see, e.g., Roemer, 1998 and citations therein). Some of these alternatives theories rely on the prospect of upward mobility (Benabou and Ok, 2001) or the effects of considering multiple dimension policy (see Lee and Roemer, 2006 for the case of income redistribution and race). Other theoretical models are based on the idiosyncratic beliefs concerning the key factors that determine economic success (Piketty 1998 and Fong 2001). In this line, Alesina and Angeletos (2005) propose that the equilibrium levels of public expenditure depend on voters' beliefs about how important is luck versus effort (merit) to determine their life time earnings. All these theories tend to explain why the poor may vote for low levels of public expenditure but they fail to explain why the rich would be happy to be taxed to increase tax revenues.

A new growing literature that focuses on the importance of the welfare state structure on attitudes towards taxation tries to explain why the rich may support a quite progressive tax scheme (among others, Barnes, 2015; Ballard-Rosa *et al.*, 2016; Roosma *et al.*, 2016; Berens and Gelepithis, 2018). Differently from the traditional theory of redistributive politics, this literature show that it is the distribution of benefits *per se*, and not the resulting distribution of income, what explains the support for tax progressivity. More precisely, they show that the support for progressive taxation is eroded where welfare spending is targeted on the poor. By contrast, in countries where welfare programs are targeted on average and higher income earners public support for tax progressivity is fostered. Following this argument, we introduce the possibility of benefit fraud and check whether it affects preferences over the size of the welfare state. Since benefit fraud is a transfer of public resources to people who are not entitled to them, we believe that high contributors to the system should be more against it. Hence, we expect to have that rich individuals prefer a lower size of the welfare state in countries where they perceive there is a large benefit fraud. To illustrate this effect of benefit fraud on the preferences for the size of the welfare state we propose a simple model. For the sake of exposition we relegate the formal description of the model to the Appendix.

---

<sup>3</sup> Other theories that obtain the same result focus on the importance of uncertainty about future incomes due to insecurity in the labour market (Iversen and Soskice, 2001; Cusack *et al.*, 2006)

All these studies assume full tax compliance. However, the possibility of tax evasion may shape also preferences over taxation. The possibility of evading or avoiding, joined to the fact that the cost of doing so decreases with rising income, makes taxes less progressive as the rich report a lower proportion of their income than the poor, and thus enjoy a benefit who are not entitled to. Therefore, middle-income voters may become the highest net contributors to welfare policies. They subsidize the poor by the traditional redistributive channel, and the rich by the channel associated to tax evasion. If individuals acknowledge this, rich individuals may prefer larger taxes, associated with larger public spending, since they are going to evade/avoid them. Poor people rely on the traditional redistribution channel so they prefer higher taxes. However, middle-income individuals prefer lower taxes because they become poorer with the public spending. This non-monotonic relationship between income and preferences for taxation is called the *ends against the middle* result in the literature and is obtained in recent theoretical papers by Ronie (2006), Borck (2007b, 2009) and Solano-García (2017).

Finally, other regarding preferences and inequality aversion may also explain why high income earners would prefer a large welfare state (among others, Dimick, *et al.*, 2017 and Ackert *et al.*, 2007).

### **3. Data Set and Variables**

#### **3.1. Data Set**

The European Social Survey (ESS) is an academically driven, cross-national survey that has been conducted every two years across Europe since 2001, which has been administered in over 30 countries to date. The ESS goals are to monitor and interpret changing public attitudes and values within Europe and to investigate how they interact with Europe's changing institutions. It also develops a series of European social indicators, including attitudinal indicators.

In the fourth round, year 2008, the survey contains questions on a variety of core topics repeated from previous rounds, but also included a module of interest to us: "Welfare attitudes in a changing Europe". It is a cross-section data set where the unit of analysis is the individual. The sample is made up of all individuals aged 15 and over resident within private households, regardless of their nationality, citizenship, language or legal status. The ESS includes data for twenty-five European Union countries and for six non-European

Union countries<sup>4</sup>. For more details see EES Round 4 (2008).

We also use different data sets such as EUROSTAT, World Bank and the Worldwide Governance Indicators, to collect country characteristics that could affect attitudes to taxation. We will present a list of variables and sources in the next section. Our sample contains 32, 290 observations.

### **3.2. Attitudes towards taxation**

The survey contains information about individuals' welfare attitudes, in particular about the relationship between taxes and social benefits and services. The question included is the following: "Many social benefits and services are paid for by taxes. If the government had to choose between increasing taxes and spending more on social benefits and services, or decreasing taxes and spending less on social benefits and services, which should they do?"<sup>5</sup> The answers are elicited on a single item with an 11-point scale. Answers ranges from value 0 "Government should decrease taxes a lot and spend much less on social benefits and services" to value 10 "Government should increase taxes a lot and spend much more on social benefits and services". We denote the variable as *Attitudes\_Taxation*. We assume that each individual makes an evaluation of his/her preferences, and classifies it under one of the available categories. Table 1 presents summary statistics for our dependent variable by country. In our sample, we have data available for 26 countries. The average welfare attitude for the whole set of countries is 5.03, where the maximum evaluation is 6.06 in Denmark and the minimum is 3.56 in Romania.

-----Insert Table 1 about here -----

### **3.3. Determinants of attitudes towards taxation**

In the empirical analysis, we first consider the group of variables required to study attitudes towards taxation. Based on the empirical literature, we also incorporate two additional sets of variables, some at the individual level and others at the country level. Main descriptive statistics of those variables are reported in Table 2, relegated to the Appendix<sup>6</sup>. It is

---

<sup>4</sup>European Union countries included are Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Latvia, Lithuania, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom. The no-European Union countries in the data set are Israel, Norway, Switzerland, Russian Federation, Turkey and Ukraine.

<sup>5</sup> Unfortunately, this question was not used again in the new wave of ESS2016 devoted to welfare attitudes.

<sup>6</sup>The main descriptive statistics by country are reported in the Supplementary Data File. They are available

important to note that although there are variables measured at individual and country level, the inclusion of both types can be assured due to the use of multilevel techniques in the analysis.

-----Insert Table 2 about here -----

We begin by describing the variables selected to explore the effect of individuals' income on preferences for taxation. We exploit information on the respondents' position in the income distribution based on their individual net income. We define the variables *Rich* and *Poor* as dummies that take the value 1 in the case of individuals being located in the two top and bottom quintiles of the income distribution respectively.<sup>7</sup> In our sample around 18% of the population are in the top quintiles of the income distribution, and 18% are in the bottom ones. Following the traditional theoretical models based on pure self-interested individuals, we expect a negative relationship between attitudes towards taxation and income presented before.

To analyze the effect of the perceived level of benefit fraud on people's attitude toward taxes, data set provides us the proxy *Fraud\_perc*, measuring "how much the individual agrees with the fact that many people manage to obtain benefits and services to which they are not entitled to".<sup>8</sup> The average degree of agreement measured by *Fraud\_perc* is 3.67 over 5, a value that implies "Agree strongly". Since according to the theoretical background the effect of tax and benefit fraud is the same on attitudes towards taxation, we use the latter as a proxy. According to the theoretical background, we expect a negative correlation between attitudes towards taxation and *Fraud\_perc*. To test if this effect is more intense for the rich, we introduce the interactions variables regarding the income level.

To make our study comparable with the existing empirical evidence, we introduce an additional set of determinants Following Hennighausen and Heinemann (2014)<sup>9</sup>, we classify the determinants at individual level in the following categories: self-interest, information and socio-economic characteristics. This classification is similar to the one in

---

upon request from the authors.

<sup>7</sup>Unfortunately ESS does not offer information on income but on deciles, and it is self-reported information.

<sup>8</sup> We are aware of the limitations of this variable representing the perceived level of benefit fraud. However, we introduce, at a country level, an alternative variable measuring the perceptions of the extent to which agents have confidence in and abide by the rules of society (*Rule\_law*).

<sup>9</sup> Our results extend the findings of this paper to the set of European countries included in the sample, since they only study attitudes in Germany.



Keller and Tóth (2011).

Most of the political economic models postulate that individual preferences for redistribution are driven by self-interest, supporters being those that are net-recipients. We include social status (*SocialStatus*) to capture this self-interest effect with the question about feelings about household income. The average level is 2.19 in a range from value 1 meaning "living comfortably" to value 4 meaning "finding it very difficult".

The individual assessment of economic policy is influenced by the level of information. Highly educated and politically informed people are more likely to understand the different tax systems. We use the number of years of education (*Inf\_edu* as a variable that represents the number of years of education) and interest in politics (*Pol\_int* as a dummy that takes value 1 if individual obtains information about politics). On average in our sample the number of years of education are 12.17 and 22% of the population obtains information about politics.

According with the literature on tax morale and its effect on shaping preferences for taxation (Solano-García, 2017; Dulleck, *et al.*, 2016 Doerrenberg and Peichl, 2013), we include a proxy that measures the individual importance of following the rules (*Morale*). This variable comes from the answer to a question in which a third person is described to respondents as "She/he believes that people should do what they're told. She/he thinks people should follow rules at all times, even when no-one is watching".<sup>10</sup> Individuals responds the degree of agreement ranged from 1 meaning "Not like me at all" to 6 meaning "Very much like me". The average degree of agreement measured by *Morale* is 3.92 over 6. Again, according to theoretical background, we expect a positive correlation between attitudes towards taxation and *Morale*.

Some of the socioeconomic individual characteristics could go along with preferences towards taxation. We include a set of variables that consists of: a continuous variable *Age*; and dummies *Gender*, that takes value 1 if male; *Non\_immig*, valued 1 if the individual is citizen of the country; and *Active*, if the individual is active in the labour market. In our sample, on average, individuals are 45.6 years old, 48% are women, 9.2% immigrants and 58% are active in the labour market.

---

<sup>10</sup> Again, we are aware that this question is too generic to learn a lot about tax morale and there may be better questions in others surveys such as the ISSP. However, as we explained in the introduction the multilevel analysis determines the choice of our main data base.

Additionally, we incorporate variables of social capital. Respondents are asked about how often they meet with friends and relatives, about their active membership in a political party, a church or other religious organization, etc. This information is used to construct the components of social capital: bonding and bridging social capital. As suggested by Sabatini (2009), we use the information about the frequency of contacts with friends and relatives to construct the categorical variable *SC-Bonding*. This variable takes the value of 1 if the respondent meets with friends and relatives at least once a month, and 0 otherwise.<sup>11</sup> On average 39% of population meets friends. Regarding the empirical approximation to bridging social capital, we include information about variables concerning attending to social acts, religious services or voluntary work last month (*Att\_social*, *Att\_relig* and *Att\_volun* respectively). On average 17%, 25% and 13% attend to those activities at least once in a month.

At country level, the empirical literature shows that there are country-specific characteristics that affect tax attitudes (see for example Keller and Tóth, 2011). To describe the general situation of the economy, we consider the Gross Domestic Product, *Gdp*, from EUROSTAT. The macro effect of inequality on preferences to taxation will be captured by the variable *S80s20* from EUROSTAT that measures the ratio of total income received by the 20% of the population with the highest income (top quintile) to that received by the 20% of the population with the lowest income (lowest quintile). On average in our set of countries this ratio is 5.64. Finally, we consider the importance of the shadow economy of a country as a percentage of its Gross Domestic Product (GDP), through the variable *Shadow* from the index in Schneider *et al.* (2010) extracted from the World Bank data-base. On average in our sample the importance of the shadow economy is 0.25 in a range from 0.086 to 0.497. Finally, we include the variables *Rule\_law* and *Corrup* from Worldwide Governance indicators. The former reflects perceptions of the extent to which agents have confidence in and abide by the rules of society. It takes values from -2.5, meaning a weak governance performance, to 2.5, meaning a strong governance performance. In our sample the minimum and maximum value are -0.9 to 1.96 respectively, with an average value of 0.75. The latter reflects perceptions of the extent to which public power is exercised for

---

<sup>11</sup> As seen in Bartolini et al (2003) we have chosen the reported frequency “at least once a month” as a threshold because it well captures the sample variation.

private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. It takes values from -2.5, meaning a weak control of corruption, to 2.5, meaning a strong control of corruption. In our sample the minimum and maximum value are -1 to 2.47 respectively, with an average value of 0.70.

#### **4. Econometric Model**

To model the intensity of attitudes towards taxation, which is an ordered categorical variable, we rely on the achievements of the existing literature as extensively discussed by Ferrer-i-Carbonell and Frijters (2004) and van Praag and Ferrer-i-Carbonell (2008). We use the probit adapted ordinary least squares (POLS). This method allows us to consider the reported attitudes to be cardinal, that is, the distance between the categories of attitudes carries a meaning. It has been shown that assuming cardinality as opposed to regressing satisfaction with ordinal models is rather irrelevant for the results. Ferrer-i-Carbonell and Frijters (2004) and van Praag and Ferrer-i-Carbonell (2008) have shown that the sign of the coefficients is the same, the significance is the same, and the trade-offs between variables are roughly the same, which means that indifference curves are similar. This methodology will allow us to easily interpret the interaction terms.

Bearing this in mind, and given the hierarchical structure of the data, that is, individuals (first level) clustered into countries (second level), the most appropriate econometric method is the multilevel model (Goldstein 2003; Rabe-Hesketh and Skrondal 2008). This is because the standard regression model violates the assumption of the independence of errors, even if we do not include country-level variables.<sup>12</sup>

A natural way to analyze such a hierarchical data structure is to use contextual regression models that integrate variables at several levels of a hierarchy in a single analysis. Related literature has proposed three different approaches in contextual regression modelling: traditional non-hierarchical extensions (e.g., separate regressions by country), classical contextual models (e.g., analysis of covariance), and modern multilevel models (random components). In separate regressions, no country-level explanatory variables can be included in the analysis. A major drawback to the analysis of covariance is that the effects of country-level explanatory variables are confounded by the effects of country

---

<sup>12</sup>We can assume the exchangeability assumption required when treating cluster effects as random is satisfied because we include country-specific covariates.

dummies.

In classical contextual models and in modern multilevel models, individual- and country-level variables can be introduced simultaneously. These methods can adequately split the variation into a between-individual level and a within-country level, but each in their own way. Classical contextual models let the intercept and/or the coefficients vary in a fixed way, while modern multilevel models allow the intercept and/or the coefficients to vary randomly.

Therefore, the multilevel approach is the appropriate estimation method for our goal since, first, it also allows us to introduce all the hypotheses that incorporate variables of both levels. We can also measure country-level variation (between-group variation) in relation to individual-level variation (within-group variation). Since country differences are of substantive interest to us, we need a model in which we can explore the information behind clustering.

Let us then consider a two-level structure where individuals,  $i$  (first level), are nested into countries,  $c$  (second level). We model random effects in the form of random intercepts and slopes. Each random effect is summarized according to its estimated variance. Let  $y_{ic}$  denote the response for individual  $i$  in country  $c$ , and the vectors  $X_{ic}$  and  $Z_{ic}$  contain explanatory variables of the first level and the second level respectively.

To analyze our goals, we work with the null model specification, which does not include any explanatory variable, and gives us information on whether there are country differences in attitudes towards taxation. We will call this null specification as the Null Model

$$y_{ic} = \gamma_0 + \xi_{0c} + \varepsilon_{ic}$$

where  $\xi_{0c}$  designates the random intercept and  $\varepsilon_{ic}$  the individual level residuals. Both residuals are assumed to be independent and to follow normal distributions with zero mean. Therefore, we define the between-country variance,  $\sigma_{\xi_0}^2$ , and the within-country between-individual variance,  $\sigma_{\varepsilon}^2$ . If the within-country variance were zero, all variability would be between countries. In contrast, if the between-country variance were zero, then there is only variability between individuals of the same country. However, if it is significantly different

from zero, then we can say that country differences are present. As it is usual in this literature, to set the proportion of the total variance due to differences between countries, we use the variance partition coefficient (VPC), given by

$$VPC = \sigma_{\xi_0}^2 / (\sigma_{\xi_0}^2 + \sigma_{\varepsilon}^2)$$

The differential effect of being rich or poor on attitudes towards taxation, without any other determinant is captured by the following specification (Model 1), and therefore the possible existence of a U-shape,

$$y_{ic} = \gamma_0 + \gamma_1 Rich_{ic} + \gamma_2 Poor_{ic} + \xi_{0c} + \xi_{rc} Rich_{ic} + \xi_{pc} Poor_{ic} + \varepsilon_{ic}$$

where dummies *Rich* and *Poor* cover the 20th and 80th percentile of the distribution and the parameters  $\xi_{rc}$  and  $\xi_{pc}$  designate the random slope corresponding to dummies *Rich* and *Poor*. Note that, in this specification with random slopes, the VPC<sup>13</sup> can be also defined for rich and for poor people separately.

In Model 2 we introduce as explanatory variables *Fraud\_perc* that captures the effect of the perceived level of benefit fraud and the vector  $\mathbf{W}_{ic}$ , which is the set of all self-interest, information, social capital and socio-economic variables at individual level described before in the previous section. In this specification we can account for the explanatory power of individual characteristics with the VPC.

$$y_{ic} = \gamma_0 + \gamma_1 Rich_{ic} + \gamma_2 Poor_{ic} + \gamma_3 Fraud\_perc_{ic} + \gamma'_5 \mathbf{W}_{ic} + \xi_{0c} + \xi_{rc} Rich_{ic} + \xi_{pc} Poor_{ic} + \varepsilon_{ic}$$

In Model 3, we will include vector  $\mathbf{Z}_c$  to control for the explanatory variable of all country characteristics. As before, we can calculate the VPC and explore to what extent country characteristics are more relevant than individual characteristics.

$$y_{ic} = \gamma_0 + \gamma_1 Rich_{ic} + \gamma_2 Poor_{ic} + \gamma_3 Fraud\_perc_{ic} + \gamma'_5 \mathbf{W}_{ic} + \gamma'_6 \mathbf{Z}_c + \xi_{0c} + \xi_{rc} Rich_{ic} + \xi_{pc} Poor_{ic} + \varepsilon_{ic}$$

Finally, to explore the idea that some determinants affect differently depending on

---

<sup>13</sup>  $VPC = Var(\xi_{0c} + \xi_{rc} Rich_{ic} + \xi_{pc} Poor_{ic}) / [Var(\xi_{0c} + \xi_{rc} Rich_{ic} + \xi_{pc} Poor_{ic}) + Var(\varepsilon_{ic})]$ .

the level of individual's income, vector  $\mathbf{I}_{ic}$ , we include some interaction variables concerning the theoretical hypothesis (Model 4).

$$y_{ic} = \gamma_0 + \gamma_1 Rich_{ic} + \gamma_2 Poor_{ic} + \gamma_3 Fraud\_perc_{ic} + \gamma'_5 \mathbf{W}_{ic} + \gamma'_6 \mathbf{Z}_c + \gamma'_7 \mathbf{I}_{ic} + \xi_{0c} + \xi_{rc} Rich_{ic} + \xi_{pc} Poor_{ic} + \varepsilon_{ic}$$

In this type of analysis if the inclusion of different explanatory variables (individual- and country-level) makes the country-level intercept variance and individual-level slope variances not statistically significantly different from zero, then it is said that variables of this type capture either country variation or individual variation. Therefore there is no significant country heterogeneity left. We can also set the relative importance of different types of variables in explaining the variance of attitudes to taxation.

## 5. Results

We present the estimation results for the attitudes towards taxation for the multilevel technique in Table 3 and the random effects estimations in Table 4 in the Appendix. Before looking at the results concerning our hypotheses, we comment on some general results.

-----Insert Table 3 and 4 about here -----

Our first result indicates that there is evidence of differences in the tax attitude among individuals who live in different countries. In the multilevel model these country differences are modelled with  $\hat{\sigma}_{\xi_0}^2$ , which is significantly different from zero, although decreasing when controls are included (see Table 4). The likelihood ratio test also confirm those differences by country are significantly different from zero. We can observe that initially the fraction of the total variance due to country characteristics is around 8%. Note that after controlling for all the determinants the results still hold, although the variability has decreased (as shown by the evolution of *VPC* in Table 4), showing that all countries are placed around the average.

From these estimations, we can rank countries in terms of the average tax attitude in the simplest model and show how it changes after controlling for all determinants. In Table 5 we report the value of the random effects (random intercepts) and in Figure 1 we picture these values for each country. We can identify three different groups of countries: countries whose assessment of attitudes toward taxation is either below, over or above the average of

the whole population ( $\hat{\gamma}_0$  for the multilevel model since  $\xi_0$  is distributed with zero variance).

-----Insert Table 5 and Figure 1 about here -----

Our second result is the negative effect of the perceived level of benefit fraud on attitudes towards taxation ( $\hat{\gamma}_3 < 0$ ). That is, we obtain that those individuals who perceived a larger level of benefit fraud have lower preferences for taxation.

Now we analyze the relationship between income and preferences for taxation. If we look at the average effect of being either rich or poor in Table 3,  $\hat{\gamma}_1$  and  $\hat{\gamma}_2$  respectively, we find that attitudes towards taxation are decreasing in income according to Model 1 (although the parameter of poor is not statistically significantly different from zero). This is in line with the traditional theoretical result on political competition over income redistribution (see Romer 1975; Roberts 1977; Meltzer and Richard 1981). However, if we introduce individual and country characteristics in Model 2-3 this result is ruled out. By introducing the interactions variables in Model 4 we obtain our main result: rich individuals are more in favour of increasing the size of the welfare state than middle-income and poor individuals. This can be explained because the rich are more concerned about the consequences on income redistribution of benefit fraud than the rest of the population (see the positive and significant coefficient of *Fraud\_perc\_Rich* in Model 4). Our results suggest that the negative attitude towards taxation of the rich is mainly explained by their perception about benefit fraud rather than by their pure economic self-interest.

Moreover, the introduction of random effects concerning the fact of being poor or rich ( $\xi_{rc}$  and  $\xi_{pc}$  in Model 1-4) shows us that the effect of being rich or poor presents now mixed evidence. We find first that there are differences on attitudes towards taxation between rich and poor people belonging to different countries (the  $\hat{\sigma}_{\xi_{rc}}^2$  and  $\hat{\sigma}_{\xi_{pc}}^2$  are significantly different from zero although decreasing when controlling for other determinants in Table 4). Note also that we do not find any relationship among the country specific random effect and the rich or poor people random effect (all covariances are not statistically significantly different from zero in Table 4).

Regarding the rich's preferences, we can identify three groups of countries: countries whose rich individuals prefer high taxes, that is, those countries whose random effect is positive ( $\hat{\gamma}_1 + \hat{\xi}_{rc} > 0$ ); countries whose rich individuals have the average preferences (i.e.  $\hat{\gamma}_1$ ), that is those whose random effect is zero; and countries whose rich individuals prefer low taxes ( $\hat{\gamma}_1 + \hat{\xi}_{rc} < 0$ ).<sup>14</sup> We report them in Table 5 and Figure 2.

Regarding the poor's preferences, we also find the three groups of countries (see also Table 5 and Figure 2). Note that in most of the countries the random effect is positive; except for PL (where rich and poor prefer low taxes), EL and RO (where the rich prefer high taxes and the poor low taxes) and a group consisting of ES, SI, PT and HR (where poor individuals prefer low taxes and rich individuals are indifferent).

Additionally, we obtain that *VPC* is larger for rich and poor people than for middle income individuals. In all cases the *VPC* decreases for both types of individuals while introducing more control variables.

As we mentioned before, in order to capture some differential effects of some variables regarded in the theoretical background, we include interactions concerning income and calculate the average net effect of being rich and poor in each country. Our results, presented in Table 5 and pictured in Figure 3, indicate that the average gross effect of being rich has turned out to be positive and significantly different from zero, while the effect of being poor still is positive although not significantly different from zero. This is against the traditional theoretical result on political competition over income redistribution and but it neither supports to the *Ends Against the Middle* result. In particular, we find a weakly positive correlation between attitudes towards taxation and individuals' income in all countries. Around those aggregate effects we find that the variability among countries of the effect of being rich and poor has decreases up to the level that the net effect is equal in all countries. This in not surprisingly since we have introduce country characteristics as controls.

Finally, our results in terms of the other set of controls are as expected. Individuals that show larger preference for high taxes are those whose perceived social status is lower, more informed individuals, older individuals, non-active individuals, those with economic

---

<sup>14</sup> Note that this econometric technique allows us to differentiate between the gross effect of being rich on average and the net effect of being rich by country.



and personal goals, those with no social goals, and those with larger contacts with cross-cutting ties. We find that people living in countries with more GDP, more inequality, larger shadow economy and less tightness of rules are more in favour of high taxes.

## **6. Concluding Remarks**

After the negative effect of the recent financial crisis on public finances in many countries, taxes on large fortunes have been proposed to support the welfare state. The opposition to this measure by the rich might produce large levels of tax avoidance or tax evasion, which would undermine the final goal of taxation. Therefore, it is of a great interest to study attitudes towards taxation to identify effective measures to enhance public support for taxation and welfare programs.

In this paper we study the determinants of attitudes towards taxation regarding individuals' income. In particular we focus on the effect of the perception of benefit fraud on preferences for the size of the welfare state. For this aim, using multilevel methods, we conduct an extensive comparative analysis in different European countries to determine the sources of heterogeneity in preferences over the size of the welfare state and seek to identify to what extent individual- and contextual-level variables account for systematic differences at the individual and aggregate levels.

We find that the perception of benefit fraud reduces preferences towards taxation and this effect is more intense among the high earners. Moreover, controlling for the perception of benefit fraud, we actually find that top income individuals prefer higher taxes and a large welfare state than middle-income ones in all countries. All this suggest that it is the rich individuals' perception towards the benefit fraud (and possibly its consequences on the effectiveness of welfare programs), and not their pure economic interests, what drives them to have a negative attitude towards taxation. Finally, we find that country characteristics explain a larger variance of attitudes toward taxation than individual characteristics.

All in all, our results suggest that governments should implement measures to fight against benefit fraud and its overrepresentation in order to obtain public support for higher taxes and larger public expenditure. This is a key issue when tax schemes are highly progressive and the rich constitute a pressure group that influences public policy.

## References

1. Ackert, L. F., Martinez-Vazquez, J. and Rider, M. (2007). 'Social Preferences and Tax Policy Design: Some Experimental Evidence', *Economic Inquiry*, Vol. 43, pp. 487–501.
2. Alesina, A. and Giuliano, P. (2010). 'Preferences for Redistribution', in Benhabib, J., Jackson M.O. and Bisin, A. (eds) *Handbook of Social Economics*, The Netherlands: North Holland, pp. 93-131.
3. Alesina, A. and Angeletos, G.M. (2005). 'Fairness and Redistribution', *The American Economic Review*, Vol. 95, pp. 960-980.
4. Bartolini, S., Bilancini, E. and Sarracino, F. (2013). 'Predicting the Trend of Well-Being in Germany: How Much Do Comparisons, Adaptation and Sociability Matter?', *Social Indicators Research*, Vol. 114, pp. 169-191.
5. Ballard-Rosa, C., Martin, L and Scheve, K. (2016). 'The Structure of American Income Tax Policy Preferences', *Journal of Politics*, Vol. 79, pp. 1–16.
6. Barnes, L. (2015). 'The Size and Shape of Government: Preferences over Redistributive Tax Policy', *Socio-Economic Review*, Vol. 13, pp. 55–78.
7. Benabou, R. and Ok, E.A. (2001). 'Social mobility and the demand for redistribution: the POUM hypothesis', *The Quarterly Journal of Economics*, Vol. 116, pp. 447-487.
8. Berens, S. and Gelepithis, M. (2018). 'Welfare State Structure, Inequality, and Public Attitudes Towards Progressive Taxation', *Socio-Economic Review*, Vol. 0, 1-28. <https://doi.org/10.1093/ser/mwx063>.
9. Borck, R. (2007a). 'Voting, Inequality and Redistribution', *Journal of Economic Surveys*, Vol. 21, pp. 90-109.
10. Borck, R. (2007b). 'On the Choice of Public Pensions when Income and Life Expectancy Are Correlated', *Journal of Public Economic Theory*, Vol. 9, pp. 711-725.
11. Borck, R. (2009). 'Voting on redistribution with tax evasion', *Social Choice and Welfare*, Vol. 32, pp. 439-454.
12. Cusack, T., Iversen, T. and Rehm, P. (2006). 'Risks at Work: The Demand and Supply Sides of Government Redistribution', *Oxford Review of Economic Policy*, Vol. 22, pp. 365–389.
13. Dimick, M., Rueda, D. and Stegmueller, D. (2017). 'The Altruistic Rich? Inequality and

- Other-Regarding Preferences for Redistribution', *Quarterly Journal of Political Science*, Vol. 11, pp. 385–439.
14. Doerrenberg, P. and Peichl, A. (2013). 'Progressive taxation and tax morale', *Public Choice*, Vol. 155, pp. 293-316.
  15. Dulleck, U., Fooker, J., Newton, C.J., Ristl, A., Schaffner, M. and Torgler, B. (2016). 'Tax compliance and psychic costs: Behavioral experimental evidence using a physiological marker', *Journal of Public Economics*, Vol. 134, pp. 9-18.
  16. Ferrer-i-Carbonell, A. and Frijters, P. (2004). 'How important is methodology for the estimates of the determinants of happiness?', *The Economic Journal*, Vol. 114, pp. 641-659.
  17. Halla, M., Lackner, M. and Schneider, F. G. (2010). 'An Empirical Analysis of the Dynamics of the Welfare State: The Case of Benefit Morale', *Kyklos*, Vol. 63, pp. 55-74.
  18. Hennighausen, T. and Heinemann, F. (2015). 'Don't Tax Me? Determinants of Individual Attitudes toward Progressive Taxation', *German Economic Review*, Vol. 16, pp. 255–289.
  19. Iversen, T. and Soskice, D. (2001). 'An Asset Theory of Social Policy Preferences', *American Political Science Review*, Vol. 95, pp. 875–893.
  20. Jaime-Castillo A.M. and Saez-Lozano J.L. (2016). 'Preferences for tax schemes in OECD countries, self-interest and ideology', *International Political Science Review*, Vol. 37, pp. 1-18.
  21. Keller, T. and Tóth I.G. (2011). 'Income Distribution, Inequality Perception and Redistribution Claims in European Societies', In Gornick, J C and Jäntti, M. (ed.): 'Income Inequality', Stanford University Press, Stanford.
  22. Lago-Peñas, I. and Lago Peñas, S. (2010). 'The Determinants of Tax Morale in Comparative Perspective: Evidence from European Countries', *European Journal of Political Economy*, Vol. 26, pp. 441-453.
  23. Laporta, R., Lopez-de-Silanes, F. and Shleifer, A. (2006). 'What Works in Securities Laws?', *The Journal of Finance*, Vol. 61, pp. 1-32.
  24. Meltzer A.H. and Richards S.F. (1981). 'A rational theory of the size of government', *Journal of Political Economy* Vol. 89, pp. 914-927.

25. Persson T. and Tabellini G. (2002). *Political Economics: Explaining Economic Policy*. MIT Press Books, The MIT Press.
26. Pittau, M.G., Farcomeni, A. and Zelli, R. (2016). 'Has the attitude of US citizens towards redistribution changed over time?', *Economic Modelling* Vol. 52, pp. 714-724.
27. Pittau, M.G., Massari, R. and Zelli R. (2013). 'Hierarchical Modelling of Disparities in Preferences for Redistribution', *Oxford Bulletin of Economics and Statistics*, Vol. 75, pp. 556-584.
28. Roberts, K. W. S. (1977). 'Voting over Income Tax Schedules', *Journal of Public Economics*, Vol. 8, pp. 329-40.
29. Ronie, J. (2006). 'The political economics of not paying taxes', *Public Choice*, Vol. 126, pp. 107-13.
30. Romer, T. (1975). 'Individual Welfare, Majority Voting, and the Properties of a Linear Income Tax', *Journal of Public Economics*, Vol. 4, pp. 163-85.
31. Roosma, F., Oorschot, W. and Gelissen, J. (2016). 'A Just Distribution of Burdens? Attitudes Toward the Social Distribution of Taxes in 26 Welfare States', *International Journal of Public Opinion Research*, Vol. 28, pp. 376–400.
32. Sabatini, F. (2009). 'Social capital as social networks: A new framework for measurement and an empirical analysis of its determinants and consequences', *The Journal of Socio-Economics*, Vol. 38, pp. 429-442.
33. Schneider, F., Buehn, A. and Montenegro, C. (2010). 'Shadow Economies All over the World: New Estimates for 162 Countries from 1999 to 2007', *Policy Research Working Paper 5356*. The World Bank, Development Research Group.
34. Solano-García A. (2017). 'Fairness in tax compliance: A political competition model', *Journal of Public Economic Theory*, Vol. 19, pp. 1026–1041.
35. Van Praag, B.M.S. and Ferrer-i-Carbonell, A. (2008). 'Happiness Quantified: A Satisfaction Calculus Approach', Oxford University Press, Revised edition.

## Appendix

**Table 1: Main descriptive statistics of tax attitudes**

Country	N. Obs.	Mean	Stand. Dev.
BE	1402	5.09	1.79
CH	1197	5.16	1.69
CZ	1193	5.23	2.13
DE	2006	4.77	1.89
DK	1240	6.08	2.06
EE	1004	5.64	2.01
EL	1090	5.15	2.33
ES	1309	5.25	1.82
FI	1617	5.95	1.79
FR	1669	5.03	1.99
HR	876	4.85	2.24
HU	838	3.62	2.36
IE	1420	5.23	2.19
IL	1261	5.52	2.16
LV	1186	4.60	1.98
NL	1361	5.26	1.57
NO	1189	5.67	1.75
PL	994	4.48	2.11
PT	638	5.04	2.00
RO	1152	3.51	2.41
RU	1295	5.21	2.22
SE	1300	5.53	2.03
SI	802	4.54	2.12
TR	1518	5.31	2.63
UA	903	4.79	2.52
UK	1830	5.22	2.22
Total	32290	5.02	2.18

Note: BE(Belgium), CH (Switzerland), CZ (Czech Republic), DE (Germany), DK (Denmark), EE (Estonia), EL (Greece), ES (Spain), FI (Finland), FR (France), HR (Croatia), HU (Hungary), IE (Ireland), IL (Israel), LV (Latvia), NL (Netherlands), NO (Norway), PL (Poland), PT (Portugal), RO (Romania), RU (Russian Federation), SE (Sweden), SI (Slovenia), TR (Turkey), UA (Ukraine), UK (United Kingdom).

**Table 2: Main descriptive statistics of determinants**

INDIVIDUAL CHARACTERISTICS	Mean	Std. Dev.	Min	Max
<i>Poor</i>	0.18	0.38	0	1
<i>Rich</i>	0.19	0.39	0	1
<i>Fraud_perc</i>	3.68	0.98	1	5
<i>Moral</i>	3.92	1.43	1	6
<i>Social_Status</i>	2.19	0.89	1	4
<i>Inf_Edu</i>	12.28	3.90	0	18
<i>Inf_Pol</i>	0.22	0.41	0	1
<i>Age</i>	46.85	16.11	20	85
<i>Gender</i>	0.48	0.50	0	1
<i>Active</i>	0.60	0.49	0	1
<i>Non_immig</i>	0.92	0.27	0	1
<i>Ec_goal</i>	3.10	1.38	1	6
<i>Soc_goal</i>	2.21	1.02	1	6
<i>Pers_goal</i>	3.18	1.41	1	6
<i>SC-Bonding</i>	0.41	0.49	0	1
<i>Att_Social</i>	0.17	0.37	0	1
<i>Att_Relig</i>	2.64	3.16	0	7
<i>Att_volun</i>	0.13	0.34	0	1
COUNTRY CHARACTERISTICS	Mean	Std. Dev.	Min	Max
<i>Gdp</i>	2.09	1.12	0.39	5.39
<i>s20/s80</i>	5.63	1.42	3.20	8.50
<i>Shadow</i>	0.26	0.12	0.09	0.50
<i>Rule_law</i>	0.75	1.02	-0.9	1.96
<i>Corrup</i>	0.70	1.11	-1.00	2.47

**Table 3: Multilevel estimation results**

INDIVIDUAL CHARACTERISTICS	Null Model	Model 1	Model 2	Model 3	Model 4
<i>Rich</i>		-0.023* (0.012)	-0.024 (0.025)	-0.028 (0.025)	0.419* (0.214)
<i>Poor</i>		0.010 (0.012)	-0.011 (0.025)	-0.011 (0.025)	0.096 (0.215)
<i>Fraud_perc</i>			-0.088*** (0.005)	-0.088*** (0.005)	-0.084*** (0.006)
<i>Moral</i>			0.005 (0.004)	0.005 (0.004)	0.006 (0.004)
<i>Social_Status</i>			-0.017*** (0.007)	-0.017** (0.007)	-0.017** (0.007)
<i>Inf_Edu</i>			0.007*** (0.001)	0.007*** (0.001)	0.006*** (0.001)
<i>Inf_Pol</i>			0.010 (0.011)	0.010 (0.011)	0.009 (0.011)
<i>Age</i>			0.333* (0.178)	0.331* (0.178)	0.325* (0.178)
<i>Age2</i>			-0.085 (0.182)	-0.083 (0.182)	-0.081 (0.182)
<i>Gender</i>			-0.002 (0.009)	-0.002 (0.009)	-0.002 (0.009)
<i>Active</i>			-0.051*** (0.012)	-0.051*** (0.012)	-0.052*** (0.012)
<i>Non_immig</i>			0.018 (0.016)	0.018 (0.016)	0.018 (0.016)
<i>Ec_goal</i>			0.030*** (0.004)	0.030*** (0.004)	0.030*** (0.004)
<i>Soc_goal</i>			-0.029*** (0.005)	-0.029*** (0.005)	-0.029*** (0.005)
<i>Pers_goal</i>			0.009** (0.004)	0.009** (0.004)	0.009** (0.004)
<i>SC-Bonding</i>			0.008 (0.010)	0.009 (0.010)	0.009 (0.010)
<i>Att_Social</i>			0.026** (0.012)	0.026** (0.012)	0.026** (0.012)
<i>Att_Relig</i>			0.005*** (0.002)	0.005*** (0.002)	0.005*** (0.002)
<i>Att_volun</i>			0.015 (0.014)	0.015 (0.014)	0.014 (0.014)

**Table 3: Multilevel estimation results (Cont.)**

COUNTRY CHARACTERISTICS	Null Model	Model 1	Model 2	Model 3	Model 4
<i>Gdp</i>				0.108** (0.044)	0.103** (0.045)
<i>s20/s80</i>				0.063** (0.029)	0.056* (0.029)
<i>Rule_law</i>				0.096 (0.163)	0.119 (0.181)
<i>Shadow</i>				1.483* (0.801)	1.833** (0.883)
<i>Corrup</i>				0.049 (0.122)	0.083 (0.133)
<b>INTERACTIONS</b>					
<i>Cost_Poor</i>					-0.001 (0.009)
<i>Cost_Rich</i>					0.001 (0.009)
<i>Fraud_perc_Poor</i>					0.017 (0.013)
<i>Fraud_perc_Rich</i>					-0.042*** (0.013)
<i>Shadow_Poor</i>					-0.628 (0.577)
<i>Shadow_Rich</i>					-0.737 (0.581)
<i>Rule_Poor</i>					0.004 (0.116)
<i>Rule_Rich</i>					-0.037 (0.111)
<i>Corrup_Poor</i>					-0.021 (0.078)
<i>Corrup_Rich</i>					-0.081 (0.080)
<i>Const.</i>	-0.219*** (0.048)	-0.216*** (0.048)	-0.163** (0.072)	-1.221*** (0.353)	-1.328*** (0.377)
N	32290	32290	32290	32290	32290



**Table 4: Multilevel estimation results (random parameters)**

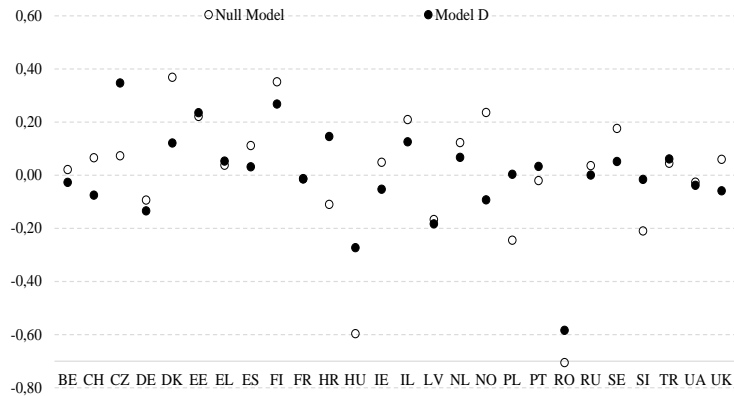
	Null Model	Model 1	Model 2	Model 3	Model 4
$\hat{\sigma}_{\xi_r}^2$		0.011 (0.005)	0.010 (0.004)	0.011 (0.005)	0.008 (0.004)
		0.011 (0.004)	0.011 (0.004)	0.011 (0.004)	0.009 (0.004)
	0.059 (0.017)	0.062 (0.018)	0.050 (0.014)	0.031 (0.009)	0.030 (0.009)
$\hat{\sigma}_{\xi_r, \xi_p}$		-0.004 (0.003)	-0.004 (0.003)	-0.005 (0.003)	-0.003 (0.003)
$\hat{\sigma}_{\xi_r, \xi_0}$		-0.011 (0.007)	-0.009 (0.006)	-0.010 (0.005)	-0.007 (0.005)
$\hat{\sigma}_{\xi_p, \xi_0}$		0.006 (0.006)	0.005 (0.006)	0.002 (0.005)	0.002 (0.004)
	0.666 (0.005)	0.662 (0.005)	0.649 (0.005)	0.649 (0.005)	0.649 (0.005)
N	32.29	32.29	32.29	32.29	32.29
Likelihood	-39305.23	-39302.85	-38929.65	-38922.39	-38911.45
<i>VPC (Rich)</i>		0.099 (0.023)	0.084 (0.020)	0.061 (0.015)	0.054 (0.014)
<i>VPC (Poor)</i>		0.098 (0.022)	0.085 (0.019)	0.060 (0.014)	0.056 (0.013)
<i>VPC</i>	0.082 (0.021)	0.085 (0.022)	0.071 (0.019)	0.045 (0.013)	0.044 (0.012)

**Table 5: Random effects ranking**

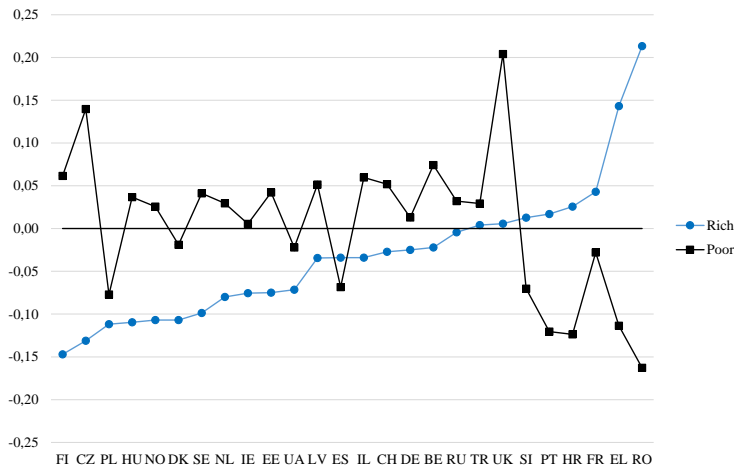
Country	Random intercept ( $\xi_0$ )				Random Slope (Poor, ( $\xi_p$ ))				Random Slope (Rich, ( $\xi_r$ ))					
	Null Model		Model 3		Null Model		Model 3		Null Model		Model 3			
	Mean	St. Dev.	Mean	St. Dev.	Country	Mean	St. Dev.	Mean	St. Dev.	Country	Mean	St. Dev.	Mean	St. Dev.
RO	-0.71	0.02	-0.54	0.03	BE	0.06	0.08	-0.16	0.05	BE	0.00	0.05	0.31	0.21
HU	-0.60	0.03	-0.27	0.03	CH	0.04	0.06	-0.14	0.08	CH	-0.03	0.06	0.29	0.21
PL	-0.25	0.03	0.02	0.03	CZ	0.11	0.05	-0.12	0.09	CZ	-0.13	0.09	0.11	0.22
SI	-0.22	0.03	-0.05	0.03	DE	0.01	0.05	-0.14	0.06	DE	-0.05	0.06	0.28	0.21
LV	-0.16	0.02	-0.13	0.03	DK	-0.05	0.06	-0.09	0.08	DK	-0.09	0.05	0.30	0.21
HR	-0.11	0.03	0.16	0.03	EE	0.02	0.07	-0.08	0.08	EE	-0.07	0.06	0.25	0.21
DE	-0.09	0.02	-0.16	0.02	EL	-0.15	0.07	-0.06	0.08	EL	0.17	0.06	0.40	0.21
PT	-0.02	0.03	0.03	0.03	ES	-0.09	0.06	-0.07	0.06	ES	-0.03	0.06	0.27	0.21
UA	-0.02	0.03	0.00	0.03	FI	0.07	0.06	-0.03	0.08	FI	-0.16	0.05	0.22	0.21
FR	-0.01	0.02	-0.01	0.02	FR	-0.03	0.05	-0.07	0.06	FR	0.04	0.05	0.32	0.21
BE	0.02	0.02	-0.05	0.03	HR	-0.18	0.06	0.00	0.07	HR	0.05	0.06	0.29	0.21
TR	0.03	0.02	0.10	0.02	HU	0.06	0.07	-0.01	0.07	HU	-0.09	0.06	0.18	0.21
EL	0.03	0.02	0.10	0.03	IE	-0.02	0.05	-0.01	0.07	IE	-0.04	0.06	0.28	0.21
RU	0.03	0.02	0.07	0.03	IL	0.04	0.06	-0.03	0.07	IL	-0.04	0.06	0.23	0.21
UK	0.06	0.02	-0.05	0.02	LV	0.03	0.05	0.02	0.08	LV	-0.02	0.06	0.25	0.21
IE	0.06	0.02	-0.06	0.02	NL	0.03	0.06	0.01	0.07	NL	-0.08	0.05	0.26	0.21
CZ	0.07	0.02	0.39	0.03	NO	0.02	0.07	0.01	0.07	NO	-0.11	0.05	0.26	0.21
CH	0.07	0.02	-0.09	0.03	PL	-0.09	0.07	0.04	0.06	PL	-0.14	0.05	0.14	0.21
ES	0.11	0.02	0.04	0.02	PT	-0.14	0.07	0.06	0.08	PT	0.02	0.08	0.31	0.22
NL	0.13	0.02	0.02	0.03	RO	-0.17	0.05	0.04	0.06	RO	0.23	0.05	0.46	0.21
SE	0.18	0.02	-0.02	0.03	RU	0.00	0.05	0.07	0.08	RU	0.01	0.06	0.24	0.21
IL	0.21	0.02	0.16	0.03	SE	0.05	0.07	0.04	0.07	SE	-0.08	0.05	0.29	0.21
EE	0.23	0.03	0.21	0.03	SI	-0.10	0.06	0.05	0.07	SI	0.04	0.06	0.32	0.21
NO	0.25	0.02	-0.11	0.03	TR	0.07	0.05	0.08	0.07	TR	-0.01	0.06	0.23	0.21
FI	0.36	0.02	0.19	0.02	UA	-0.06	0.05	0.13	0.09	UA	-0.06	0.07	0.21	0.21
DK	0.38	0.02	0.05	0.03	UK	0.19	0.05	0.18	0.06	UK	0.02	0.05	0.30	0.21

Note: BE(Belgium), CH (Switzerland), CZ (Czech Republic), DE (Germany), DK (Denmark), EE (Estonia), EL (Greece), ES (Spain), FI (Finland), FR (France), HR (Croatia), HU (Hungary), IE (Ireland), IL (Israel), LV (Latvia), NL (Netherlands), NO (Norway), PL (Poland), PT (Portugal), RO (Romania), RU (Russian Federation), SE (Sweden), SI (Slovenia), TR (Turkey), UA (Ukraine), UK (United Kingdom).

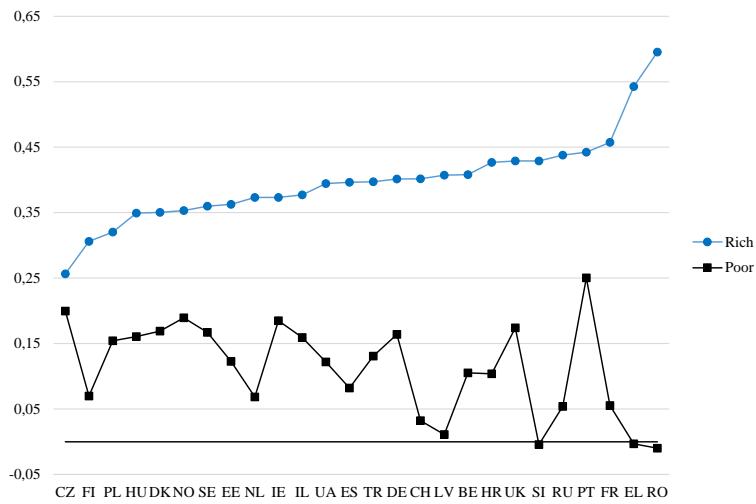
**Figure 1: Random Intercept**



**Figure 2: Random Slope (Model 1)**



**Figure 3: Random Slope (Model 4)**



## Theoretical Model.

Let us consider a simple economy populated by two types of individuals characterized by their pre-tax income  $y_H$  and  $y_L$  where  $y_H > y_L$ . Let  $\alpha_H \in [0,1]$  be the proportion of individuals with their pre tax income  $y_H$ . All Individuals must pay a proportional income tax  $\tau \in [0,1]$  that finances a lump sum transfer  $b$ . Let  $\lambda_H \in [0,1]$  ( $1 - \lambda_H$ ) be the share of public transfer targeted to individuals with high (low) income.

There is a share of the population with pre-tax income  $y_L$  that receive public benefits which they are not entitle to, that is they enjoy public benefits but they do not pay taxes to finance them. We will refer to this group of individuals as the dishonest individuals.<sup>15</sup> We denote  $\alpha_D \in [0,1]$  as the share of dishonest individuals. Let us define now  $\theta_D \in [0,1]$  as the share of public transfer devoted to individuals with pre-tax income  $y_L$  that are enjoyed by dishonest individuals.

Assuming budget balance, the government budget constraint is just:

$$(\alpha_H y_H + (1 - \alpha_H - \alpha_D) y_L) \tau = \lambda_H b + (1 - \lambda_H) ((1 - \theta_D) b + \theta_D b)$$

Regarding individuals preferences, we assume that individuals with high income not only care about their private consumption and their public benefits, but they also care about the amount of public benefits enjoyed by other groups. Therefore, there is a concern about the distribution of public transfers and the level of benefit fraud. Formally, the utility of an individual whose income is  $y_H$  is given by:

$$u_H(y_H, G) = (1 - \tau) y_H + \beta_H (\lambda_H b)^{\frac{1}{2}} + \beta_{Lh} ((1 - \lambda_H) (1 - \theta_D) b)^{\frac{1}{2}} - \beta_{Ld} ((1 - \lambda_H) \theta_D b)^{\frac{1}{2}}$$

where  $\beta_H > 0$ ,  $\beta_{Lh} > 0$  and  $\beta_{Ld} > 0$  stands for the marginal utility effects of the distribution of public benefits among themselves, honest and dishonest individuals with income  $y_L$ , respectively.

Maximizing the utility of individuals with a high income with respect of the tax rate we obtain that their optimal tax rate is:

$$\tau_H^* = \frac{(\alpha_H y_H + (1 - \alpha_H - \alpha_D) y_L)}{4 y_H^2} \left[ \beta_H \lambda_H^{1/2} + (1 - \lambda_H)^{1/2} (\beta_{Lh} (1 - \theta_D)^{1/2} - \beta_{Ld} \theta_D^{1/2}) \right]^2.$$

---

<sup>15</sup> The model can be extended to the case in which both groups of individuals may commit benefit fraud and results do not change substantially. We assume that only individuals with low income may do it for the sake of exposition..

One relevant effect is how this optimal tax rate evolves with the size of the benefit fraud, given a fixed proportion of dishonest individuals. We obtain that benefit fraud makes individuals with a high income to prefer a lower size of the welfare state.<sup>16</sup>

$$\frac{\partial \tau_H^*}{\partial \theta_D} = -\frac{(\alpha_H y_H + (1 - \alpha_H - \alpha_D) y_L)}{4y_H^2} (1 - \lambda_H)^{\frac{1}{2}} \varphi \left[ \left( \frac{\beta_{Lh}}{(1 - \theta_D)^{\frac{1}{2}}} + \frac{\beta_{Ld}}{\theta_D^{\frac{1}{2}}} \right) \right] < 0$$

where  $\varphi = \left[ \beta_H \lambda_H^{1/2} + (1 - \lambda_H)^{1/2} (\beta_{Lh} (1 - \theta_D)^{1/2} - \beta_{Ld} \theta_D^{1/2}) \right]$ .

---

<sup>16</sup> A symmetric analysis can be made regarding the preferences of honest individuals with low pre-tax income.