ThE Papers

Dpto. Teoría e Historia Económica
Universidad de Granada

Working Paper n. 14/02

Fairness in Tax compliance: A Political Competition Model

Ángel Solano García

April, 2014

Fairness in Tax compliance: A Political Competition Model*

Angel Solano-García†

Abstract

This paper analyzes the political economy of income redistribution when voters are concerned about fairness in tax compliance. We consider a two stage-model where there is a two-party competition over the tax rate and over the intensity of the tax enforcement policy in the first stage, and voters decide about their level of tax compliance in the second stage. We find that if the concern about fairness in tax compliance is high enough, a liberal middle-income majority of voters may block any income redistribution policy. Alternatively, we find an equilibrium in which the preferences of the median voter are ignored in favor of a coalition formed by a group of relatively poor voters and the richest voters. In this equilibrium income redistribution prevails with no tax enforcement.

*I would like to thank Enriqueta Aragonès, Humberto Llavador, Santiago Sanchez-Pages, Socorro Puy and Ascension Andina for their helpful comments. The usual caveat applies.

†Department of Economic Theory and Economic History. Universidad de Granada. Spain. Email: asolano@ugr.es

Keywords tax evasion, political parties, income redistribution, fairness.

JEL Classification D72, H26

"I'll bet a million dollars against any member of the Forbes 400 who challenges me that the average (federal tax rate including income and payroll taxes) for the Forbes 400 will be less than the average of their receptionists" Warren Buffett, 2007.[1]

1 Introduction

In the midst of the recent debt crisis, tax compliance has been a hot issue in many parliaments of developed countries. For instance, Mitt Romney's case of tax avoidance introduced another dimension into the debate about income taxes in the 2012 US Elections. The importance of tax compliance in politics is even more intense in European countries with financing problems such as Greece, Portugal, Ireland, Spain and Italy. While millions of citizens are required by their governments to bear heavy tax hikes, recent news reports have unveiled important cases of tax evasion, tax avoidance and tax fraud by politicians and large fortunes in these countries (see the case of the Barcenas scandal[2], Lagarde's list or the Spanish tax amnesty for some examples). This misbehavior affects public opinion on society's tax morale which may result in voters' shifting their preferences for income redistribution.

The aim of this paper is to study the political economy of income redistribution when voters are concerned about fairness in tax compliance. We consider a two stage-model where there is a two-party competition over the tax rate and over the level of tax enforcement in the first stage, and voters

[1] For the full interview with Warren Buffett see http://www.cnbc.com/id/21553857

[2] For some reviews of the case see: http://www.nytimes.com/2013/02/01/world/europe/prime-minister-of-spain-accused-of-receiving-payouts.html?_r=0

decide about their level of tax compliance in the second stage. In our framework, the possibility of tax evasion adds an opposite way of redistributing income from the poor to the rich to traditional taxation models. These two opposing ways of redistributing income turn middle-income voters into the highest net contributors to welfare policies: They are subsidizing both the poor by the traditional redistributive channel, and the rich by the channel associated to tax evasion. We find that if fairness concern in tax compliance is large enough, a liberal middle-income majority of voters may block any income redistribution policy. Alternatively, a coalition of the poorest and the richest voters in favor of income redistribution but against any tax enforcement policy can be also a feasible equilibrium.

There is a vast literature on tax compliance (see Andreoni,1998; Slemrod and Yitzhaki, 2002; Slemrod, 2007 for excellent surveys). Most of the studies in the literature are based on the framework proposed by Allingham and Sandmo (1972) in which tax payers maximize their expected utility under the probability of a penalty if they are caught underreporting their taxable income. This deterrence theory has been criticized by many authors because it predicts a much lower compliance rate than what we actually observe (see Graetz and Wilde, 1985; Alm et al., 1992; Frey and Feld, 2002).

Behavioral models that assume some tax morale in tax payers try to solve this empirical problem. For instance, Erard and Feinstein (1994) proposed a model in which tax noncompliance produces feelings of guilt and shame that are incorporated exogenously in taxpayers' utility function. Gordon (1989) addressed the topic of fairness and tax compliance. He makes the psychic cost of tax evasion endogenous in a dynamic model in which this psychic cost varies inversely with the number of individuals evading in the previous period. A similar approach is suggested in Bordignon(1993), who considered that individuals' decisions about tax compliance depend on what they consider is fair, which in turn would depend on their conjectures about the aggregated level of tax compliance. More recently, Taxler (2010) incorporated tax morale into the Allingham and Sandmo (1972) model. His study underlines the role of beliefs about others' level of tax compliance in shaping the relationship between tax enforcement and tax evasion.

Other papers have focused on the effect of corruption and waste of resources by the government on tax compliance. Pommerehne, Albert Hart, and Frey (1994) presented a dynamic model in which taxpayer compliance reduces with deviation between the individual's optimal choice of public good provision and the one implemented, noncompliance by other taxpayers, and the level of government waste in the previous period.

Empirically, Spicer and Becker (1980) supported the premise that fairness is important for tax compliance. They experimentally found that individuals' decisions about tax evasion depend on the relative comparison between their payments and others' payments. Other more recent empirical papers such as Cummings et al. (2009), Frey and Togler (2007) and Togler (2002 and 2005) found a significant relationship between tax compliance, tax morale and trust in public institutions.

Following the approach of these behavioral models and empirical results, we assume that individuals are concerned about fairness in tax compliance. More precisely, we assume that tax payers suffer a psychic cost of deviating from the expected average level of tax compliance. Our main findings are the following.

We find that voters' preferences on both policy instruments heavily depend on their sensitivity to the social cost of tax evasion, as well as their perception about the wasting of public funds. Regardless of the analysis of other cases, throughout the paper we focus on the scenario in which the latter voters' characteristics are important enough. In this context, we obtain that preferences for income redistribution are non-monotonic in tax payers' income, with middle-income voters being against income redistribution and voters in the extremes of the income distribution in favor of it.

This result contrasts with the classical result that preferences for income redistribution are decreasing in income (see Meltzer and Richard, 1981). In our framework, tax evasion adds an opposite way of redistributing income from the poor to the rich to the traditional taxation models. In the traditional taxation models, poor voters prefer a high income tax in order to extract income from the rich. Including the possibility of tax evasion makes the poor prefer a lower tax rate than the rich because their cost of tax compliance is larger. As a result of this trade off, middle-income voters prefer a lower tax rate, while the rich and the poor prefer a higher tax rate. This is because middle-income voters become the highest net contributors to welfare policies: they subsidize both the poor by the traditional redistributive channel, and the rich by the new channel associated to tax evasion.

Based on these preferences, we find that income redistribution prevails in equilibrium only if the maximum level of tax enforcement is low enough. The reason for this result is that, as the maximum level of tax enforcement becomes larger, more voters around the median voter find tax evasion too costly and therefore prefer a zero tax rate. However, if income redistribution is guaranteed in equilibrium, this policy may not be the optimal policy for the median voter. In particular, income redistribution prevails with no tax enforcement at equilibrium when these policies are supported by a majority of relatively poor and rich voters, even when the optimal policy for the median voter opposes income redistribution.

Comparative static exercises show that the expected average level of tax evasion is critical to determine the level of tax enforcement implemented in equilibrium. In particular, the larger the expected average level of tax evasion, the more likely it is that no tax enforcement will be implemented in equilibrium. Similarly, the lower the expected average level of tax evasion, the more likely it is that the highest level of tax enforcement will be implemented in equilibrium.

We discuss the empirical applications of our model to explain preferences for taxation. Using data from the European Economic Survey for 2008, we explore individuals' preferences for taxation regarding their place in the income distribution. We find that, in most of the countries analyzed, minimum taxation is preferred by middle-income individuals in line with our theoretical results.

Our work is closely related with the literature analyzing the effect of tax avoidance on income redistribution. The closest study to our paper is Ronie (2006), which proposes a model of political competition over the tax schedule when tax avoidance is possible. Another paper in a similar line is Taxler (2012), which focuses on the welfare consequences of the possibility of tax avoidance in the standard model of redistributive policies. Taxler found that the higher the median voter's level of avoidance, the higher the inefficiency produced by the tax schedule chosen by majority vote. However, this inefficiency is decreasing in the average level of avoidance. The main difference between these papers and ours is that we focus on tax evasion rather than tax avoidance, so it is a choice under uncertainty. Our main contributions relative to these papers is: i) first, we endogenize the level of tax enforcement by considering a two dimensional policy space in which voters do not only vote over the tax schedule but also over the level of tax enforcement, and ii) second, we introduce fairness in voters' concern about tax compliance.

Our paper is also related to the literature on income inequality and income redistribution. Most of the papers try to fill the gap between the Meltzer-Richard hypothesis and the empirical evidence. Bethecourt and Kunze (2013) use the concept of the structure induced equilibrium (Shepsle, 1979) to obtain the income tax and the level of tax enforcement chosen simultaneously by majority voting. The authors find that higher income inequality may imply lower income redistribution. They argue that a larger income inequality increases the average level of tax avoidance and hence the cost of tax enforcement, and this reduces the tax base. All of this makes income redistribution more costly.[3] We use a similar two dimensional political framework; however, we do not need to use the concept of the structure induced equilibria due to our simpler model specification. We do this for the sake of simplicity and to

[3] Other papers such as Bredemeier (2013) and De Freitas (2012) have also obtained this result, but they propose different explanations. While Bredemeier (2013) focuses on tax avoidance with imperfect information, De Freitas (2012) focuses on the incidence of direct and indirect taxes on the size of the underground economy.

present our concept of tax fairness in a clear way.

The rest of the paper is organized as follows. In section 2, we formally describe the model, and analyze voters' preferences for income redistribution and the level of tax enforcement. In section 3, we focus on the political competition stage and characterize the set of equilibria by doing some comparative statics. In section 4 we discuss the implication of the model using survey data. Finally, in section 5 we conclude and discuss some results.

2 The Model

Society is composed of a continuum of voters of **a** mass equal to one. Voters are characterized by their pre-tax income $y_i \in (0, Y]$ according to a probability distribution function $F(y_i)$ with mean $\overline{y} = \int_0^Y y_i dF(y_i)$ and median $y_m = [F]^{-1}(1/2)$. We denote $a_i \in [0,1]$ as the share of income that it is not reported by voter i, that is voter i's level of tax evasion. Voters face uncertainty about the average level of tax evasion, that is, they face uncertainty about the mean of the distribution of the share of taxable income not reported by voters. We assume that all voters have the same beliefs about the average level of tax evasion in society, which is denoted by $\overline{a} \in [0,1]$.

Voters have direct preferences over consumption (c_i) and the deviation from the perceived average level of tax evasion. Formally, we take the utility of a native to be

$$u_i(c_i, a_i) = c_i - \beta(a_i - \overline{a})_i^2 \tag{1}$$

with $\beta > 0$. We assume that voters suffer a psychic cost of evading more than the perceived average level of tax evasion, and also suffer a psychic cost of evading that is less than the perceived average level of tax evasion. This cost can be justified by feelings of guilt and anger correspondingly. Moreover, this specification is based on other regarding preferences of inequality aversion as proposed by Fehr and Smith (1999) and Bolton and Ochenfels (2000).

Voters pay a proportional income tax $t \in [0, 1]$ and receive a public transfer $b \geq 0$. Voters may not report their whole taxable income and they may be audited and punished for that reason. We assume that tax evaders who are audited have to pay a fine of $\lambda a_i y_i$, where $\lambda > 0$ states for the fine rate. Additionally, the probability of auditing is given by $p \in [0, 1]$. Assuming that voters are risk neutral and that they consume their whole after-tax income, voters' expected consumption is

$$c_i = p[y_i(1 - a_i)(1 - t) + a_i y_i + b - f a_i y_i] + (1 - p)[y_i(1 - t)(1 - a_i) + a_i y_i + b].$$

Simplifying and using (1), we define the following voters' expected utility function as:

$$EU_i(a_i) = y_i - (1 - a_i)ty_i - pf a_i y_i + b - \beta(a_i - \overline{a})^2. \tag{2}$$

We define $\theta \in [0, \overline{\theta}]$ as the product of the probability of auditing and the fine rate, $\theta = \lambda p$, and it states for the intensity of the tax enforcement policy. Let us assume that the tax system faces an efficiency constraint such that the intensity of this policy cannot exceed a certain level. According to data on policy against tax evasion, we assume that the maximum level of tax enforcement is such that $\overline{\theta} < 1$ (see Andreoni et al., 1998 for some estimates of the level of tax enforcement policy).

Government is formed by the winner of an electoral process that we will describe later on. The goal of the government is to redistribute income and to fight against tax evasion. To do so it has three policy instruments: an income tax, t, a public transfer, b, and a policy against tax evasion, θ.

We assume that public transfers are financed with the sum of tax revenues and the net profits that the government obtains from the tax enforcement policy. However, we assume that public funds are wasted and only a proportion of these funds are transferred to voters. We denote this proportion as $\delta \in (0, 1]$. We assume that the government budget constraint is balanced, so all voters believe that they will get the following public transfer:

$$b = \delta(t(1 - \overline{a})\overline{y} + \theta\overline{ay}) \tag{3}$$

Therefore, government actually has to define two policy instruments since the remaining one is given by its commitment to balancing the budget. We choose the tax rate and the policy against tax evasion as the strategic policy variables.

We propose a game described by the following stages:

1. Political parties announce their political platforms formed by a tax rate and a level of tax enforcement.

2. Elections are held and voters vote for the political platform they most

prefer.

3. The winner of the election implements their announced policy.

4. Voters decide their level of tax compliance given the implemented tax rate, the level of tax enforcement, and their beliefs about the average level of tax compliance.

5. Tax auditing is executed.

6. Taxes are levied, public transfers are paid, and consumption is realized.

We solve the game backwards. That is, first we analyze voters preferences for tax evasion, second we characterize voters' preferences over the political instruments (i.e. the level of income redistribution and the tax enforcement policy), and finally, we analyze the behavior of political parties.

2.1 Voters' decisions about tax evasion

Given the tax rate, the level of tax enforcement, and the expected average level of tax evasion, voters decide their optimal level of tax evasion. In particular, they decide to evade a proportion of income such that their expected utility is maximized. The first order condition of this problem is given by

$$\underbrace{(t-\theta)y_i}_{\text{Economic Effect}} - \underbrace{2\beta(a_i-\overline{a})}_{\text{Behavioral Effect}} = 0 \tag{4}$$

The individual tax evasion decision has two potential effects on welfare. First, there is an effect on private consumption that could be positive or negative depending on the level of tax enforcement compared to the tax rate.

We call this effect the *economic effect.* Second, there is an effect on voters' psychic cost of tax evasion whose sign is positive or negative depending if voters expect to evade more than the average or not. We call this effect the *behavioral effect.*

From (4) we obtain voter i's optimal level of tax evasion:

$$a_i^* = \overline{a} + \frac{(t-\theta)y_i}{2\beta}. \tag{5}$$

Voters evade optimally more than the expected average when the *economic effect* is positive, that is, when tax evasion is economically profitable. In this case, voters are willing to compensate the guilt of evading more than the average in order to increase private consumption. On the contrary, if tax enforcement policy is tough enough to make tax evasion an economically unprofitable activity, voters are willing to bare the anger resulting from evading less than the average in order to keep private consumption.

There may then be a mismatch between the perceived average level of tax evasion and the actual one. We are aware that voters may update their prior beliefs about the average level of tax evasion in a repeated setting and thus reduce this bias in the long run. However, this issue is beyond the scope of this paper. Nevertheless, if the actual average level of tax evasion is not observable, this mismatch may continue in a dynamic setting.[4]

In the following proposition we characterize the mismatch between the perceived average level of tax evasion and the actual one.

[4]For a dynamic model of norms and tax evasion see the recent paper Besley *et al* (2014). They derive the equilibrium responses of tax compliance to a temporary shocks to intrinsic motivation to comply, as well as a permanent shock to tax enforcement.

Proposition 1 *Only if $\theta = t$, the optimal average level of tax evasion coincides with the perceived average level of tax evasion. Otherwise, if $\theta < t$ ($\theta > t$), the optimal average level of tax evasion is larger (smaller) than the perceived one.*

Let us now analyze how the structure of voters' preferences about tax evasion depends on the individual pre-tax income. Again, from (5) it is straightforward to see that voters' distribution of optimal level of tax evasion crucially depends on the level of tax enforcement. If tax enforcement is low enough, the rich prefer to evade a larger proportion of their income than the poor. This is because rich voters face a larger opportunity cost of tax compliance than poor voters do, and this makes them willing to evade more. However, the opposite applies when the level of tax enforcement is high enough. The cost of evading in terms of consumption becomes larger with income and this makes richer voters prefer a lower level of tax evasion. The following proposition states the latter result.

Proposition 2 *If $\theta < t$ ($\theta > t$), the optimal level of tax evasion is increasing (decreasing) in voters' income.*

Regarding policy instruments, as the tax rate increases tax evasion becomes more profitable *ceteris paribus*. This is because a larger tax rate increases the opportunity cost of tax compliance. As we have explained above, the opposite applies when the level of tax enforcement increases. We state this result in the following proposition.

Proposition 3 *The optimal level of tax evasion is increasing in the tax rate.*

However, the optimal level of tax evasion is decreasing in the level of the tax enforcement, i.e. in θ.

Once we have analyzed voters' decisions about tax compliance, we characterize their preferences over the tax rate and the level of tax enforcement in the following subsection.

2.2 Voters' preferences on policy instruments

In the previous section we proved that voters' preferences over tax evasion depend crucially on both the level of tax enforcement and the tax rate. Now we characterize voters' preferences on these two policy instruments.

Substituting the optimal level of tax evasion, a_i^*, in voters' expected utility function, we obtain the general expression of voters' expected indirect utility function, which is given by the following expression:

$$v_i(t,\theta) = y_i - (y_i - \delta\overline{y})(t - \overline{a}(t-\theta)) + \frac{(t-\theta)^2 y_i^2}{4\beta}. \tag{6}$$

Notice first that voters' expected indirect utility function is strictly convex in both the tax rate and the tax enforcement policy. This means that voters prefer extreme values of both the tax rate and the level of tax enforcement. This feature of the model comes from the assumption that voters are considered risk neutral and the psychic cost of tax evasion is increasing in tax evasion at an increasing rate.

2.2.1 Optimal tax rate

Let us characterize voters preferences for the tax rate given a certain level of tax enforcement. Voters' optimal tax rate is equal to 1 when they obtain a larger utility than under no taxation, that is, when

$$v_i(1,\theta) - y_i \geq 0 \Leftrightarrow$$

$$(\delta\overline{y} - y_i)(1 - \overline{a}(1-\theta)) + \frac{(1-\theta)^2 y_i^2}{4\beta} \geq 0. \quad (7)$$

Notice that using the expression above, we can define a pair of different income levels corresponding to voters who are indifferent between a maximum and a minimum tax rate. Let us denote the income levels of these indifferent voters by

$$(y_{t1}(\theta), y_{t2}(\theta)) : \frac{(1-\theta)^2}{4\beta} y_i^2 - (1 - \overline{a}(1-\theta))y_i + (1 - \overline{a}(1-\theta))\delta\overline{y} = 0. \quad (8)$$

In the following proposition we characterize voters preferences on the tax rate.

Proposition 4 *Given a certain level of tax enforcement θ, if $\frac{\delta}{\beta} < \frac{1-\overline{a}(1-\theta)}{(1-\theta)^2\overline{y}}$, the optimal tax rate is $t^* = 0$ for voters with income such that $y_i \in [y_{t1}(\theta), y_{t2}(\theta)]$, and it is $t^* = 1$ for the rest . Otherwise the optimal tax rate is $t^* = 1$ for all voters*

Proposition 4 underlines the important features that shape voters preferences towards public expenditure. Reasonably, all voters prefer taxation when there is little concern for fairness in tax compliance and the expected waste of public expenditure is small enough. Otherwise, there are voters who prefer no taxation and hence no income redistribution, and those voters are middle-income voters.[5] Both situations are depicted in Figure 1.a and Figure 1.b, respectively.

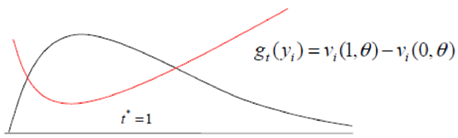

Figure 1.a.

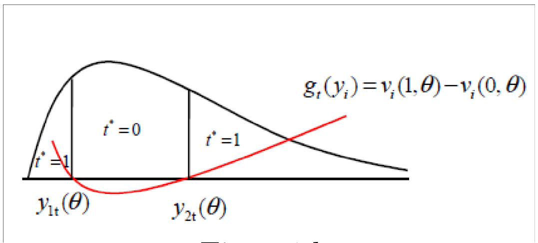

Figure1.b.

This result contrasts with the classical result that preferences for income redistribution are decreasing in income. This is because tax evasion adds an opposite way of redistributing income from the poor to the rich to the traditional taxation models. In traditional taxation models, poor voters prefer a large income tax in order to extract income from the rich. Including the possibility of tax evasion makes the poor prefer a lower tax rate than the rich because their cost of tax compliance is larger. As a result of this trade off, middle-income voters prefer no taxation, while the rich and the poor prefer the maximum tax rate. This is because middle-income voters become the highest net contributors to welfare policies: they subsidize both the poor by the traditional redistributive channel and the rich by the new channel associated to tax evasion.

[5] We assume that Y is large enough in order to have $y_{t2}(\theta) < Y$.

2.2.2 Optimal tax enforcement policy

Let us now characterize voters' preferences for the level of tax enforcement given a certain tax rate $t > 0$.[6] Recall that the expected indirect utility function is convex so the optimal intensity of tax enforcement policy is either $\theta = 0$ or $\theta = \overline{\theta}$. Voters prefer the maximum level of tax enforcement, $\overline{\theta}$, to no enforcement if the former policy gives them a larger utility than the latter policy. This happens when

$$v_i(t, \overline{\theta}) - v_i(t, 0) \geq 0 \Leftrightarrow$$

$$(\delta\overline{y} - y_i)\overline{a} + \frac{(\overline{\theta} - 2t)y_i^2}{4\beta} \geq 0. \tag{9}$$

Notice that if $\overline{\theta} = 2t$, then the optimal level of tax enforcement for voters with low enough income ($y_i < \delta\overline{y}$) is the maximum level of tax enforcement, $\overline{\theta}$. On the contrary, voters with high enough income ($y_i \geq \delta\overline{y}$) prefer no tax enforcement policy. Otherwise, if $\overline{\theta} \neq 2t$, we can define a pair of different income levels corresponding to voters who are indifferent between $\theta = 0$ or $\theta = \overline{\theta}$. Let us denote the income levels of such indifferent voters by

$$(y_{\theta 1}(t), y_{\theta 2}(t)) : \frac{(\overline{\theta} - 2t)}{4\beta} y_i^2 - \overline{a} y_i + \overline{a}\delta\overline{y} = 0 \tag{10}$$

Let us define two different scenarios depending on how the net cost of tax evasion, $\overline{\theta} - t$, compares to the net cost of tax compliance, t. The first scenario describes a situation in which the net cost of evading is always smaller than

[6]Notice that for $t = 0$ it makes no sense to analyze tax evasion.

the net cost of complying for any tax rate (i.e. $\overline{\theta} - t < t$). We call this scenario a *pro-tax evasion scenario.* This situation may be caused by the structure of the tax system, which favors tax evasion. However, the second scenario describes the opposite situation in which the net cost of evading is always larger than the net cost of complying for any tax rate (i.e. $\overline{\theta} - t > t$). We call this scenario an *against-tax evasion scenario.*

Voters' preferences for the level of tax enforcement in both scenarios are characterized in the following proposition.

Proposition 5 *In a* pro-tax evasion scenario*, the optimal level of tax enforcement is $\theta^* = \overline{\theta}$ for voters with $y_i < y_{\theta 1}(t)$, and $\theta^* = 0$ for voters with $y_i \geq y_{\theta 1}(t)$. However, in an* against-tax evasion scenario*, if $\frac{\delta}{\beta} \leq \frac{\overline{a}}{(\overline{\theta}-2t)\overline{y}}$, the optimal level of tax enforcement is $\theta^* = 0$ for voters with $y_i \in [y_{\theta 1}(t), y_{\theta 2}(t)]$ and $\theta^* = \overline{\theta}$ for the rest of voters. Otherwise, the optimal tax rate is $\theta^* = \overline{\theta}$ for all voters*

Proof. See the appendix. ■

The above proposition states voters' preferences on the intensity of the tax enforcement policy in a *pro-tax evasion scenario* and in an *against-tax evasion scenario.* In the *pro-tax evasion scenario*, the profitability of tax evasion is increasing proportionally in income. Therefore, while poor voters are better off under a very strict policy to fight tax evasion and preserve income redistribution, rich voters prefer no tax enforcement, thus reducing income redistribution.

Differently, in an *against-tax evasion scenario* rich voters face a larger cost of tax evasion than poor voters. This increasing cost produces a trade off in voters' preferences for the level of tax enforcement. On the one hand, rich voters have incentives to reduce the level of tax enforcement in order to reduce total tax revenues, as well as traditional income redistribution. But on the other hand, rich voters evade a smaller proportion of their income than poor voters do. Therefore, they have incentives to increase the level of the tax enforcement in order to lower redistribution from the rich to the poor through the tax evasion channel. This latter effect is increasing in income and overcomes the former effect for voters with high enough income.

Throughout the rest of the paper we are going to focus on the *pro-tax evasion scenario* because we consider this scenario to be more realistic. Figure 2 shows an example of voters' optimal level of tax enforcement in a *pro-tax evasion scenario.*

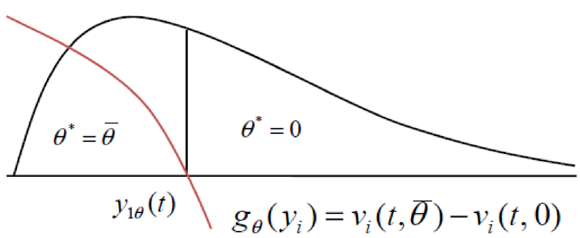

Figure 2. Pro-tax evasion escenario.

2.2.3 Optimal policy combinations and types of voters

We define a policy as a pair consisting of a tax rate and a level of tax enforcement, (t, θ). Assuming a *pro-tax evasion scenario,* we can either be in a case in which all voters prefer the highest tax rate or be in a case in which the welfare state is challenged by a middle-income group of voters. In both cases, the optimal level of tax enforcement for a voter is the maximum level if her income is low enough (and it is the minimum if her income is high enough).

In the case in which all voters prefer the highest tax rate, there are two types of voters defined by the threshold in income $y_{\theta 1}(1)$. Voters with an income below $y_{\theta 1}(1)$ have an optimal policy $(1, \overline{\theta})$ and voters with an income above $y_{\theta 1}(1)$ have an optimal policy $(1, 0)$. However, in the case in which the welfare state is challenged, groups of voters with the same preferences are not so easily identified. In order to clearly identify group of voters according to their preferences, we perform some comparative statics in the following Lemma.

Lemma 1 *In a pro-tax evasion scenario,* $\frac{\partial y_{\theta 1}(t)}{\partial t} > 0$ *for any* $t \in (0, 1]$; $\frac{\partial y_{t1}(\theta)}{\partial \theta} < 0$, *and* $\frac{\partial y_{t1}(\theta)}{\partial \theta} > 0$ *for any* $\theta \in [0, \overline{\theta}]$.

This Lemma offers two interesting insights. First, the larger the tax rate, the larger the proportion of voters supporting a maximum level of tax enforcement. A higher tax rate implies, *ceteris paribus*, a higher level of tax evasion. This makes a large proportion of the population prefer the maximum level of tax enforcement. Second, the higher the level of tax enforcement, the larger the proportion of voters who are in favor of no income redistribution. A higher level of tax enforcement implies a higher expected cost of tax evasion. The proportion of voters who are in favor of taxation are so because their cost of evading is low enough. However, if this cost increases, they are no longer better off with income redistribution.

Using Lemma 1 we can state the following proposition that perfectly characterizes the different groups of voters according to their preferences on both policy instruments.

Proposition 6 *In a pro-tax evasion scenario, if* $\frac{\delta}{\beta} < \frac{1-\overline{a}(1-\theta)}{(1-\theta)^2\overline{y}}$, *there are four types of voters: i) the honest poor, with income* $y_i \leq y_{\theta 1}(t)$ *and an optimal policy of* $(1, \overline{\theta})$*; ii) the evader poor, with income* $y_i \in [y_{\theta 1}(t), y_{t1}(\theta)]$ *and an optimal policy of* $(1, 0)$*;iii) the middle-income voter, with income* $y_i \in [y_{t1}(\theta), y_{t2}(\theta)]$ *and an optimal policy of* $(t = 0)$*; and iv) the rich, with income* $y_i \geq y_{t1}(\theta)$ *and an optimal policy of* $(1, 0)$.

Figure 3 depicts the partition of the constituency that defines the whole set of types of voters and their optimal policies described in Proposition 6.

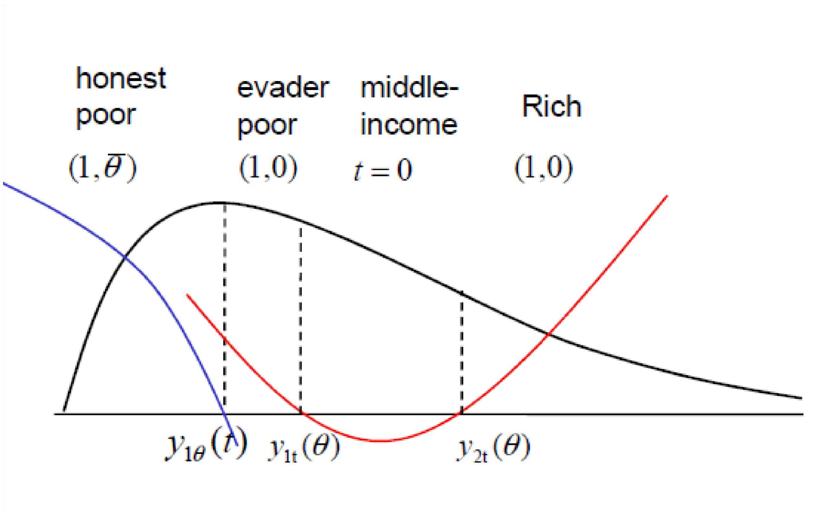

Figure 3. Types of voters

One interesting remark from Proposition 6 is that there exists a group of relatively poor voters who have the same optimal policies as the richest voters. We call them evader-poor voters. These voters enjoy both kinds of channels for income redistribution explained above. They are poor enough to receive income from the middle- and high-income voters through social transfers, but they are rich enough to receive income from the poorest voters through tax evasion. Differently, the motivation of rich voters to have these preferences only comes from the fact that they practically do not pay taxes because they evade a huge proportion of their taxable income, so they are better off with a high tax schedule.

3 Political Equilibria

After having analyzed voters' preferences for policy instruments, we will now describe the political game that results in the policy implemented at equilibrium. We consider two political parties labeled by $j = l, r$ competing under majority rule that simultaneously announce their platforms. A platform is a pair comprised of tax rate and a level of tax enforcement, (t_j, θ_j). Voters vote for the platform that gives them the higher utility. The winning party has to implement the announced platform.

We also assume that parties and voters have the same information about the expected average level of tax evasion. Thus, parties decide their proposal about the tax rate and tax enforcement in order to balance the budget according to this information, regardless of whether it is finally right or wrong.

We consider that the only motivation of parties is to win the election. This means that they have an identical utility function which is equal to the probability of winning the election. This probability can be either 1 if they obtain more than half of the votes, 0 if they obtain less than half of the votes, and 1/2 if they tie.

We distinguish two cases depending on voters' tax rate preferences. The first case applies to societies in which the perceived waste of tax revenues by the government and the concern for fairness in tax compliance are both low enough. As we have seen in the previous section, all voters have the same optimal tax rate, $t^* = 1$. The following proposition characterizes the equilibrium policies in this scenario.

Proposition 7 *If* $\frac{\delta}{\beta} > \frac{1-\overline{a}(1-\theta)}{(1-\theta)^2\overline{y}}$*, in equilibrium,* $(t_j, \theta_j) = (1, \overline{\theta})$ *if* $y_m \leq y_{\theta 1}(1)$*, and* $(t_j, \theta_j) = (1, 0)$ *if* $y_m \geq y_{\theta 1}(1)$ *for all* $j = l, r$

In this case, both parties always propose the optimal policy for the median voter. As there are only two groups of voters (the one that prefers a policy against tax evasion and the one that does not), the median voter belongs to one of these groups. If the median voter is rich enough, she will prefer no policy against tax evasion, and this will be the policy that is implemented. Otherwise, the policy that is implemented will be the maximum level of tax enforcement.

The second case is more complex and it applies to societies in which the perceived waste of tax revenues by the government, as well as the concern for fairness in tax compliance, are high enough. In this case, the constituency is formed by the four groups of voters mentioned in Proposition 6. Therefore, we have to distinguish two scenarios depending on whether a group of voters forms a majority alone or no group of voters does.

A straightforward result is that, in equilibrium, both parties will offer the optimal policy for a group of voters if that group of voters forms a majority alone, that is, if the median voter (i.e. the voter with income y_m) is decisive.

The median voter is not decisive if no group forms a majority alone. Notice that the median voter belongs to either the evader-poor group or the middle-income group in that case. The size of a coalition formed by evader-poor voters and rich voters is critical in this scenario. If the size of this coalition is more than half of the electorate, both parties will offer the optimal policy for both groups, even in the case in which the median voter is a middle-income voter. We can then have a situation in which the optimal policy for the median voter is not implemented in equilibrium.

In the following proposition we state the sufficient conditions for both types of possible equilibria.

Proposition 8 *If the median voter is decisive, both parties propose the optimal policy for the median voter in equilibrium. Otherwise, either equilibrium does not exist or it is unique and it is such that both parties propose the optimal policy for both groups of rich and evader-poor voters, i.e.* $(t_j, \theta_j) = (1, 0)$ *for all* $j = l, r$.

The benchmark result in the literature on redistributive policies that the poorer the median voter, the higher the tax rate chosen by the majority voting is challenged. The possibility of tax evasion triggers non-monotonic voters' preferences for the income tax schedule. This result relies on the existence of a majority of middle-income voters blocking any possibility of income redistribution in equilibrium. More interestingly, if the median voter belongs to the group of middle-income voters, the policy implemented in equilibrium may not be her most preferred policy. Income redistribution may survive thanks to a coalition of the groups of voters who are more in favor of no tax enforcement, that is the groups of evader-poor and rich voters.

3.1 Comparative statics

In the previous section we proved that the perceived waste of tax revenues by the government, $1-\delta$, and the sensitivity to the psychic cost of tax evasion, β, are key factors to guarantee income redistribution in equilibrium. However, in the case in which income redistribution is not always guaranteed, there are other parameters that affect the policies implemented in equilibrium.

In this scenario, conditions (8) and (10) show that the perceived average of tax evasion, $\overline{a}$, and the maximum level of tax enforcement, $\overline{\theta}$, mostly determine which tax rate and tax enforcement policy are finally chosen in equilibrium. In what follows, we perform comparative statics on these parameters to make additional predictions.

3.1.1. The perceived average of tax evasion. By (5) the higher the expected average of tax evasion, the higher the optimal proportion of income evaded by any voter. Intuitively, an increase in the expected average of tax evasion increases the behavioral cost of tax evasion and this makes voters evade more in order to reduce such a cost. Consequently, we can expect that a large amount of voters will prefer no policy against tax evasion if the expected average of tax evasion is large enough. On the opposite end, and by the same reasoning, a large amount of voters will prefer the maximum level of tax enforcement if the expected average of tax evasion is low enough.

Both cases are shown in figure 4.a. and 4.b., respectively.

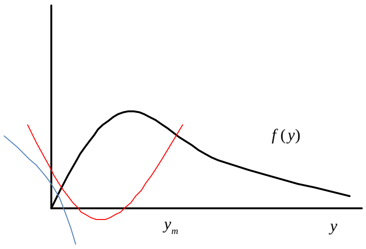

Figure 4.a. Large $\overline{a}$.

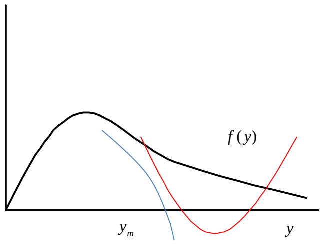

Figure 4.b. Low $\overline{a}$.

3.1.2. The maximum level of the tax enforcement. The higher the maximum level of tax enforcement, the higher the cost faced by voters who decide to evade. Recall that middle-income voters prefer not to redistribute income because their cost of tax evasion is too high. Rich and evader-poor voters are the groups that benefit from tax evasion. Thus, an increase in the efficiency of the policy against tax evasion reduces the size of those groups, and increases the size of the group of voters who prefer no income redistribution, as shown in Figure 5.

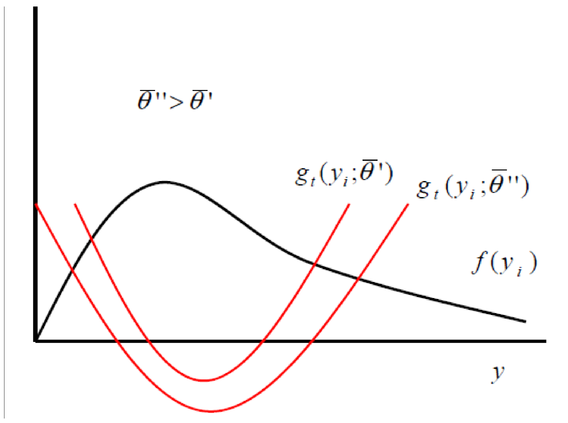

Figure 5. The effect of $\overline{\theta}$.

We can summarize the results stated in 3.1.1 and 3.1.2 in the following proposition.

Proposition 9 *Assume that* $\frac{\delta}{\beta} \leq \frac{1-\overline{a}(1-\theta)}{(1-\theta)^2\overline{y}}$, *then* $(1, \overline{\theta})$ *is the policy implemented in equilibrium if* $\overline{a}$ *is low enough, and* $(1, 0)$ *is the policy implemented in equilibrium if* $\overline{a}$ *is large enough. Otherwise, if* $\overline{a}$ *is intermediate, there is no income redistribution if* $\overline{\theta}$ *is large enough.*

One interesting implication of this proposition is that a tax system with a high expected penalty for tax evasion may result in a low income redistribution policy chosen by majority voting. This situation would occur in a context of moderated expectations about the average level of tax evasion.

3.2 Tax evasion and government budget deficits

By Proposition 1 it is very likely that voters and parties form wrong conjectures about the actual average level of tax evasion. We are aware that voters may react to this mismatch between conjectures and reality in a repeated setting. However, as voters and politicians seem to be short-run players, it is not hard to find examples in which this mismatch has not had future electoral consequences. More interestingly, this mismatch triggers an unbalanced government budget in equilibrium. The next question is: what are the factors that make the government budget become more unbalanced?

In a *pro-tax evasion scenario*, income redistribution is implemented in equilibrium with either a very intense policy against tax evasion or without any control of tax evasion. Both equilibria imply an unexpected government budget deficit since the average level of tax evasion is larger than the expected one. Let $D_{\overline{\theta}}$ and D_0 be the government budget deficits in both equilibria, respectively. In particular,

$$D_{\overline{\theta}} = \frac{(1-\overline{\theta})^2}{2\beta} E(y_i^2) \tag{11}$$

$$D_0 = \frac{1}{2\beta} E(y_i^2), \tag{12}$$

where $E(y_i^2) = \displaystyle\int y_i^2 f(y_i) dy_i$. Since the bias in the expectation about the aggregated level of tax evasion is lower in the equilibrium with the maximum level of tax enforcement than the equilibrium in which there is no tax evasion control, the government budget deficit is also lower in that equilibrium. Moreover, the higher the maximum level of tax enforcement, the lower the deficit at equilibrium. However, the government budget deficit is decreasing in the concern about fairness in tax compliance in both equilibria.

4 Discussion

In contrast with the benchmark result that preferences for taxation are decreasing in income, our model predicts that individuals' preferences for taxation may not be monotonic in income. The concern about fairness in tax compliance in the population makes the possibility of tax evasion more attractive for richer tax payers because they are willing to face a higher psychic cost of evading than poor or middle-income tax payers are. This implies that tax evasion is a way of redistributing income from the poor to the rich, and this is what triggers tax payers' non-monotonic preferences for taxation.

Do we observe this result in reality? Figure 6 below displays data from nine European countries[7] on individuals' attitudes towards taxation. We measure individuals' attitudes towards taxation by using responses to one question in the European Social Survey (ESS4-2008). The question asks individuals if they believe that government should decrease/increase taxes and social spending (responses are scored from -5 if they state that government should decrease taxes and social spending a lot to 5 if they state that government should increase taxes and social spending a lot). We calculate the average of these responses for every quintile of the household's net income distribution.

[7] The countries are Belgium (BE), France (FR), Germany (GE), Greece (GR), Ireland (IR), Portugal (PR), Spain (SP), Sweden (SW), and the United Kingdom (UK).

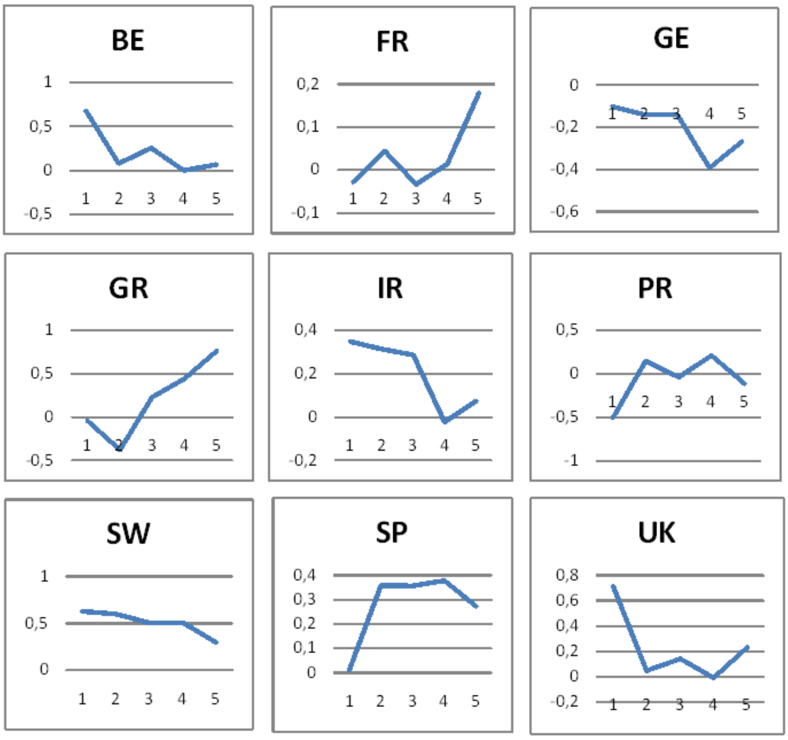

Figure 6. Preferences for taxation.

By and large, we do not observe a homogenous pattern of preferences on taxation across countries. However, six out of the nine countries in Figure 6 show an increase in the preferences for taxation in the top quintile of the income distribution. Moreover, preferences for low taxation are located either in the second, third or forth quintile of the income distribution in all of these countries, which is in line with our theoretical results.

We are aware that this is a very limited exercise to test non-monotonic preferences for taxation. However, it is useful as a first view of the relationship between preferences for taxation and income distribution.

5 Concluding Remarks

This paper has studied the political economy of linear income taxation when tax payers are concerned about fairness in tax compliance. More precisely, we propose a two stage-model where there is a two-party competition over a linear tax rate and over the intensity of the tax enforcement policy in the first stage, and voters decide about their level of tax compliance in the second stage. Tax morale implies that voters face a psychic cost of deviating from their expected average level of tax evasion. We also incorporate the possibility that the government wastes tax revenues. The most relevant findings of the paper are as follows.

We find that voters' preferences on both policy instruments heavily depend on their concern about fairness in tax compliance as well as the perceived waste of public funds. In particular, if the concern about fairness in tax compliance as well as the government's waste of tax revenues are high enough, there exists a non monotonic relationship between voters' income and their preferences for taxation. More precisely, middle-income voters are against any income taxation, while voters at the extremes of the income distribution prefer the highest tax rate. As a consequence of these preferences, no income redistribution policy is implemented in equilibrium when there is a majority of middle-income voters with this policy as their optimal policy. We can expect this to happen in countries with a tax system that allows a high expected penalty of tax evasion.

Moreover, the policy implemented in equilibrium may not be the optimal policy for the median voter. This would happen when no income redistribution is the optimal policy for the median voter but there is a majority of relatively poor and rich voters in favor of income redistribution but against any tax enforcement policy. We can expect this policy in countries with a tax system that allows evading taxes at a low expected penalty.

Despite the lack of data, it would be interesting in a future line of research to test the non-monotonic preferences on income taxation, and their relationship with the effectiveness of tax enforcement policy, public opinion about the average level of tax evasion, and attitudes towards issues such as fairness in tax compliance and the waste of public resources.

References

[1] Allingham, M. G., Sandmo A., 1972. Income tax evasion: A theoretical analysis. *Journal of Public Economics* 1, 323-338.

[2] Alm, J, Mcclelland, G.H., Schulze, W.D., 1992. Why Do People Pay Taxes? *Journal of Public Economics*, 48(1): 21-38.

[3] Andreoni, J., Brian, B. and Feinstein, J., 1998. Tax compliance. *Journal of Economic Literature* 36, 818-860.

[4] Besley T., Jensen, A., Pearson, T., 2014. Norms, Enforcement, and Tax Evasion. *Mimeo.*

[5] Bethencourt, C. and Kunze, L., 2013. The political economics of redistribution, inequality and tax avoidance, *MPRA Paper 51127*, University Library of Munich, Germany.

[6] Bredemeier, 2013. Imperfect Information and the Meltzer-Richard Hypothesis, *Ruhr Economic Papers 0213*, Ruhr-Universität Bochum, Universität Dortmund.

[7] Boadway, R., Marceau, N., Mongrain, S., 2007. Redistributive Taxation under Ethical Behavior. *Scandinavian Journal of Economics* 109, 505–529.

[8] Bolton, G., Ockenfels, A., 2000. ERC– A theory of equity, reciprocity and competition. *American Economic Review*, 90(1): 166-193.

[9] Bordignon, M., 1993. A Fairness Approach to Income Tax Evasion. *Journal of Public Economics*, 52(3): 345-62.

[10] Clotfelter, C. T., 1983. Tax evasion and tax rates: An analysis of individual returns. *Review of Economics and Statistics* 65, 363-373.

[11] Cummings, R. G., Martinez-Vazquez, J., McKee, M., Torgler, B., 2009. Tax morale affects tax compliance: Evidence from surveys and an artefactual field experiment, *Journal of Economic Behavior & Organization*, 70(3): 447-457.

[12] De Freitas J., 2012. Inequality, the politics of redistribution and the tax mix. *Public Choice* 151(3): 611-630.

[13] Erard, B., Feinstein, J.S., 1994. Honesty and Evasion in the Tax Compliance Game. *Rand Journal of Economics*, 25(1): 1-19.

[14] Fehr. E., Smith K., 1999. A Theory of Fairness,Competition, and Cooperation. *Quarterly Journal of Economics*, 114 (3): 817-868

[15] Feinstein, J.S., 1991. An econometric analysis of income evasion and its detection. *Rand Journal of Economics*, 22, 14-5.

[16] Feld L.P., Frey B. S., 2002. Trust breeds trust: How taxpayers are treated. *Economics of Governance* 3, 87–99.

[17] Frey, B., Togler, B., 2007. Tax morale and conditional cooperation. *Journal of Comparative Economics*, 35(1): 136-159.

[18] Gordon, J. P.F., 1989. Individual Morality and Reputation Costs as Deterrents to Tax Evasion, *European Economic. Review*, 33(4): 797-805.

[19] Graetz, M.J., Wild, L.L., 1985. The Economics of Tax Compliance: Fact and Fantasy. *National Tax Journal* 38, 355-63.

[20] Meltzer A.H., Richards S.F., 1981. A rational theory of the size of government. *Journal of Political Economy* 89 (5): 914-927

[21] Pommerehne, W.W., Hart, A., Frey, B.S., 1994. Tax Morale, Tax Evasion and the Choice of Policy Instruments in Different Political Systems. *Public Finance*, 49, 52-69.

[22] Ronie, J., 2006. The political economics of not paying taxes. *Public Choice*, 126(1): 107-13.

[23] Sandmo A., 2005. The Theory of Tax Evasion: A Retrospective View, *National Tax Journal*, 58(4): 643-663.

[24] Shepsle, K., 1979. Institutional Arrangements and Equilibrium in Multidimensional Voting Models. *American Journal of Political Science*, 23(1): 27-59

[25] Slemrod, J., 2007. Cheating ourselves: the economics of tax evasion. *The Journal of Economic Perspectives,* 21, 25–48.

[26] Slemrod J., Yitzhaki S., 2002. Tax Avoidance, Evasion, and Administration, In *Handbook of Public Economics*, 3, 1423-1470.

[27] Spicer, M.W., Becker, L.A., 1980. Fiscal Inequity and Tax Evasion: An Experimental Approach. *National Tax Journal*, 33(2): 171-75.

[28] Taxler, C., 2010. Social norms and conditional cooperative taxpayers. *European Journal of Political Economy*, 26(1): 89-103.

[29] Taxler, C., 2012. Majority voting and the welfare implications of tax avoidance, *Journal of Public Economics*, 96(1): 1-9.

[30] Torgler, B., 2002. Speaking to theorists and searching for facts: tax morale and tax compliance in experiments. *Journal of Economic Surveys*, 16, 657–684.

[31] Torgler, B., 2005. Tax Morale in Latinoamerica *Public Choice*, 122, 133–157.

A Appendix

The **Proofs of Propositions 1, 2 and 3** are straightforward from expression (5).

Proof of Proposition 4. First, notice that the equation in condition (7) has a minimum in

$$y_i = \frac{2\beta(1-\overline{a}(1-\theta))}{(1-\theta)^2}$$

Substituting the expression above in (7), we can prove that $t = 1$ is the optimal tax rate for all voters if

$$\frac{\delta}{\beta} \geq \frac{1-\overline{a}(1-\theta)}{(1-\theta)^2\overline{y}}$$

Otherwise, if $\frac{\delta}{\beta} < \frac{1-\overline{a}(1-\theta)}{(1-\theta)^2\overline{y}}$, solving equation (8) we obtain:

$$\begin{aligned}(y_{t1}(\theta), y_{t2}(\theta)) \quad = \quad & \frac{2\beta}{(1-\theta)^2}[(1-\overline{a}(1-\theta)) \pm \\ & \sqrt{(1-\overline{a}(1-\theta))\left(1-\overline{a}(1-\theta)-\frac{(1-\theta)^2}{\beta}\delta\overline{y}\right)}].\end{aligned} \tag{13}$$

Since the term $1-\overline{a}(1-\theta)-\frac{(1-\theta)^2}{\beta}\delta\overline{y}$ is positive and smaller than the term $(1-\overline{a}(1-\theta))$ for any $\theta \geq 0$, we have that the square root term in (13) is always smaller than $(1-\overline{a}(1-\theta))$,implying that $(y_{t1}(\theta), y_{t2}(\theta)) \in R^2_+$. Thus, condition (7) is not satisfied only for individuals with income in the interval $[y_{t1}(\theta), y_{t2}(\theta)]$. Therefore, for all voters such that $y_i \in [y_{t1}(\theta), y_{t2}(\theta)]$, the optimal tax rate is $t = 0$, and the optimal tax rate for the rest of voters is $t = 1$. ■

Proof of Proposition 5 . Solving equation (10) we obtain:

$$(y_{\theta 1}(t), y_{\theta 2}(t)) = \frac{2\beta}{(\overline{\theta} - 2t)} \left[\overline{a} \pm \sqrt{\overline{a}^2 - \frac{\delta \overline{ay}}{\beta}(\overline{\theta} - 2t)} \right].$$

Consider first the case in which $\overline{\theta} < 2t$, i.e. a *pro-tax evasion scenario.* Therefore, $(y_{\theta 1}(t), y_{\theta 2}(t))$ is such that one is positive and the other is negative as can be seen:

$$\begin{aligned} y_{\theta 1}(t) &= \frac{2\beta}{(\overline{\theta} - 2t)} \left[\overline{a} - \sqrt{\overline{a}^2 - \frac{\delta \overline{ay}}{\beta}(\overline{\theta} - 2t)} \right] > 0 \\ y_{\theta 2}(t) &= \frac{2\beta}{(\overline{\theta} - 2t)} \left[\overline{a} + \sqrt{\overline{a}^2 - \frac{\delta \overline{ay}}{\beta}(\overline{\theta} - 2t)} \right] < 0 \end{aligned}$$

Given the strict concavity of that function with respect to y_i when $\overline{\theta} < 2t$, we can conclude that the optimal level of tax enforcement is $\theta = \overline{\theta}$ for voters with an income such that $y_i < y_{\theta 1}(t)$, and $\theta = 0$ for voters with an income such that $y_i \geq y_{\theta 1}(t)$.

Consider now the case in which $\overline{\theta} > 2t$, i.e. an *against-tax evasion scenario.* In this case, there is not a real number solution if $\frac{\delta}{\beta} > \frac{\overline{a}}{(\overline{\theta} - 2t)\overline{y}}$. Given the strict convexity of that function with respect to y_i, we can conclude that the optimal level of tax enforcement is $\theta^* = \overline{\theta}$ for all voters. Otherwise, if $\frac{\delta}{\beta} \leq \frac{\overline{a}}{(\overline{\theta} - 2t)\overline{y}}$, we have that $(y_{\theta 1}(t), y_{\theta 2}(t)) \in R^2_+$ by the same argument as in Proposition 4. Given the strict convexity of that function with respect to y_i, we can conclude that the optimal level of tax enforcement is $\theta^* = 0$ for voters with an income such that $y_i \in [y_{\theta 1}(t), y_{\theta 2}(t)]$ and it is $\theta^* = \overline{\theta}$ for the rest of the voters. ■

Proof of Lemma 1. We know that in *a pro-evasion scenario* $2t - \overline{\theta} > 0$. Renaming $(2t - \overline{\theta})$ as x and computing we obtain that:

$$\frac{\partial y_{\theta 1}(t)}{\partial t} = 2\beta \frac{2x\frac{\delta \overline{ay}}{\beta}\left[\overline{a}^2 + \frac{\delta \overline{ay}}{\beta}x\right]^{\frac{-1}{2}} - 2\left[\overline{a}^2 + \frac{\delta \overline{ay}}{\beta}x\right]^{\frac{1}{2}} + 2\overline{a}}{x^2} < 0 \Leftrightarrow$$

$$\left[\overline{a}^2 + \frac{\delta \overline{ay}}{\beta}x\right]^{\frac{1}{2}} > x\frac{\delta \overline{ay}}{\beta}\left[\overline{a}^2 + \frac{\delta \overline{ay}}{\beta}x\right]^{\frac{-1}{2}} + \overline{a} \Leftrightarrow$$

$$\frac{\delta \overline{ay}}{\beta}x < -\frac{\overline{a}^2}{4}.$$

Because this inequality is never satisfied, we conclude that $\frac{\partial y_{\theta 1}(t)}{\partial t} > 0$.

Let us now calculate $\frac{\partial y_{t1}(t)}{\partial \theta}$ and $\frac{\partial y_{t2}(t)}{\partial \theta}$. Renaming $1 - \theta = x$ we have:

$$(y_{t1}(x), y_{t2}(x)) = \frac{2\beta}{(x)^2}\left[(1 - \overline{a}(x)) \pm \sqrt{(1 - \overline{a}(x))\left(1 - \overline{a}(x) - \frac{(x)^2}{\beta}\delta \overline{y}\right)}\right].$$

Notice $\frac{\partial y_{t2}(x)}{\partial x} < 0$ and then $\frac{\partial y_{t2}(\theta)}{\partial \theta} > 0$ for all $\theta < 1$. However, $\frac{\partial y_{t1}(x)}{\partial x} < 0$ for all $\theta < 1$ iff:

$$\frac{\partial y_{t1}(x)}{\partial x} = \frac{2\beta}{x^3}[\overline{a}x - 2+$$

$$+\frac{x}{2}\left((1 - \overline{a}(x))\left(1 - \overline{a}(x) - \frac{(x)^2}{\beta}\delta \overline{y}\right)\right)^{\frac{-1}{2}}$$
$$\left(\overline{a}\left(1 - \overline{a}(x) - \frac{(x)^2}{\beta}\delta \overline{y}\right) + (\overline{a} + 2x\frac{\delta \overline{y}}{\beta})(1 - \overline{a}(x))\right)$$

$$+2\left((1 - \overline{a}(x))\left(1 - \overline{a}(x) - \frac{(x)^2}{\beta}\delta \overline{y}\right)\right)^{\frac{1}{2}}] < 0 \Leftrightarrow$$

$$-(1 - \overline{a}x)\frac{(x)^2}{\beta}\delta \overline{y} > (1 - \overline{a}x)^2 + \left(3\frac{x^2 \delta \overline{y}}{2\beta}\right)^2 + (1 - \overline{a}x)\frac{3x^2}{2\beta}\delta \overline{y}.$$

But again this inequality is never satisfied, so we can conclude that $\frac{\partial y_{t1}(x)}{\partial x} > 0$ and then $\frac{\partial y_{t1}(\theta)}{\partial \theta} < 0$ for all θ. ■

Proof of Proposition 6. Given conditions (7) and (9) depicted in Figure 1b and Figure 2, respectively, we need to compare $(y_{t1}(\theta), y_{t2}(\theta))$ with $y_{\theta 1}(t)$ in a *pro-tax evasion scenario*. Let us first prove that $y_{\theta 1}(1) < y_{t1}(\overline{\theta})$.That is the case if and only if:

$$\frac{(1-\overline{\theta})^2}{(2-\overline{\theta})}\left[\overline{a}^{\frac{1}{2}}\left(\overline{a}+\frac{\delta\overline{y}}{\beta}(2-\overline{\theta})\right)^{\frac{1}{2}}-\overline{a}\right]<$$

$$(1-\overline{a}(1-\overline{\theta}))-(1-\overline{a}(1-\overline{\theta}))^{\frac{1}{2}}\left(1-\overline{a}(1-\overline{\theta})-\frac{\delta\overline{y}}{\beta}(1-\overline{\theta})^2\right)^{\frac{1}{2}} \Leftrightarrow$$

$$x^2\overline{a}^{\frac{1}{2}}\left(\overline{a}+\frac{\delta\overline{y}}{\beta}(1+x)\right)^{\frac{1}{2}}+(1+x)(1-\overline{a}x))^{\frac{1}{2}}\left(1-\overline{a}x-\frac{\delta\overline{y}}{\beta}x^2\right)^{\frac{1}{2}}<(1-\overline{a}x)(1+x)+x^2\overline{a}. \tag{14}$$

Notice that the right hand side of (14) is strictly decreasing in $\frac{\delta\overline{y}}{\beta}$ if and only if

$$x^2\overline{a}^{\frac{1}{2}}(1+x)\left(\overline{a}+\frac{\delta\overline{y}}{\beta}(1+x)\right)^{-\frac{1}{2}}-(1+x)x^2(1-\overline{a}x))^{\frac{1}{2}}\left(1-\overline{a}x-\frac{\delta\overline{y}}{\beta}x^2\right)^{-\frac{1}{2}}<0 \Leftrightarrow$$

$$-\overline{a}\frac{\delta\overline{y}}{\beta}x^2<(1-\overline{a}x)\frac{\delta\overline{y}}{\beta}(1+x).$$

But this is always true since $-\overline{a}\frac{\delta\overline{y}}{\beta}x^2<0$. Then, the right hand side term in the inequality (14) reaches a maximum when $\frac{\delta\overline{y}}{\beta}$ is close to 0. We substitute the term $\frac{\delta\overline{y}}{\beta}$ by 0 in (14) and we obtain:

$$x^2\overline{a}+(1+x)(1-\overline{a}x)\leq(1-\overline{a}x)(1+x)+x^2\overline{a},$$

so we can conclude that $y_{\theta 1}(1) < y_{t1}(\overline{\theta})$ for any $\frac{\delta \overline{y}}{\beta} > 0$. By Lemma 1, $y_{\theta 1}(1)$ is the maximum level of $y_{\theta 1}(t)$ for all $t \in [0,1]$, and $y_{t1}(\overline{\theta})$ is the minimum level of $y_{t1}(\theta)$ for all $\theta \in [0, \overline{\theta}]$. Therefore, in a pro-tax evasion scenario if $\frac{\delta}{\beta} < \frac{1-\overline{a}(1-\theta)}{(1-\theta)^2 \overline{y}}$, there are four types of voters: i) the poor, with income $y_i \leq y_{\theta 1}(t)$ and an optimal policy of $(1, \overline{\theta})$; ii) the evader-poor, with income $y_i \in [y_{\theta 1}(t), y_{t1}(\theta)]$ and an optimal policy of $(1,0)$;iii) the middle-income voter, with an income $y_i \in [y_{t1}(\theta), y_{t2}(\theta)]$ and an optimal policy of $(t = 0)$; and iv) the rich, with an income $y_i \geq y_{t1}(\theta)$ and an optimal policy of $(1,0)$. ■

Proof of Proposition 7. If $\frac{\delta}{\beta} > \frac{1-\overline{a}(1-\theta)}{(1-\theta)^2 \overline{y}}$, $(1, \overline{\theta})$ is the optimal policy for all voters with income $y_i \leq y_{\theta 1}(1)$, and it is $(1,0)$ for the rest of the voters. If $y_m \leq y_{\theta 1}(1)$, then $(1, \overline{\theta})$ is the optimal policy for a majority of voters. Otherwise, a $(1,0)$ is the optimal policy for a majority of voters. Both political parties propose the optimal policy of the majority of voters to maximize their utility. Therefore, $(t_j, \theta_j) = (1, \overline{\theta})$ if $y_m \leq y_{\theta 1}(1)$, and $(t_j, \theta_j) = (1,0)$ if $y_m \geq y_{\theta 1}(1)$ for all $j = l, r$ in equilibrium. ■

Proof of Proposition 8. Let us prove first that if the median voter is decisive, both parties propose the optimal policy for the median voter in equilibrium.

The median voter is decisive when she belongs to a group of voters that form a majority alone. It is straightforward that any deviation from the optimal policy for that group of voters implies an election defeat. Hence, both parties will offer the optimal policy for the median voter.

If no group forms a majority alone, we distinguish two cases: First, if $\overline{\theta}$ is small enough, the coalition of the group of rich voters and the group of poor-evader voters form a majority, i.e. $1-F(y_{2t}(\overline{\theta}))+F(y_{1t}(\overline{\theta}))-F(y_{\theta 1}(1)) > 1/2$. Second, if $\overline{\theta}$ is large enough $1 - F(y_{2t}(\overline{\theta})) + F(y_{1t}(\overline{\theta})) - F(y_{\theta 1}(1)) < 1/2$.

Consider the case in which $1 - F(y_{2t}(\overline{\theta})) + F(y_{1t}(\overline{\theta})) - F(y_{\theta 1}(1)) > 1/2$. By Lemma 1 we know that $\overline{\theta}$ maximizes the size of the group of middle-income voters, and $t = 1$ maximizes the size of poor voters. This implies that $1 - F(y_{2t}(\overline{\theta})) + F(y_{1t}(\overline{\theta})) - F(y_{\theta 1}(1))$ is the minimum size of the sum of the groups of poor-evader and rich voters. In this scenario, both parties will propose the optimal policy for voters in both groups, i.e. $(t_j, \theta_j) = (1, 0)$, because otherwise they would be defeated in the election by a party proposing that policy. Therefore, if $1-F(y_{2t}(\overline{\theta}))+F(y_{1t}(\overline{\theta}))-F(y_{\theta 1}(1)) > 1/2$, $(t_j, \theta_j) = (1, 0)$ for all $j = l, r$ is the unique Nash equilibrium.

Second, if $\overline{\theta}$ is large enough such that $1-F(y_{2t}(\overline{\theta}))+F(y_{1t}(\overline{\theta}))-F(y_{\theta 1}(1)) < 1/2$ there is no Nash equilibrium in pure strategies. To prove that suppose first that, in equilibrium, both parties propose $(t_j, \theta_j) = (t_j, \overline{\theta})$ for any $t_j \in (0, 1]$. In this case, both parties face a profitable deviation to $(t_j, \theta_j) = (t_j - \varepsilon, 0)$ because rich, poor-evader and middle-income voters would vote for this policy. Suppose now that in equilibrium both parties propose $(t_j, \theta_j) = (t_j, 0)$ for any $t_j \in (0, 1]$. In this case, both parties face a profitable deviation to $(t_j, \theta_j) = (t_j - \varepsilon, \overline{\theta})$ because poor and middle-income voters form a majority voting for this policy. Similarly, suppose that in equilibrium both parties propose (t_j, θ_j) for any $t_j \in (0, 1)$ and $\theta_j \in (0, \overline{\theta})$. In this case, both parties face a profitable deviation to $(t_j, \theta_j) = (t_j - \varepsilon, \theta_j + \varepsilon)$ because poor and middle-income voters form a majority voting for this policy. Finally, if both parties propose $t_j = 0$ in equilibrium, then it is not an equilibrium because both parties face a profitable deviation $(t_j, \theta_j) = (1, \theta_j)$ with $\theta_j \in (0, \overline{\theta})$ supported by poor, poor-evader and rich voters. ■

Proof of Proposition 9. From (13) it is straightforward that $\frac{dy_{1t}}{d\overline{a}} < 0$ and $\frac{dy_{2t}}{d\overline{a}} < 0$. This implies that as $\overline{a}$ becomes larger it is more likely that the median voter will belong to the group of rich voters. Therefore, $(1, 0)$ is the policy implemented in equilibrium if $\overline{a}$ is large enough. Otherwise, as $\overline{a}$ becomes lower it is more likely that the median voter will belong to the group of poor voters. Thus, $(1, \overline{\theta})$ is the policy implemented in equilibrium if $\overline{a}$ is low enough.

If $\overline{a}$ is intermediate, the median voter does not belong to either the group of rich voters or the group of poor voters. By Lemma 1, If $\frac{\delta}{\beta} \leq \frac{1-\overline{a}(1-\theta)}{(1-\theta)^2\overline{y}}$, the size of the group of middle-income voters is increasing in $\overline{\theta}$. Thus, the group of middle-income voters form a majority if $\overline{\theta}$ is high enough. Thus if $\overline{a}$ is intermediate, there is no income redistribution if $\overline{\theta}$ is high enough. ■