

# 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 characterise 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

## I. Introduction

It is apparent that in many social and economic situations, individuals do not behave as a selfish *homo oeconomicus* would behave. On the contrary, many studies suggest that individuals exhibit concern for others in their

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behaviour. 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 (1995), who finds that individuals avoid free-riding in public good provision games, 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) and charitable donations discussed by Bilodeau and Slivinski (1997) or Andreoni (1998). Fong (2001) reports evidence from surveys that people do indeed care about non-related individuals in society. We also observe concerns about fairness and reciprocity in the determination of prices or wages, as in Blinder and Choi (1990). 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. Kahneman, Knetsch and Thaler (1986) find that consumers who regard a monopoly price as unfair may refuse to buy a product even if buying it would benefit them.

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. 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.<sup>1</sup> There are various potential explanations for this. Erard and Feinstein (1994) have suggested that it is the shame of getting caught. Others, like Gordon (1989), argue that tax evasion is influenced by a social norm, whereby individuals experience a psychic cost of tax evasion which depends on the level of tax evasion in the general population. Bordignon (1993) turns to fairness and ethical considerations as a way to endogenise the norm. Following an approach similar to Laffont (1975), he develops a model in which individuals display what he calls Kantian preferences. It involves a two-step

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<sup>1</sup> 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.

process. First, individuals determine what would be a fair amount of taxes to pay to finance public goods based on their income relative to the average and what they think the average person should pay. 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.<sup>2</sup> There is some evidence to support such behaviour. Spicer and Becker (1980) use an experimental approach to show that individuals who feel they are victims of fiscal inequality evade taxes more.

The intent of this paper is to extend the notion of ethical behaviour to the case of tax avoidance. 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 on the amount of redistribution to be financed by labour income taxes. Ethical preferences and behaviour have been used as an argument for conditioning individual decisions influencing the provision of a 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 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. 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.<sup>3</sup> Nonetheless, since we observe non-selfish behaviour in other social and economic situations where legal sanctions are not required for enforcement, one might also expect non-selfish tax-paying behaviour given that paying taxes has explicit social consequences.

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<sup>2</sup> Bordonon builds on an earlier paper of his in which he uses a similar procedure to justify the absence of free-riding in public good contributions; see Bordonon (1990). More recently, Bilodeau and Gravel (2004) generalised 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.

<sup>3</sup> 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. While legal sanctions are not imposed on those providing a low level of labour supply, it is quite possible for society to stigmatise those who work less, thereby making that choice less attractive. On such social norms and sanctions, see Besley and Coate (1992), Lindbeck, Nyberg and Weibull (1999) or, more related to our analysis, Cervellati, Esteban and Kranich (2004).

The approach we use bears some formal similarity to Bordignon (1993), 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 concerned with using taxes for redistribution rather than for public goods. Finally, we suppose that households use a social welfare function to calculate their fair tax burdens. As in Bordignon, ethical behaviour enters into individuals' decisions in a two-step 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-maximising problem for the economy as a whole, which yields both an ethical tax system and a set of ethical labour supplies for all households.

As in Bordignon (1990) and Bilodeau and Gravel (2004), this procedure fits nicely with the Kantian principle (or Golden Rule): “Do unto others as you would have them do unto you”. Bilodeau and Gravel highlight two important conditions for an ethical rule to be consistent with this Kantian principle. The first is the principle of anonymity, which is satisfied by the social welfare function that we choose. The second is that the rule must yield the most preferred outcome to all individuals, when all individuals follow that rule. For example, in a simple, contributing or not, symmetric, public good game, “all contributing” or “none contributing” are two rules that satisfy anonymity, but only “all individuals contributing” satisfies 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. To simplify matters, we assume that the tax system is a linear progressive income tax. With this two-parameter tax system, this first-best ethical outcome will occur if individuals are of two wage types, and we take advantage of that simplification in what follows.

To emphasise 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 fewer 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 than what they believe to be fair. The equivalent applies for low-wage agents when tax rates are high. In the many studies on labour supply elasticity, it is typically found that those elasticities are relatively small or even close to zero, the traditional argument being that income and substitution effects cancel each other out.<sup>4</sup> In our paper, we abstract from income effect. Low elasticities will come instead from fairness considerations. Overall, our model generates labour supplies that are higher and less responsive to the after-tax wage rate than those a model with purely selfish individuals would generate, especially for extreme tax rates, either high or low.

Once we have described individual behaviour, we can consider the effect of the tax rate on equilibrium outcomes. 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 individuals may behave ethically given the tax system, they might reasonably vote at least partly according to self-interest. We analyse 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. 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.

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<sup>4</sup> For a discussion of different studies on labour elasticity and taxation, see Blundell (1992). More closely related to taxes, Arrufat and Zabalza (1986) pointed out the relatively low concentration of income at tax kinks, suggesting that agents are not very responsive to taxes.

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. Under such an assumption, 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 inadequate.

## II. The Model

There are  $n$  taxpayers whose common preferences are represented by a quasi-linear additive utility function  $u(c, \ell) = c - h(\ell)$ , where  $c$  is consumption,  $\ell$  is labour, and  $h'(\ell) > 0$  and  $h''(\ell) > 0$ . Taxpayers are indexed by  $i \in \{1, \dots, n\}$  and differ only in their wage rate  $w_i$ . A taxpayer of type  $i$  working  $\ell$  hours earns an income  $w_i \ell$  which is taxed by a linear income tax 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  $u = (1 - t)w_i \ell + e - h(\ell)$ .

We assume that when a taxpayer faces tax liabilities that correspond to what she views as fair, she behaves *ethically*. She 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.

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

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

Thus,  $\underline{\ell}_i(t)$  solves the first-order condition  $(1 - t)w_i = h'(\underline{\ell}_i)$ , where  $\underline{\ell}'_i(t) = -w_i/h''(\underline{\ell}_i) < 0$ . This implies that  $\underline{\ell}_i(t)$  increases with the wage rate:  $\underline{\ell}_i(t) > \underline{\ell}_j(t)$  for  $w_i > w_j$ .

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

$$\bar{\ell}_i = \arg \max_{\ell} w_i \ell - h(\ell). \quad (2)$$

An ethical taxpayer ignores the tax schedule  $(t, e)$  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 ethical, and let  $\bar{\ell}_l^i$  be  $i$ 's view of the ethical behaviour for taxpayers  $l = 1, \dots, n$ . These are computed by  $i$  as the solution to a social welfare-maximising problem in which  $i$ : (i) uses an additive social welfare function with constant aversion to inequality  $\rho$ , (ii) puts the same weight on all other individuals' well-being as on her own, and (iii) sees through the government budget constraint by recognising that the average tax liability equals the demogrant. Taxpayer  $i$ 's ethical tax rate  $\bar{t}_i$  and ethical labour supplies  $\bar{\ell}_l^i, l = 1, \dots, n$ , solve the following problem:<sup>5</sup>

$$\max_{t, \bar{\ell}_1^i, \dots, \bar{\ell}_n^i} \frac{[(1-t)w_i \bar{\ell}_i^i + e - h(\bar{\ell}_i^i)]^{1-\rho}}{1-\rho} + \sum_{j \neq i} \frac{[(1-t)w_j \bar{\ell}_j^i + e - h(\bar{\ell}_j^i)]^{1-\rho}}{1-\rho}, \quad (3)$$

subject to the government budget constraint:

$$e = t \frac{\sum_k w_k \bar{\ell}_k^i}{n}. \quad (4)$$

Note that the social welfare function used here could be interpreted as a utilitarian one in which the term  $[(1-t)w_l \bar{\ell}_l^i + e - h(\bar{\ell}_l^i)]^{1-\rho} / (1-\rho)$  acts as the individual utility function. It is a particular cardinalisation of the household's quasi-linear ordinal preferences. It is immediately apparent that, if all taxpayers have the same ethical preference as we assume, the ethical tax rate  $\bar{t}_i$  and labour supplies  $\bar{\ell}_l^i$  are identical for all individuals  $i = 1, \dots, n$  since they all solve the same problem.<sup>6</sup> For this reason, we simply use the notation  $\bar{t}$  for the ethical tax rate, and  $\bar{\ell}_l^e$  as the ethical labour supply for individual  $l \in \{1, \dots, n\}$  in what follows. Note that even if individuals agree on  $\bar{\ell}_l^e$ , ethical labour supplies generally vary across individuals:  $\bar{\ell}_k^e \neq \bar{\ell}_l^e$ .

<sup>5</sup> This approach is in contrast with Cervellati *et al.* (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 on others, but with an exogenously set level of "acceptable"—we would say ethical—labour supplies.

<sup>6</sup> 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 they put a lower weight, say  $\beta^i < 1$ , on the utility of others than on themselves. If individuals were to put a weight  $\beta^i < 1$  on others, each would then face a different problem and  $\bar{\ell}_l^i$  would typically differ for  $i = 1, \dots, n$ . In order to make our arguments as simple as possible, we concentrate on the fully ethical case, where  $\beta^i = 1$ .

After substituting constraint (4) into the objective function (3), we can write the first-order conditions on  $\bar{t}$  and  $\ell_i^e$  as follows:

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

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

where  $\theta_j \equiv w_j \ell_j^e - h(\ell_j^e)$  is the utility in consumption units that household  $j$  would get from earning the income associated with the ethical labour supply  $\ell_j^e$ , and  $\bar{y} \equiv \sum_k w_k \ell_k^e / n$  is *average ethical income*. Equation (5) characterises the tax rate perceived as ethical, while (6) characterises the choice of labour supplies for all taxpayers  $l = 1, \dots, n$  that are viewed as ethical.

Given  $\bar{t}$ , 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:  $\bar{T}_i = \bar{t}w_i \ell_i^e - \bar{t}\bar{y}$ . Since  $\bar{T}_i$  is increasing in the wage rate  $w_i$ , if the government's policy is purely redistributive,  $\bar{T}_i < 0$  for the lowest-wage households. Note that in an economy with two wage rates, the ethical tax rate—the solution to (5)—equalises utilities for the two types.<sup>7</sup> This result that utilities are equalised in our model regardless of the value of  $\rho$  is a useful one that simplifies our exposition and analysis considerably. Because the tax system has two instruments and there are two types of agents, the appropriate tax rate and demogrant can replicate the lump-sum tax system. Consequently, it is evident that the undistorted labour supply maximises social welfare.

On the other hand, in an economy with more than two wage rates, the ethical tax rate does not generally equalise 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 characterised 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

<sup>7</sup> This contrasts with the well-known Mirrlees (1974) result that under utilitarianism (of which the above can be interpreted), 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.

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 our behavioural assumptions on the choice of labour supply of taxpayer  $i$  facing some tax schedule  $(t, e)$ . We assume that she behaves ethically and supplies  $\ell_i^e$  if her net tax liability when she supplies  $\ell_i^e$  does not exceed  $\bar{T}_i$ , that is, if  $tw_i\ell_i^e - e \leq \bar{T}_i$ . 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  $\ell_i$  so that she pays exactly her ethical net tax liability  $\bar{T}_i$ . In that case, she supplies  $\ell_i^*(t, e)$  such that  $tw_i\ell_i^* - e = \bar{T}_i$ . Clearly,  $\ell_i^*(t, e) < \ell_i^e$ , and as  $t$  diverges from  $\bar{t}$ ,  $\ell_i^*(t, e)$  also diverges from  $\ell_i^e$ . The taxpayer turns to full egoism when it is not possible to select  $\ell_i^*(t, e)$  such that she pays exactly  $\bar{T}_i$  while satisfying  $\ell_i^*(t, e) > \underline{\ell}_i(t)$ .

In this case, taxpayer  $i$  chooses  $\underline{\ell}_i(t)$ . Taxpayer  $i$ 's behaviour is summarised as follows:

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

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

### *The Case with Two Wage Types*

We consider a simplified world with two types of taxpayer:  $n_1$  taxpayers with wage rate  $w_1$ , and  $n_2 = n - n_1$  with wage rate  $w_2$ , where  $w_2 > w_1$ . Most of the qualitatively interesting results apply in this case. As mentioned, the first best is attainable in the ethical optimum, so the ethical labour supply is simply the undistorted one.

Both wage types have the same optimal–ethical tax rate  $\bar{t} = \bar{t}_1 = \bar{t}_2 > 0$ , since all have the same objective function in (3). And, since utilities are equalised for the two types, we know by (6) that  $\ell_i^e = \bar{\ell}_i$ . Given these, we immediately obtain from (5):

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

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: more productive individuals earn more.

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  $\underline{\ell}_i(\tilde{t}_i) = \ell_i^*(\tilde{t}_i, e)$  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  $(\ell_1, \ell_2)$  which simultaneously satisfy (7).*

A behavioural equilibrium is the analogue of a Nash equilibrium except that the players, instead of maximising an objective function, follow the behavioural rule given in (7). Using Lemma 1, we can characterise the behavioural equilibrium choices of  $\ell_1$  and  $\ell_2$  for various levels of  $t$ . In characterising 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, we abuse notation innocuously by suppressing  $e$  from the  $\ell_i^*(\cdot)$  function and simply write  $\ell_i^*(t)$  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  $(\ell_1, \ell_2)$  are as*

follows:

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

In words, taxpayer with wage  $w_2$ , who is a net contributor, behaves ethically for tax rates  $t$  below  $\bar{t}$ . As  $t$  increases above  $\bar{t}$ , she becomes egoistic, at first partially to maintain a constant net tax liability, then fully for  $t \geq \tilde{t}_2$  to prevent it from growing too fast as in the standard model. Despite becoming fully egoistic, the tax liability increases at  $t = \tilde{t}_2$ . Eventually, for some  $t > \tilde{t}_2$ , the top of the Laffer curve is reached and the tax liability declines. Conversely, a taxpayer with a low wage  $w_1$  is a net recipient of government resources. She behaves ethically 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. Then, for all tax rates  $t$  below  $\tilde{t}_1$ , she behaves fully egoistically.

We depict the equilibrium pairs of labour supply in Figures 1a and 1b. The solid lines represent the labour supplies under ethical behaviour, while the dashed lines represent the standard egoistic labour supplies. 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.

In Figure 1c, we depict equilibrium net tax liabilities when there are an equal number of taxpayers of each type. (Differences in  $n_1$  and  $n_2$  affect the relative height of the curves, but not their shape.) 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). Figures 2a and 2b represent the equilibrium levels of utility under ethical behaviour (the solid line) and egoistic preferences (the dashed line). To understand these figures, we need to know how utility changes with  $t$  in both regimes.

Begin with the benchmark of egoistic utilities. Denote the level of utility achieved by a type  $i$  individual when all individuals in the economy act

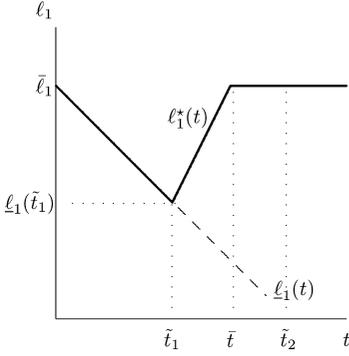


Fig. 1a. Choice of taxpayer 1

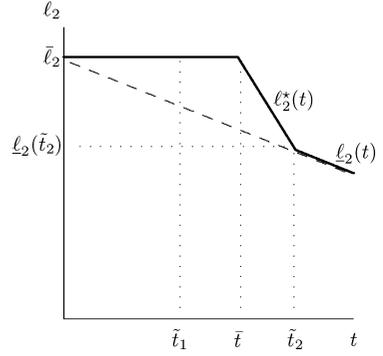


Fig. 1b. Choice of taxpayer 2

egoistically as follows:

$$v_i^S(t) = (1-t)w_i \underline{\ell}_i(t) + t[n_1 w_1 \underline{\ell}_1(t) + n_2 w_2 \underline{\ell}_2(t)]/n - h(\underline{\ell}_i(t)), \quad i = 1, 2. \quad (10)$$

Applying the envelope theorem to  $v_2^S(t)$  and  $v_1^S(t)$ , we obtain:

$$\begin{aligned} v_2^{S'}(t) &= -n_1[w_2 \underline{\ell}_2(t) - w_1 \underline{\ell}_1(t)]/n + t[n_1 w_1 \underline{\ell}'_1(t) + n_2 w_2 \underline{\ell}'_2(t)]/n, \\ v_1^{S'}(t) &= n_2[w_2 \underline{\ell}_2(t) - w_1 \underline{\ell}_1(t)]/n + t[n_1 w_1 \underline{\ell}'_1(t) + n_2 w_2 \underline{\ell}'_2(t)]/n. \end{aligned} \quad (11)$$

Therefore, an increase in  $t$  leads to an unambiguous decrease in welfare for type 2's. On the other hand, welfare of type 1's will be increasing in  $t$  only if  $n_2$  is sufficiently large and  $w_2 - w_1$  is sufficiently large relative to  $t$ . 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  $v_1^{S'}(t) > 0$ .

Consider now the impact of taxes on individuals' welfare in an economy with ethical behaviour. Obviously, when  $t = 0$ , ethical behaviour or egoistic preferences yield the same results. 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  $\tilde{t}_1 < t < \tilde{t}$ , type 2's choose  $\underline{\ell}_2$ , while labour supply for type 1's increases as  $t$  goes up, so they always receive a net total transfer of  $\tilde{T}_1$ . 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  $\tilde{t}$ , all individuals are better off under ethical behaviour, so there exists a point between  $\tilde{t}_1$  and  $\tilde{t}$  where the welfare of type 2's is identical under ethical behaviour and egoistic preferences. Then, for all tax rates between  $\tilde{t}$  and  $\tilde{t}_2$ , type 2's pay

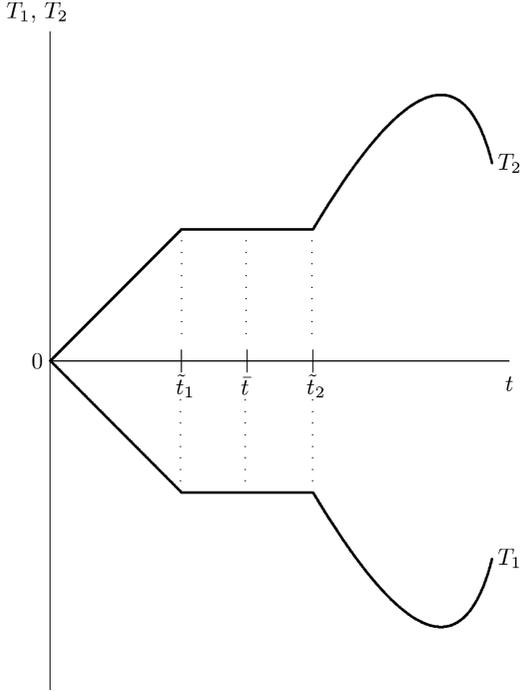


Fig. 1c. Net tax liabilities for taxpayers 1 and 2

the same net total taxes, so the variation in welfare is given by:

$$v'_2(t) = [w_2 - h'(\ell_2^*(t))] \ell_2^{*'}(t) < 0. \quad (12)$$

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 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). Under ethical behaviour, for tax rates less than  $\tilde{t}_1$ , the impact of a change in  $t$  on utility is given by:

$$v'_1(t) = n_2[w_2 \ell_2(t) - w_1 \ell_1(t)]/n + tn_1 w_1 \ell_1'(t)/n. \quad (13)$$

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

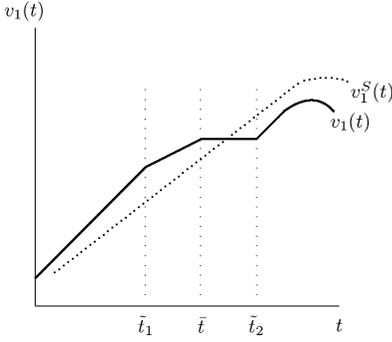


Fig. 2a. Case A: welfare of taxpayer 1

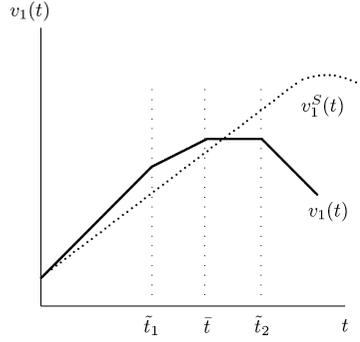


Fig. 2a. Case B: welfare of taxpayer 1

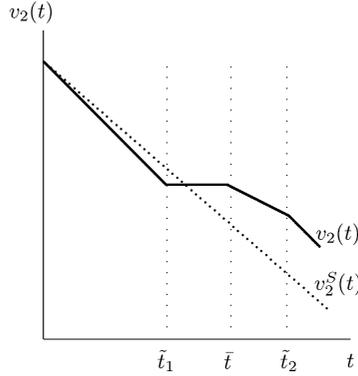


Fig. 2b. Welfare of taxpayer 2

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:

$$v_1'(t) = [w_1 - h'(\ell_1^*(t))] \ell_1^{*'}(t) > 0. \tag{14}$$

Intuitively, a type 1 individual receives the same transfer, but works more (and gets paid more) as taxes increase 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  $\tilde{t}_2$ ,

$$v_1'(t) = n_2[w_2\bar{\ell}_2(t) - w_1\bar{\ell}_1]/n + tn_2w_2\bar{\ell}_2'(t)/n, \quad (15)$$

which may be increasing (Case A) or decreasing (Case B) in  $t$  at  $\tilde{t}_2$ . The reason is as follows. First,  $\partial v_1(t)/\partial t$  contains the term  $[w_2\bar{\ell}_2(t) - w_1\bar{\ell}_1]$ , while the same derivative for the egoistic preferences contains the term  $[w_2\bar{\ell}_2(t) - w_1\bar{\ell}_1(t)]$ . Consequently, it is possible for the derivative of  $v_1(t)$  with respect to the 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 (because behaving egoistically is a best response to the egoistic behaviour of others), there exists a point between  $\bar{t}$  and  $\tilde{t}_2$  where both types of preference yield the same 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  $\tilde{t}_2$ . However, each type may be better off at tax rates outside that range. This is relevant when considering tax rates that may be determined by voting, to which we now turn.

### III. Voting

Suppose majority voting determines  $t$ . A critical assumption is what preferences are used when voting. Generally, the most preferred tax rates of voters of wage types 1 and 2, anticipating the behavioural equilibrium, are the solutions to the following problems:

$$\begin{aligned} \max_t v_1(t) + \beta[(n_1 - 1)v_1(t) + n_2v_2(t)], \\ \max_t v_2(t) + \beta[n_1v_1(t) + (n_2 - 1)v_2(t)], \end{aligned} \quad (16)$$

where  $\beta$  is the ethical weight put on others in society. We refer to the case of  $\beta = 1$ —where households vote in accordance with the social welfare benchmark given in (3)—as ethical voting. In this case, the voting outcome is trivial: the most preferred outcome for all households would be  $\bar{t}$ . On the other hand, individuals who vote egoistically will use  $\beta < 1$ . As Figure 2 indicates, private utilities are not necessarily maximised for either type 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 preferred by egoistic voters will often conflict with the ethical tax policy and will differ for the two types.

Why might individuals vote egoistically if they behave ethically? 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 makes it difficult for voting behaviour to be influenced by such considerations. For this reason, we explore 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. We first consider the fully egoistic voting case in which  $\beta = 0$ , and then discuss briefly the partially ethical case ( $0 < \beta < 1$ ).

With  $\beta = 0$ , 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. 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.

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  $\tilde{t}_2$  and  $t_1^B$  when it is less than  $\tilde{t}_2$ : thus,  $t_1^A \in [\tilde{t}_2, 1[$  and  $t_1^B \in [\bar{t}, \tilde{t}_2]$ . Consider the optimal tax rates for each of these cases in turn.

For  $t > \tilde{t}_2$ , type 2's behave egoistically, while type 1's supply the ethical amount of labour. Utility for a type 1 can be written:

$$\begin{aligned} v_1(t) &= (1-t)w_1\bar{\ell}_1 + e(t) - h(\bar{\ell}_1) \\ &= (1-t)w_1\bar{\ell}_1 + t[\alpha_1w_1\bar{\ell}_1 + \alpha_2w_2\bar{\ell}_2(t)] - h(\bar{\ell}_1), \end{aligned} \quad (17)$$

with  $v_1'(t) = -w_1\bar{\ell}_1 + [\alpha_1w_1\bar{\ell}_1 + \alpha_2w_2\bar{\ell}_2(t)] + t\alpha_2w_2\bar{\ell}_2'(t)$  and  $v_1''(t) = 2\alpha_2w_2\bar{\ell}_2'(t) + t\bar{\ell}_2''(t)$ , where  $\alpha_i = n_i/n$  is the share of type  $i$ 's in the economy. Since  $\bar{\ell}_2'(t) < 0$ , then  $v_1''(t) < 0$  if  $\bar{\ell}_2''(t) < 0$ , which is not guaranteed. Nonetheless, it is reasonable to suppose that  $v_1''(t) < 0$ , in which case preferences are single-peaked.<sup>8</sup> 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:

$$-(1-\alpha_1)w_1\bar{\ell}_1 + \alpha_2w_2\bar{\ell}_2(t_1^A) + t_1^A\alpha_2w_2\bar{\ell}_2'(t_1^A) = 0. \quad (18)$$

Now suppose  $t \in [\bar{t}, \tilde{t}_2]$ . 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  $i$ . The government budget constraint can be written as  $n_1T_1(t) + n_2T_2(t) = 0$ . From Figure 1c we know that for  $t \in [\bar{t}, \tilde{t}_2]$ , all individuals of type 2 supply

<sup>8</sup> In fact, single-peakedness is not necessary for a median-voter equilibrium. As Gans and Smart (1996) show, there will be a Condorcet winner in voting over linear progressive tax schedules if preferences satisfy a single-crossing property in consumption-income space, which holds here.

$\ell_2^*(t)$  so that  $T_2(t)$  remains constant:  $T_2'(t)=0$ . This and the government budget constraint implies that  $T_1(t)$  also remains constant:  $T_1'(t)=0$ . The choice of  $t \in [\bar{t}, \tilde{t}_2]$  by a type 1 person satisfies:

$$\max_t w_1 \bar{\ell}_1 - T_1(t) - h(\bar{\ell}_1). \quad (19)$$

Since  $T_1'(t)=0$ , type 1's are indifferent among tax rates in this region.

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  $\tilde{t}_2$  satisfying (17). 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 larger than  $\tilde{t}_2$ . Using (17),  $v_1(t_1^A) > v_1(t_1^B)$  if  $w_2[t_1^A \underline{\ell}_2(t_1^A) - t_1^B \ell_2^*(t_1^B)] > (t_1^A - t_1^B)w_1 \bar{\ell}_1$ . The LHS 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 RHS is the loss in welfare to the individuals of type 1 from their higher tax liabilities. Thus, if type 1's 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 is ethical (as given by (7)) with that under pure egoistic behaviour. The latter, denoted  $t_1^E$ , is the tax rate that maximises  $v_1(t) = (1-t)w_1 \underline{\ell}_1(t) + e(t) - h(\underline{\ell}_1(t))$ , where  $ne(t) = t[n_1 w_1 \underline{\ell}_1(t) + n_2 w_2 \underline{\ell}_2(t)]$ . The preferred tax rate  $t_1^E$  satisfies the first-order condition:

$$n_2 [w_2 \underline{\ell}_2(t_1^E) - w_1 \underline{\ell}_1(t_1^E)] + t_1^E [n_1 w_1 \underline{\ell}'_1(t_1^E) + n_2 w_2 \underline{\ell}'_2(t_1^E)] = 0. \quad (20)$$

When behaviour is ethical and  $t_1^A$  is the voting outcome, the first-order condition (18) applies. To determine whether  $t_1^A \geq t_1^E$ , we can evaluate the LHS of (18) at  $t_1^E$  to obtain:

$$t_1^A \geq t_1^E \iff n_2 [w_2 \underline{\ell}_2(t_1^E) - w_1 \bar{\ell}_1] + t_1^E n_2 w_2 \underline{\ell}'_2(t_1^E) \geq 0. \quad (21)$$

Combining this with first-order condition (20) for  $t_1^E$  and simplifying, we obtain:

$$t_1^A \geq t_1^E \iff \underline{\ell}(t_1^E) - t_1^E \underline{\ell}'_1(t_1^E) \geq \bar{\ell}_1 \quad \text{or} \quad t_1^A \geq t_1^E \iff 1 + \frac{t_1^E}{1 - t_1^E} \varepsilon \geq \frac{\bar{\ell}_1}{\underline{\ell}_1}, \quad (22)$$

where  $\varepsilon$  is the elasticity of egoistic labour supply. Thus, if the elasticity of labour supply is high enough, the tax rate chosen under egoistic voting when behaviour is ethical will be higher than that when it is purely egoistic, as in Figure 2a, Case A. The intuition is that a higher labour supply elasticity magnifies the deadweight loss associated with pure egoistic behaviour.

To summarise, for the case where the voters of wage type 1 are the majority, 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. With ethical voting ( $\beta = 1$ ), the voting equilibrium tax rate is  $\bar{t}$ . It is then possible to show that with 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 that when voting becomes more egoistic (i.e., when  $\beta$  decreases), voting becomes more polarised and the voting outcome 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  $\beta$  increases), voting becomes less polarised and the result of the voting equilibrium is more consensual, the equilibrium tax rate  $t$  converging to  $\bar{t}$ .

#### IV. Altruism

Under ethical behaviour, individuals effectively act against their own self-interest when they choose to supply labour ethically. In contrast, preferences might be modelled so that behaving socially is in one's own interest. A common approach in the case of redistribution and bequests is to assume that households are motivated by altruism; see Hochman and Rodgers (1969) and Barro (1974). We now consider the case where altruism influences labour supply (variations in which are the only way of satisfying the altruistic urge). With altruistic preferences, individuals will react to changes in other individuals' welfare in a symmetric fashion: if you are better off, I will want to contribute less, and vice versa. The key feature is that my action does not depend on your action *per se*, but on your level of welfare. That you are better off because your wage increased, or because you chose to work less, is unimportant. With ethical preferences, such a distinction is relevant. Once the appropriate overall redistribution target is determined, an agent is not willing to contribute more. However, if an economy-wide parameter changes, the redistribution target may change. This distinction leads to different predictions about behaviour.

Individuals now maximise utility including an altruistic component. In particular, the labour supply of a type  $i$  satisfies:

$$\max_{\ell_i} \frac{[(1-t)w_i\ell_i + e - h(\ell_i)]^{1-\rho}}{1-\rho} + \beta_i \sum_{j \neq i} \frac{[(1-t)w_j\ell_j + e - h(\ell_j)]^{1-\rho}}{1-\rho} \quad \text{s.t. } e = \frac{t}{n} \sum_i w_i \ell_i, \quad (23)$$

where  $\beta_i$  is the degree of altruism of individual  $i$ . This assumes that individuals see through the government budget constraint when making their

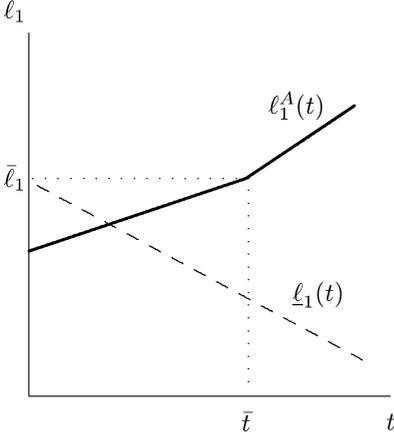


Fig. 3a. Choice of taxpayer 1

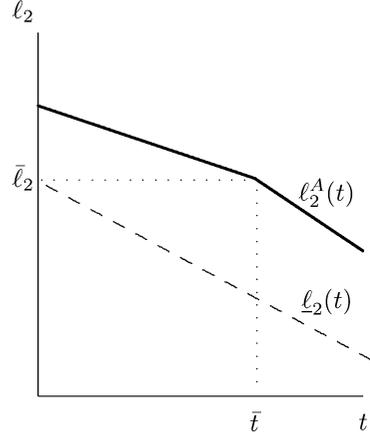


Fig. 3b. Choice of taxpayer 2

choices. If not, they will not realise that changing their labour supply affects others' well-being, so they will behave egoistically. The first-order condition for agent  $i$  is given by:

$$w_i(1-t) - h'(\ell_i) = -\frac{t}{n}w_i \left\{ 1 + \beta_i \sum_{j \neq i} \left[ \frac{(1-t)w_j \ell_j + e - h(\ell_j)}{(1-t)w_i \ell_i + e - h(\ell_i)} \right]^\rho \right\}. \quad (24)$$

Let us focus on the case in which  $\beta_i = 1$ , a case which resembles that with ethical behaviour studied above. Moreover, to facilitate comparison with the case of ethical behaviour, we assume there are two wage types with  $w_2 > w_1$  with populations  $n_1$  and  $n_2$  as before. In this case, utilities can be equalised using a linear progressive tax, in which case (24) becomes:

$$w_i(1-t) - h'(\ell_i) = -tw_i[1 + (n-1)]/n, \quad i = 1, 2, \quad (25)$$

which implies that  $w_i = h'(\ell_i)$ , and that  $\ell_i = \bar{\ell}_i$ , which is the ethical labour supply. Therefore, this outcome would correspond with the case of ethical behaviour when there are two wage types and  $t = \bar{t}$ . Therefore, 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  $t$  differs from  $\bar{t}$ . To simplify the notation, let  $\psi$  be defined as follows:

$$\psi = \left[ \frac{(1-t)w_1 \ell_1 + e - h(\ell_1)}{(1-t)w_2 \ell_2 + e - h(\ell_2)} \right]^\rho. \quad (26)$$

Using this, the first-order conditions (24) in equilibrium become:

$$w_1(1-t) - h'(\ell_1) = -tw_1[1 + (n_1 - 1) + n_2\psi]/n, \quad (27)$$

$$w_2(1-t) - h'(\ell_2) = -tw_2[1 + (n_2 - 1) + n_1/\psi]/n. \quad (28)$$

When  $t < \bar{t}$ , the type 1's have a lower level of utility than type 2's, so  $\psi < 1$ . Then,

$$w_1(1-t) - h'(\ell_1) = -tw_1[n_1 + n_2\psi]/n > -tw_1[n_1 + n_2]/n, \quad (29)$$

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:

$$w_2(1-t) - h'(\ell_2) = -tw_2[1 + (n_2 - 1) + n_1/\psi]/n < -tw_2[n_1 + n_2]/n, \quad (30)$$

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  $\bar{t}$ . Figures 3a and 3b show the labour supplies for the two types under altruistic and egoistic preferences.

The contrast with respect to both egoistic and ethical labour supplies is 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 characterised by inelastic ranges that are unique to the ethical case.

## V. Conclusion

As we showed in the preceding section, the pattern of labour supply choices is very different when we compare the more standard altruistic model with our proposed ethical behaviour. One important reason for such differences comes from the asymmetry we introduced in our behavioural assumptions. When individuals are asked to pay more in taxes than what they believe 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 than what they believe to be ethical, they do not provide more than the ethical labour supply to redistribute to others, as in the altruistic case. Others have made equivalent asymmetric assumptions. 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. Bilodeau and Gravel (2004) make the same type of asymmetric assumption

in dealing with voluntary contributions to public goods. Even if this form of asymmetric treatment were to be relaxed, altruistic and ethical behaviours would still generate some different predictions. To see this, note that for every tax rate between  $\tilde{t}_1$  and  $\tilde{t}_2$  the total tax liability for both agents remains constant. For example, if the tax rate were to slightly increase above  $\bar{t}$ , the high-wage agent would reduce her labour supply to avoid paying taxes above what she believes to be ethical. The low-wage agent would then face the same tax burden, and consequently would still choose the same labour supply. It is only when the tax rate is raised above  $\tilde{t}_2$  that symmetric treatment would make a difference. It is not obvious what would be the consequence of relaxing this assumption for a tax rate outside of the range  $[\tilde{t}_1, \tilde{t}_2]$ , but we are confident that our result would hold for a tax rate in between.

If ethical behaviour can be applied to income tax, it can also be applied to other forms of taxation, like consumption taxes. If an individual is aware that the payment of consumption taxes provides social benefits by allowing the government to make transfers or provide public goods, this individual can compute what would be an ethical tax burden using a social welfare function. From there, the behaviour of this individual would be similar to that described here. As the tax on a good rises, an individual may not alter her consumption until the tax burden becomes large enough, and so on. However, the important aspect is that the individual realised that the tax paid provides social benefit. Consequently, some form of taxation may be more prone to the formation of ethical behaviour.

Among the potential extensions to this paper, the most obvious would be to consider more than two types of individuals. With more than two types, utilities will not be equalised among all agents in an optimum. Nevertheless, this would not change our results significantly provided individuals recognise the limits of the tax system when assessing their ethical tax burden. All individuals would agree on the ethical tax rate  $\bar{t}$ , which would still maximise the same social welfare function. The rest of individuals' choices would be made in the same fashion.

A final, but conceptually difficult, extension would be to introduce heterogeneity among agents in terms of ethics. This would amount to finding out whether there can be more than one ethical tax rate. An easy approach would be to assume that when assessing their ethical tax rate, each individual maximises a social welfare function that puts a weight  $\beta < 1$  on others. As a consequence, different individuals would have different  $\bar{t}$ 's. This would make it unlikely 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, in turn, will put pressure on the tax burden of the rich, 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.

## Appendix

### *Proof of Lemma 1*

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

$$\tilde{t}_i \left[ w_i \underline{\ell}_i(\tilde{t}_i) - \frac{n_i w_i \underline{\ell}_i(\tilde{t}_i) + n_j w_j \underline{\ell}_j(\tilde{t}_i)}{n} \right] = \bar{t} \left[ w_i \bar{\ell}_i - \frac{n_i w_i \bar{\ell}_i + n_j w_j \bar{\ell}_j}{n} \right], \quad (\text{A1})$$

where  $\underline{\ell}_j(\tilde{t}_i) = \bar{\ell}_j$  (by definition of  $\tilde{t}_i$ ). Equation (A1) describing  $\tilde{t}_i$  can be rewritten as:

$$\tilde{t}_i [w_i \underline{\ell}_i(\tilde{t}_i) - w_j \bar{\ell}_j] = \bar{t} [w_i \bar{\ell}_i - w_j \bar{\ell}_j]. \quad (\text{A2})$$

Consider first the determination of  $\tilde{t}_1$ . From equation (A2),  $\tilde{t}_1$  is given by

$$\tilde{t}_1 = \bar{t} \left[ \frac{w_2 \bar{\ell}_2 - w_1 \bar{\ell}_1}{w_2 \bar{\ell}_2 - w_1 \underline{\ell}_1(\tilde{t}_1)} \right]. \quad (\text{A3})$$

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  $\bar{t}w_i\bar{\ell}_i - (\bar{t}/n)[n_1w_1\bar{\ell}_1 + n_2w_2\bar{\ell}_2]$ . Recall from equation (7) 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 rates 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:

$$\ell_1^*(t) = \left[ \frac{\bar{t}}{t} \right] \bar{\ell}_1 - \left[ \frac{\bar{t} - t}{t} \right] \frac{w_2 \bar{\ell}_2}{w_1}. \quad (\text{A4})$$

When the tax  $t$  reaches  $\tilde{t}_1$ , then  $\ell_1^*(\tilde{t}_1) = \underline{\ell}_1(\tilde{t}_1)$  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. To 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:

$$\frac{\partial \ell_2(t)}{\partial t} > - \frac{[w_2\ell_2(t) - w_1\bar{\ell}_1]}{tw_2}. \quad (\text{A5})$$

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  $t \in [\tilde{t}, \tilde{t}_2]$ , individuals of type 2 supply labour such that:

$$\ell_2^*(t) = \left[ \frac{\tilde{t}}{t} \right] \bar{\ell}_2 - \left[ \frac{\tilde{t} - t}{t} \right] \frac{w_1\bar{\ell}_1}{w_2}. \quad (\text{A6})$$

When  $t$  reaches  $\tilde{t}_2$ , then  $\ell_2^*(\tilde{t}_2) = \ell_2(\tilde{t}_2)$ . For all tax rates above  $\tilde{t}_2$ , individuals of type 2 supply  $\ell_2(t)$ . 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:

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

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

■

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