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Redistributive Taxation Under Ethical Behaviour

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Abstract:
We consider the implications of ethical behaviour on the effect of a redistributive tax-transfer system. In choosing their labour supplies, individuals take into account whether their tax liabilities correspond to what they view as ethically acceptable. If tax liabilities are viewed as ethically acceptable, a taxpayer behaves ethically, does not distort her behaviour, and chooses to work as if she were not taxed. On the other hand, if ethical behaviour results in tax liabilities that exceed those that are ethically acceptable, she behaves egoistically (partially or fully), distorts her behaviour, and chooses her labour supply taking into account the income tax. We establish taxpayers' equilibrium behaviour and obtain that labour supply is less elastic when taxpayers may behave ethically than when they act egoistically. We characterize and compare the egoistic voting equilibrium linear tax schedules under potentially ethical and egoistic behaviour. We also compare our results to those obtained under altruism, an alternative benchmark.

Keywords: Ethical behaviour, Kantian preferences, income taxation, redistribution

JEL Classification: H24, H21, Z13

1. Introduction

It is apparent that in many social situations, individuals do not behave as a selfish 'homo oeconomicus' would behave. On the contrary, many studies suggest that individuals exhibit care for others in their behaviour. In his survey paper on psychology and economics, Rabin (1998) highlights many examples, both inside and outside of laboratories, where people demonstrate behaviour that departs from pure self-interest. Experimental evidence includes Andreoni (1995b), who finds that individuals avoid free-riding in public good provision games due to some form of kindness, and Camerer and Thaler (1995), who discover non-selfish behaviour in ultimatum and dictator games. Non-experimental evidence of benevolent behaviour includes the cases of tipping studied by Lynn and Grassman (1990), fairness considerations in the determination of wages considered by Blinder and Choi (1990), and, more obviously, charitable donations discussed by Bilodeau and Slivinski (1997) or Andreoni (1998). Fong (2001) reports evidence from surveys that people do indeed care for non-related individuals in society.

Given that individuals display benevolent behaviour in some dimensions of their economic life, could it be that they also display such behaviour when paying taxes? In this context, it is useful to distinguish tax evasion from tax avoidance (see Slemrod and Yitzhaki, 2002). Tax evasion involves illegal behaviour, such as under-reporting income to the tax authorities, while tax avoidance involves reducing one's tax liabilities by entirely legal means, such as tax planning or simply substituting non-taxable activity (leisure, household production, consumption of untaxed goods) for taxable activity (earning income, consuming taxable goods). According to Andreoni, Erard and Feinstein (1998), the answer to the question posed above is affirmative in the case of tax evasion: indeed, that is regarded as being the main problem with the conventional theory of tax evasion which treats it as a problem in portfolio choice. In their survey paper, they highlight the fact that tax compliance around the world is surprisingly high given the low probabilities of audit and the size of the sanctions. For example, in 1988 almost 70% of U.S. households chose not to evade taxes. Yet, the audit rate over that period was only 0.8%, and typically the penalties applied were of the order of only 20% of the unpaid taxes.[1]

There are various potential explanations for such a puzzle. Erard and Feinstein (1994) have suggested that it is the shame of getting caught. Others, like Gordon (1989), argue that there is an endogenous social norm, whereby individuals experience a psychic cost of tax evasion which depends on the level of tax evasion in the general population. The problem with these explanations is that tax evasion is a private decision, and the identification of tax evaders in the population is difficult if not impossible unless the evader is caught. Consequently, the psychic

[1] For those who are convicted of fraud, the rate goes up to 75%, while fines up to $100,000 and imprisonment up to five years could be imposed for felony cases. However, such events are rare. In 1995 for example, only 4.1% of all evasion cases received a penalty for fraud or felony.

cost is more likely to come from within the individual, rather than being imposed by outsiders. For this reason, other economists have turned to fairness and ethical considerations as a way to explain the low level of tax evasion. The basic idea of such an approach is that individual taxpayers have in mind what their fair contribution is, and will happily not evade taxes as long as what is asked from them does not exceed this fair contribution.

Following an approach similar to Laffont (1975), Bordignon (1993) develops a model in which individuals display what he calls Kantian preferences. It involves a two-step process. First, individuals determine what would be a fair amount of taxes to pay to finance public goods if they were endowed with the average income in the economy. Then, one's own fair contribution is based both on the amount of public goods provided and on their relative position on the income scale. Agents with above-average incomes believe they should contribute more, while agents with below-average income believe they should contribute less. This is because individuals compare their income to the average income level, rather than because they are using some explicit social welfare function when constructing the ethical contribution. Then, in a second stage, they choose how much to evade. If their tax liability is no more than what they believe is fair, they will choose not to evade. Otherwise, they will evade, and the extent of their evasion will depend upon the difference between their actual tax liability and their fair one.[2] There is some evidence to support Bordignon's model. Spicer and Becker (1980) use an experimental approach to show that individual who feel they are victims of fiscal inequality evade taxes more. The approach we use in this paper will bear some formal similarity to Bordignon's, but it differs in three key respects. First, our analysis involves the decision to avoid taxes rather than to evade them. Next, our analysis is explicitly concerned with using taxes for redistribution rather than for public goods. Finally and most important, we suppose that households use a social welfare function to calculate their fair tax burdens.

Tax avoidance is qualitatively different from tax evasion in an important dimension: it does not involve illegal behaviour. Since there is no legal sanction against tax avoidance, it might be thought that it is correspondingly more difficult to make the case that individuals will not engage in it, especially since it apparently goes against their own self-interest.[3] However, there

[2] Bordignon builds on an earlier paper of his (Bordignon, 1990) in which he uses a similar procedure to justify the absence of free-riding in public good contributions. More recently, Bilodeau and Gravel (2000) generalized such an approach for a wide variety of games with public goods. In a related approach, Sugden (1984) develops a model of 'reciprocity' in which households choose not to free-ride in their voluntary public goods contributions as long as those in their community do, but deviate otherwise.

[3] In this context, it is interesting to note the argument of Musgrave (1992) that the deadweight loss of redistributive taxation (tax avoidance) should not count (have 'standing') from the point of view of normative tax analysis, unlike in standard optimal tax theory. That is, tax avoidance — like free-riding — is somehow unethical so should not be rewarded.

is some evidence that individuals do care about fairness in making certain economic decisions, and apparently take actions that make themselves worse off, as in the case of choosing not to avoid taxes.[4] Kahneman, Knetsch and Thaler (1986) find that consumers who see a monopoly price as unfair may refuse to buy a product even if buying the product would generate a surplus for themselves. We also observe concerns about fairness and reciprocity in the determination of prices, or wages. Fehr and Gächter (2000) survey a variety of situations where such phenomena can be observed. For example, interpreting wage determination as a gift exchange, whereby firms offer wages and workers respond with labour, can help explain why more profitable firms pay higher wages. What is notable about these arguments is that taking fairness into account involves making decisions that are contrary to one's own selfish interests. This should be contrasted with arguments for benevolent behaviour that rely on altruism. These effectively make it in one's self-interest to take others' interests into account. As we shall see, in our context, ethical and altruistic behaviour lead to quite different behavioural outcomes.[5]

The intent of this paper to introduce the notion of ethical behaviour to address another form of social interaction: supplying labour to finance taxation for the purpose of redistribution. In particular, we study the extent to which households may choose not to change their labour supply (thereby not avoiding taxes) when faced with distortionary taxation if they have ethical views over the amount of redistribution. As we have discussed, ethical preferences and behaviour have been used as an argument for conditioning individual decisions about provision of public good, either directly through voluntary provision, or indirectly through their decision to comply with the tax system by choosing not to evade taxes. We shall deploy ethical behaviour to address the issue of redistribution in an environment where taxes are distortionary so individuals can avoid paying taxes (legally) by changing their labour supply. For simplicity, we concentrate on a simple linear income tax in conjuction with a lump-sum transfer to all individuals, that is, a linear progressive income tax.

As in the earlier literature, ethical behaviour enters into individuals' decisions in a two-step

[4] In the current paper, tax avoidance takes the form of a reduced labour supply. While legal sanctions are not imposed on those providing a low level of labour supply, it is quite possible for society to stigmatize those who work less, thereby making that choice less attractive. On such social norms and sanctions, see Besley and Coate (1992) and Lindbeck, Nyberg, and Weibull (1999). An interesting extension of those two papers, which is related to our analysis, is Cervellati, Esteban and Kranich (2004) in which individuals, when voting over redistributive policies, use a social welfare function and place more weight on individuals that are working more than some exogenous social norm (e.g. average labour supply), and less on those who work less.

[5] Another related method for inducing benevolent behaviour is to posit that households obtain utility simply from the act of giving, independent of the consequences of that act. In the context of the voluntary contribution to public goods, this is referred to as the 'warm glow effect'. It leads to yet different predictions, though we do not explore that possibility in this paper. However, it does share with altruism the property that benevolent behaviour is turned into self-interested behaviour, a property that presumably accounts for its acceptance by economists.

process. In the first step, individuals determine what they regard as their fair, or *ethical* tax liabilities (or the transfers they should receive depending on their income level). In the second step, they compare the net tax liability that they would incur under the existing tax system if they behaved in a non-distortionary manner with the amount they regard as fair according to the first-stage ethical calculation. If this tax liability exceeds their ethical one, they deviate from non-distortionary behaviour by supplying less labour to reduce their tax liability. The precise amount by which they reduce their labour supply is discussed in detail in the following section. The ethical tax liability is calculated by solving a social welfare maximizing problem for the economy as a whole. Each individual chooses the marginal tax rate, the lump-sum transfer and the labour supply for all individuals that maximizes a social welfare function with some aversion to inequality. This yields an ethical tax system, a set of ethical labour supplies, and ethical tax liabilities. As pointed out by Bordignon (1990) and Bilodeau and Gravel (2004), a procedure such as this fits nicely with the Kantian principle (or Golden Rule): 'Do unto others as you would have them do unto you'. Bilodeau and Gravel (2004), in the context of voluntary contributions to a public good, highlight two important conditions for an ethical rule to be consistent with this Kantian principle. The first one is the principle of anonymity, which is satisfied by the social welfare function that we choose.[6] The second condition is that the rule must yield the most preferred outcome to all individuals, when all individuals follow that rule. For example, in a simple contribute or not, symmetric, public good game, all individuals contributing or none contributing are two rules that satisfied anonymity, but only all individuals contributing satisfied the second rule. In our context, matters are complicated because of the redistributive aspect of our game. We assume that all individuals use the same social welfare function for ethical purposes, and this guarantees satisfaction of the second condition.

An important aspect of such a process is that, if there were enough tax instruments, the outcomes of all individuals' ethical calculation would not only be identical, but they would also be first-best. Then, the ethical labour supply of every individual would be the undistorted labour supply that would apply if taxes had been lump-sum redistributive taxes. In our setting with a two-parameter income tax system, this first-best ethical outcome will only occur if individuals are of two wage types, and we shall take advantage of that simplification in what follows.

The idea that individuals maximize a social welfare function with some aversion to inequality when assessing what is their desirable tax payment is far from being frivolous. Rabin (1998) highlights the fact that experiments suggest that individuals even use a maximin social welfare function in some circumstances. If they behave this way when it comes to experimental behaviour regarding the sharing of some fixed pot, or with respect to illegal behaviour such as tax evasion, it seems equally reasonable that they would do so with respect to perhaps the most significant

[6] For a discussion of this axiom, see Blackorby, Bossert and Donaldson (2005).

form of behaviour that influences redistribution, their labour supply.

To emphasize the main features of our analysis, we adopt a form of household preferences—quasi-linear in consumption and additive—such that there are no income effects on labour supply: labour supply depends only on the net wage rate. One of the most striking differences we find under ethical behaviour compared to behaviour originating from standard preferences is that labour supplies are much less elastic with respect to changes in the tax rate in general, and in some cases can be perfectly inelastic. For example, if the tax rate is relatively low, high-wage agents end up paying less taxes than they believe is fair. Consequently, they choose their labour supply as if the tax were lump-sum. In the absence of income effects, a change in the tax rate will not change the situation, as long as the net tax they have to pay (the tax on their income less the lump-sum transfer) is no greater that what they believe to be fair. The equivalent applies for low-wage agents when tax rates are high.

The labour supply elasticity has been the subject of many studies. It is typically found that the elasticity for men is close to zero, and that for married women, for whom the elasticity is among the highest, is still relatively small.[7] The traditional argument for such low elasticities come from the fact that income and substitution effects cancel each other out. In our paper, we shut down the income effect, so all the action in term of low elasticities comes from fairness considerations. Overall, our model generates labour supplies that are higher and less responsive to the after-tax wage rate than a model with purely selfish individuals would generate, especially for extreme tax rates, either high or low. Such behaviour can have important consequences for the individuals' utility, which tends to be higher under ethical behaviour than under purely self-interested preferences. The case in which the agents agree on the social welfare function is instructive in that regard. In this case, all agents in the economy agree on what is fair to pay (or receive): that is, they agree on what a fair tax rate (and lump-sum transfer) is. The tax system is in fact able to generate transfers which are consistent with the fair contribution. If the tax rate chosen is in fact that tax rate, all agents will be happy to provide undistorted labour supply, leading to full efficiency. Moreover, if there are only two types of individuals — the case that we focus on in this paper — the fair outcome will yield the first-best outcome, that is, the one that a lump-sum tax-transfer system would yield. That is because with only two types, a two-parameter linear progressive tax will have enough degrees of freedom to replicate a lump-sum system. With more than two types, the first-best could not be achieved so inequality would remain, but the amount of inequality would still be regarded as fair by all households, given the restrictions implicit in a linear progressive income tax.

[7] For a discussion of different studies on labour elasticity and taxation see Blundell (1992). Another puzzle more closely related to taxes, as pointed out by Arrufat and Zabalza (1986), is the relatively low concentration of income at tax kinks, suggesting that agents are not very responsive to taxes.

Once we have described individual behavior, we can consider the effect of the tax rate on equilibrium outcomes, and the tax rate that would be chosen under alternative institutional assumptions. A benchmark would be the optimal tax rate chosen by a benevolent government. As mentioned, when households behave in the same ethical manner, this choice is trivial since all households will agree on the fair tax rate. We study what happens to labour supply and welfare when the tax rate deviates from the fair one, and compare this with the case of selfish behaviour. It is then natural to consider voting over the tax schedule in such a context. When individuals vote using as their preferences the ethical social welfare function benchmark ("fully ethical voting"), the voting problem is also trivial since all will vote for the fair tax rate. However, we argue that even though individual individuals may behave ethically given the tax system, they might reasonably vote at least partly according to self-interest. We analyze the consequences of this for equilibrium outcomes assuming that the median voter is a low-wage individual. Contrary to our first intuition, we find that the tax rate chosen by low-wage egoistic voters could actually be lower when workers may potentially behave ethically than when they behave egoistically for sure. Intuitively, because labour elasticities are lower under ethical behaviour, higher tax rates might reasonably be chosen since they are less distortionary. However, low-wage individuals, anticipating that they will behave ethically under high tax rates, may prefer a lower tax rate as a way to protect themselves from such ethical behaviour. The relative size of the preferred tax rates under potentially ethical and egoistic behaviour will obviously depend on the labour supply elasticity. This result is consistent with Glaeser, Ponzetto and Shapiro (2004) who present evidence showing that in the 2000 US Presidential election, the relative share of low-income individuals among those voting for the Republican Party was surprisingly high.[8]

Finally, we compare our approach with a competing alternative where agents are simply altruistic, and regard providing higher labour supply as a way to increase the welfare of others. The remarkable consequence of such an assumption is that agents will adjust their labour supply so that they compensate for the imperfections of the tax system. For example, if taxes are too low, high-wage agents will choose to work *more* than the efficient amount and low-wage agents will choose to work less. This is reminiscent of the neutrality result in Bernheim and Bagwell (1988), except that neutrality in our context is not a consequence of undoing the distortionary tax system, but rather a consequence of undoing levels of redistribution that are judged to be unfair. However, altruism is unable to generate an inelastic labour supply, which is counterfactual. High-wage agents display a monotonically decreasing labour supply as the marginal tax rate increases, while low-wage agents end up with a monotonically *increasing* labour supply, even with no income effects. The reason is that when the tax rate increases, low-wage agents become better off and want to redistribute part of the benefit to the richer agents. The only way to do

[8] In their paper, they argue that such behaviour is due to the strategic bundling of extreme platforms on religious issues by the two main parties.

so is by working more.

2. The Model

Consider a world populated with n taxpayers deriving utility from consumption c and disutility from working ℓ hours according to the quasi-linear additive utility function $u(c, \ell) = c - h(\ell)$, where $h' > 0$ and $h'' > 0$. We can think of these preferences as being ordinal for the purposes of determining household behaviour. As we shall see below, the manner in which they are cardinalized can be viewed as equivalent to defining the individual social utility functions in an additive social welfare function. Taxpayers are indexed by $i \in \{1, \cdots, n\}$ and can differ according to their wage rate w_i. A taxpayer of type i working ℓ hours earns an income $w_i\ell$ which is taxed through a linear income tax (to be endogenized later) with a proportional tax rate t and a demogrant e. Consumption is therefore given by $c = (1-t)w_i\ell + e$ and utility by $u = (1-t)w_i\ell + e - h(\ell)$.

Our analysis differs from previous work in the manner in which individuals choose their labour supply in the face of taxation. In words, we assume that a taxpayer, when faced with tax liabilities that correspond to what she views as reasonable or fair (which we define below), behaves *ethically* — i.e., does not distort her behaviour to avoid taxes — and chooses to work as if she were not taxed (as if $t = 0$). On the other hand, if she faces tax liabilities that she views as unreasonable, she behaves *egoistically* (*partially* or *fully*), distorts her behaviour to reduce her tax payment, and chooses her labour supply taking into account the linear income tax schedule (with $t > 0$). Our assumption of quasi-linear additive preferences serves to make this distinction precise because labour supply in this case depends only upon the after-tax wage rate, or equivalently, the marginal tax rate given the household's wage rate.

Specifically, let $\underline{\ell}_i(t)$ be the fully egoistic labour supply of taxpayer i given tax schedule (t, e). It is determined as follows:

$$\underline{\ell}_i(t) = \arg\max_{\ell} \ (1-t)w_i\ell + e - h(\ell)$$

Thus, $\underline{\ell}_i(t)$ solves the first-order condition $(1-t)w_i = h'(\underline{\ell}_i)$ from which it follows that $\underline{\ell}_i'(t) = -w_i/h''(\underline{\ell}_i) < 0$. This implies that $\underline{\ell}_i(t)$ depends on the wage rate w_i: in particular, $\underline{\ell}_i(t) > \underline{\ell}_j(t)$ for $w_i > w_j$. Note that what we call the fully egoistic labour supply is nothing other than the standard labour supply of mainstream microeconomics.[9]

[9] It is assumed that the population size is large enough that it does no matter whether the household sees through the government budget constraint. When a household realizes that the taxes paid are redistributed back to all taxpayers in the form of the lump-sum transfer e, the first-order condition becomes $(1-t)w_i + tw_i/n = h'(\underline{\ell}_i)$. As the population size n becomes large, the effect on the household's labour supply of the lump-sum transfer becomes negligible. The ability of agents to see through the government budget constraint will be important in our later discussion.

Now let $\bar{\ell}_i$ be what we subsequently call the ethical labour supply of taxpayer i:

$$\bar{\ell}_i = \arg\max_{\ell} \; w_i \ell - h(\ell)$$

In other words, an ethical taxpayer completely abstracts from taxation — both the tax rate t and the transfer e — in her choice of labour supply, and $\bar{\ell}_i$ solves the first-order condition $w_i = h'(\bar{\ell}_i)$. Again note that $\bar{\ell}_i$ is increasing in the wage rate.

Taxpayer i's ethical behaviour depends upon her perception of ethical outcomes for the economy as a whole. Let $\bar{t}_i$ be the tax rate that taxpayer i views as optimal or ethical, and let $\bar{\ell}_l^i$ be i's view of the ethical behaviour for taxpayers $l = 1, \cdots, n$. These are computed by i as the solution to a social welfare-maximizing problem[10] in which i: i) uses a standard additive social welfare function with constant aversion to inequality ρ, ii) puts an equal weight on all other individuals' well-being as on her own, and iii) sees through the government budget constraint by recognizing that the average tax liability equals the demogrant. Thus, taxpayer i's ethical tax rate $\bar{t}_i$ and ethical labour supplies $\bar{\ell}_l^i$, $l = 1, ..., n$, are given by the solution to following problem:

$$\max_{t, \ell_1^i, \ldots, \ell_n^i} \; \frac{[(1-t)w_i\ell_i^i + e - h(\ell_i^i)]^{1-\rho}}{1-\rho} + \sum_{j \neq i} \frac{[(1-t)w_j\ell_j^i + e - h(\ell_j^i)]^{1-\rho}}{1-\rho} \tag{1}$$

subject to the government budget constraint:

$$e = t\frac{\sum_k w_k \ell_k^i}{n} \tag{2}$$

Note that the social welfare function used here could be interpreted as a utilitarian one in which the term $[(1-t)w_l\ell_l^i + e - h(\ell_l^i)]^{1-\rho}/(1-\rho)$ acts as the individual utility function. It is a particular cardinalization of the household's quasi-linear ordinal preferences.[11] It is immediately apparent that, if all taxpayers have the same ethical preference as we assume, the ethical tax

[10] Our approach is to endogenize the perceived ethical tax rate and labour supplies by having each individual maximize a social welfare function in which the weights put onto others are fixed and exogenous. This is in contrast with Cervellati, Esteban, and Kranich (2004), who, in a different context and with a different focus, assume that an individual's preferences for redistribution are established using a social welfare function with endogenous weights put onto others, but with an exogenously set level of "acceptable" — we would say ethical — labour supplies.

[11] In a more general treatment, we might consider the case where individuals are only partially ethical. One way to do this would be to assume that their ethical tax rate and labour supplies solve the following problem instead:

$$\max_{t, \ell_1^i, \ldots, \ell_n^i} \; \frac{[(1-t)w_i\ell_i^i + e - h(\ell_i^i)]^{1-\rho}}{1-\rho} + \beta^i \sum_{j \neq i} \frac{[(1-t)w_j\ell_j^i + e - h(\ell_j^i)]^{1-\rho}}{1-\rho} \tag{1'}$$

where $\beta^i < 1$. In order to make our arguments as simple as possible, we concentrate on the fully ethical case, where $\beta^i = 1$.

rate $\bar{t}_i$ and labour supplies ℓ_l^i are identical for all individuals $i = 1, \cdots, n$ since they all solve the same problem.[12] For this reason, we simply use the notation $\bar{t}$ for the ethical tax rate, and ℓ_l^e as the ethical labour supply for individual $l \in \{1, \cdots, n\}$ in what follows. Note that even if individuals agree on ℓ_l^e, all individuals do not necessarily supply the same amount of labour: for $k \neq l$, it might be that $\ell_k^e \neq \ell_l^e$.

After substituting constraint (2) into the objective function (1), we obtain the following first-order conditions on $\bar{t}$ and ℓ_l^e:

$$\begin{aligned} &\left(\frac{\sum_k w_k \ell_k^e}{n} - w_i \ell_i^e\right)\left[w_i \ell_i^e - h(\ell_i^e) + \bar{t}\left(\frac{\sum_k w_k \ell_k^e}{n} - w_i \ell_i^e\right)\right]^{-\rho} \\ &+ \sum_{j \neq i}\left\{\left(\frac{\sum_k w_k \ell_k^e}{n} - w_j \ell_j^e\right)\left[w_j \ell_j^e - h(\ell_j^e) + \bar{t}\left(\frac{\sum_k w_k \ell_k^e}{n} - w_j \ell_j^e\right)\right]^{-\rho}\right\} = 0, \end{aligned} \tag{3}$$

and

$$\begin{aligned} &\left[(1-\bar{t})w_l + \bar{t}\frac{w_l}{n} - h'(\ell_l^e)\right]\left[w_l \ell_l^e - h(\ell_l^e) + \bar{t}\left(\frac{\sum_k w_k \ell_k^e}{n} - w_i \bar{\ell}_i\right)\right]^{-\rho} \\ &+ \sum_{j \neq i}\left\{\bar{t}\frac{w_l}{n}\left[w_j \ell_j^e - h(\ell_j^e) + \bar{t}\left(\frac{\sum_k w_k \ell_k^e}{n} - w_j \ell_j^e\right)\right]^{-\rho}\right\} = 0 \qquad l = 1, \cdots, n \end{aligned} \tag{4}$$

Equation (3) characterizes the tax rate perceived as ethical, while (4) characterizes the choice of labour supplies for all taxpayers $l = 1, \cdots, n$ that are viewed as ethical. To further simplify notation, we define *income net of the disutility of labour* as $\theta_i \equiv w_i \ell_i^e - h(\ell_i^e)$ (the utility in consumption units that household i would get from earning the income associated with the ethical labour supply ℓ_i^e) and *average ethical income* as $\bar{y} \equiv \sum_k w_k \ell_k^e / n$. Using these, we can rewrite (3) and (4) as follows:

$$\sum_j \left\{[\bar{y} - w_j \ell_j^e][\theta_j + \bar{t}(\bar{y} - w_j \ell_j^e)]^{-\rho}\right\} = 0, \tag{5}$$

and

$$[(1-\bar{t})w_l + \bar{t}\frac{w_l}{n} - h'(\ell_l^e)][\theta_l + \bar{t}(\bar{y} - w_l \ell_l^e)]^{-\rho} + \sum_{j \neq l}\left\{\bar{t}\frac{w_l}{n}[\theta_j + \bar{t}(\bar{y} - w_j \ell_j^e)]^{-\rho}\right\} = 0 \qquad l = 1, \cdots, n \tag{6}$$

from which $\bar{t}$ and all ℓ_l^e can be solved as a function of the relevant parameters.

Given the definition of $\bar{t}$, we can define the ethical tax liability of i, denoted $\bar{T}_i$, as the amount of tax she pays under $\bar{t}$ when all individuals behave ethically: $\bar{T}_i = \bar{t} w_i \ell_i^e - \bar{t}\bar{y}$. Note that $\bar{T}_i$ is

[12] If individuals were to put a weight $\beta^i < 1$ onto others, each would then possibly face a different problem and ℓ_l^i would possibly differ for $i = 1, ..., n$.

increasing in the wage rate w_i. In our analysis below where the government's policy is purely redistributive, $\bar{T}_i < 0$ for the lowest-wage households. Note from (6) that if all individuals have the same utility levels, then the ethical labour supply $\ell_i^e = \bar{\ell}_i$, the undistorted labour supply. Note also that in an economy with two wage levels, the ethical tax rate — the solution to (5) — equalizes utilities among all households regardless of their wage rate.[13] This result that utilities are equalized in our model regardless of the value of ρ is a useful one that simplifies our exposition and analysis considerably. Because the tax system has two instruments and there are two type of agents, the appropriate tax rate and demogrant can replicate the lump-sum tax system. Consequently, it is the evident that the undistorted labour supply maximizes social welfare.

On the other hand, in an economy with more than two wage levels, the ethical tax rate does not generally equalize utilities among all households. With a linear progressive income tax, there are not enough instruments to replicate a lump-sum tax system, and utility will increase with the wage rate in the second-best ethical optimum. In this case, labour supply can be used to compensate for the lack of instruments in the tax system. For example, the ethical labour supply for the lowest-wage taxpayer, say, $i = 1$, is characterized by $\ell_1^e = (1 - \bar{t})w_1 + \bar{t}w_1/n - h'(\ell_1^e) + \bar{t}w_1(n-1)/n > 0$, which is less than the undistorted labour supply. In contrast, the highest-wage taxpayer is expected to provide more than the undistorted labour supply. This trade-off might seem surprising at first sight since utility functions are separable between consumption and leisure, but recall that applying the social welfare function undoes such separability. Finally, since reducing the labour supply below the undistorted one is used solely to increase the utility of lower-wage taxpayers, all taxpayers are still expected to provide a labour supply which is equal or higher to the egotistical case, since reducing it further would only reduce utility.

We can now state explicitly our behavioural assumptions on the choice of labour supply of taxpayer i when she faces tax schedule (t, e). We assume that she behaves ethically under (t, e) and supplies ℓ_i^e if her net tax liability when she supplies ℓ_i^e does not exceed $\bar{T}_i$, that is, if $tw_i\ell_i^e - e \leq \bar{T}_i$. If her net tax liability when she supplies ℓ_i^e is larger than $\bar{T}_i$, that is, if $tw_i\ell_i^e - e > \bar{T}_i$, she adopts one of two possible behaviours: partial or full egoism depending on which one leads to higher labour supply. Under partial egoism, she adjusts her labour supply to the level that ensures that she pays exactly her ethical net tax liability $\bar{T}_i$. In that case, she supplies $\ell_i^\star(t, e)$ such that $tw_i\ell_i^\star - e = \bar{T}_i$. Clearly, it must be that $\ell_i^\star(t, e) < \ell_i^e$, and as t diverges from $\bar{t}$, $\ell_i^\star(t, e)$ also diverges from ℓ_i^e. The taxpayer turns to full egoism when it is not possible

[13] This should be contrasted with the famous Mirrlees (1974) result that under utilitarianism (of which the above can be interpreted, as we have mentioned), high-wage households will be worse off than low-wage ones under first-best lump-sum transfers. This difference can be accounted for by the fact that with quasi-linear preferences, leisure is not a normal good, which is required for the Mirrlees result.

for her to select $\ell_i^\star(t,e)$ such that she pays exactly $\bar{T}_i$ while satisfying $\ell_i^\star(t,e) > \underline{\ell}_i(t)$. In this case, taxpayer i simply chooses $\underline{\ell}_i(t)$. The behaviour of taxpayer i is summarized as follows:[14]

$$\ell_i = \begin{cases} \ell_i^e & \text{if } \; tw_i\ell_i^e - e \leq \bar{T}_i \\ \ell_i^\star(t,e) = (\bar{T}_i + e)/tw_i & \text{if } \; tw_i\ell_i^e - e > \bar{T}_i \;\text{ and }\; \ell_i^\star(t,e) > \underline{\ell}_i(t) \\ \underline{\ell}_i(t) & \text{if } \; tw_i\ell_i^e - e > \bar{T}_i \;\text{ and }\; \ell_i^\star(t,e) \leq \underline{\ell}_i(t) \end{cases} \tag{7}$$

Note that the net tax liability of taxpayer i is exactly $\bar{T}_i$ when she supplies ℓ_i^e or $\ell_i^\star(t,e)$, and that it differs from $\bar{T}_i$ when she supplies her fully egoistic labour supply $\underline{\ell}_i(t)$. This analysis applies whether $\bar{T}_i \gtrless 0$. That is, for a transfer recipient for whom $\bar{T}_i < 0$, ethical labour supply $\bar{\ell}_i$ will be supplied whenever $tw_i\bar{\ell}_i - e \leq \bar{T}_i$, so that the transfer is larger in absolute terms than that regarded as ethical. For the transfer recipient, *reductions* in t will ultimately result a move from ℓ_i^e to $\ell_i^\star(t,e)$ and then to $\underline{\ell}_i$, whereas for a taxpayer the opposite is the case.

3. The case with only two types of individuals

We consider a simplified world in which there are only two types of taxpayers. Most of the qualitatively interesting results apply in this case. In this case, the first best is attainable in the ethical optimum, so the ethical labour supply is simply the undistorted one. With more that two type of agents, because the tax system is not flexible enough only a second best would be possible and this complicates the analysis slightly. However, the dynamics of how this second best is attainable are the same as in the two-type case. We assume n_1 taxpayers with wage rate w_1, and n_2 with wage rate w_2, where $w_2 > w_1$. Total population is still $n = n_1 + n_2$.

As mentioned, all taxpayers have the same optimal-ethical tax rate $\bar{t} = \bar{t}_1 = \bar{t}_2 > 0$, since all have the same objective function in (1). And, since utilities are equalized for the two types, we know by (6) that $\ell_i^e = \bar{\ell}_i$. Given these, we immediately obtain from (5):

$$\bar{t} = \frac{\theta_2 - \theta_1}{w_2\bar{\ell}_2 - w_1\bar{\ell}_1} = 1 - \frac{h(\bar{\ell}_2) - h(\bar{\ell}_1)}{w_2\bar{\ell}_2 - w_1\bar{\ell}_1} \tag{8}$$

where recall that $\theta_i \equiv w_i\bar{\ell}_i - h(\bar{\ell}_i)$ is income net of the disutility of labour under ethical behaviour. Since $\bar{t} > 0$, this implies that $\theta_2 > \theta_1$. Thus, while all taxpayers have the same utility under $\bar{t}$, their incomes net of the disutility of labour differ: high-wage individuals earn more since they are more productive.

[14] An alternative, and perhaps stronger, form of ethical behaviour would have the taxpayer increase her labour supply *above* the ethical level ℓ_i^e if her tax liability is less than $\bar{T}_i$. The approach we adopt where individuals only deviate from ethical behaviour when their tax liabilities are too high mirrors the ethical assumption adopted by Bordignon (1993) and Bilodeau and Gravel (2004) in a voluntary contribution to public good setting. We return to the motivation for our choice of ethical assumptions in the concluding section.

Let $\tilde{t}_i$ be the tax rate at which a taxpayer i chooses to become fully egoistic given that taxpayer j behaves ethically, that is, such that $\underline{\ell}_i(\tilde{t}_i) = \ell_i^\star(\tilde{t}_i, e)$ given j supplies $\bar{\ell}_j$. Then, taxpayer i's choice of labour supply depends on the level of the prevailing tax rate t relative to the optimal-ethical tax rate $\bar{t}$ and to $\tilde{t}_i$, as well as on whether her net tax liability is positive (net contributor) or negative (net recipient). In our analysis with only two types, a taxpayer with a high wage w_2 is a net contributor to the government budget while a taxpayer with a low wage w_1 is a net recipient of government resources as long as $t > 0$. Given that, the following lemma is apparent:

Lemma 1: *The key tax rates are ordered as follows:* $\tilde{t}_1 < \bar{t} < \tilde{t}_2$.

In the context of the current model, we define a Behavioural equilibrium as follows.

Definition: *For a given* t*, a* Behavioural equilibrium *is a pair of labour supplies* (ℓ_1, ℓ_2) *which simultaneously satisfy (7).*

Thus, a Behavioural equilibrium is the analog of a Nash equilibrium except for the fact that the players, instead of maximizing an objective function, follow the behavioural rule given in (7).

Using Lemma 1, we can readily characterize the Behavioural equilibrium choices of labour supply by the two types of taxpayer for various levels of the tax rate t. Note that in characterizing equilibrium behaviour, we take account of the fact that the government budget constraint is satisfied so that the demogrant e equals average tax revenue. Then, in what follows, we abuse notation innocuously by suppressing e from the $\ell_i^\star(\cdot)$ function and simply writing $\ell_i^\star(t)$ for the partially egoistic labour supply given the prevailing tax rate t and the associated transfer.

Proposition 1: *Given Lemma 1, there exists a Behavioural equilibrium associated with each tax rate* t *in which labour supplies* (ℓ_1, ℓ_2) *are as follows:*

$$
\begin{array}{lll}
\{\underline{\ell}_1(t), \bar{\ell}_2\} & \text{for} & t \leq \tilde{t}_1; \\
\{\ell_1^\star(t), \bar{\ell}_2\} & \text{for} & \tilde{t}_1 < t < \bar{t}, \quad \text{where } \ell_1^\star(t) = [\bar{t}/t]\bar{\ell}_1 - [(\bar{t}-t)/t][w_2\bar{\ell}_2/w_1]; \\
\{\bar{\ell}_1, \bar{\ell}_2\} & \text{for} & t = \bar{t}; \\
\{\bar{\ell}_1, \ell_2^\star(t)\} & \text{for} & \bar{t} < t < \tilde{t}_2, \quad \text{where } \ell_2^\star(t) = [\bar{t}/t]\bar{\ell}_2 - [(\bar{t}-t)/t][w_1\bar{\ell}_1/w_2]; \\
\{\bar{\ell}_1, \underline{\ell}_2(t)\} & \text{for} & \tilde{t}_2 \leq t.
\end{array}
\tag{9}
$$

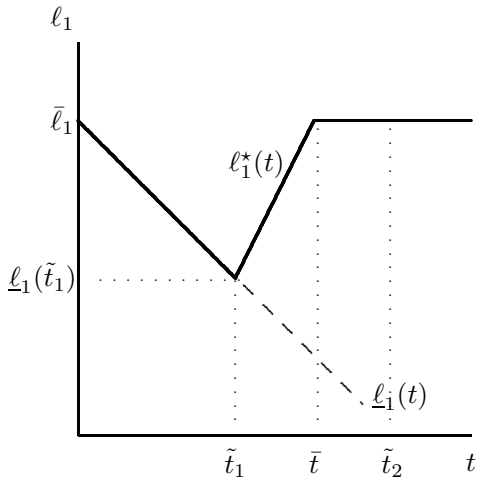

Figure 1a
Choice of Taxpayer 1

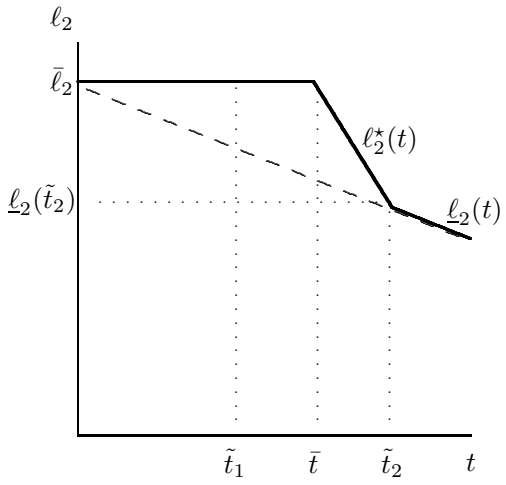

Figure 1b
Choice of Taxpayer 2

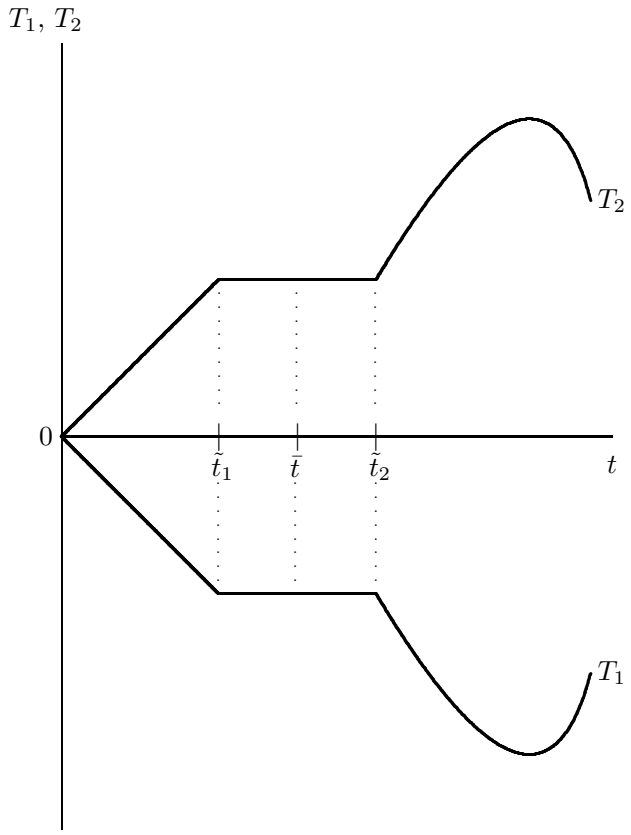

Figure 1c
Net Tax Liabilities for Taxpayers 1 and 2

In words, because a taxpayer with a high wage w_2 is a net contributor, she behaves ethically for all tax rates t below $\bar{t}$. As the tax rate t increases above $\bar{t}$, she becomes egoistic, at first partially so as to maintain constant her net tax liability, and then fully for $t \geq \tilde{t}_2$ to prevent it from growing too fast as in the standard model.[15] Conversely, a taxpayer with a low wage w_1 is a net recipient of government resources. She behaves ethically as long as she receives enough from the government, that is, as long as the prevailing tax rate is above $\bar{t}$ and can finance what she views as a reasonable net transfer. When the tax rate t decreases below $\bar{t}$, she initially becomes partially egoistic, ensuring that she still obtains a constant net transfer from the government (a constant negative net tax liability). Then, for all tax rates t below $\tilde{t}_1$, she behaves fully egoistically. We depict the equilibrium pairs of labour supply in Figure 1a and 1b, and the corresponding equilibrium net tax liabilities in Figure 1c.

In Figures 1a and 1b, the solid lines represent the labour supplies for the two types of households under ethical behaviour, while the dashed lines represent the standard egoistic labour supplies. Because there are no income effects, the egoistic labour supplies are always decreasing. The striking difference between the two cases is that under ethical behaviour, labour supplies display some stickiness. Moreover, labour supplies for the low-wage (transfer-receiving) household are not even weakly monotonic in the tax rate: for a range of tax rates, they are actually increasing.[16]

In Figure 1c, we have depicted net tax liabilities for the case where there are an equal number of taxpayers of each type.[17] In that case, the net tax liability of a taxpayer of type 2 is the inverted image of that of a taxpayer of type 1. Note that whatever the number of taxpayers, the curves always exhibit a flat portion between $\tilde{t}_1$ and $\tilde{t}_2$. Also note that T_2 (T_1) is necessarily increasing (decreasing) at the left of $\tilde{t}_1$ and at the right of $\tilde{t}_2$.

This Behavioural equilibrium generates private indirect utility functions (which can be found in the proof of Proposition 1 in the Appendix). These private indirect utility function will be used later when we investigate voting behaviour. For now, we can use them to compare utility levels achieved under our assumed ethical behaviour and under egoistic preferences. Figures 2a and

[15] Note that despite individuals of type 2 becoming fully egoistic, we have that at $t = \tilde{t}_2$, their tax liability increases. Eventually, for some $t > \tilde{t}_2$, the top of the Laffer curve will be reached and their tax liability will decline.

[16] Note that it is possible to ascertain the impact of a change in wages — or any other exogenous parameter — on the shape of the labour supplies in Figures 1a and 1b. Consider, for example, an increase in w_2. Such a change leads to an increase in $\bar{t}$ and $\tilde{t}_1$ but it has an ambiguous impact on $\tilde{t}_2$. Thus, in Figure 1a, the first downward solid segment goes further down. From there, the solid line goes up and reaches the flat segment corresponding to unchanged $\bar{\ell}_1$ at a higher level of tax $\bar{t}$, and it remains flat for larger tax rates. In Figure 1b, $\bar{\ell}_2$ increases so the first flat solid segment shifts up and remains flat for a longer distance as $\bar{t}$ also increases. From $\bar{t}$, all we can say is that the solid line goes down, and that it may or may not cross with the initial solid line.

[17] The number of taxpayers affects the relative height of the curves, but not their shape.

2b represent the equilibrium levels of utility under ethical behaviour (the solid line) and egoistic preferences (the dashed line).

To understand these figures better, we need to know how utility changes when the tax rate changes under both regimes. Begin with the benchmark of egoistic utilities, which is the simplest case. Denote the level of utility achieved by individual i when all individuals in the economy act egoistically as follows:

$$v_i^S(t) = (1-t)w_i\underline{\ell}_i(t) + \frac{t[n_1w_1\underline{\ell}_1(t) + n_2w_2\underline{\ell}_2(t)]}{n} - h(\underline{\ell}_i(t))$$

Applying the envelope theorem to $v_i^S(t)$, we obtain:

$$\frac{\partial v_i^S(t)}{\partial t} = -w_i\underline{\ell}_i(t) + \frac{n_1w_1\underline{\ell}_1(t) + n_2w_2\underline{\ell}_2(t)}{n} + \frac{t}{n}\left[n_1w_1\frac{\partial\underline{\ell}_1(t)}{\partial t} + n_2w_2\frac{\partial\underline{\ell}_2(t)}{\partial t}\right].$$

The last two terms represent the impact of a change in the tax rate on total tax revenue, which we assume is positive. That is, we restrict ourselves to the left-hand side of the Laffer curve. It is then easy to show that an increase in t leads to an unambiguous decrease in welfare for type 2's:

$$\frac{\partial v_2^S(t)}{\partial t} = -\frac{n_1}{n}[w_2\underline{\ell}_2(t) - w_1\underline{\ell}_1(t)] + \frac{t}{n}\left[n_1w_1\frac{\partial\underline{\ell}_1(t)}{\partial t} + n_2w_2\frac{\partial\underline{\ell}_2(t)}{\partial t}\right] < 0.$$

On the other hand, welfare of type 1's will be increasing in t if and only if

$$\frac{n_2}{n}[w_2\underline{\ell}_2(t) - w_1\underline{\ell}_1(t)] > -\frac{t}{n}\left[n_1w_1\frac{\partial\underline{\ell}_1(t)}{\partial t} + n_2w_2\frac{\partial\underline{\ell}_2(t)}{\partial t}\right]. \tag{10}$$

For such condition to be satisfied, it must the case that n_2 is sufficiently large and also that $w_2 - w_1$ be sufficiently large compared to t. In the extreme case of an economy with only type 1's, an increase in tax will only be distortionary. Similarly, if w_1 is close to w_2, type-1 individuals do not benefit much from redistribution. Of course, if the welfare of type-1's is also decreasing in t, there is no conflict and both types prefer a lower t. Consequently, we restrict ourselves to cases where the tax rate is small enough so that $\partial v_1^S(t)/\partial t > 0$ and (10) applies.

Consider now the impact of taxes on the welfare of each type of individual in an economy with ethical behaviour. Obviously, when $t = 0$, ethical behaviour or egoistic preferences yield the same results, and we can take that as our starting point. Begin with the type-2's. When $0 < t < \tilde{t}_1$, the welfare of type 2's is decreasing with the tax rate, because their labour supply is unchanged, while type 1's reduce their labour supply. In this range, type 2's get lower utility compared to the case of egoistic preferences. In the range of tax rates such that $\tilde{t}_1 < t < \bar{t}$, type-2's choose $\bar{\ell}_2$, while labour supply for type-1's increases as t goes up, so they always receive a net total transfer of $\bar{T}_1$. With two wage-types, this implies that a type-2 individual pays the same net total taxes in this range, as shown in Figure 1c. Given that labour supply stays constant, her

welfare does not change as t goes up. At $\bar{t}$, all individuals are better off under ethical behaviour, so there exist a point between $\tilde{t}_1$ and $\bar{t}$ where the welfare of type-2's is identical under ethical behaviour and egoistic preferences. Then, for all tax rates between $\bar{t}$ and $\tilde{t}_2$, type-2's pay the same net total taxes, so the variation in welfare is given by

$$\frac{\partial v_2(t)}{\partial t} = [w_2 - h'(\ell_2^\star(t))]\frac{\partial \ell_2^\star(t)}{\partial t} < 0.$$

Finally, $v_2(t)$ is decreasing in $t > \tilde{t}_2$ since type 2's pay more tax and work less. Note that for all tax rates above $\bar{t}$, type-2's are better off under ethical behaviour, since type-1's provide more effort than their egoistic level. Figure 2b depicts clearly all these effects.

Figure 2a illustrates the equilibrium levels of utility for type-1's as t changes. As mentioned earlier, under egoistic preferences, the utility of these individuals is monotonically increasing with the tax rate (until maximal tax revenues are reached). Things are different under ethical behaviour. For tax rates less than $\tilde{t}_1$, the impact of a change in tax rate on utility is given by

$$\frac{\partial v_1(t)}{\partial t} = \frac{n_2}{n}[w_2\underline{\ell}_2(t) - w_1\underline{\ell}_1(t)] + \frac{t}{n}\left[n_1 w_1 \frac{\partial \underline{\ell}_1(t)}{\partial t}\right].$$

Thus, given our assumption above that $v_1^S(t)$ is increasing in t, so is $v_1(t)$ by (10). Of more interest, utility is also increasing in the range of taxes between $\tilde{t}_1$ and $\bar{t}$. In this range, type-2's increase their labour supply so that their tax payment, and therefore the transfer received by type-1's net of tax is constant. This implies that the change in welfare for type-1's is given by:

$$\frac{\partial v_1(t)}{\partial t} = [w_1 - h'(\ell_1^\star(t))]\frac{\partial \ell_1^\star(t)}{\partial t} > 0.$$

Intuitively, a type-1 individual receives the same transfer, but works more (and gets paid more) as taxes increases over that range. Since labour supply is less than $\bar{\ell}_1$, type-1's end up better off by working more. Note that for every tax rate $t \leq \bar{t}$, type-1's obtain a higher level of utility under ethical preference because type-2's provide the efficient labour supply $\bar{\ell}_2$. Then, when the tax rate is higher than $\bar{t}$, but less than $\tilde{t}_2$, the utility level of type-1's is constant. They receive the same net transfer, because the type 2's pay the same net taxes, and they provide the same labour supply $\bar{\ell}_1$. Finally, for tax rates above $\tilde{t}_2$,

$$\frac{\partial v_1(t)}{\partial t} = \frac{n_2}{n}[w_2\underline{\ell}_2(t) - w_1\bar{\ell}_1] + \frac{t}{n}\left[n_2 w_2 \frac{\partial \underline{\ell}_2(t)}{\partial t}\right],$$

which may be increasing (Case A) or decreasing (Case B) in t at $\tilde{t}_2$. The reason is as follows. First, notice that the derivative of $v_1(t)$ with respect to tax rate contains the term $[w_2\underline{\ell}_2(t) - w_1\bar{\ell}_1]$, while the same derivative for the egoistic preferences contains the term $[w_2\underline{\ell}_2(t) - w_1\underline{\ell}_1(t)]$ instead. Consequently, it is possible for the derivative of $v_1(t)$ with respect to tax rate to be negative while its counterpart for the egoistic preferences is positive. Intuitively, under ethical behaviour, type

1's provide higher labour supply for higher tax rates, so the loss of income due to an increase in tax rate is higher. Since at $\tilde{t}_2$, the utility of a type-1 individual is higher under egoistic preference,[18] there exists a point between $\bar{t}$ and $\tilde{t}_2$ where both types of preference yield the same level of utility.

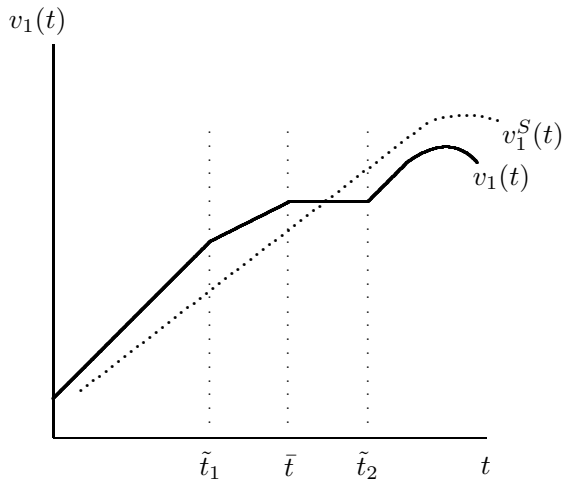

Figure 2a, Case A
Utility of Taxpayer 1

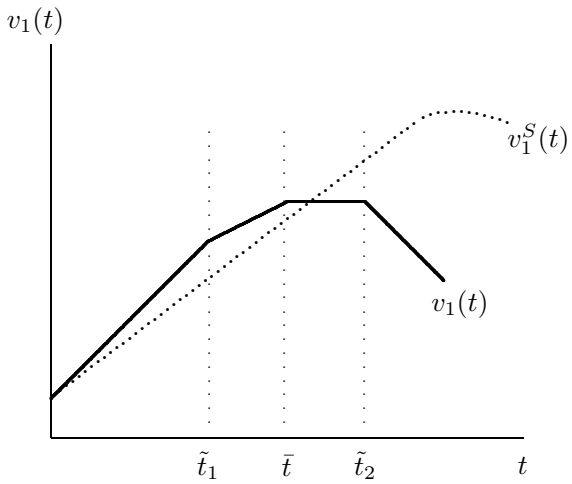

Figure 2a, Case B
Utility of Taxpayer 1

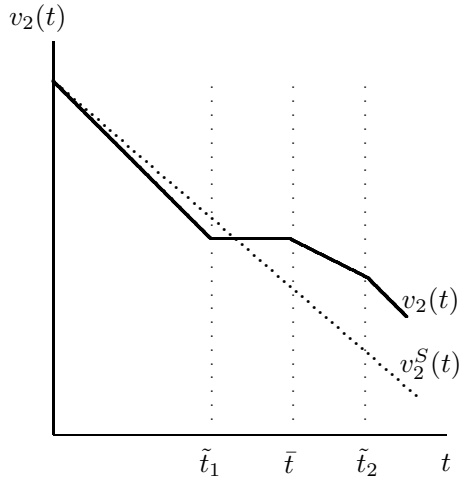

Figure 2b
Welfare of Taxpayer 2

[18] This is because behaving egoistically is a best response to the egoistic behaviour of others. Thus, supplying $\underline{\ell}_1$ is by definition the best response to $\underline{\ell}_2$, and it must yield a higher level of utility.

An interesting feature of the ethical preference environment is that a tax rate of $\bar{t}$ Pareto dominates any other tax rate between $\tilde{t}_1$ and $\tilde{t}_2$.

4. Voting

In this section, we investigate and compare the voting outcome when households vote ethically or egoistically. Thus, a critical assumption is what preferences are used when voting. Generally, anticipating the Behavioural equilibrium in labour supplies and the associated private utilities, it is possible to identify the most-preferred tax rate of a voter of wage-type 1 as the solution to the following problem:

$$\max_t \; v_1(t) + \beta[(n_1 - 1)v_1(t) + n_2 v_2(t)]$$

where β is the ethical weight put onto others in society. The corresponding problem for a voter of wage-type 2 is:

$$\max_t \; v_2(t) + \beta[n_1 v_1(t) + (n_2 - 1)v_2(t)]$$

We use the term 'ethical voting' to describe the situation in which households vote in accordance with the ethical social welfare benchmark given in equation (1), i.e. with $\beta = 1$. In such a case, the voting outcome would be trivial: the most-preferred outcome for all households would be $\bar{t}$. This would correspond with the optimal tax system under ethical behaviour as well.

However, individuals might put a weight $\beta < 1$ onto others when voting. As we have seen in Figure 2, household private utilities are not necessarily maximized for either household at the ethical tax rate $\bar{t}$. Low-wage households might be better off for tax rates $t \geq \tilde{t}_2$, while high-wage households would be better off for $t \leq \tilde{t}_1$. Consequently, the tax policy which maximizes one's utility will often conflict with the ethical tax policy.

Because avoidance activities are at least partially observable, social stigma and/or associated repercussions may be the underlying force of conformity with ethical behaviour. However, the secret ballot, which is widely used in democratic societies, makes it difficult for voting behaviour to be influenced by such considerations. For this reason, we consider the case in which households vote at least in part according to their self-interest, even though once the tax rate is set, they may behave ethically. Of course, their voting behaviour will take into account the fact that the equilibrium tax rate may deviate from the ethically preferred one and may result in them behaving partially or fully egoistically.

We first consider the extreme case in which $\beta = 0$, which we label "fully egoistic voting", and then turn to the case where voting is "partially ethical" ($0 < \beta < 1$). When $\beta = 0$, and since low-wage households will tend to prefer higher tax rates than high-wage households, there

will be a conflict between them that will be resolved by whichever type is in the majority. As we shall see, private preferences of both types will be single-peaked in the tax rate under reasonable assumptions, so the median voter's most-preferred outcome will constitute a voting equilibrium. In fact, we need not even rely on single-peaked preferences to obtain a median-voter equilibrium. As Gans and Smart (1996) show, there will be a Condorcet winner in voting over linear progressive tax schedules as long as household preferences satisfy a single-crossing property in consumption-income space, which holds in our problem. We assume in what follows that $n_1 > n_2$, so that the median voter is low-wage. This implies that we need only investigate the voting preferences of type-1 households. The case with $n_2 > n_1$ is far less interesting since the utility of the individuals of type 2 is decreasing with the tax rate, implying that their most preferred tax rate is simply zero.

Thus, under egoistic voting, type-1 voters prefer a tax rate that weakly exceeds the ethical tax rate $\bar{t}$. However, their preferred tax rate may either exceed or fall below $\tilde{t}_2$. To distinguish these cases, we denote type-1's preferred tax rate as t_1^A when it exceeds $\tilde{t}_2$: thus, $t_1^A \in [\tilde{t}_2, 1[$. Similarly, t_1^B denotes type 1's preferred tax rate when it is less that $\tilde{t}_2$, so $t_1^B \in [\bar{t}, \tilde{t}_2]$. Consider the optimal tax rates for each of these cases in turn.

For tax rates above $\tilde{t}_2$, individuals of type 2 are behaving egoistically, while those of type 1 supply the ethical amount of labour. Utility for a type 1 for any tax rate above $\tilde{t}_2$ can be written:

$$v_1(t) = (1-t)w_1\bar{\ell}_1 + e(t) - h(\bar{\ell}_1) = (1-t)w_1\bar{\ell}_1 + t\left[\alpha_1 w_1\bar{\ell}_1 + \alpha_2 w_2\underline{\ell}_2(t)\right] - h(\bar{\ell}_1),$$

where $\alpha_i = n_i/n$ is the share of type i's in the economy. The first and second derivatives of $v_1(t)$ are:

$$v_1'(t) = -w_1\bar{\ell}_1 + \left[\alpha_1 w_1\bar{\ell}_1 + \alpha_2 w_2\underline{\ell}_2(t)\right] + t\alpha_2 w_2\frac{\partial\underline{\ell}_2(t)}{\partial t}, \quad v_1''(t) = 2\alpha_2 w_2\frac{\partial\underline{\ell}_2(t)}{\partial t} + t\frac{\partial^2\underline{\ell}_2(t)}{\partial t^2}.$$

Since $\partial\underline{\ell}_2(t)/\partial t < 0$, $v_1''(t) < 0$ if $\partial^2\underline{\ell}_2(t)/\partial t^2 < 0$, which is not guaranteed. Nonetheless, it is not unreasonable to suppose that $v_1''(t) < 0$, in which case preferences are single-peaked. However, as mentioned above, this condition is not necessary to ensure that a Condorcet winner exists. If type 1's preferred tax rate is above $\tilde{t}_2$, it will satisfy the first-order condition $v'(t_1^A) = 0$, or:

$$-(1-\alpha_1)w_1\bar{\ell}_1 + \alpha_2 w_2\underline{\ell}_2(t_1^A) + t_1^A\alpha_2 w_2\frac{\partial\underline{\ell}_2(t_1^A)}{\partial t_1^A} = 0. \tag{11}$$

Consider now tax rates below $\tilde{t}_2$, i.e. $t \in [\bar{t}, \tilde{t}_2]$. Let $T_i(t) = tw_i\ell_i(t) - (t/n)[n_1w_1\ell_1(t) + n_2w_2\ell_2(t)]$ be the net tax liability of an individual of type i. Using this notation, the government budget constraint can be written as $n_1T_1(t) + n_2T_2(t) = 0$. Now, from Figure 1c we know that for $t \in [\bar{t}, \tilde{t}_2]$, all individuals of type 2 supply $\ell_2^\star(t)$ so that their net tax liability remains constant:

$\partial T_2(t)/\partial t = 0$. This and the government budget constraint implies that the net tax liability of the type 1 individuals also remains constant: $\partial T_1(t)/\partial t = 0$. Consider now the problem of an individual of type 1 having to chose a tax rate $t \in [\bar{t}, \tilde{t}_2]$:

$$\max_t \quad w_1\bar{\ell}_1 - T_1(t) - h(\bar{\ell}_1).$$

Clearly, the objective function of this problem is flat and there is no preferred tax rate by individuals of type 1 in that range.

Whether type 1's preferred tax rate lies above or below $\tilde{t}_2$ depends on the parameters of the problem. In Figure 2a, Case A, since $v_1(t)$ is increasing in t at $\tilde{t}_2$, individuals of type 1 are better off at a tax rate t_1^A above $\tilde{t}_2$ characterized by (11). On the contrary, in Figure 2a, Case B, $v_1(t)$ is decreasing in t at $\tilde{t}_2$ so that any tax rate $t_1^B \in [\bar{t}, \tilde{t}_2]$ dominates tax rates that larger than $\tilde{t}_2$. Algebraically, $v_1(t_1^A) > v_1(t_1^B)$ if:

$$(1-t_1^A)w_1\bar{\ell}_1 + t_1^A[\alpha_1 w_1\bar{\ell}_1 + \alpha_2 w_2\underline{\ell}_2(t_1^A)] > (1-t_1^B)w_1\bar{\ell}_1 + t_1^B[\alpha_1 w_1\bar{\ell}_1 + \alpha_2 w_2\ell_2^\star(t_1^B)],$$

or

$$w_2\left[t_1^A\underline{\ell}_2(t_1^A) - t_1^B\ell_2^\star(t_1^B)\right] > (t_1^A - t_1^B)w_1\bar{\ell}_1.$$

The left-hand side is the extra revenue collected from the individuals of type 2 from imposing the higher tax t_1^A rather than t_1^B. The right-hand side is the loss in welfare to the individuals of type 1 from their higher tax liabilities. Thus, if individuals of type 1 can extract high enough additional revenue to compensate for their own higher tax liabilities, they will prefer to do so, as is the case in Figure 2a, Case A.

Next, let us compare the preferred tax rate of a type 1 voting egoistically when behaviour can potentially be ethical (as given by equation (7)) with that under pure egoistic behaviour. The former, characterized above, is t_1^A or t_1^B, while the latter, denoted t_1^E, is the tax rate that maximizes $v_1(t) = (1-t)w_1\underline{\ell}_1(t) + e(t) - h(\underline{\ell}_1(t))$, where $e(t) = t[\alpha_1 w_1\underline{\ell}_1(t) + \alpha_2 w_2\underline{\ell}_2(t)]$. The preferred tax rate t_1^E satisfies the first order-condition:

$$-w_1\underline{\ell}_1(t_1^E) + \alpha_1 w_1\underline{\ell}_1 + \alpha_2 w_2\underline{\ell}_2 + t_1^E\left[\alpha_1 w_1\frac{\partial\underline{\ell}_1}{\partial t} + \alpha_2 w_2\frac{\partial\underline{\ell}_2}{\partial t}\right] = 0,$$

or

$$n_2\left[w_2\underline{\ell}_2(t_1^E) - w_1\underline{\ell}_1(t_1^E)\right] + t_1^E\left[n_1 w_1\frac{\partial\underline{\ell}_1}{\partial t} + n_2 w_2\frac{\partial\underline{\ell}_2}{\partial t}\right] = 0.$$

When behaviour can potentially be ethical, assuming t_1^A applies, the first-order condition can be written:

$$n_2\left[w_2\underline{\ell}_2(t_1^A) - w_1\bar{\ell}_1\right] + t_1^A n_2 w_2\frac{\partial\underline{\ell}_2}{\partial t} = 0.$$

To determine whether $t_1^A \gtrless t_1^E$, we can evaluate the first-order condition for t_1^A at t_1^E:

$$n_2 \left[w_2 \underline{\ell}_2(t_1^E) - w_1 \bar{\ell}_1 \right] + t_1^E n_2 w_2 \frac{\partial \underline{\ell}_2(t_1^E)}{\partial t} \gtrless 0.$$

The first-order condition for t_1^E can be used to replace the last term in this expression:

$$n_2 \left[w_2 \underline{\ell}_2(t_1^E) - w_1 \bar{\ell}_1 \right] + n_2 \left[w_1 \underline{\ell}_1(t_1^E) - w_2 \underline{\ell}_2(t_1^E) \right] - t_1^E n_2 w_2 \frac{\partial \underline{\ell}_1(t_1^E)}{\partial t} \gtrless 0,$$

or

$$\underline{\ell}(t_1^E) - t_1^E \frac{\partial \underline{\ell}_1(t_1^E)}{\partial t} \gtrless \bar{\ell}_1.$$

Equivalently, this can be written:

$$1 + \frac{t_1^E}{1 - t_1^E} \varepsilon \gtrless \frac{\bar{\ell}_1}{\underline{\ell}_1},$$

where ε is the elasticity of the egoistic labour supply. Thus if $1 + [t_1^E/(1-t)_1^E]\varepsilon > \bar{\ell}_1/\underline{\ell}_1$, then $t_1^A > t_1^E$. In words, if the elasticity of labour supply is high enough, the tax rate chosen under egoistic voting when behaviour is potentially ethical will be higher than that when it is purely egoistic. The intuition is that a higher labour supply elasticity magnifies the deadweight loss associated with pure egoistic behaviour.

As an example, consider the case in which individuals all have the same utility function $u(c, \ell) = c - e^{\ell}$, and let $n_1 = n_2$. It can then be shown that $\bar{t}$, which is also t_1^B,[19] is given by:

$$\bar{t} = 1 - \frac{w_2 - w_1}{w_2 \ln(w_2) - w_1 \ln(w_1)}$$

We have seen that t_1^A is the solution to equation (11), which, in the context of the current example, is written as:

$$[w_2 \ln(w_2) - w_1 \ln(w_1)] + w_2 \left[\ln(1 - t_1^A) - \frac{t_1^A}{1 - t_1^A} \right] = 0$$

As for t_1^E, it is the solution to:

$$[w_2 \ln(w_2) - w_1 \ln(w_1)] + [w_2 - w_1] \ln(1 - t_1^E) - [w_1 + w_2] \frac{t_1^E}{1 - t_1^E} = 0$$

It is difficult to compare t_1^B with t_1^A and t_1^E because t_1^A and t_1^E are the solution to an implicit equation. However, for given values of the wages, it is possible to solve numerically for t_1^A and t_1^E. Hence, if $w_1 = 50$ and $w_2 = 200$, we obtain $t_1^A = 0.75$, $t_1^B = \bar{t} = 0.44$, and $t_1^E = 0.72$. Thus, we have that $t_1^A > t_1^E > t_1^B$. Consequently, the tax rate chosen when behaviour may be ethical

[19] Since voters of type 1 are indifferent between any tax rate in $[\bar{t}, \tilde{t}_2]$, we simply assume that they select $t_1^B = \bar{t}$.

is larger than the one chosen when individuals are purely egoistic. This corresponds to Case A in Figure 2a.

To summarize, for the case where the voters of wage-type 1 are the majority, we have seen that for egoistic voting ($\beta = 0$), the voting equilibrium is established at $t_1^A > \bar{t}$ in Case A, or $t_1^B = \bar{t}$ in Case B. As for the case of fully ethical voting ($\beta = 1$), we have seen that the voting equilibrium tax rate is $\bar{t}$. It is then possible to show that for the case of partially ethical voting ($0 < \beta < 1$), the voting equilibrium tax rate must be some $t \in [\bar{t}, t_1^A]$. When the voters of wage-type 2 are the majority, the equilibrium tax rate under egoistic voting is 0 while that under fully ethical voting is $\bar{t}$. In the case of partially ethical voting ($0 < \beta < 1$), the voting equilibrium tax rate must then be some $t \in [0, \bar{t}]$. It follows from this analysis that when voting becomes more egoistic (i.e. when β decreases), voting becomes more polarized and the result of the voting equilibrium is more extreme, i.e. the equilibrium tax rate t is closer to 0 or t_1^A. On the other hand, when voting becomes more ethical (i.e. when β increases), voting becomes less polarized and the result of the voting equilibrium is more consensual, the equilibrium tax rate t converging to $\bar{t}$.

5. Altruism

Under ethical behaviour, households are effectively acting against their own personal interests when they choose to supply labour ethically. In contrast to that, preferences might be modeled so that behaving socially is in one's own interest. There are different ways of doing this. One way, common in the literature on voluntary contributions to public goods, is to suppose there is a 'warm glow' associated with giving, that is, that there is utility of giving *per se*, as in Andreoni (1995a). The analogue in the context of intergenerational transfers is that households obtain a utility from their bequests, as in, say, Atkinson (1971).

Alternatively, households might be motivated by altruism, that is, by the benefits accruing to others in society as a result of their social contributions. This is a common approach in the literatures on redistribution and bequests, the former going back to Hochman and Rodgers (1969) and the latter to Barro (1974). In this section we consider the case where altruism influences labour supply. This provides a useful contrast with ethical behaviour because whereas those behaving ethically must make a sacrifice in their own utility to behave in a way that helps others, under altruism that is not the case: giving is in their own self-interest. The two cases turn out to lead to different predictions about behaviour.

As before, we denote by t the marginal tax rate, and by e the lump-sum transfer. Each individual i's personal welfare measured in terms of consumption is again given by $(1-t)w_i\ell_i + e - h(\ell_i)$. However, self-interested individuals no longer maximize this personal utility, but maximize utility

including an altruistic component. In particular, the labour supply of a type-i household satisfies:

$$\max_{\ell_i} \frac{[(1-t)w_i\ell_i + e - h(\ell_i)]^{1-\rho}}{1-\rho} + \beta_i \sum_{j\neq i} \frac{[(1-t)w_j\ell_j + e - h(\ell_j)]^{1-\rho}}{1-\rho}, \tag{12}$$

where β_i is the degree of altruism of the household i. It will turn out to be important whether or not households see through the government budget constraint when making their choices. Obviously, if they do not see through the government budget constraint, which is given by $t\sum_i w_i\ell_i = ne$, they will choose the egoistic labour supply $\underline{\ell}_i$, characterized by the solution to $w_i(1-t) = h'(\underline{\ell}_i)$. There is nothing surprising here: even if households care about the well-being of others, they do not realize that changing their labour supply affects that well-being, so they act as purely egoistic households.

Suppose, however, that altruistic households do see through the government budget constraint. This makes for a more meaningful comparison with the ethical preference outcomes, although it is important to recognize that such an assumption is more substantive than is needed for the ethical preference scenario. Each household solves problem (12) subject to the government budget constraint. The first-order condition for agent i is given by:

$$w_i(1-t) - h'(\ell_i) = -\frac{t}{n}w_i\left\{1 + \beta_i \sum_{j\neq i}\left[\frac{(1-t)w_i\ell_i + e - h(\ell_i)}{(1-t)w_j\ell_j + e - h(\ell_j)}\right]^{\rho}\right\}.$$

If this type-i household does not care about other households ($\beta_i = 0$), the labour supply decision would be done accordingly to the first order condition $w_i(1-t) - h'(\ell_i) = -tw_i/n$, which implies that $\ell_i > \underline{\ell}_i$. Households equalize the marginal cost of effort to their after-tax wage, but also take in consideration the fact that part of the tax they pay will be returned to them as a lump-sum transfer. When the population size becomes large, $\ell_i = \underline{\ell}_i$, because a household's tax contribution does not perceptibly affect the transfer she receives.

Let us focus on the case in which $\beta_i = 1$, a case which resembles that with ethical behaviour studied above. Notice that if the tax system were such that all households obtained the same utility, the first-order condition would become:

$$w_i(1-t) - h'(\ell_i) = -\frac{tw_i[1 + (n-1)]}{n}$$

which implies that $w_i = h'(\ell_i)$, and that $\ell_i = \bar{\ell}_i$. Therefore, as long as we end up with full equalization of utilities, households will choose to behave as if the tax were lump-sum. When there are two wage types ($i = 1, 2$), this actually corresponds to the case where $t = \bar{t}$ under an ethical utility function. With more that two types of agents, it is not generally possible to equalize all utilities levels with a linear progressive tax system. As in the ethical behaviour case, we concentrate here on the case where there are only two types of households.

Recall that n_1 is the number of agents with wage w_1, and n_2 is the number of agents with wage w_2, where $w_2 > w_1$. Since all households of a given type will have the same utility, the first-order conditions for each of the two types in equilibrium are given by:

$$w_1(1-t) - h'(\ell_1) = -\frac{t}{n} w_1 \left\{ 1 + n_2 + (n_1 - 1) \left[\frac{(1-t)w_1\ell_1 + e - h(\ell_1)}{(1-t)w_2\ell_2 + e - h(\ell_2)} \right]^{\rho} \right\},$$

$$w_2(1-t) - h'(\ell_2) = -\frac{t}{n} w_2 \left\{ 1 + n_1 + (n_2 - 1) \left[\frac{(1-t)w_2\ell_2 + e - h(\ell_2)}{(1-t)w_1\ell_1 + e - h(\ell_1)} \right]^{\rho} \right\}$$

Recall also that if both agents choose $\bar{\ell}_i$, and the tax is set such that $t = \bar{t}$, then both utility levels are equalized. From the first-order condition, we can see that if the tax rate is set at $\bar{t}$, both agents will in fact choose $\bar{\ell}_i$. At $\bar{t}$ both pure altruism and our assumed ethical behaviour yield the same result that both households act as if the tax were lump-sum: neither exploits the tax distortion for their own egoistic advantage.

Suppose now that the tax rate differs from $\bar{t}$. To simplify the notation, let ψ be defined as follows:

$$\psi = \left[\frac{(1-t)w_1\ell_1 + e - h(\ell_1)}{(1-t)w_2\ell_2 + e - h(\ell_2)} \right]^{\rho}$$

Using this, the first-order conditions in equilibrium become:

$$w_1(1-t) - h'(\ell_1) = -\frac{t}{n} w_1 [1 + (n_1 - 1) + (n_2)\psi],$$

$$w_2(1-t) - h'(\ell_2) = -\frac{t}{n} w_2 \left[1 + (n_2 - 1) + (n_1)\frac{1}{\psi} \right].$$

When the tax rate is lower than $\bar{t}$, the type-1 households have a lower level of utility than type-2's, so $\psi < 1$. For such a tax rate,

$$w_1(1-t) - h'(\ell_1) = -\frac{t w_1 [n_1 + n_2\psi]}{n} > -\frac{t w_1 [n_1 + n_2]}{n}$$

so type 1 households labour supply is less than $\bar{\ell}_1$. On the other hand, the first-order condition for individuals of type 2 reveals that:

$$w_2(1-t) - h'(\ell_2) = -\frac{t}{n} w_2 \left[1 + (n_2 - 1) + (n_1)\frac{1}{\psi} \right] < -\frac{t}{n} w_2 [n_1 + n_2]$$

so individuals of type 2 supply more than $\bar{\ell}_2$. With altruistic preference, there are no limits to how much households will compensate for the imperfection in the tax system. The same analysis can be undertaken for tax rates above $\bar{t}$. Figure 3a and 3b show the labour supplies for the two types under altruistic and egoistic preferences.

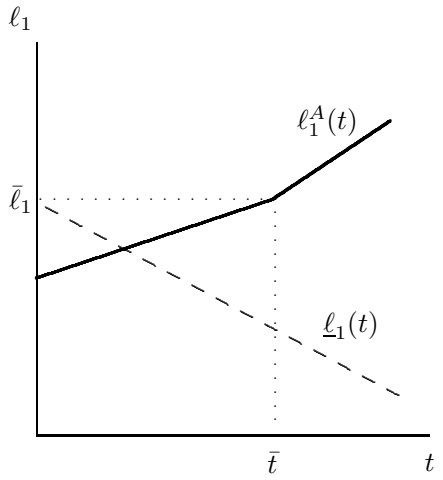

Figure 3a
Choice of Taxpayer 1

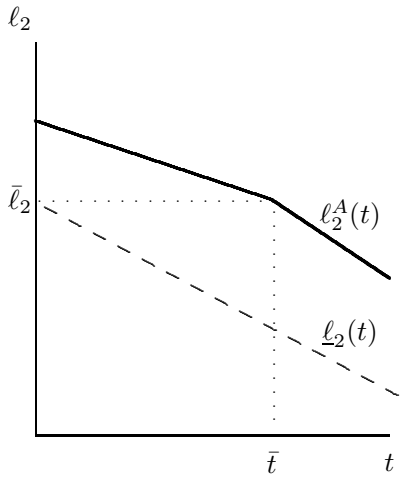

Figure 3b
Choice of Taxpayer 2

The contrast with respect to both egoistic and ethical labour supplies are striking, especially for the low-wage households. For low-wage altruistic households, labour supplies are monotonically *increasing* in the tax rate, the mirror image of the egoistic case. For the high-wage types, the labour supply is decreasing in t, but is everywhere higher under altruistic preferences than under egoistic ones. Labour supplies in the ethical case are intermediate to the other two, and are characterized by inelastic ranges that are unique to the ethical case.

In the case of ethical behaviour, taxpayers chose their labour supply such that it conflicted with their own preferences. Consequently, it made sense to assume that voters in such an environment could vote according to their egoistic utility functions (egoistic voting), but anticipating their potentially ethical choice of labour supply. For the case of altruistic preferences, it would not make much sense to use an egoistic utility function as the basis for voting decisions, since the welfare of others enters directly in the actual utility function of the agent. If agents use their full utility function, including the altruistic part when they vote, the voting becomes trivial as all agents choose $\bar{t}$ as their most preferred tax rate.

6. Conclusion

As we showed in the last section, the pattern of labour supply choices are very different when we compare the more standard altruistic model with our proposed ethical behaviour. A main reason for such differences come from the asymmetry we introduced in our behavioural assumptions. When individuals are asked to pay more in taxes than they believed to be ethical, they respond by avoiding taxes to prevent their tax liabilities from exceeding their ethical ones. However, when they are asked to pay less that what they believe to be ethical, they do not provide more

than the ethical labour supply to redistribute to others, which is what they do in the altruistic case. We are not alone in making this kind of asymmetric assumption. In Bordignon (1990), agents choose between evading taxes or not, and tax evasion only occurs if taxes are viewed as being unfairly high. There is no attempt to pay more taxes when liabilities are viewed as being lower than fair levels. One can say that the illegal aspect of tax evasion makes the ethics of tax evasion different than that of tax avoidance, which is our concern. However, Bilodeau and Gravel (2004) make that same type of asymmetric assumption in dealing with voluntary contributions to public goods. Take their example of littering on the beach, which was also used in Laffont (1975). Beach-goers face a prisoner dilemma in which trash reduces utility, but to dispose of it is costly. With ethical behaviour comparable to the one used in this paper, no littering can be sustained.

Among the potential extensions to this paper, the most natural one would be to consider more than two types of individuals. Having only two types of agents guarantees that even without personalized taxes, utilities can be equalized for the two types of agents because the tax system has enough instruments. With more than two types, it would generally be impossible to do so. Nevertheless, this would not change our results significatively provided individuals acknowledge the limits of that tax system when assessing their ethical tax burden. All individuals in the economy would agree on the ethical tax rate $\bar{t}$, which would not necessarily lead to the full equalization of utility, but that would still maximize the same social welfare function. The rest of individual's choices would be done in the same fashion.

Another natural extension, although conceptually more difficult, would be to introduce a public good, say g, in the economy so that taxation (t, e) would finance both redistribution and public good provision. Interestingly, it would be possible to compare the marginal cost of public funds under egoistic preferences to that under ethical behaviour. Our first intuition is that since labour supplies are less elastic under ethical behaviour, it is likely that the marginal cost of public funds would be lower in that case. However, we have not been able to confirm that intuition because the generalization of the assumed ethical behaviour of an individual facing policies (t, e, g) is not a straightforward task. For example, how should individual k with ethical views $(t^e_k, e^e_k, g^e_k, \ell^e_{k,1}, ..., \ell^e_{k,n})$ behave when faced with (t, e, g) such that his actual net tax liability is less than his ethical tax liability $(tw_k\ell^e_{k,k} - e < t^e_k w_k \ell^e_{k,k} - e^e_k)$ and when actual public good provision is less than his ethical public good provision $(g < g^e_k)$? It is necessary to answer this and other difficult questions before we can extend the model to deal with the case in which a government has several possible uses for the same dollar.

Finally, another interesting extension, also conceptually difficult, would be to introduce heterogeneity among agents in terms of ethics. This would amount to finding out whether there can be more that one ethical tax rate. An easy way to do so would be to assume that when assessing

their ethical tax rate $\bar{t}$, each individual maximizes a social welfare function that puts a weight $\beta < 1$ on others. As a consequence, different individuals would have different $\bar{t}$. This would considerably reduce the likelihood that the first-best outcome can be reached in equilibrium. Intuitively, if the poor believe they are entitled to more than what the rich view as fair to pay, they will choose to avoid more. This will in turn put pressure on the rich's tax burden, and will induce them to avoid more. This approach implies that multiple visions of what ethical behaviour is or should be may coexist in the same society.

Finally, an ambitious extension, which applies to the entire Kantian preference literature, would be to derive the behaviour described in this paper as originating from a more primitive and/or axiomatic framework. The goal would be to identify the class of preferences from which ethical behaviour can potentially emerge, and that from which only standard egoistic behaviour is possible.

Appendix

Proof of Lemma 1: The partially ethical labour supply is $\ell_i^\star(t,e) = (\bar{t}w_i\bar{\ell}_i - \bar{t}\bar{y} + e)/tw_i$. The cutoff tax rate $\tilde{t}_i$ is defined as the point where $\ell_i^\star(\tilde{t}_i, e) = \underline{\ell}_i(\tilde{t}_i)$. If we replace e by its equilibrium value, we get that $\tilde{t}_i$ is given by

$$\tilde{t}_i \left[w_i \underline{\ell}_i(\tilde{t}_i) - \frac{n_i w_i \underline{\ell}_i(\tilde{t}_i) + n_j w_j \ell_j(\tilde{t}_i)}{n} \right] = \bar{t} \left[w_i \bar{\ell}_i - \frac{n_i w_i \bar{\ell}_i + n_j w_j \bar{\ell}_j}{n} \right],$$

where $\ell_j(\tilde{t}_i) = \bar{\ell}_j$ (by definition of $\tilde{t}_i$). The equation describing $\tilde{t}_i$ can be re-written as:

$$\tilde{t}_i[w_i \underline{\ell}_i(\tilde{t}_i) - w_j \bar{\ell}_j] = \bar{t}[w_i \bar{\ell}_i - w_j \bar{\ell}_j].$$

Consider the first the determination of $\tilde{t}_1$. From the last equation, $\tilde{t}_1$ is given by

$$\tilde{t}_1 = \bar{t} \left[\frac{w_2 \bar{\ell}_2 - w_1 \bar{\ell}_1}{w_2 \bar{\ell}_2 - w_1 \underline{\ell}_1(\tilde{t}_1)} \right].$$

That $\tilde{t}_1 < \bar{t}$ follows from the fact that $w_1 \bar{\ell}_1 > w_1 \underline{\ell}_1(\tilde{t}_1)$ which in turn implies that $w_2 \bar{\ell}_2 - w_1 \bar{\ell}_1 < w_2 \bar{\ell}_2 - w_1 \underline{\ell}_1(\tilde{t}_1)$.

An analogous condition exists for $\tilde{t}_2$ which implies that $\tilde{t}_2 > \bar{t}$. ∎

Proof of Proposition 1: We solve for the Behavioural equilibrium labour supplies for all possible tax rates. Consider first the case of $t = \bar{t}$. The net tax payment for both types when they supply $\bar{\ell}_i$ is given by $\bar{t}w_i\bar{\ell}_i - (\bar{t}/n)[n_1 w_1 \bar{\ell}_1 + n_2 w_2 \bar{\ell}_2]$. Recall from equation (5) that all agents facing such tax liabilities provide $\bar{\ell}_i$.

Consider now the effect of reducing t on the equilibrium labour supplies, starting from $\bar{t}$. The tax liability of an individual of type 2 when she chooses $\bar{\ell}_2$ is given by $t(n_1/n)[w_2\bar{\ell}_2 - w_1\ell_1(t)]$. Consequently, a decrease in the tax rate reduces her tax liability. This implies that for all tax rate below $\bar{t}$, individuals of type 2 continue to provide $\bar{\ell}_2$. This in turn implies that for all $t \in [\tilde{t}_1, \bar{t}]$, an individual of type 1 chooses her labour supply as follows:

$$\ell_1^\star(t) = \left[\frac{\bar{t}}{t} \right] \bar{\ell}_1 - \left[\frac{\bar{t} - t}{t} \right] \frac{w_2 \bar{\ell}_2}{w_1}.$$

When the tax t reaches $\tilde{t}_1$, then $\ell_1^\star(\tilde{t}_1) = \underline{\ell}_1(\tilde{t}_1)$ and so, for all tax rates lower than $\tilde{t}_1$, individuals of type 1 supply $\underline{\ell}_1(t)$.

For tax rates above $\bar{t}$, it is now individuals of type 1 who supply labour ethically, $\bar{\ell}_1$ in their case. Too see this, note that the net benefit of these individuals, i.e. $t(n_2/n)[w_2\ell_2(t) - w_1\bar{\ell}_1]$, is non-decreasing in the tax rate t unless:

$$\frac{\partial \ell_2(t)}{\partial t} > -\frac{[w_2\ell_2(t) - w_1\bar{\ell}_1]}{tw_2}.$$

In other words, the net benefit of the type 1 is non-decreasing in t provided the type 2 individuals are not too reactive. Assuming this, individuals of type 1 provide $\bar{\ell}_1$ for all tax rates above $\tilde{t}_1$. For all $t \in [\bar{t}, \tilde{t}_2]$, individuals of type 2 supply labour such that:

$$\ell_2^\star(t) = \left[\frac{\bar{t}}{t}\right]\bar{\ell}_2 - \left[\frac{\bar{t}-t}{t}\right]\frac{w_1\bar{\ell}_1}{w_2}.$$

When t reaches $\tilde{t}_2$, then $\ell_2^\star(\tilde{t}_2) = \underline{\ell}_2(\tilde{t}_2)$. For all tax rates above $\tilde{t}_2$, individuals of type 2 supply $\underline{\ell}_2(t)$. Given behaviour of the two types of taxpayers in the Behavioural equilibrium and their net tax liabilities, it is possible to write their indirect utility in terms of consumption as a function of the prevailing tax rate t, denoted $v_i(t)$. We have:

$$v_1(t) = \begin{cases} (1-t)w_1\underline{\ell}_1(t) + (t/n)[n_1w_1\underline{\ell}_1(t) + n_2w_2\bar{\ell}_2] - h(\underline{\ell}_1(t)) & \text{if } t \leq \tilde{t}_1 \\ (1-t)w_1\ell_1^\star(t) + (t/n)[n_1w_1\ell_1^\star(t) + n_2w_2\bar{\ell}_2] - h(\ell_1^\star(t)) & \text{if } \tilde{t}_1 < t < \bar{t} \\ (1-\bar{t})w_1\bar{\ell}_1 + (\bar{t}/n)[n_1w_1\bar{\ell}_1 + n_2w_2\bar{\ell}_2] - h(\bar{\ell}_1) & \text{if } t = \bar{t} \\ (1-t)w_1\bar{\ell}_1 + (t/n)[n_1w_1\bar{\ell}_1 + n_2w_2\ell_2^\star(t)] - h(\bar{\ell}_1) & \text{if } \bar{t} < t < \tilde{t}_2 \\ (1-t)w_1\bar{\ell}_1 + (t/n)[n_1w_1\bar{\ell}_1 + n_2w_2\underline{\ell}_2(t)] - h(\bar{\ell}_1) & \text{if } \tilde{t}_2 \leq t \end{cases}$$

$$v_2(t) = \begin{cases} (1-t)w_2\bar{\ell}_2 + (t/n)[n_1w_1\underline{\ell}_1(t) + n_2w_2\bar{\ell}_2] - h(\bar{\ell}_2) & \text{if } t \leq \tilde{t}_1 \\ (1-t)w_2\bar{\ell}_2 + (t/n)[n_1w_1\ell_1^\star(t) + n_2w_2\bar{\ell}_2] - h(\bar{\ell}_2) & \text{if } \tilde{t}_1 < t < \bar{t} \\ (1-\bar{t})w_2\bar{\ell}_2 + (\bar{t}/n)[n_1w_1\bar{\ell}_1 + n_2w_2\bar{\ell}_2] - h(\bar{\ell}_2) & \text{if } t = \bar{t} \\ (1-t)w_2\ell_2^\star(t) + (t/n)[n_1w_1\bar{\ell}_1 + n_2w_2\ell_2^\star(t)] - h(\ell_2^\star(t)) & \text{if } \bar{t} < t < \tilde{t}_2 \\ (1-t)w_2\underline{\ell}_2(t) + (t/n)[n_1w_1\bar{\ell}_1 + n_2w_2\underline{\ell}_2(t)] - h(\underline{\ell}_2(t)) & \text{if } \tilde{t}_2 \leq t \end{cases}$$

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References

Andreoni, J. (1995a), "Warm-Glow versus Cold-Prickle: The Effects of Positive and Negative Framing on Cooperation in Experiments," *Quarterly Journal of Economics* **110**, 1–21.

Andreoni, J. (1995b), "Cooperation in Public Goods Experiments: Kindness or Confusion?" *American Economic Review* **85**, 891–904

Andreoni, J. (1998), "Toward a Theory of Charitable Fundraising," *Journal of Political Economy* **106**, 1186–1213.

Andreoni, J., B. Erard and J. Feinstein (1998), "Tax Compliance," *Journal of Economic Literature* **36**, 818–860.

Arrufat, J.L. and A. Zabalza (1986), "Female Labor Supply with Taxation, Random Preferences, and Optimization Errors," *Econometrica* **54**, 47–63.

Atkinson, A.B. (1971), "Capital Taxes, the Redistribution of Wealth and Individual Savings," *Review of Economic Studies* **38**, 209–228.

Barro, R.J. (1974), "Are Government Bonds Net Wealth?" *Journal of Political Economy* **82**, 1095–1117.

Bernheim, B.D. and K. Bagwell (1988), "Is Everything Neutral?" *Journal of Political Economy* **96**, 308–338.

Besley, T. and S. Coate (1992), "Understanding Welfare Stigma: Taxpayer Resentment and Statistical Discrimination", *Journal of Public Economics* **48**, 165–183.

Bilodeau, M. and A. Slivinski (1997), "Rival Charities," *Journal of Public Economics* **66**, 449–467.

Bilodeau, M. and N. Gravel (2004), "Voluntary Provision of Public Good and Individual Morality," *Journal of Public Economics* **88**, 645–666.

Blackorby, C., W. Bossert, and D. Donaldson (2005), "Population Issues in Social Choice Theory, Welfare Economics, and Ethics" *Econometric Society Monographs* **#39**, Cambridge University Press.

Blinder, A.S. and D.H. Choi (1990), "A Shred of Evidence on Theories of Wage Stickiness" *The Quarterly Journal of Economics* **105**, 1003–1015.

Blundell, R. (1992), "Labor Supply and Taxation: A Survey," *Fiscal Studies* **13**, 15–40.

Bordignon, M. (1990), "Was Kant Right? Voluntary Provision of Public Goods under the Principle of Unconditional Commitment," *Economic Notes* **3**, 342–372.

Bordignon, M. (1993), "A Fairness Approach to Income Tax Evasion," *Journal of Public Economics* **52**, 345–362.

Camerer, C., and R.H. Thaler (1995), "Ultimatums, Dictators, and Manners," *Journal of Economic Perspectives* **9**, 209–219.

Cervellati, M., J. Esteban, and L. Kranich (2004), "Redistributive Taxation with Endogenous Sentiments", mimeo, Universitat Autonoma de Barcelona.

Erard, B. and J.S Feinstein (1994), "The Role of Moral Sentiments and Audit Perceptions in Tax Compliance," *Public Finance* **49**, 70–89.

Fehr, E. and S. Gächter (2000), "Fairness and Retaliation: The Economics of Reciprocity," *Journal of Economic Perspectives* **14**, 159–181.

Fong, C. (2001), "Social Preferences, Self-Interest and the Demand for Redistribution", *Journal of Public Economics* **82**, 225–246.

Gans, J.S. and M. Smart (1996), "Majority Voting with Single-Crossing Preferences," *Journal of Public Economics* **59**, 219–237.

Glaeser, E.L., G.A.M. Ponzetto and J.M. Shapiro (2004), "Strategic Extremism: Why Republicans and Democrats Divide on Religious Values," HIER Discussion Paper 2044, Harvard University.

Gordon, J.P.F. (1989), "Individual Morality and Reputation Cost as Deterrents to Tax Evasion," *European Economic Review* **33**, 797–805.

Hochman, H.M. and J.D. Rodgers (1969), "Pareto Optimal Redistribution," *American Economic Review* **59**, 542–557.

Kahneman, D., J.L. Knetsch and R. Thaler, (1986), "Fairness as a Constraint on Profit Seeking: Entitlements in the Market," *American Economic Review* **76**, 728–741.

Laffont, J.-J. (1975), "Macroeconomic Constraints, Economic Efficiency and Ethics: An Introduction to Kantian Economics" *Economica* **42**, 430–437.

Lindbeck, A., S. Nyberg and J.W. Weibull (1999), "Social Norms and Economic Incentives in the Welfare State", *Quarterly Journal of Economics* **114**, 1–35.

Lynn, M. and A. Grassman (1990), "Restaurant Tipping: An Examination of Three Rational Explanations," *Journal of Economic Psychology* **11**, 169–181.

Mirrlees, J.A. (1971), "An Exploration in the Theory of Optimum Income Taxation," *Review of Economic Studies* **38**, 175–208.

Mirrlees, J.A. (1974), "Notes on Welfare Economics, Information, and Uncertainty," in M. Balch, D. McFadden and S. Wu, eds., *Essays on Equilibrium Behavior under Uncertainty* (Amsterdam: North-Holland), 243–258.

Musgrave, R. A. (1992), "Social Contract, Taxation and the Standing of Deadweight Loss," *Journal of Public Economics* **49**, 369–381.

Rabin, M. (1998), "Psychology and Economics," *Journal of Economic Literature* **36**, 11–46.

Spicer, M.W. and L.A. Becker (1980), "Fiscal Inequity and Tax Evasion: An Experimental Approach," *National Tax Journal* **33**, 171–175.

Slemrod, J. and S. Yitzhaki (2002), "Tax Avoidance, Evasion, and Administration," in A.J. Auerbach and M.S. Feldstein, eds., *Handbook of Public Economics*, Volume 3 (Amsterdam: North-Holland), Chapter 22, 1423–1470.

Sugden, R. (1984), "Reciprocity: The Supply of Public Goods Through Voluntary Contributions," *Economic Journal* **94**, 772–787.