Income inequality and redistribution: the role of tax evasion

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Income Inequality and Redistribution: The Role of Tax Evasion

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Abstract: Using a simple model of income redistribution, we examine the effect of income inequality on redistribution in the presence of tax evasion. Our results suggest that in the presence of tax evasion, higher income inequality may be associated with lower per capita transfers but inefficiently high taxation. This is because in countries characterized by weak institutional framework parties may increase the probability of winning the elections by choosing policies that expand the number of tax evading individuals.

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En général, l'art du gouvernement consiste à prendre le plus d'argent qu'on peut à une grande

partie des citoyens, pour le donner à une autre partie.

In general, the art of government consists in taking as much money as possible from one party of

the citizens to give to the other.

Voltaire.

1. Introduction

For long economists and political scientists alike, have been trying to answer what determines the extent and the nature of government redistributive programs. Following the seminal contributions of Romer (1975), Roberts (1977) and Meltzer and Richard (1981), income redistribution is portrayed as the voting outcome in elections with office motivated parties who seek the support of the median voter. In all these models, as long as the income of the median voter is below the average income, the median voter will support policies that impose a positive tax rate on income accompanied with positive per capita transfers. Moreover there will be more redistribution the lower median income is relative to mean income (the higher is the inequality).

There is a large number of empirical studies examining the effect of increased income inequality on redistribution (see Borck, 2007 for a more complete review). However, the findings of the relevant literature are fairly mixed. Alesina and Rodrik (1994), Persson and Tabellini (1994), Milanovic (2000) and Scervini (2011) provide empirical evidence of a positive relationship between income inequality and redistribution whereas Perotti (1996), Rodriguez (1999) and Bassett et al. (1999) fail to report a robust relationship. Finally, Moene and Wallerstein (2003) point to a negative association between the two variables.

Contradicting empirical findings has led many researchers to modify some of the main assumptions of the theoretical models, which ultimately led to different conclusions. Roemer (1998) introduces a second dimension in the political competition process, Persson and Tabellini (2000) and Besley and Case (2003) underline the role of political institution on government redistribution programs whereas Epple and Romano (1996), Grossman (2003) and Katsimi and Moutos (2004) introduce redistribution through public provision of private goods.

More recently a number of papers (Roine, 2006; Borck, 2009; Traxler, 2009; Traxler, 2012) have introduced tax evasion and avoidance in the standard model of income redistribution. The central finding of these papers is that in the presence of tax evasion, the tax system may be less redistributive than if everyone reported truthfully. Moreover if the tax evasion technology is such that the rich evade more than the poor, these models predict redistribution from the middle class towards both the poor and the rich. However, none of these models examine the effects of inequality on the level of redistribution, in the presence of tax evasion.

In the present paper we seek to examine to impact of income inequality on redistribution in the presence of tax evasion. We build a rather standard model of redistribution in the presence of tax evasion (see e.g. Roine 2006; Borck, 2009; Traxler, 2009) where we assume that individuals are able to evade taxes by paying a lump sum cost.[1] This assumption guarantees that richer individuals are evading, whereas poor people pay taxes. In this setting, preferences are not necessarily single-peaked nor satisfy the single crossing property (Borck, 2009; Traxler, 2009).

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[1] The two papers most closely related to this one are Roine (2006) and Borck (2009). Both these papers examine and characterize median voter equilibrium, either numerically- as in Roine (2006) or by complete characterization of the voting outcomes- as in Borck (2009). Here instead we focus on a probabilistic voting equilibrium. This allows us to derive explicit equilibrium conditions, and well behaved comparative statics over wide parameter values. Moreover this also allows us to examine in a direct way the effect of inequality on the level of redistribution.

Therefore, the "identity" of the decisive voter may be unknown (and changing) and median voter theorem does not hold. In order to address this issue we assume that voting over the tax rate is probabilistic and this allows us to derive the political equilibrium level for redistribution.

Under these assumptions- i.e., tax evasion by the rich and probabilistic voting- our model produces a number of interesting results. First, we show that there can be a negative relationship between inequality and redistribution. When inequality declines, then there are more individuals at the end of the income distribution, which ceteris paribus implies an increase in the share of evaders. Then the (political) equilibrium is restored by increasing the size of redistribution towards lower end of the income distribution, which can only be achieved by increasing spending.[2]

Second, our model predicts that the equilibrium tax rate may be above the revenue maximizing tax rate. The economy therefore operates on the negatively slopped part of a "Laffer type curve".[3] This is because, in our model, an increase in the tax rates, apart from raising revenues to finance spending, also increases the number of tax evaders. Hence the office motivated parties propose a higher tax- than the one that maximizes revenues- in order to increase the welfare of those individuals that marginally choose to evade taxes when facing a higher tax rate. Then tax evasion is used by the government as a means of redistributing income to those individuals that increase the probability of winning the elections.

The paper is organized as follows. Section 2 presents the basic model and shows how individuals choose whether to evade or not, as well as the effects of tax evasion on the level of revenues. In Section 3, we explain how the political equilibrium is

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[2] If the economy operates on the positively (negatively) sloped side of the "Laffer type curve" this is achieved by higher (lower) tax rate.
[3] In general, the theoretical justification for a Laffer curve, rests on the changes in factor supplies due to changes on the tax rate. Following Sanyal et al. (2000) we call the non- monotonic relationship between tax rates and revenues due to the presence of tax evasion, as "Laffer type curve".

determined and derive the equilibrium conditions. In Section 4, the comparative statics of the endogenous variables with respect to changes in inequality are presented. As the results are in general ambiguous, we present the results of our numerical analysis. Finally Section 5 concludes.

2. The model

Consider an economy populated by a fixed number of risk neutral individuals, N.[4] Individuals differ in their income endowment, with e_i standing for household's i income. We assume that there is a continuum of individuals, $i \in [0,1]$, and that their income endowment is distributed according to a Pareto Probability Distribution Function (PDF).

$$f(e) = a \frac{b^a}{e^{a+1}}, \text{ with } \alpha > 1 \tag{1}$$

Parameter b stands for the lowest income in the population, and parameter a determines the shape of the distribution- with higher values of a implying greater equality. The Pareto distribution, in addition to being easy to work with, is a relatively good approximation of actual income distributions. Empirical estimates of the value of a range between 1.5 and 3.0 (see, Creedy (1977)).[5] The mean of the Pareto distribution is equal to

$$\mu = \frac{ab}{a-1} \tag{2}$$

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[4] A more elaborate model would include risk averse individuals and endogenous labor supply. These features however add further non- linearities in the first order conditions, making the comparative statics intractable and causing the model to break down for a wide range of parameter values. Thus for the sake of clarity and keeping in line with the models of Roine (2006) and Borck (2009) we assume risk neutrality and exogenous income.

[5] These values correspond to a Gini coefficient in the range between 0.2 and 0.5.

The government levies a proportional tax on income, at a tax rate *t*, in order to finance per capita income transfers *g*. Therefore, the government redistributes income by taxing proportionally individual income and paying a fixed amount *g* to each *i*, irrespective of their income (reported or true). As we allow individuals to evade taxes the net beneficiaries of government spending are those that their tax payment based on their reported income is below the per capita transfers. Therefore redistribution occurs from those with higher than average reported income to those with lower reported income. As long as the distribution of reported incomes is different from the distribution of true incomes, redistribution does not necessarily take place from the rich to poor.

Following Roine (2006) we assume that individuals may conceal a part ψ of their income from the tax authorities. This is achieved by incurring a fixed cost equal to θ. However, there is a fixed probability π that evaders will be audited and their income will be revealed. In this case this they pay a fine proportional to the total amount evaded, given by fe_it, where *f>1*. With risk- neutral individuals, this is equivalent to assuming that by paying a fixed cost θ, *i* can evade the payment of a share $\psi(1-\pi)f$ of his tax payment. Hence, even though we model risky tax evasion, the assumption of risk- neutrality results to equivalent results to a model of legal tax avoidance.

 2.1 Individual decisions

Individuals in this economy face two decisions. A binary choice of whether they will evade or not and a political decision of how to vote for the tax rate and the consequent level of redistribution. The above imply that the utility of a tax evading individual *i* can be written as:

$$U_i^E = e_i - (1-\psi)e_i t - \theta - \pi f \psi e_i t + g \tag{1}$$

whereas the utility of an individual which truthfully declares its income is

$$U_i^{NE} = e_i(1-t) + g \qquad (2)$$

Then individual i will choose to evade taxes, if the utility derived under tax evasion is greater than the utility by honestly declaring its income, i.e. if (1) is greater than (2), i.e.

$$e_i > \frac{\theta}{\psi(1-\pi f)t} \qquad (3)$$

Letting if ε denote the level of income for which it holds that

$$\varepsilon = \frac{\theta}{\psi(1-\pi f)t} \qquad (4)$$

it follows that only individuals with $e_i > \varepsilon$ will choose to tax evade ψ part of their income, and individuals with $e_i < \varepsilon$ will declare their full income and pay full taxes. In other words in the present model, the tax evading individuals are those top of the income distribution.[6]

Equation (4) reveals that ceteris- paribus, lower cost of tax evasion- i.e. lower θ-, or higher share of taxes evaded- i.e. higher $\psi(1-\pi)f$- results into a lower threshold income for tax evasions ε and consequently to more tax evasion. Moreover a higher tax rate t –which is endogenously determined in the political equilibrium- also results into a higher share of tax evaders in total population.

2.2 Government

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[6] This is consistent with the empirical evidence; studies on the effect on tax evasion on income inequality show that the share of tax evasion is positively correlated with income (see for example Pashardes and Polycarpou, 2008; Matsaganis and Flevotomou, 2010). Moreover the results of the 1999 World Values Survey show that the share of respondents disagreeing with the statement "cheating on taxes if you have the chance is never justified" is greater for individuals at high than low income levels. For example, in Greece 69.9% of high income respondents disagreed with the statement (compared to the 57.4% for the low income respondents), whereas for Italy the corresponding figures were 48.2% and 40.2% and for the Japan 19.5% and 14% respectively.

The government receives income tax revenues and fines from those caught tax evading. We assume that it uses all these revenues in order to finance per capita transfers, g.

Then using the PDF of the Pareto distribution, the total tax receipts of the government are equal to:

$$T = t\mu N - t\psi(1-\pi f)N\int_{\varepsilon}^{\infty} e\left(a\frac{b^a}{e^{a+1}}\right)de \qquad (5)$$

Equation (5) states that total collected taxes are equal to total revenues in the absence of tax evasion (i.e. $t\mu N$) minus the net (i.e. excluding fines) total amount evaded. According to (5) higher θ, π and f, i.e. higher cost of tax evasion, higher probability of detection and higher penalty are associated with higher revenue.

The above equation, presents a Laffer- type relationship between the tax rate and total government revenues. Typically the Laffer curve represents a non- linear effect between the tax rate and total revenues due to changes in factor supplies (see for example Minford and Ashton, 1991). Here the non- linear effect is derived from the incentives for tax evasion: increases on t, changes the level of income for which the individual is indifferent between evading and truthfully declaring its income, i.e. ε, inducing an increase in tax evading individuals (see also Sanyal et al., 2000). In other words a higher tax increases the share of individuals for which tax evasion has a positive net benefit. Thus the overall effect of a change in t is ambiguous: on the hand a higher t results into higher revenues, by increasing the share of taxes received, whereas on the other hand a higher t reduces declared income, reducing overall revenues.

Given the setup of our model, equation (5) is concave in t. We can therefore derive a unique revenue maximizing tax rate, by simply differentiating (5) with respect to t

$$t^{\max} = \frac{\theta}{b} \psi^{\frac{a}{1-a}} (1 - \pi f)^{\frac{a}{1-a}} a^{\frac{1}{1-a}} \tag{6}$$

As all tax revenues are used to finance per capita transfers g, the government budget constraint can be written as:

$$g = t\mu - t^a \psi^a (1 - \pi f)^a \frac{ab^a}{(a-1)} \theta^{1-a} \tag{7}$$

3. Political equilibrium

In the above general setting described preferences are not in general single-peaked nor satisfy the single crossing property. The rationale for this is as follows: consider an individual with income above the average. As long as the tax rate (t) is so low that the individual does not evade, his utility is an decreasing function of t. This is because individual's tax payment is larger than the per capita transfers he receives. Thus, he votes against higher taxes. However as t rises, there exists a threshold above which the individual chooses to evade taxes. For t above that threshold, utility is increasing in t, due to the fact that the individual is a net beneficiary of government spending (and as long as $t < t^{max}$). This is because the individual no longer pay taxes whereas at the same time receives positive per capita transfers. In this case, he votes for higher taxation.

When preferences are not single- peaked nor satisfy the single crossing property the "identity" of the decisive voter may be unknown (and changing) and median voter

theorem does not hold.[7] To overcome this problem, we assume that taxes are chosen though probabilistic voting.[8] The political mechanism works as follows: before any individual choices are made (i.e. before individuals choose whether to tax evade or not), there is voting among the population about the level of t and g. In these elections, two political parties compete over winning the elections, by proposing a tax rate t. Then the level of g follows directly from equation (7). After the elections the winning party (government) implements the proposed policy.

We assume that each individual votes with a positive, but not necessarily equal to 1, probability the party's proposal that gives him the highest utility.[9] Under probabilistic voting each party seeks to maximize its expected vote share given the expected vote share of the other party. The maximization problem of each party implements the maximum of the following weighted Benthamite social welfare function (Muller, 2003, p. 253- 259):

$$W = k\int_b^\varepsilon \left[e_i(1-t)+g\right]\frac{ab^a}{e_i^{a+1}}de + \int_\varepsilon^\infty \left[\left[e_i(1-t)-\theta-\psi(1-\pi f)e_i t\right]+g\right]\frac{ab^a}{e_i^{a+1}}de \quad (8)$$

where k is the relative weight of the non- evaders in the utility of the government.[10] Maximizing (8) subject to the government budget constraint (7), with respect to t, yields the following first order condition

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$$t^{-1}\theta + \frac{(1+a)b}{a-1}(1-k) - 2\frac{b^a t^{a-1}}{a-1}\psi^a (1-\pi f)^a \theta^{1-a} + (1-k)\frac{\theta}{\psi(1-\pi f)t^2} +$$

$$+ \frac{(a-2)\theta\left[\psi\pi f(1-k)-(1-\psi-k\psi)\right]}{(a-1)\psi(1-\pi f)t} = 0$$

(9)

The solution to equation (9) gives the equilibrium tax rate, denoted as t^*. Then equation (7) can be directly used to determine g.

4. Results

4.1 The effect of inequality

As can be easily verified, equation (9) cannot be solved analytically for t^*, however it can used to derive the comparative statics effect of changes in the (in)equality parameter a. Total differentiating (9), and solving yields after some simplifications:

$$\frac{dt}{da} = \frac{\hat{t}\left[-2(1-k)b + \hat{\varepsilon}\left[\psi\pi f(1-k)-(1-\psi-k\psi)\right] + 2\frac{\theta}{\hat{t}}\left(\frac{b}{\hat{\varepsilon}}\right)^a\left[\log\left(\frac{b}{\hat{\varepsilon}}\right)-(a-1)^{-1}\right]\right]}{\frac{(a-1)}{\hat{t}}\left[-\theta - 2\theta\left(\frac{b}{\hat{\varepsilon}}\right)^a - 2(1-k)\hat{\varepsilon}\right] - (a-2)\hat{\varepsilon}\left[\psi\pi f(1-k)-(1-\psi-k\psi)\right]}$$

(10)

where hats above variables indicate the underlying equilibrium values of t and ε. From the second order conditions of the maximization problem, the denominator of (10) is negative. However the numerator of (10) can be either positive or negative depending on the underlying parameter values. In what follows we try to numerically determine the relationship between α and t, and to give the intuition behind our main result.

Since our interest lies on the effects of a—ceteris paribus—change in inequality, and changes in a affect the average ability (and income) in the economy, in the following figures we depict the relationship between inequality and the variables of

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interest for a given level of average ability (by changing the underlying value of b).

Following the empirical estimates of Creedy (1977) we assumed that a takes values

between *1.5* and *3.0*. The rest of the parameter values used in the following figures are

f=1.2, π=0.05, k=0.85, μ=0.3, ψ=0.75. These values guarantee that the second order

conditions of the maximization problem are satisfied, all endogenous variables of the

model satisfy the underlying non- negativity constraints and that the equilibrium share

of tax evading households takes on realistic values (i.e. undeclared income up to

around 50%, as in Schneider, 2005).[11]

The following figure depicts the relationship between a and the equilibrium tax

rate t^* for θ=0.05 and θ=0.04. Moreover in each diagram we also depict revenue

maximizing tax rate, denoted t^{max} and the per capita transfer g as a share of average

income $μ$ as these are crucial for understanding the intuition behind the underlying
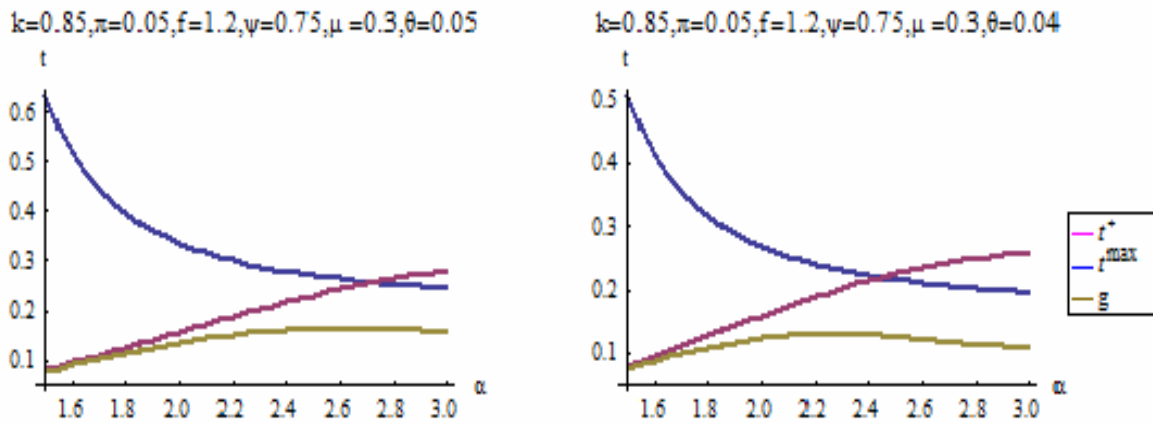
relationship between a and t^*

Figure 1: Relationship between *t* and *a*, for *θ=0.05* and *θ=0.04*

Our main results can be summarized along the following lines. Firstly, the effect

of a change in a on the per capita transfers (g) is non- linear. However, for a wide

range of values for $α$ (in the first diagram of Figure 1 for α<2.7 and in the second

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[11] See figure 2 below.

diagram for $\alpha<2.5$) there is a negative association between income inequality and g. Therefore in the presence of tax evasion the standard positive relationship between income inequality and redistribution may be reversed.

The intuition behind the above relationship can be better understood using the properties of the probabilistic voting model. The political equilibrium is achieved when the marginal welfare of the two groups (evaders and non- evaders) is equalized (Mueller, 2003). Consider then an increase in a. Due to the Pareto distribution, for given t, higher a implies an increase in the share of the tax evading households (more individuals with income above ε) and thus the marginal utility of the evaders becomes greater than the marginal utility of the non –evaders. In order to restore the equilibrium, political parties propose a higher t^* as this will increase the marginal welfare of the non- evaders and restore the equilibrium. When $t^* < t^{max}$, the new equilibrium is reached by also lowering marginal welfare of evaders, whereas When $t^* > t^{max}$, the marginal utility of the evaders is also increasing in t thus in the new equilibrium the marginal utility of the evaders is also higher.

4.2 Equilibrium tax rate above the revenue maximizing tax rate

Figure 1 also shed light to our second result. Specifically, there is a range of parameter values for which t^* is higher than t^{max}. In this case the government chooses a tax rate on the negatively sloped side of the Laffer type curve, and increases in t^* are associated with falling per capita transfers. As can be verified, this occurs for relatively large values of α. The rationale for this is as follows: taxation redistributes income by changing (i) net transfers and (ii) the share of tax evading individuals. The probabilistic voting mechanism ensures that political parties equalize the marginal benefits of a higher t on (i) and (ii). For low values of α, parties increase the share of

expected votes by redistributing between rich and poor. Whereas for high α (i.e. higher equality) the gains in terms of expected votes, are achieved through expanding the number of tax evading individuals rather than from redistributing income to the existing net recipients. Thus when α is high, parties propose a tax rate above the one that maximizes revenues.

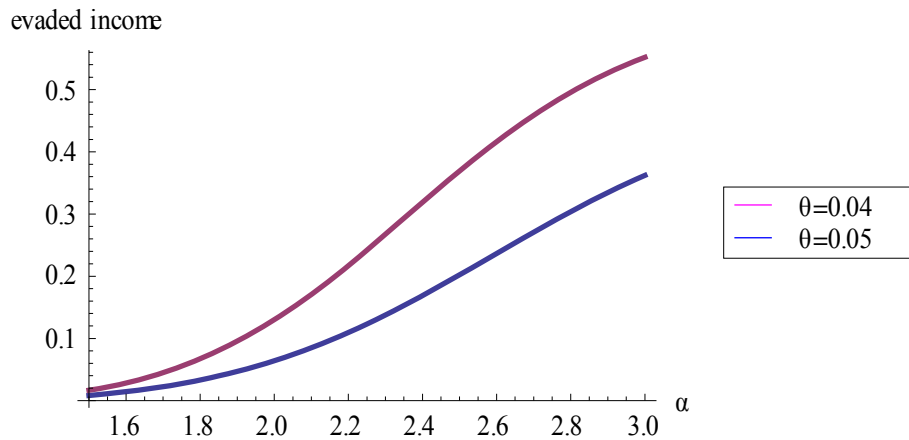The following figure presents the relationship between a and the share of evade income, for two levels of θ.

Figure 2: Relationship between evaded income and *a*, for *θ=0.05* and *θ=0.04*

When θ is lower, political parties try to expand the number of expected votes by proposing a t that increases the number of tax evaders. This is consistent with the result in figure 1, where it is clear when θ is smaller the range of values of α, over which $t^*>t^{max}$ is greater.

5. Conclusions

Our findings suggest that in the presence of tax evasion, higher income inequality may be associated with lower redistribution and that a government that cares enough

for the tax evading population, may impose a greater tax rate than the one required to maximize revenue. These results have important bearings both on a theoretical level as well as for policy recommendations. On the theoretical front, the present paper has shown that in the presence of tax evasion the relationship between inequality and government transfers may be reversed. Since the relevant empirical literature on the relationship between inequality and redistribution does not take into account the role of institutions, our analysis may provide a potential explanation for the lack of clear cut empirical evidence (see e.g. Perotti,1996; Bassett et al.,1999; Rodriguez,1999). Moreover it provides a clear testable hypothesis for empirical research: inequality may positively affect redistribution only in countries with low tax evasion, shadow economy and corruption. For the rest of the countries the Meltzler and Richard (1981) effect may be the exact opposite.

The conclusions of the present analysis can also be generalized further. Here we have shown that the government (or to be more specific the political parties running for office) use taxation in order to increase tax evasion- which increases the welfare of a specific segment of the electorate- as a means to increase their expected vote share. In a more general setting this implies that the degree of tax evasion is not necessarily an exogenous constraint for the government. Rather it may be used by the politicians in order to get re- elected. In the present setting this leads even to a tax rate higher than the revenue maximizing tax rate. More generally it implies that policies implemented may be highly inefficient.

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