The Distributive Basis of Tax Compliance

Pablo Beramendi
Duke University
Aslı Cansunar
university of Oxford
and
Raymond M. Duch
Centre for Experimental Social Sciences
Nuffield College
University of Oxford
0X1 1NF Oxford UK
raymond.duch@nuffield.ox.ac.uk

*

Tuesday 29th October, 2019

*This Pre-analysis Plan was submitted to the Nuffield Centre for Experimental Social Sciences Pre-registration Site on July 15, 2018. The data and replication material for this essay are available at `https://github.com/rayduch/The-Distributive-Basis-of-Tax-Compliance`

1 Introduction: Why Tax Compliance Matters

Governments' capabilities depend, by and large, on their ability to raise revenue. Without resources to re-allocate there is no politics, as the room to alter *who gets what* gets dramatically reduced. A vast body in the political economy of development also shows how the very development of markets requires effective legal and fiscal institutions (Besley and Persson, 2011)[1]. Historically, the fiscal development of the state has itself been a major political battleground between status quo winners and both elites and social groups aspiring to a different distribution of assets and production opportunities. The stakes are indeed high.

Figure 1 [2]below presents an indicator of tax capacity, measured as the number of tax collection employees relative to the population (thousands), against the overall tax revenue yield as a share of economy (left panel) and a measure of post tax and transfers income inequality (right panel). Unequivocally, the institutional capacity of the state drives both the level of revenue collection and the ability to combat inequality. The data suggest that today there is a strong positive correlation between tax capacity, revenue collection, and equality. In contrasting developed and developing countries, Southern Europe works as the turning point between developed democracies and a world in which the government's choice set becomes narrower as a result of reduced capacity.

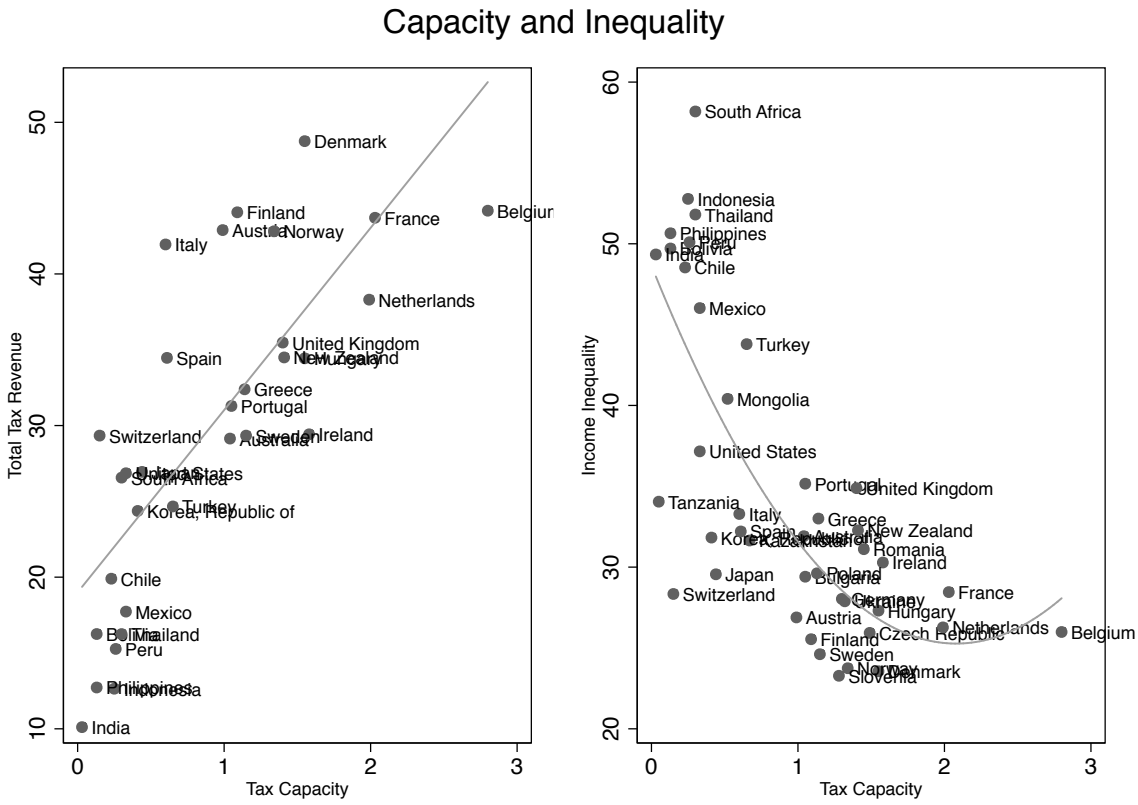
To remain effective the state rests on the willingness by citizens to observe their obligations towards the rest of the political community. This fundamental intuition was central to Levi's notion of *quasi-voluntary compliance*. Citizens comply not only because of the monitoring ability of the state but also, and primarily, because of a normative endorsement to collective exchanges that they perceive as fair and good for the community. In her own words: *"Citizens comply less when they perceive that others are not paying their fair share and the state is not delivering the perceived goods"* (Levi, 1988). Insofar as this combination of strategic and normative considerations lead a sufficient number of people to comply, the process is reinforced over time and quasi-voluntary compliance becomes self-enforced.

One can think of compliance as the slope of the fitted line in the left panel: how much the state is able to generate given a fixed level of capacity. A steep line implies that citizens are responsive to state's efforts to increase their fiscal capacity. A flat line implies that citizens are not sensitive to increases in effort to generate resources. Holding states' efforts constant, compliance drives the effective capacity of the state, and with it, much of what we refer to as politics. Without compliance, there are less means for policy, and ultimately less room

[1]See for instance Pincus and Robinson (2011) for evidence on the expansion of PPGG over time in the case of XIX and early XX century England, and the associated pressures on tax revenues

[2]Sources: The tax capacity data are from the Project on Fiscal Reform, USAID. The tax revenue data come from the IMF, GFS Statistics. The inequality data are from Solt (2009)

Figure 1: Inequality and Capacity



for using policy to expand the citizens' capability set. We see tax compliance as an essential mechanism linking capacity and equality: what facilitates the political pursuit of equality is the tolerance of tax payers to high levels of revenue collection.

This is precisely what makes compliance so central for political economy, yesterday and today. In this paper we revisit the mechanisms driving self-enforcement in quasi-voluntary compliance, thus contributing to an old puzzle in political economy: *why do people pay taxes?*. In particular, why do high income citizens pay taxes even in the absence of auditing institutions? What explains the fact that actual tax compliance is higher than the level identified as a fair norm by experimental researchers? In addressing this questions, we propose a *distributive logic* of tax compliance. In essence we argue that beyond arguments about the monitoring ability and the efficiency of state institutions and normative concerns for the worse-off in society, the distributive incidence of the public sector over the long run drives the level of compliance. In other words, the distribution of net benefits (as determined by the progressivity of taxes and transfers) is a key determinant of what individuals perceive as collectively fair, and therefore drives their willingness to contribute to the common pool. We

test the argument on the basis of a series of lab and online experiments in which subjects are randomly assigned to different fiscal treatments, treatments that approximate the variation in the design of national fiscal systems around the world.

By exploring the individual responses in terms of compliance to the specifics in the design of different fiscal systems, the paper makes several contributions. First, it offers a deeper exploration of some of the micro-level assumptions in the macro PE literature on tax capacity and tax compliance. Second, it uses the macro comparative taxation literature to illuminate several important mechanisms driving compliance at the individual level, thereby providing a bridge between behavioral economic approaches and macro-political ones. Third, by performing this blending experimentally, the paper contributes to disentangle important elements of the micro-logic of state capacity building free of the important limitations affecting observational research, most prominently in this case the feedback loops connecting state performance and citizens's dispositions to each other. The rest of the paper is organized as follows. We first present the argument underpinning the *distributive logic of tax compliance* and derive our theoretical expectations. Second, we describe in detail the design in our experiment and outline the main features of both the lab and survey implementations. Third, we present our main findings. The final section draws the main implications from the results and outlines future lines of research.

2 The Argument: Fiscal Incidence and Tax Compliance

Under what conditions should compliance occur? Taking a step back, a first response emerging from standard political economy models suggests that compliance should *never* be a rational response. Challenging the idea that compliance is, at least partially, in the interest of low income people, a strictly rationalist approach in a one-shot game implies that low income citizens have no incentives to comply. Their optimal strategy is to take the benefits provided by the state without contributing to them. Knowing this, the optimal response by high income citizens is to never comply either. Any one shot game in which contributions to the state are perceived as a zero-sum game would yield such a prediction (e.g. (Meltzer and Richards, 1981)). This benchmark result helps motivate the driving puzzle in this literature as citizens across the world *do* comply. The very notion of quasi-voluntary compliance was a response to this puzzle: Citizens comply more when the fear the the disciplinary hand of the state and they perceive the collective exchange with the state as fair.(Levi, 1988). Yet what citizens perceive as collectively fair, and therefore, drives them to comply is not obvious.

Compliance implies different motives for people at different ends of the income distribution. For low income citizens, compliance is in part self interested as they are net beneficiaries of public goods that otherwise would not be viable; for high income citizens, compliance implies a sacrifice in the short run of a larger share of their private assets. What are the criteria governing such a sacrifice? In many fundamental ways, this is equivalent to asking when the correction of inequalities is justified for those disproportionately bearing its costs.

To address this question, we investigate the interplay between the design of the fiscal system and the motivations to comply. From this perspective, we distinguish two alternative sets of motivations behind compliance: *compliance as a sacrifice* or material interests for the sake of other drives of what citizens consider collectively fair; versus *compliance as an investment*. How citizens react (in compliance terms) to the the distributional implications of different fiscal systems should discriminate, at least in part, which set of motives has a stronger pull on micro-behavior.

2.1 Compliance as a Sacrifice

The first potential explanation of compliance theorizes compliance as a sacrifice of material interests driven by non-material motives. An important premise within this line of work is that the rich derive some utility from from their "non material values" (Duch and Rueda, 2014) at the expense of material losses in a political exchange that is fundamentally a zero-sum one. The specific nature of this "non material values" is potentially quite heterogenous. Well off citizens may exhibit altruistic behavior due to their *advantageous inequality aversion* (AIA), i.e. a utility loss associated with the fact that others are economically worse off (Fehr and Schmidt, 1999). In this framework, AIA lead citizens to act politically in ways that run, prima-facie, counter their material interest. Since pro-equality interventions require revenue, one would expect that AIA-citizens are more likely to comply if the returns of revenue collection serves to correct the source of their disutility.

The underlying motivation, and the behavioral implications associated with it, need not be necessarily altruistic however. It could also reflect a concern with the fairness of the allocation principles governing inequality in society. Within this family of arguments fairness is defined as the correction of inequalities whose origins are not attributable to citizens' past choices or actions (Dworkin, 2000; Roemer, 2005). Along these lines for instance, AlesinaAngeletos2005argue that citizens are more willing to support pro-redistributive interventions if they think that inequality is more a reflection of luck (aka undeserved need) than effort/merit. The normative principles underpining these normative considerations go back to Rawls's notion of *Justice as Fairness* (Rawls, 1971, 1985), which is analytically broken down

into two principles: the principle of *Fair Equality of Opportunity* and the *Difference Principle*. The former requires that equality of opportunity be effective, not merely formal. The latter establishes, critically, that, provided equality of opportunity exists, the only tolerable inequalities are those that benefit the worse off by eliminating differences that do not emerge from human choices (e.g. natural talent. cumulative inherited advantages). For Rawls, fair implies addressing inequalities that cannot be helped; that is to focus on the incidence of inequalities that do not derive from conscious human choices assuming a fair distribution of economic opportunity and natural talent. Critically, these principles are articulated behind a*veil of ignorance* , which implies that "no one knows his place in society, his class position or social status; nor does he know his fortune in the distribution of natural assets and abilities, his intelligence and strength, and the like." (Rawls, 1971, p.118)[3] Since interventions to correct these various sources of allocative unfairness require additional resources, better off citizens concerned about unduly inequalities should comply more, again, *insofar as the returns of revenue collection serves to correct the source of their disutility.*

We contend that progressive fiscal designs feature a number of institutional characteristics that satisfy the latter condition. The progressivity of the fiscal system determines its distributive incidence (Kakwani, 1977), that is who accrues net gains and who bears the bulk of the cost. Under progressive designs politics works as a zero-sum game in which the winners and losers of unfair market allocations are clearly identifiable. Both the burden and the benefits are clearly identifiable and the institutional implementation of interventions specifically targeted to benefit the worse-off is at the core of the political exchange. An altruistic contributor, or somebody concerned with allocative fairness of talent or cumulative advantage, we argue, will comply more if she anticipates ex ante that her efforts are precisely targeted to those groups whose fortune are the cause of her disutility. By implication, a more progressive fiscal design should lead to higher levels of tax compliance. [4] The continuous line in Figure 1 below captures the predicted relationship between the progressivity of the fiscal system and the level of compliance if compliance is theorized as a sacrifice of material gains for the sake of other normative concerns.

[3]The imprint, however explicit, of this conceptualization of fairness on political economy cannot be overstated. It underlies for instance the inequality aversion parameter in Atkinson's index of Inequality (Atkinson, 1995), where the parameter α captures how sensible the index is to the relative welfare of those at the lower part of the income distribution. For a paper investigating experimentally the different elements of Rawls' theory and how they combine and offering partial support to the notion that individuals make distributive allocation decisions on the basis of the maximin principle, see (Michelbach et al., 2003).

[4]See also Doerrenberg and Peichl (2013) for an empirical test of the impact of progressivity on tax morale partially consistent with this expectation. They find that progressivity has a positive impact on tax morale and low and medium levels of income.

2.2 Compliance as Investment

There is however a second, alternative, view of the behavioral basis for tax compliance. Instead of thinking of compliance as a normative deviation from distributive calculations, that is a calculation in which individuals sacrifice utility in the short term for the sake of their principles, we posit in this paper that there in fact exists a *distributive logic* for tax compliance, a logic that does not require the introduction of specific normative assumptions to explain the behavior of middle and high income voters in democracies. This alternative conceptualization of the basis for compliance builds on three assumptions that in turn rest on recent developments in the political economy of taxation and redistribution:

- First, when making decisions about tax contributions, and compliance is perhaps the most important among the latter, individuals care about their relative position in the distribution of expected net benefits in the short and the long run.

- Second, we reason from a basic framework of material self-interest, in which self interest is determined by the fiscal design of the state (Beramendi and Rehm, 2016) in terms of both size and progressivity. The size of the budget determines the amount of goods at stake. The progressivity, as argued above, ultimately determines the distribution of net benefits.

- Third, the state does not necessarily serve as an institutionalized version of Robin Hood. Rather, it combines redistributive (short-run effects) and insurance (long-run life course effects) functions to various degrees (Baldwin, 1992; Varian, 1980; Atkinson, 1995; Mares, 2003; Rehm, 2015). Ultimately, whether the middle and high income citizens share in the rewards from a larger state depends on the relative importance of these two functions of state institutions.

Building on these premises, in what follows we develop a formal analysis to substantiate our hypotheses. ** New formal Model Motivating Hypotheses***

Consider an economy with N individuals. These individuals are given an exogenous income, y_i. In this economy, individuals can report their real income, y_i, or choose to hide a proportion of their income to evade taxes. We denote $\lambda_i \in [0,1]$ to be the proportion the individual i chooses to hide. In other words, when $\lambda_i = 1$, individual i reports no income to tax authorities, when $\lambda_i = 0$ the individual reports her true income level.

The expected utility of individual i is given by

$$Eui = T(i) + B(i) - pC(i) \tag{1}$$

Where T(i) is defined to be the post-tax income of the individual i, B(i) is the amount of transfers individual i gets from the welfare state, C(i) denotes the cost of tax evasion in the event of an audit, and $p \in [0, 1]$ denotes the probability of an audit by the tax authorities.

In particular, we define the post-tax income, T(i) to be:

$$T(i) = (1 - \tau(1 - \lambda_i))y_i \tag{2}$$

where τ is a progressive tax rate that is defined as:

$$\tau = \gamma\left(\frac{y_i(1-\lambda_i)}{M}\right)^{\phi}, \text{with } 0 \leq \gamma \leq 1 \text{ and } \phi \geq 0, \tag{3}$$

where $y_i(1 - \lambda_i)$ is the reported income, and M is some income level such that $M > y_{max}$. Observe that γ and ϕ determine the level and the slope of tax schedule respectively. When $\phi = 0$, the tax rate is γ for every individual in the economy, i.e. tax schedule is not progressive. When $\phi > 0$, the tax schedule is progressive, that is individuals with higher income are subject to higher tax rates.

We assume that fiscal policy is characterized by two distinct kinds of benefits: pure redistribution and social insurance. In particular, we define B(i) as:

$$B(i) = {b^R}_i + {b^S}_i \tag{4}$$

where ${b^R}_i$ are benefits in the form of pure redistribution and ${b^S}_i$ are the benefits in the form of social insurance, where.

$${b^R}_i = r \tag{5}$$

$${b^S}_i = \alpha(1 - \lambda_i)y_i \tag{6}$$

We characterize the benefits in the form of pure redistribution as a lump-sum payment that is paid to every individual in the economy. Following Moene and Wallerstein (2003), Case 3, we depict social insurance payment as a payment that is an increasing function of individual contribution to the welfare system and that is also paid to everyone in the economy(i.e. health benefits).

C is defined as the cost of tax evasion defined as:

$$C(i) = k\lambda_i y_i \tag{7}$$

where k is the rate of the punishment.

Let z denote the total amount of reported income, in other words let $z = \sum_{i \in N}(1 - \lambda_i)y_i$. Following Moene and Wallerstein(2003) and Dimick and Stegmueller(2015), we can write the government budget constraint in the following way:

$$\epsilon\tau z + (1 - \epsilon)\tau z = \sum_{i \in N} {b^R}_i + \sum_{i \in N} b_{Si} \tag{8}$$

Observe that ϵ determines the share of revenue spent on transfers that are purely redistributive. Thus, when $(\epsilon = 1)$, fiscal policy is purely redistributive. On the other hand,when $(\epsilon = 0)$, government transfers come in the form of social insurance. We can treat the parameter ϵ as the progressivity of the benefits.

According to this classification, it follows that:

$$\epsilon\tau z = \sum_{i \in N} {b^R}_i \tag{9}$$

$$(1 - \epsilon)\tau z = \sum_{i \in N} b_{Si} \tag{10}$$

It directly follows that,

$$\epsilon\tau z = \sum_{i \in N} {b^R}_i = rN \tag{11}$$

$$r = \frac{\epsilon\tau z}{N} \tag{12}$$

and,

$$(1 - \epsilon)\tau z = \sum_{i \in N} b_{Si} = \sum_{i \in N} \alpha(1 - \lambda_i)y_i \tag{13}$$

$$(1 - \epsilon)\tau \sum_{i \in N}(1 - \lambda_i)y_i = \sum_{i \in N} \alpha(1 - \lambda_i)y_i \tag{14}$$

$$(1-\epsilon)\tau = \alpha \tag{15}$$

Hence, we can rewrite the expected utility of individual i in the following form:

$$Eu_i = (1-\tau(1-\lambda_i)y_i + \frac{\epsilon\tau z}{N} + (1-\epsilon)\tau(1-\lambda_i)y_i - pk\lambda_i y_i \tag{16}$$

Observe that the maximization problem becomes:

$$\underset{x}{\text{maximize}} \quad \left[1-\gamma\left(\frac{y_i(1-\lambda_i)}{M}\right)^{\phi}(1-\lambda_i))y_i\right] + \frac{1}{N}\epsilon\gamma\left(\frac{y_i(1-\lambda_i)}{M}\right)^{\phi} z + (1-\epsilon)\gamma\left(\frac{y_i(1-\lambda_i)}{M}\right)^{\phi}(1-\lambda_i)y_i -$$

$$\text{subject to} \quad 0 \leq \lambda_i \leq 1$$

The FOC gives us the following result:

$$\lambda_i{}^* = 1 - \frac{M}{y_i}\left[\frac{pK}{(\phi+1)\gamma\epsilon(1-\frac{1}{N})}\right]^{\frac{1}{\phi}} \tag{17}$$

Thus, we can define the optimal rate of tax evasion in the following way:

$$\lambda_i{}^* = \begin{cases} 1 - \frac{M}{y_i}\left[\frac{pK}{(\phi+1)\gamma\epsilon(1-\frac{1}{N})}\right]^{\frac{1}{\phi}} & \text{if } 0 \leq 1 - \frac{M}{y_i}\left[\frac{pK}{(\phi+1)\gamma\epsilon(1-\frac{1}{N})}\right]^{\frac{1}{\phi}} \leq 1 \\ 1 & \text{if } 1 - \frac{M}{y_i}\left[\frac{pK}{(\phi+1)\gamma\epsilon(1-\frac{1}{N})}\right]^{\frac{1}{\phi}} > 1 \end{cases}$$

Comparative Statics:

$$\frac{\partial \lambda_i{}^*}{\partial y_i} > 0 \tag{18}$$

$$\frac{\partial \lambda_i{}^*}{\partial \epsilon} > 0 \tag{19}$$

$$\frac{\partial \lambda_i{}^*}{\partial p} < 0 \tag{20}$$

$$\frac{\partial \lambda_i{}^*}{\partial k} < 0 \tag{21}$$

$$lim_{\epsilon \to 0}\lambda_i{}^* = 0$$

$$\frac{\partial^2 \lambda_i{}^*}{\partial y \partial \phi} < 0 \iff ln\left[\frac{pk}{(\phi+1)\gamma\epsilon(1-\frac{1}{N})}\right] > 0$$

$$\iff \frac{pk}{(\phi+1)\gamma\epsilon(1-\frac{1}{N})} > 1$$

$$\iff pk > (\phi+1)\gamma\epsilon(1-\frac{1}{N})$$

observe that when $lim_{N\to\infty} 1-\frac{1}{N}=1$, thus canceling out the expression,

$$\iff pk > (\phi+1)\gamma\epsilon$$

Observe that for very low values of ϵ, i.e. in very low progressivity of the benefits, $\frac{\partial^2 \lambda_i{}^*}{\partial y \partial \phi} < 0$. When benefits are not redistributive, increasing progressivity of the tax system will decrease the magnitude of the positive effect of income on tax evasion.

A number of important insights emerge from this analysis:

1. The optimal level of tax evasion increases in income (y_i) and the progressivity of benefits (ϵ)

2. The optimal level of tax evasion decreases jointly in the monitoring ability of the state (p) and the rate of punishment (k)

3. There is a conditional relationship between the progressivity of benefits and the progressivity of taxes, as suggested by our intuition.Observe that for very low values of ϵ, i.e. in very low progressivity of the benefits, $\frac{\partial^2 \lambda_i{}^*}{\partial y \partial \phi} < 0$. When benefits are not redistributive, increasing progressivity of the tax system will decrease the magnitude of the positive effect of income on tax evasion. And viceversa.

These micro-foundations provide a number of interesting insights that establish a number of conditions under which tax compliance is above 0, the standard prediction emerging from one shot game theoretic treatments. In other words, the design of the fiscal state shapes compliance by shaping the distributive incidence of tax systems, beyond a specific level of punishment or monitoring ability.

The model also has a number of implications when we consider fiscal bureaucracies with different macro level characteristics.

Consider first a scenario in which the tax burden is low. Assuming standard deadweight losses and monitoring ability by the state, both the net losses for the rich and the potential net gains for the poor are of limited scope. The trade-off for both is about balancing the economic gains of operating informally against the redistributive incidence of the state via fiscal

policy. To the extent that economic informality and compliance are substitutes, the trade-off becomes starker as progressivity increases, yet in opposite directions. A self-interested middle or high income citizen has more incentives to comply the lower the progressivity of the system; by contrast, other things being equal, a self-interested low income citizen has more incentives to comply the higher the level of progressivity.

As the tax burden increases, the trade-offs associated with increasing progressivity exacerbate. Citizens at opposite ends of the pre-tax income distribution have more to gain (lose). In principle the rich have every incentive to cheat, and the poor every incentive to comply, which begs the question of the conditions under which medium and high income citizens in high tax burden states tolerate revenue collection by *complying*. The answer lies in the marginal sacrifice of progressivity for the sake of short and long term benefits provided by the state. To be sustainable, compliance by high wage earners in high tax burden states must be perceived as a worthy *investment*. This requires the short (and certainly the long) run benefits to be sufficiently attractive and the short term cost to be manageable.

The first condition typically materializes in the form of well established encompassing insurance and public service programs.[5] Provided these programs remain in place, the distribution of net benefits over the long run will be far less skewed than the distribution of net benefits at any given point in time. That being the case, middle and high income individuals, which tend to be the ones that discount the future less, have incentives to comply and contribute to the common pool. There is no gainsaying that significant commitment problems may undermine these calculations over time. Regarding time inconsistency, self-enforced compliance requires the ability of middle and high income groups to monitor their relative position in the common pool and act politically to adjust it if necessary. [6]

In turn, the second condition requires that *everyone* contributes her fair share, and not just those better of (Cusack and Beramendi, 2006; Beramendi and Rueda, 2007; Lindert, 2003). The latter condition, essential for the sustainability of the common pool over time, has direct implications for the link between progressivity and compliance. If the sustainability

[5]The premise, implicit across the risk and insurance models (Varian, 1980), is that in the medium to long run everyone can be among the *worse off* with a certain probability. Except for a small minority with enough wealth to consistently rely on market options, there will a period in everyone's life in which the tax/benefit (By benefit we refer here to both transfers and in kind services) balance becomes positive (this will more the case the higher the life expectancy). Note that arguably this certainty is for the vast majority of citizens' the opposite of Rawls' "veil of ignorance".

[6]The sustainability of such programs requires effective institutional monitoring of inter-temporal commitment problems, such as PR (Dixit and Londegran, 1996; Iversen and Soskice, 2006; Austen-Smith, 2000). More recently, a second, increasingly prominent issue, concerns the composition of the population of those with access to the common pool.The increasing importance of immigration as a second dimension fragmenting welfare state support in places like Sweden provides a good illustration of the way high income voters react to broadening the pool to sub sectors of the population that (i) do not belong to the original community, and (ii) have not contributed sufficiently before drawing benefits.

of PPGG provision requires everyone to contribute, progressivity must be sacrificed, at least in part. Therefore, to the extent that compliance reflects more a self-interested investment over the life course than a Rawlsian concern for the worse off, the expected relationship between progressivity and compliance reverses. More progressivity reduces the feasibility of the commons, the expected long run net benefits of high income citizens, and with them the overall level of compliance. In contrast, compliance should peak at medium levels of progressivity, that is to say in systems where both the worse off and middle-to-high income citizens can expect a positive net benefit over the long-run. Arguably, in the extreme case of total absence of fiscal progressivity, the overall levels of compliance should decline again: the well to do citizens will comply if, regressively, they are the main recipients of states' policies, but low income citizens, which in regressive systems are as likely to be taxed, will find no incentives to comply.

If this interpretation of the distributive basis of tax compliance applies, it should hold empirically that

1. High income people are more likely to comply at relatively lower levels of progressivity
2. As a result, ceteris paribus, high levels of progressivity lead to lower levels of compliance in society
3. Finally, motives should be responsive to the size of the state (i.e. the size of the tax burden) which, following Besley and Persson (2011) reflects in part the inherited level of state capacity. If compliance is a sacrifice the size of the tax burden should play a lesser role: well off citizens should be roughly as compliant in low and high burden states (or, in less stark terms, the gap between regimes otherwise equal should not be very large as other regarding motives trump the increase in cost associated with a larger average tax burden). If on the contrary compliance is primarily an investment, the poor should be more compliant with the size of the return is larger (high burden, high progressivity), and the rich should be less compliant when the expected net benefit is at its lowest (high burden, high progressivity).

2.3 Empirical Strategy and Hypothesized Treatment Effects

To test these hypotheses we resort to a series of lab experiments in which subjects are randomly assigned to different treatments that capture differences in the core dimensions of fiscal systems. The idea behind this design is that our treatments resemble characteristics of actual fiscal systems. The key dimensions over which systems vary are as follows:

- *Level (or burden)*: defined by the average tax rate in the system.

- *Progressivity of Taxes:* defined by the elasticity of the tax rate to the level of pre-tax income. In progressive designs, the higher the income, the higher the revenues collected. In other words, the revenue inflow increases more than proportionally with respects to increases in income.

- *Progressivity of Benefits:* defined by the elasticity of the allocation of revenues collected to pre-tax income. In progressive designs, the lower the income the higher the share of benefits received. Regressivity, on the other hand, equates benefits with one's initial contributions.

Variation in levels is incorporated into the treatment as a control for the potential role of the size of the burden on citizens' disposition towards tax compliance. Moreover, level and progressivity are far from independent from each other. It is a well known empirical results that there is a trade-off between the overall size of the fiscal budget and the level of progressivity. In light of these contributions, we know that a state organization that combines a very high tax burden and very high levels of fiscal progressivity is yet to emerge. The reasons behind this *impossibility* are well known and bring us back to the set of necessary political conditions for the state's common pool to remain sustainable over time (Lindert, 2003; Korpi and Palme, 1998). When defining the different treatments via combinations among these three dimensions, we limit ourselves to a set of realistic alternatives, defined as follows[7]:

- Treatment 1: low burden, low progressivity (example of reference: Spain)[8]

- Treatment 2: low burden, high progressivity (example of reference: USA)

- Treatment 3: high burden, low progressivity (example of reference: Germany)

- Treatment 4: high burden, medium progressivity (example of reference: Sweden)

We implement a total of eight treatments that are summarized in Table 1. Our expectation is that subjects will either resemble "investment" types in which case the behavior of rich and poor subjects will resemble the compliance rates on the left two columns under the "Invest" heading. Alternatively, subjects could correspond to our "sacrifice" model of tax compliance in which case their pattern of compliance would correspond to the extreme two right columns under "Sacrifice".

[7]The precise distributions of tax rates and benefit shares across pre-tax income groups are displayed below in Table 1

[8]These attributions of country-reference examples are based on the literature on comparative tax structure/incidence. SeeSteinmo (1996, 2010) and Whiteford (2008) as additional sources.

The "Tax Progressivity" column reflects the extent to which the tax regime is progressive. The regime can be highly progressive in which case the poor contribute nothing to tax collection. Or they can be progressive in which case there is proportional contributions depending on income. We observe subjects in both progressive and regressive tax regime in high (50 percent tax) and low (25 percent tax) tax burden conditions.

The "Benefit Regime" treatments are described in the second column. And these can either be progressive (the poor receive everything and the rich get nothing). Or the benefits regime can be regressive in which case there is an equal division of tax revenues.

There are experimental sessions for each combination of the two tax progressivity regimes and the two benefits regimes. And we observe each of these four unique combinations in the low tax (25%) and high tax (50%) condition. This gives us a total of eight treatments.

Table 1 also provides hypothetical expected outcomes (percent of earnings declared for tax purposes) under the two different models – Investment versus Sacrifice. The bold predicted outcomes indicate where we expect to actually see differences in treatment effects that speak to the predictions of our two models. Note we expect all of this leverage to come from differences in the behavior of the rich.

Table 1: Tax Compliance Experimental Treatments and Hypothesized Treatment Outcomes

		Invest		**Sacrifice**	
Tax Progressivity	**Benefits Regime**	**Poor**	**Rich**	**Poor**	**Rich**
Low Tax (25%)					
High (Rich contribute all/poor zero)	Regressive (Equal Division)	30%	**100%**	30%	**70%**
High (Rich contribute all/poor zero)	Progressive (Poor all/rich zero)	50%	80%	50%	90%
Low (Proportional contribution)	Regressive (Equal Division)	60%	90%	60%	90%
Low (Proportional contribution)	Progressive (Poor all/rich zero)	80%	**50%**	80%	**100%**
High Tax (50%)					
High (Rich contribute all/poor zero)	Regressive (Equal Division)	30%	**100%**	30%	**50%**
High (Rich contribute all/poor zero)	Progressive (Poor all/rich zero)	80%	**50%**	90%	**70%**
Low (Proportional contribution)	Regressive (Equal Division)	30%	**20%**	30%	**70%**
Low (Proportional contribution)	Progressive (Poor all/rich zero)	100%	**10%**	100%	**90%**

Randomly exposing subjects to these treatments will provide leverage to discriminate between the hypotheses stated above. By approaching the problem experimentally, we avoid potential post-treatment biases, and, most importantly, the perennial presence of feedback effects between policy designs and political support for different designs, a problem that limits the scope of what can be gained from approaching the study of compliance on the basis of

standard cross-national surveys. Lab experiments are particularly informative because they provide considerable control over ensuring the internal validity of the treatments designed to test our conjectures regarding the factors that shape tax compliance.

3 The Lab Experimental Design

Our theoretical conjectures are about the micro-foundations of individual reasoning regarding tax compliance. What characteristics of the fiscal regime encourage compliance or, alternatively, generate cheating? The analysis of observational data make it difficult to tease out the precise features of these regimes that shape individual behavior. Accordingly, we have designed a lab experiment that helps assess our conjectures regarding the causal effects of fiscal regimes on tax compliance.

The broad features of the experiments are the following: each experimental session is conducted employing one of the four different fiscal regimes described earlier; subjects are randomly assigned to groups of four; they earn money from real effort tasks; subjects report the amount they earned and can lie about these earnings if they wish; these earnings are taxed according to the tax rates of the fiscal regimes; there are two different audit rate treatments that determine the probability by which subjects' reported earnings are verified; deductions applying to the group members are pooled and then shared according to a formula specific to the fiscal regime. Subjects are paid at the end of experiment, and do not receive feedback about earnings until the end of the experiment.

The experiments will be conducted at the CESS experimental lab in Santiago Chile with 400 university students based in Santiago.[9] Participants receive printed instructions at the beginning of each module, instructions are read and explained aloud, and questions are answered in private.

Once the Chile experiments are completed, our plans are to conduct identical experiments at the Oxford CESS with a similar number of student subjects (400).

4 Design

The experiment consists of 8 different treatments that are summarized in Table 1, with 5 modules each. A total of 24 sessions will be conducted in Chile, with an average of 16 people per session. Table 2 indicates the number of subjects we will include in each of the 8 treatment cells.

[9] A mayority of the subjects in the pool are students at the Universidad de Santiago de Chile, but there are also participants from other universities in the Metro República area.

Table 2: Summary of Tax Compliance Experimental Treatments

Tax Progressivity	**Benefits Regime**	**Chile**	**UK**
Low Tax (25%)			
High (Rich contribute all/poor nothing)	Regressive (Equal Division)	50	50
High (Rich contribute all/poor nothing)	Progressive (All to poor/zero to rich)	50	50
Low (Proportional contribution)	Regressive (Equal Division)	50	50
Low (Proportional contribution)	Progressive (All to poor/zero to rich)	50	50
High Tax (50%)			
High (Rich contribute all/poor nothing)	Regressive (Equal Division)	50	50
High (Rich contribute all/poor nothing)	Progressive (All to poor/zero to rich)	50	50
Low (Proportional contribution)	Regressive (Equal Division)	50	50
Low (Proportional contribution)	Progressive (All to poor/zero to rich)	50	50

Power Calculations

The subject cell sizes identified in Table 2 reflect Power calculations that were informed by our hypothesized treatment effects presented in Table 1. The Power minimum necessary number of subjects for each of the hypothesized treatment effects indicated in Table 1 are presented in Table 3. All of the hypothesized effects are sufficiently powered - the one border-line case is the fifth hypothesized effect (sacrifice/low versus high tax in a high tax progressivity plus regressive benefits treatment).

Table 3: Summary of 80% Power Calculations for Experimental Treatments

Tax Progressivity	**Benefits Regime**	**Effect**	**N**
Invest Rich: Low versus High Tax			
High (Rich contribute all/poor nothing)	Regressive (Equal Division)	0.00	N/A
High (Rich contribute all/poor nothing)	Progressive (All to poor/zero to rich)	0.30	30
Low (Proportional contribution)	Regressive (Equal Division)	0.70	5
Low (Proportional contribution)	Progressive (All to poor/zero to rich)	0.40	30
Sacrifice Rich: Low versus High Tax			
High (Rich contribute all/poor nothing)	Regressive (Equal Division)	0.20	71
High (Rich contribute all/poor nothing)	Progressive (All to poor/zero to rich)	0.20	49
Low (Proportional contribution)	Regressive (Equal Division)	0.20	49
Low (Proportional contribution)	Progressive (All to poor/zero to rich)	0.10	57

Module 1 - Dictator Game: Sessions start with a a standard one shot Dictator Game. Subjects are randomly assigned to groups A (dictators) and B (receivers). Group A subjects receive an endowment of 1000 ECUs and are asked what (if any) they would like to send to a group B subject. Group B subjects get paid whatever is sent by a randomly allocated Group A subject. All subjects are asked to choose how much they would like to allocate the ECUs if are assigned to group A and half of those choices are implemented.

Module 2 - Real Effort Task: The Real Effort Task (RET) consists of adding two digit numbers in the course of one minute. Instructions are provided to subjects in paper and read out load. Subjects are also provided with two, non-incentivized, RET trial periods to familiarize themselves with the RET. After the trial rounds, subjects are asked to predict their performance among all subjects in the session: whether they will be in the top, middle or bottom third. Correct predictions are rewarded 100 ECUs.

Subjects are randomly allocated to groups of four participants, that are randomly reassigned in each of the 10 rounds of the module in stranger matching. In these groups they play a modified version of the Public Goods game, where the subject's contributions are a fixed percentage of their declared gains, introduced as a deduction (a.k.a. 'tax') in the instructions. Subjects are informed of their preliminary gains (eual to 150ECUs*number of correct responses) and are asked to freely declare their gains. Subjects are also informed that there is a probability that their declarations will be audited and that if the audit finds a discrepancy between the Preliminary and Declared gains an extra 50% of the observed discrepancy will be deducted from the Preliminary Gains. In addition, the regular deduction is applied to the Preliminary Gains and not to the (miss)declared gains. In module 2, subjects are clearly informed that the probability of audit is zero.

The tax rate on the Declared Gains vary from 25-50% depending on the treatment, but is held constant throughout the session. Deductions applied to the four group members are pooled and split amongst the members of the group. The distributions of the pooled resources vary depending on the treatment and are described in Table 1.

At one randomly selected round during the RET, subjects are asked to predict their performance relative to other participants within their group, whether they estimate to be at the top, middle or bottom of their four member group. Correct predictions are rewarded with another 100 ECUs. Subjects are paid for the results of one randomly selected round in the module, but are not informed of their earnings until the end of the session.

Module 3 - Real Effort Task: In module 3, subjects repeat the same RET task for another 10 rounds, the only difference is that now the there is a 0.1 probability of being audited. Subjects are again asked to predict their performance relative to the members of their group, with the possibility of earning another 100 ECUs if their correctly predict being

in the top, middle or bottom of their group.

Module 4- Risk Preference Measures: We use a Multiple Price lottery over ten choices to use as a Risk Attitude elicitation measure with monetary payoffs. Subjects are asked to state their preferences on ten binary choices, one of which will be used to determine the earnings of Module 4. Each decision is a paired choice between "Option A" and "Option B", where option B has an increasing likelihood of paying the higher payoff. After subjects have made all of his choices, the server selects at random one of the ten decisions to be used, and a second random selection determines which payoff is selected based on the probabilities assigned to that choice.

Module 5 - Roll die and Survey:

Subjects are asked to roll a real physical die once and report the number that comes out on top. Subjects are payed 100 ECU * the number they report. Then they are asked to toss a virtual die and get paid another 100 ECUs * the number they declare. The die toss is framed as a payment for completing a short survey at the end of the experiment. The results of all modules and final payments are presented to each participant at the end of the session, after completing the survey.

Treatments: Audit Rates. There were two audit rate treatments in the experiments: 0% (Module 2 consisting of 10 rounds) and 10% (Module 3 consisting of 10 rounds). In the former treatment the subjects' Declared Gains are not subject to verification; in the latter 10% audit treatment, subjects have a 10 percent probability of being subjected to an audit. If subjects were randomly selected to be audited and if the verification finds a discrepancy between the Preliminary and Declared gains, 50% of the observed discrepancy is deducted from the subject's Preliminary Gains. This deduction applies to the Preliminary Gains and not to the declared amount.

In treatments 1,2,5 and 6, deductions applying to the two rich group members are then pooled. In treatments 3, 4, 7 and 8, deductions applying to the four group members are then pooled.

In treatments 1,3,5 and 7, the group revenues are distributed equally amongst the four participants – these reflect fiscal regimes in which the distribution of social benefits are non-progressive. In treatments 2, 4, 6 and 8, deductions applying to the four group members are then pooled. group benefits are distributed in a progressive fashion such that the poorest two group members receive 100 percent of the group revenues; and the richest two are given 0 percent.

At the end of each round participants are informed of their Preliminary and Declared gains; whether these two amounts have been audited; the amount they receive from the

deductions in their group; and the earnings in the round. At the end of each tax module one round is chosen at random, and their earnings are based on their profit for that round. Participants are only informed of their earnings for each tax module at the end of the experiment.

The experiment also measured a set of auxiliary variables designed to allow us to explore heterogeneity in treatment effects. The demographic variables were gender and income. We included a measure of trust and a measure of ideological self-identification. In order to evaluate arguments about other-regarding preferences and attitudes about redistributive taxation associated with the idea of compliance *as a sacrifice*, we include in the first module a Dictator Game. Subjects are asked to allocate an endowment of 1000 ECUs between them and another randomly selected participant in the room. Participants are informed that only half of them will receive the endowment, and the ones who receive the endowment will be randomly paired with those who don't. However, before the endowments are distributed and the pairing takes place, they may allocate the endowment between themselves and the other person as they wish if they were to receive the endowment.

References

Atkinson, A. B. 1995. *Income and the Welfare State*. Oxford University Press.

Austen-Smith, David. 2000. "Redistributing income under proportional representation." *Journal of Political Economy* 108(6):1235–1269.

Baldwin, P. 1992. *The Politics of Social Solidarity*. Princeton University Press.

Beramendi, Pablo and David Rueda. 2007. "Social Democracy Constrained: Indirect Taxation in Industrialized Democracies." *British Journal of Political Science* 37(4):619–641.

Beramendi, Pablo and Philipp Rehm. 2016. "Who gives, who gains? Progressivity and Preferences." *Comparative Political Studies* .

Besley, Timothy and Torsten Persson. 2011. *Pillars of Prosperity*. Princeton University Press.

Cusack, Thomas and Pablo Beramendi. 2006. "Taxing Work." *European Journal of Political Research* 45:43–73.

Dixit, Avinash and John Londegran. 1996. "The Determinants of Success of Special Interests in Redistributive Politics." *Journal of Politics* 58:1132–1155.

Doerrenberg, Philipp and Andreas Peichl. 2013. "Progressive Taxation and Tax Morale." *Public Choice* 155:293–316.

Duch, Raymond M. and David Rueda. 2014. "The People You Are: Personality Traits as Determinants of Redistribution Preferences." Nuffield College CESS Working Paper.

Dworkin, Ronald. 2000. *Sovereign Virtue*. Cambridge: Harvard University Press.

Fehr, E. and K.M. Schmidt. 1999. "A Theory of Fairness, Competition and Cooperation." *Quarterly Journal of Economics* 114:817–68.

Iversen, Torben and David Soskice. 2006. "Electoral Institutions and the Politics of Coalitions: Why Some Democracies Resdistribute More Than Others." *American Political Science Review* 100:165–81.

Kakwani, N.C. 1977. "Measurement of Tax Progressivity: An International Comparison." *The Economic Journal* 87(345):71–80.

Korpi, Walter and Joakim Palme. 1998. "The Paradox of Redistribution and Strategies of Equality: Welfare State Institutions, Inequality, and Poverty in the Western Countries." *American Sociological Review* 63:661–687.

Levi, Margaret. 1988. *Of Rule and Revenue*. University of California Press.

Lindert, Peter. 2003. *Growing Public*. Cambridge: Cambridge University Press.

Mares, Isabela. 2003. *The Politics of Social Risk*. Cambridge University Press.

Meltzer, Allan H. and Scott Richards. 1981. "A Rational Theory of the Size of Government." *Journal of Political Economy* 89:914–27.

Michelbach, John, John Scott, Richard Matland and Brian Bornstein. 2003. "Doing Rawls Justice: An Experimental Study of Income Distribution Norms." *American Journal of Political Science* 47(3):530–539.

Pincus, Steven CA and James A Robinson. 2011. What really happened during the glorious revolution? Technical report National Bureau of Economic Research.

Rawls, John. 1971. *A Theory of Justice*. Cambridge: Cambridge University Press.

Rawls, John. 1985. "Justice as Fairness: Political not Metaphysical." *Philosophy and Public Affairs* 14:223–251.

Rehm, Philipp. 2015. *Risking Solidarity. Social Policy in Hard Times*. Cambridge University Press.

Roemer, John. 2005. Equality and Opportunity. In *The New Palgrave Dictionary of Economics*, ed. L. Blume and S. Durlauf. Palgrave.

Solt, Frederick. 2009. "Standardizing the world income inequality database*." *Social Science Quarterly* 90(2):231–242.

Steinmo, Sven. 1996. *Taxation and democracy: Swedish, British, and American approaches to financing the modern state*. Yale University Press.

Steinmo, Sven. 2010. *The evolution of modern states: Sweden, Japan, and the United States*. Cambridge University Press.

Varian, H. 1980. "Redistributive Taxation as Social Insurance." *Journal of Public Economics* 14:49–67.

Whiteford, Peter. 2008. "How much redistribution do governments achieve? The role of cash transfers and household taxes, growing unequal: income distribution and poverty in OECD countries." *Growing unequal? Income distribution and poverty in OECD countries* pp. 97–121.